WORLD ARMAMENTS AND DISARMAMENT

SIPRI YEARBOOK 1986

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World Armaments and Disarmament
SIPRI Yearbook 1986

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Stockholm International Peace Research Institute

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During the past year, three people who have been a vital part of SIPRI's history have died: Tage Erlander, former Prime Minister of Sweden, who was the moving spirit in setting up the Institute; Alva Myrdal, the first chairman of the Governing Board, who was always ready to help SIPRI in all kinds of ways; and Olof Palme, Prime Minister of Sweden until his death, who was also a source of great support and inspiration for SIPRI.

These are some of the words that Olof Palme spoke at the memorial ceremony for Alva Myrdal on 16 February 1986, a few days before he was killed 'She devoted the last decades of her life primarily to the struggle for peace and disarmament, and against the horror of nuclear weapons. She understood what it took to work toward peace. You need knowledge. She made heavy demands on herself in that respect. You have to be strong. The weak resort to violence. The strong want peace. You need patience and a burning conviction. This is what she wrote: "Pessimism is no good as a working hypothesis, except for historians who work after the fact. Those of us who live and want to work for the future must suppress those doubts that border on despair." Alva Myrdal inspired hope and confidence in the future. She represented what was indestructible, stubbornly durable, forward-looking. She relied more and more on public opinion, on the desire of ordinary people for security, as a powerful force in working towards peace. In 1980, when she received the Albert Einstein Peace Prize, she said: "Many more people must learn not to give up their opposition to all forces which are opposed to peace, to cooperation, to life and love. Despite all disappointments I have never allowed myself to feel resigned. This is my message today: Giving up is not worthy of a human being."'

Preface

This, the seventeenth Yearbook, is published in the twentieth year of SIPRI's existence. The main themes of the Yearbook are summarized in the introductory chapter. There are, as usual, a number of special studies. The question of a comprehensive test ban is once more a live issue. The Yearbook gives a revised list of all known nuclear weapon tests, back to 1945; there is new information about the US test programme in past years. General background material is provided in a special section on the comprehensive test ban issue, and the work being done at Geneva, under the auspices of the Conference on Disarmament, is reviewed.

The material on public opinion on peace and war is expanded in this Yearbook, based on a new data bank which collects public opinion surveys from many sources.

There is a special study of Chinese nuclear weapon systems: although China is reducing the share of total military expenditure in its national budget, within that military expenditure total the development of nuclear weapon systems appears to have high priority.

There is of course a good deal of attention in this Yearbook to the US Strategic Defense Initiative: a chapter on the progress of the research; a chapter on the origin of the idea and the strategic and arms control consequences; and a chapter on the economic issues arising from other countries' participation in the research programme.

The section on new military technology includes a study of advanced computing: developments here—in particular the possible substitution of computer decision for human decision—have important implications for security and arms control. There is also a chapter on emerging conventional military technology, with particular reference to Europe and to possible arms control consequences there.

The military expenditure section includes a study of the problem of estimating Soviet military expenditure. There is also an examination of the flow of military aid (or security assistance) to Central American countries; this is a component of their military spending which has been growing fast. The statistical section on world expenditure on military research and development includes this year a comparison of military R&D with civil government R&D and total (government and non-government) spending.

In the arms control section, there is a report on the third Review Conference of the Non-Proliferation Treaty; a study of the Contadora search for regional security; and an account of the Treaty of Rarotonga—the South Pacific Nuclear Free Zone Treaty.

The record of UN General Assembly resolutions and decisions on

disarmament for 1985 is not included this year; it is intended to publish this biannually.

On the occasion of this, the last Yearbook with which I am concerned, I would like to express my particular thanks to Connie Wall and Billie Bielckus, who have had the editorial responsibility for the Yearbook throughout my period as director.

SIPRI
February 1986

Frank Blackaby
Director

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GLOSSARY AND CONVENTIONS

Acronyms

AAM	Air-to-air missile
AASM	Advanced air-to-surface missile
ABM	Anti-ballistic missile
ACM	Advanced cruise missile
ADM	Atomic demolition munition
ALCM	Air-launched cruise missile
ASAT	Anti-satellite
ASM	Air-to-surface missile
ASW	Anti-submarine warfare
ATBM	Anti-tactical ballistic missile
ATM	Anti-tank missile
AWACS	Airborne warning and control system
BMD	Ballistic missile defence
BW	Biological weapon (warfare)
C^3I	Command, control, communications and intelligence
CBM	Confidence-building measure
CBW	Chemical and biological warfare
CD	Conference on Disarmament (Geneva)
CDE	Conference on Disarmament in Europe (Stockholm)
CEP	Circular error probable
COIN	Counter-insurgency
CSBM	Confidence- and security-building measure
CSCE	Conference on Security and Co-operation in Europe (Helsinki, Belgrade, Madrid)
CTB	Comprehensive test ban
CW	Chemical weapon (warfare)
DC	Disarmament Commission
DEW	Directed-energy weapon
EDI	European Defence Initiative
EMP	Electromagnetic pulse
Enmod	Environmental modification
ERW	Enhanced radiation (neutron) weapon
ET	Emerging technology
Eureka	European Research Co-ordination Agency
FEBA	Forward edge of the battle area
FOFA	Follow-on forces attack
GLCM	Ground-launched cruise missile
IAEA	International Atomic Energy Agency
ICBM	Intercontinental ballistic missile
INF	Intermediate-range nuclear force
IOC	Initial operating capability
IRBM	Intermediate-range ballistic missile
ISMA	International Satellite Monitoring Agency
KEW	Kinetic-energy weapon
Laser	Light amplification by simulated emission of radiation
LRTNF	Long-range theatre nuclear force
MAD	Mutual assured destruction
MARV	Manoeuvrable re-entry vehicle
MFR	Mutual force reduction
MBT	Main battle tank
MHV	Miniature homing vehicle
MIRV	Multiple independently targetable re-entry vehicle
MLRS	Multiple-launch rocket system
MoU	Memorandum of understanding
MRV	Multiple (but not independently targetable) re-entry vehicle
MURFAAMCE	Mutual Reductions of Forces and Armaments and Associated Measures in Central Europe
NATO	North Atlantic Treaty Organization
NPT	Non-Proliferation Treaty

PNE(T)	Peaceful Nuclear Explosions (Treaty)
R&D	Research and development
RDT&E	Research, development, testing and evaluation
RPV	Remotely piloted vehicle
RV	Re-entry vehicle
SALT	Strategic arms limitation talks
SAM	Surface-to-air missile
SCC	Standing Consultative Commission (SALT)
SDI	Strategic Defense Initiative (US)
SICBM	Small ICBM
SLBM	Submarine-launched ballistic missile
SLCM	Sea-launched cruise missile
SRAM	Short-range attack missile
SRBM	Short-range ballistic missile
SSB	Non-nuclear-powered ballistic-missile submarine
SSBN	Nuclear-powered ballistic-missile submarine
SSN	Nuclear-powered attack submarine
START	Strategic arms reduction talks
TNF	Theatre nuclear force
TTB(T)	Threshold Test Ban (Treaty)
WTO	Warsaw Treaty Organization (Warsaw Pact)

Glossary

Anti-ballistic missile (ABM) system	Weapon system for intercepting and destroying ballistic missiles.
Binary chemical weapon	A shell or other device filled with two chemicals of relatively low toxicity which mix and react while the device is being delivered to the target, the reaction product being a supertoxic chemical warfare agent, such as nerve gas.
Biological weapon (BW)	Living organisms or infective material derived from them, which are intended for use in warfare to cause disease or death in man, animals or plants, and the means of their delivery.
Chemical weapon (CW)	Chemical substances—whether gaseous, liquid or solid—which might be employed as weapons in combat because of their direct toxic effects on man, animals or plants, and the means of their delivery
Circular error probable (CEP)	A measure of missile accuracy: the radius of a circle, centred on the target, within which 50 per cent of the weapons aimed at the target are expected to fall.
Conference on Disarmament (CD)	Multilateral arms control negotiating body, based in Geneva, which is composed of 40 states, including all the nuclear weapon powers.
Conference on Disarmament (CDE)	Conference on Confidence- and Security-Building Measures and Disarmament in Europe, the first stage of which opened in Stockholm, Sweden, in January 1984, to last until September 1986. Part of the CSCE process. *See also*: Conference on Security and Co-operation in Europe.
Conference on Security and Co-operation in Europe (CSCE)	Conference of the NATO, WTO and European neutral and non-aligned states, which began in 1972 and in 1975 adopted a Final Act (also called the Helsinki Declaration), containing, among others, a Document on confidence-building measures and disarmament. The next follow-up meeting is in the autumn of 1986 in Vienna.
Conventional weapon	Weapon not having mass destruction effects. *See also*: Weapon of mass destruction.
Counterforce attack	Nuclear attack directed against military targets.
Countervalue attack	Nuclear attack directed against civilian targets.

Cruise missile	Unmanned, self-propelled, guided weapon-delivery vehicle which sustains flight through aerodynamic lift, generally flying at very low altitudes to avoid radar detection, sometimes following the contours of the terrain. It can be air-, ground- or sea-launched and deliver a conventional or nuclear warhead.
Disarmament Commission (DC)	A subsidiary, deliberative organ of the UN General Assembly for disarmament matters, composed of all UN members.
First-strike capability	Theoretical capability to launch a pre-emptive nuclear attack which would destroy all of an adversary's retaliatory nuclear forces.
Flexible response	The NATO doctrine for reaction to an attack with a full range of military options, including the use of nuclear weapons.
Helsinki Declaration	*See*: Conference on Security and Co-operation in Europe.
Initial operating capability (IOC)	Date by which a weapon system is first deployed, ready for use in the field.
Intercontinental ballistic missile (ICBM)	Ballistic missile with a range in excess of 5500 km.
Intermediate-range nuclear force (INF)	Theatre nuclear forces with a range between 1000 and 5500 km. *See also*: Theatre nuclear force.
Kiloton (kt)	Measure of the explosive yield of a nuclear weapon equivalent to 1000 tons of trinitrotoluene (TNT) high explosive. (The bomb detonated at Hiroshima in World War II had a yield of some 12–15 kilotons.)
Launcher	Equipment which launches a missile. ICBM launchers are land-based launchers which can be either fixed or mobile. SLBM launchers are missile tubes on submarines.
Launch-weight	Weight of a fully loaded ballistic missile at the time of launch.
Megaton (Mt)	Measure of the explosive yield of a nuclear weapon equivalent to one million tons of trinitrotoluene (TNT) high explosive.
Multiple independently targetable re-entry	Re-entry vehicles, carried by one missile, which can be directed to separate targets along separate trajectories (as distinct from MRVs).
Mutual Assured Destruction (MAD)	Concept of reciprocal deterrence which rests on the ability of the nuclear weapon powers to inflict intolerable damage on one another after surviving a nuclear attack. *See also*: Second-strike capability.
Mutual reduction of forces and armaments and associated measures in Central Europe (MURFAAMCE)	Subject of negotiations between NATO and the Warsaw Treaty Organization, which began in Vienna in 1973. Often referred to as mutual force reduction (MFR).
Peaceful nuclear explosion (PNE)	Application of a nuclear explosion for non-military purposes such as digging canals or harbours or creating underground cavities.
Re-entry vehicle (RV)	That part of a ballistic missile designed to carry a nuclear warhead and to re-enter the earth's atmosphere in the terminal phase of the missile's trajectory.
Second-strike capability	Ability to survive a nuclear attack and launch a retaliatory blow large enough to inflict intolerable damage on the opponent. *See also*: Mutual Assured Destruction.
Standing Consultative Commission (SCC)	US–Soviet consultative body established in accordance with the SALT agreements, to promote the objectives and implementation of the agreements.
Strategic arms limitation talks (SALT)	Negotiations between the Soviet Union and the United States, held from 1969 to 1979, which sought to limit the strategic nuclear forces, both offensive and defensive, of both sides.
Strategic arms reduction talks (START)	Negotiations between the Soviet Union and the United States, initiated in 1982, which sought to reduce the strategic nuclear forces of both sides. Terminated by the USSR in December 1983. The nuclear and space arms talks that opened in Geneva in March 1985 include strategic arms reductions.

Strategic nuclear weapons	ICBMs, SLBMs and bomber aircraft carrying nuclear weapons of intercontinental range (over 5500 km).
Terminal guidance	Guidance provided in the final, near-target phase of the flight of missile.
Theatre nuclear force (TNF)	Nuclear weapons with ranges of less than 5500 km, sometimes divided into long-range (over 1000 km), medium-range (200–1000 km) and short-range (up to 200 km) theatre nuclear weapons.
Throw-weight	The sum of the weight of a ballistic missile's re-entry vehicle(s), dispensing mechanisms, penetration aids, and targeting and separation devices.
Toxins	Poisonous substances which are products of organisms but are inanimate and incapable of reproducing themselves. Some toxins may also be produced by chemical synthesis.
Warhead	That part of a weapon which contains the explosive or other material intended to inflict damage.
Weapon of mass destruction	Nuclear weapon and any other weapon which may produce comparable effects, such as chemical and biological weapons.
Yield	Released nuclear explosive energy expressed as the equivalent of the energy produced by a given number of tons of trinitrotoluene (TNT) high explosive. *See also*: Kiloton and Megaton.

Conventions

. .	Data not available or not applicable
—	Nil or a negligible figure
( )	Uncertain data
[ ]	Estimate with a high degree of uncertainty
m.	million
b.	billion (thousand million)
$	US $, unless otherwise indicated

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ABSTRACTS

DEN OUSTEN, E., 'Public opinion on peace and war', in *SIPRI Yearbook 1986*, pp. 17–35.

There are many more polls about issues of peace and war. Conclusions are only warranted when questions phrased in different ways get the same answers. In Western countries the fear of war seems to be receding from a high point in 1953. Concern about nuclear weapons seems not to have been decreasing. In the USA the major change has been the sharp fall in numbers of those in favour of increases in military spending. On security issues, there is ambivalence—e.g. endorsement of the idea of building the strongest military force. Public opinion in FR Germany seems favourable to arms control proposals—e.g. a comprehensive test ban and chemical weapon-free zone in Europe. In the UK there is a majority for sending the cruise missiles back to the USA, although this majority might disappear with some dual-key arrangement. In Europe there was scepticism in 1985 about any outcome from the US–Soviet negotiations on nuclear weapons.

ARKIN, W. M., BURROWS, A. S., COCHRAN, T. B., DIN, A. M., FIELDHOUSE, R. W., NORRIS, R. S. & SANDS, J. I., 'Nuclear weapons', in *SIPRI Yearbook 1986*, pp. 37–80.

In 1985 there was a new sense of movement in nuclear arms control talks. The USA and the USSR agreed to the principle of reducing their nuclear forces by 50 per cent and are trying to eliminate intermediate-range nuclear missiles. While the talk was about reductions, the actions were about increases. Both the USA and the USSR are beginning to deploy a new generation of nuclear weapon systems while Britain, France and China continue their nuclear modernization and expansion programmes. The qualitative and quantitative weapon developments are outpacing the efforts to limit them. Arms control is at a noteworthy juncture: proposals suggest the possibility of substantial reductions, while compliance issues and actions threaten to destroy previous and future agreements. Strategic defence developments may determine arms control success or failure.

BLACKABY, F., 'Space weapons and security', in *SIPRI Yearbook 1986*, pp. 81–95.

US interest in ballistic missile defence did not come from an inter-agency review of nuclear weapon strategy: it was an idea brought to the President by a few outside advisers. There is an absence of allied enthusiasm, coupled with a desire to get a share of available research funds. The original proposal was for a transition from offensive to defensive weapons, leading to the disappearance of offensive systems. This could only come about by an agreement between the USA and the USSR, which seems most unlikely. The Soviet Union's research programme seems concerned with land-based systems which might intercept missiles in their final phases, rather than space-based systems to catch missiles in their boost phase. If a unilateral decision is taken to deploy defensive systems in addition to offensive ones, that seems certain to provoke countermeasures. The sensible course appears to be to accept constraints on developing defensive weapons as part of a package which reduces offensive weapons.

FIELDHOUSE, R. W., 'Chinese nuclear weapons: an overview', in *SIPRI Yearbook 1986*, pp. 97–113.

Although China has possessed nuclear weapons since 1964, its impact as a nuclear weapon power is unstudied. China's nuclear stockpile contains only some 300–400 weapons, yet they can be considered the most significant after those of the USA and the USSR. Whereas any Soviet nuclear conflict with either Britain or France would involve the USA, China could engage in nuclear war against the USSR without any other nuclear power being involved. China's nuclear weapon history, development and deployment are examined in this context. It is unclear whether China will keep a minimum nuclear posture or pursue large nuclear forces. The latter choice could spur a regional arms race that would make arms control efforts more difficult. China may take an interest in becoming more directly involved in the arms control process.

BLACKABY, F. & FERM, R., 'A comprehensive test ban and nuclear explosions in 1985', in *SIPRI Yearbook 1986*, pp. 115–129.

The Soviet Union declared a moratorium on nuclear weapon tests from 6 August 1985 to 1 January 1986, and then extended it for a further three months. This brought the issue of a comprehensive test ban to the fore again. An agreement on a ban—even if it were initially only by three of the five nuclear weapon states—would be politically very important and do a great deal to inhibit the development of new types of nuclear warhead. The USA and the UK are not willing to reopen negotiations. This is not, it appears, because of the problems of verification. There have been considerable advances in recent years in detection capability. The USA takes the view that its security will be enhanced by continued testing. The number of nuclear explosions in 1985 was the lowest obtained for one year for more than a decade, owing to the Soviet moratorium. The methods of detecting nuclear tests have been developed through new and more sophisticated seismological stations. Although the nuclear weapon states show various degrees of secrecy about their testing programmes, information about how many tests are conducted and where they are conducted is reasonably reliable.

PERRY ROBINSON, J. P., 'Chemical and biological warfare: developments in 1985', in *SIPRI Yearbook 1986*, pp. 159–179.

The CBW arms control regime was reportedly violated by 10 countries during the year. But only in the case of Iraq's reported use of chemical weapons in the Gulf War was there any sort of international investigation. Funds for resumed US production of chemical weapons were approved by Congress but spending of them was made conditional upon endorsement by the political leaders of NATO. Further uncorroborated information emerged from Western sources about the chemical-weapon capabilities of the USSR. There were claims, also uncorroborated, that some 16 countries now possessed such capabilities. Progress towards a global chemical disarmament treaty was registered by the Geneva Conference on Disarmament, but basic disagreement persisted on core issues of verification. Negotiations to establish chemical weapon-free zones in Europe and Latin America were proposed at the governmental level. Interest grew in the idea of establishing a chemical-weapons non-proliferation regime.

JASANI, B., 'The military use of outer space', in *SIPRI Yearbook 1986*, pp. 131–157.

Technological momentum in the field of space weapons is being generated in both the USA and the USSR for offensive and defensive weapons based on the ground and in outer space. In Western Europe, ground-based anti-tactical ballistic missile technology is being seriously considered. The French Eureka proposal, a high-technology civil programme, has some elements common to the US Strategic Defense Initiative (SDI) efforts. These issues are discussed, and the problems raised from the point of view of existing arms control agreements are identified. The chapter also contains data on the military satellites launched during 1985.

DIN, A. M., 'Strategic computing', in *SIPRI Yearbook 1986*, pp. 181–191.

Strategic computing has been defined by the Defense Advanced Research Projects Agency (DARPA) as being a defiance to the defence community 'to produce adaptive, intelligent systems having capabilities far greater than current computers for use in diverse applications including autonomous systems, personalized associates and battle management systems'. Applications of advanced computing techniques, artificial intelligence and expert systems could emerge in connection with the command and control structures required for a future strategic defence. The important concern about military applications of strategic computing is the conceptual and technical shortcomings associated with letting machines take over decision-making from humans. On the other hand, the new computing techniques may have valuable arms control applications.

HEROLF, G., 'Emerging technology', in *SIPRI Yearbook 1986*, pp. 193–208.

Emerging technology (ET) is a concept known since the early 1980s: it is the NATO effort to take advantage of a higher level of technology in order to improve conventional weapon capabilities *vis-à-vis* the Warsaw Pact. Weapon systems incorporating emerging technology are now being developed in the USA and West European countries. As yet, however, there is no complete NATO conceptual framework for their use to serve as a guide for selecting the weapon systems. There is disagreement as to the technical and operational feasibility of some of these weapon systems and European apprehension for a worsened arms trade balance. There is also discussion of the effects on some concepts which incorporate emerging technology, such as NATO's FOFA (follow-on forces attack) and the US Army's AirLand Battle doctrine. Critics of these concepts hold that they might negatively affect crisis stability and lower the nuclear threshold. Different views are expressed on the relevance of the US doctrine for Europe. These discussions reflect different perceptions of threat and security, of a fundamental nature for NATO.

COLMAN, J. & ADAMS, G., 'The US defence budget', in *SIPRI Yearbook 1986*, pp. 249–261.

Since 1980 the Reagan Administration, with the support of Congress, has directed the largest peacetime military buildup in US history. In 1985 Democrats and Republicans in both Houses of Congress demonstrated their concern over massive budget deficits by rejecting the President's proposed military spending increases for FY 1986. As a result of deficit-cutting legislation passed in December 1985, further cuts were made automatically in the military budget. In total, national defence budget authority for FY 1986 was cut by roughly 6 per cent in real terms compared to FY 1985. In presenting his military budget request for FY 1987, President Reagan requested increases amounting to 8 per cent above inflation. To comply with deficit limits on the total budget, heavy cuts were made in domestic spending programmes.

TULLBERG, R., 'World military expenditure', in *SIPRI Yearbook 1986*, pp. 209–248.

Between 1980 and 1985, total world military spending grew faster than in the previous five years. It also grew faster than the world output of goods and services. Higher levels of military spending in 1980–5 compared to 1975–80 have been recorded by NATO, the WTO, the Middle East, South Asia and Oceania. Public expenditure restraints make it unlikely that these growth levels can be sustained during the remainder of the decade. In many countries, military establishments claim exemption from real spending cuts; these are to be borne instead by non-military public services. Examples illustrate that it is difficult to reduce the share of resources going to the military, even when it is clear that current resource distribution is harmful to a country's economic development.

JACOBSEN, C. J., 'Soviet military expenditure and the Soviet defence burden', in *SIPRI Yearbook 1986*, pp. 263–274.

Knowledge of the Soviet defence burden remains inadequate. The official Soviet defence expenditure figure is neither helpful nor inclusive. There is no consensus on what or how much is covered by other budget accounts. Soviet statistics do not allow independent calculation, and official Western estimates are equally dubious, reflecting Western political dynamics rather than Soviet reality. The Soviet defence industry is not immune to the vicissitudes of the economy at large. The Soviet military does not enjoy *carte blanche* but contributes extensively to civilian needs, in terms of both goods and services, extracting benefits from a wide range of civilian endeavours in turn. The military-political culture is quite different from that which prevails in the West. There is no military-industrial complex threatening the Soviet state. In the USSR the military is of the state, integral to a wider establishment. The military burden cannot be specified, for much is inextricably fused with the burden of state and culture. It is systemic and will be sustained, because it is of the system. Western debate is ethnocentric. New research and understanding are needed.

SKÖNS, E., 'The SDI programme and international research co-operation', In *SIPRI Yearbook 1986*, pp. 275–297.

The Strategic Defense Initiative programme involves sizeable investment in research and development in many high-technology fields considered crucial to future technological and economic progress, especially in computer technology. Other major industrial countries therefore view it as a threat to the competitiveness of their industries. For this reason, the US invitation in 1985 to other countries to participate in SDI projects met with considerable interest, especially from high-technology companies in many of the invited countries. Past experience from co-operation with the United States is, however, not entirely positive. In spite of the intentions to improve co-operation in arms procurement within NATO, the results have been quite limited. In addition, the transfer of US technologies has recently been subject to enhanced restrictions. While there are signs of some change in the US attitude towards international co-operation, there is no evidence of a more liberal US stance on technology control.

ACLAND-HOOD, M., 'Military research and development expenditure', in *SIPRI Yearbook 1986*, pp. 299–307.

Countries undertake military R&D with the intention of improving their national security, but much military R&D reduces security. Civil R&D is problem-solving: military R&D is in the business of creating its own series of problems. World military R&D expenditure continues to grow rapidly and reached about $80 billion in 1985. It is highly concentrated in a few countries. Among the bigger spenders on total R&D, those concentrating heavily on military R&D are not straining their general resources—its shares in GDP have been static or falling over the past 15 years—but they do not seem to be stimulating their civil or total R&D: rather the reverse. This is not surprising. Spin-offs occur in both directions. Military R&D depends on a strong general civilian base. Nor is it likely that military R&D can substitute for R&D for economic or industrial objectives. It has great risks and should be undertaken solely to improve national and international security.

TULLBERG, R. & MILLÁN, V., 'Security assistance; the case of Central America', in *SIPRI Yearbook 1986*, pp. 309–322.

Some developing countries have access to substantial sums in security assistance—military loans and grants and general economic support given to them because of their strategic importance to the donor. This strategic aspect of aid complicates proposals for the transfer of resources from the military sectors of the industrialized world to aid for developing countries. In the case of Central America, amounts of security assistance have been rising fast since 1979, and in some countries they now exceed military spending from indigenous sources. Security assistance permits levels of military activity higher than could otherwise be sustained with domestic resources alone and may encourage governments to seek military solutions to problems of civil disorder.

BRZOSKA, M. & OHLSON, T., 'The trade in major conventional weapons', in *SIPRI Yearbook 1986*, pp. 323–422.

Provisional figures for 1985 suggest that the slightly downward trend of the volume of arms transfers of the early 1980s is continuing. This trend is most pronounced in Africa and South America; demand is more stable in the Far East and the Middle East. During 1981–5 the USA was the leading supplier of major weapons (accounting for 39% of total exports). The USSR ranked second (28%), followed by France (11%). In deliveries to the Third World the USSR accounted for 32%, followed by the USA (27%). Third World exporters accounted for 5% of arms exports to the Third World. Economic problems, market saturation and more domestic arms production explain the lack of growth in arms transfers. Competition among suppliers is increasing as a result of reduced demand and the entry of more suppliers on the market. This generates conflicting trends for and against armaments control. Superpower rivalry and the economic interests of the suppliers militate against control, while economic pressure to import less facilitates control. Despite political initiatives that might enhance disarmament, prospects remain bleak.

LODGAARD, S., 'The building of confidence and security at the Stockholm and Vienna negotiations', in *SIPRI Yearbook 1986*, pp. 423–446.

Many European countries would find it difficult to attend the Third Follow-up Meeting of the CSCE with the dismal record of an unsuccessful human rights meeting in Ottawa, an unsuccessful cultural forum in Budapest, and an unfinished first phase of the CDE. The superpowers want concrete results on security issues in connection with their summit meetings. By trimming the conference proposals down to common denominators, an agreement by autumn 1986 to extend the Helsinki CBMs does not seem unrealistic. At the Vienna MFR talks, the critical question is whether the major powers are politically prepared to describe the central European situation in such terms as 'balance' and 'equivalence'. The talks are about manpower, while the central security concerns are about fighting power. Upon conclusion of a first-phase agreement there is a strong case for rearranging the whole undertaking, make the force postures less offensive and provocative. That rearrangement ought to be synchronized with the second stage of the CDE, since the two ventures address overlapping issues.

GOLDBLAT, J., 'The third review of the Non-Proliferation Treaty', in *SIPRI Yearbook 1986*, pp. 469–497.

In spite of pessimistic predictions, the NPT Review Conference, held in 1986, succeeded in working out a final declaration and in adopting it by consensus. The parties decided to reaffirm the validity of the NPT and their commitment to its purposes and provisions. They also 'agreed to disagree' on specific issues more or less directly related to the treaty. As shown in a detailed analysis of the conference proceedings and declaration, the balance of agreements and disagreements tips heavily in the direction of the former. The review of motivations of the nuclear threshold countries, which have refused to join the NPT, suggests that there is no imminent danger of an overt expansion of the nuclear club. In the long run, it is only by de-emphasizing the role of nuclear weapons in foreign policy through a sustained process of dismantling the nuclear arsenals that the imperative of non-proliferation can entrench itself among the norms of international behaviour.

GOLDBLAT, J. 'Multilateral arms control efforts', in *SIPRI Yearbook 1986*, pp. 447–467.

Only in the area of chemical weapons did the Conference on Disarmament record progress in 1985. However, the draft convention which has been elaborated contains many gaps to be filled; these are pointed out. The goal of complete chemical disarmament appears still to be far away. As an interim measure, a US–Soviet understanding to prevent proliferation of chemical weapons is considered a possibility. Also the establishment of a chemical-weapon free zone in Europe may help remove stumbling-blocks in the way of a global agreement. As regards nuclear tests, a step backwards was made with the announcement by the USA of its disinterest in a comprehensive ban. There exists a possibility of an agreed limitation on the size (and perhaps the number) of nuclear explosions. However, to have a significant impact on the nuclear arms race and to serve as an effective non-proliferation measure, a test ban must be complete and general. The discussion of outer space issues was restricted to examination of treaties with the view to identifying lacunae in existing international law. The vulnerability of orbiting satellites is a matter of general concern, calling for a multilateral arms control effort.

FRY, G. E., 'The South Pacific nuclear-free zone', in *SIPRI Yearbook 1986*, pp. 499–521.

The South Pacific nuclear-free zone—the Treaty of Rarotonga—changes no existing involvement of the member states. At the time of signature, there were no nuclear weapons stationed on any territory in the region, and no country wanted to develop or acquire nuclear weapons of its own. Transits are rather frequent but can continue unaffected. An international agreement in which governments agree to remain nuclear weapon-free and to enter obligations to that effect, backed up by verification procedures, means that the existing favourable situation is entrenched. The Treaty of Rarotonga puts an obstacle in the way of competitive base developments in the South Pacific.

GOLDBLAT, J. & MILLÁN, V., 'The Central American crisis and the Contadora search for regional security', in *SIPRI Yearbook 1986*, pp. 523–547.

Since the 1970s Central America has been in continuous crisis, characterized by civil wars and interstate conflicts. These developments have brought about interference by outside powers and an unprecedented arms buildup. The Contadora group of states—comprising Colombia, Mexico, Panama and Venezuela—has been making efforts to bring peace to the region. According to the September 1985 Contadora Act, the countries of the Central American Isthmus would have to restrict military manoeuvres, limit armaments and armed forces, remove foreign military bases and considerably reduce other foreign military presence, stop illegal traffic in arms, combat terrorism, subversion or sabotage, and establish direct communications among states. An elaborate system of verification is also provided for. In spite of some shortcomings criticized by Nicaragua, the Act, which in addition to security matters, contains clauses on national reconciliation, human rights and electoral democratic processes, as well as undertakings in the economic and social fields, is an equitable basis for a peaceful settlement. Its implementation, however, requires respect for different political and social regimes.

Part I. Introduction

1. Introduction

FRANK BLACKABY

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Objective

SIPRI, in its Yearbook, sets out to analyse what is going on in the world military sector, and what progress (if any) is being made in the attempts to control or constrain military activity. An analysis of this kind is an essential part of the answer to more basic questions: Is the risk of a major war increasing or decreasing? Are we moving towards, or away from, a more stable world order?

In 1984 and 1985, the answer to both questions was negative. It was clear that things were getting worse. There were massive rearmament programmes, no progress in arms control and increasing disregard for international law. This year the answer is less categorical. It would not be right to say (in February 1986) that there are clear signs of a firm trend of improvement: but there are possibilities which seemed hardly to exist one or two years ago. However, it is so far a matter of possible rather than actual change. The forces which could prevent improvement are still strong.

The central question remains: Will there be any progress towards arms control during 1986 or not? If there is no progress, if the chances of an agreement appear to recede again, and if the technological arms race proceeds without any prospect of check, then the risk of a major war will continue to increase. Unless some progress is made in arms control, there is no reasonable chance of an improvement in US–Soviet relations. Apart from the risk of a major war, there are many areas of the world where success in reducing tensions depends on an improvement in those relations.

There are three reasons for some optimism. First, the summit meeting between President Reagan and General Secretary Gorbachev in November 1985 was not wholly without content. There was a joint statement about nuclear war: 'The sides . . . have agreed that a nuclear war cannot be won and must never be fought'. That represents progress of a kind. It indicates some measure of success for all those bodies and organizations which over the years have tried to spread the 'nuclear-weapon allergy'. Over a good part of the post-war period, the pressure from some military quarters has been to get politicians to accept the idea that nuclear weapons are only different from other weapons in that they are more powerful. The military position has always been to advocate replacing less powerful weapons by more powerful ones: hence the spread of tactical nuclear weapons in the 1950s and 1960s. It is in large part thanks to the efforts of the campaigning anti-nuclear organizations that the barrier between conventional and nuclear weapons has been kept, and indeed—by this joint US–Soviet statement—has been reinforced.

Second, the fact that further summit meetings have been agreed for both

1986 and 1987 may force some progress. Both sides will want to show something from these further meetings, and may consequently be ready to make the necessary concessions so that the negotiators can come up with something in the field of arms control or confidence-building which they can sign. Neither side can be happy with a series of summits which produce nothing. Summits which produce nothing would simply lead to an exchange of polemics, with each side blaming the other for the failure.

The third reason for optimism is an economic one. Both the United States and the Soviet Union are under economic pressure at least not to increase the diversion of economic resources into the military sector. On the US side economic policy seems likely to be dominated by the need to reduce the budget deficit. It will be very difficult to do this if military spending continues to rise as it has been doing in the past five years. In a centrally planned economy, the burden of military spending is more obvious than in a free market economy, and in the Soviet Union the share of military spending in national product is clearly much higher than in the United States. A further diversion of resources from civil to military use will not be welcome.

It will not be hard to judge whether 1986 is a year of progress or regress. For there to be progress there must be some signs on the arms control front: for example, there should be some agreement at Stockholm on confidence-building measures in Europe, and some significant progress in Geneva on an agreement about intermediate-range nuclear forces. The parties must also continue to abide by the main provisions of the unratified SALT II Treaty, and to continue to comply with the terms of the ABM Treaty in what the USA has chosen to call its 'restrictive' interpretation.

Of course it is possible—though at this moment it seems unlikely—that even more progress might be made. There could be an agreement at Vienna on the reduction of armed forces in Central Europe. It would be a remarkable step forward if the USA and the United Kingdom were willing to join the Soviet moratorium on nuclear weapon tests. It would also be a step forward if these two powers indicated that they were prepared to resume negotiations on a comprehensive test ban. There might be more rapid progress on a chemical weapons convention at the Conference on Disarmament in Geneva. It is just on the map of possibilities that significant progress might be made on the negotiations about offensive and defensive strategic nuclear weapon systems—though, given the basic divergence of views on defensive systems, this would be an almost miraculous outcome. These will be some of the indicators on the basis of which 1986 will be judged.

The introductory chapter, therefore, is particularly concerned this year with a discussion and an assessment of arms control possibilities. After examining some of the trends in military spending and the arms trade, it concentrates on weapon developments in the two areas—nuclear weapons and chemical weapons—in which negotiations concerning those weapon systems are in progress.

II. Military spending and the arms trade

Economic pressures may slow down the rise in world military spending. In some ways, it is surprising that this should be so. It is true that in Western industrial countries the share of military spending in national product has been rising in recent years. Even so, it is still well below the share which it had in the late 1950s: and that was not a period of great concern about the size of military budgets. For example, in the USA military spending in 1986 will probably be around 6–6.5 per cent of national product; in the late 1950s it was 9–10 per cent.

In Western countries, the economic pressure which is likely to hold back further substantial increases in military spending comes from budgetary policy. The best example is from the USA. The federal budget deficit in the fiscal year (FY) 1985 was $212 billion, and it is expected to be just over $200 billion in FY 1986. There is a general consensus that these figures must be brought down. However, this is coupled with strong reluctance—at least on the part of the present US Administration—to increase taxes. These two economic imperatives make it virtually impossible for military spending in the USA to continue to rise as it has been doing since 1980, by over 7 per cent a year in real terms. That rate is bound to come down sharply; even the present Administration's forward plans suggest that the real rise in actual outlays will slow down to some 3 per cent a year. Of course, it will still be running at a level very much higher than at the beginning of the decade.

West European members of NATO have not followed the US pattern: there has been no massive arms expansion programme in Western Europe in the past five years. Nor is there likely to be one now. It is true that NATO countries have readopted a 3 per cent annual rise in military spending as a target up to the year 1991. However, none of the main West European members of NATO intends to meet this target in 1986, and it does not seem likely that they will do so in 1987 either. Strict controls on public expenditure seem currently to be a fairly universal economic imperative.

In the Soviet Union, the best figure for the trend since 1976 is still the Central Intelligence Agency's estimate of an annual rise of around 2 per cent a year in volume. The increase in 1985 may have been higher than this, since this was the year in which the Soviet Union announced a 12 per cent increase in its official military budget (although the real overall increase is clearly significantly lower, since other defence-related budget items were not similarly augmented). The Soviet Union has set high targets for the rise in the standard of living between now and the turn of the century. If it were to accelerate the rise in its military spending, it would almost certainly mean that those civil targets could not be met.

However, although the rise in world military spending (in real terms) may be slowing down, the level is still very high. A slowing down certainly does not mean an end to the technological arms race—although it may fortunately set some limit to inordinately expensive new programmes. Present figures can accommodate a great deal of military technological change; and unfortunately it seems probable that expenditure on military research and development will continue to rise much faster than military spending as a whole. For instance,

the US budget request for FY 1987 incorporates a figure for military research and development which is 20 per cent higher than the figure for the previous year.

Estimates of military expenditure in Third World countries are often highly uncertain—particularly, of course, where wars or lower-level conflicts are in progress, as in Afghanistan, Iran/Iraq, Nicaragua, Kampuchea, Angola and Chad. In many of these conflicts, the USA and the USSR confront each other by proxy: their objectives seem to be not to help to solve the conflict, but rather to fuel the enemy of the other side with military aid.

World economic conditions also explain recent trends in the arms trade. After the boom in arms sales in the 1970s, there has—in the early 1980s—been a slight downward trend in the volume of sales of major weapons. The level of these sales is still historically high. There has been roughly a fourfold increase in the volume of sales of major weapons to the Third World between the second half of the 1960s and the first half of the 1980s. But the trend is no longer rising. The reasons are predominantly economic. Oil-exporting countries no longer have large financial surpluses from oil sales which they can use for weapon purchases. Third World countries in general are heavily indebted, and are preoccupied with debt rescheduling and further borrowing.

The changes in the structure of the arms trade do not, on balance, improve the prospects of any arms control in this field. The shares of the two superpowers have been falling as more producers enter the market. In the past few years there have been many newcomers from Third World countries themselves. More intense competition means the weakening of government control, with a tendency for arms sales to become more matters of private commercial arrangements than matters of official negotiation. However, in some countries—for instance, in Latin America—there is a certain interest in the idea of trying to agree on some regional arrangements for mutual restraint.

III. Nuclear weapon developments

World attention has to some extent been concentrated on the nuclear arms reduction proposals of both sides—and particularly on the idea of a 50 per cent reduction in the number of strategic nuclear offensive warheads. This has diverted attention from what in fact is going on in the nuclear weapon field. While negotiations about cuts slowly get under way, there are massive programmes in being to improve and extend existing strategic nuclear offensive forces—programmes stretching up to the turn of the century. As usual, we know much more about the plans of the United States; our information about Soviet plans comes from US intelligence sources.

The USA has on hand a strategic 'modernization' programme which is very large. The greater part of it has been approved by the Congress, and in many cases the funds have already been authorized. There is now full authorization for 100 B-1 bombers: the first squadron should be operational in September 1986. Increasing funds are now being allocated for the production of the Stealth bomber, a bomber whose main objective is to evade radar defences: the idea is apparently that this bomber should be able, among other missions, to hunt out

mobile Soviet ICBMs. The programme for equipping older bombers, the B-52s, with air-launched cruise missiles is well under way: 90 B-52s have been so equipped. Research and development is nearly complete on the advanced cruise missile which—like the new bomber—will have 'stealth' characteristics: that is, it will be difficult for radar to detect it.

The Trident strategic submarine programme proceeds. The eighth submarine has been launched, and there is now funding authorization for 13; the full size of the programme is not yet clear. The sea-launched cruise missile programme continues with high priority; by January 1986 some 100 nuclear land-attack SLCMs were deployed on attack submarines and surface ships. The objective is to have some 200 ships and submarines capable of carrying these weapons by the mid-1990s.

The one programme where the Congress modified the Administration's request was for the MX intercontinental ballistic missile. (Fortunately, the name 'Peacekeeper' has not caught on.) The total number to be deployed has been limited to 50; further deployments could only come about if the President proposes and the Congress approves a more survivable basing mode.

The impression is sometimes given by the US Administration that the Minuteman missiles, which are of course the main component of the US arsenal of ICBMs, are in some sense obsolete. This is not the case. There has been a succession of little-noticed programmes to upgrade these missiles, and in particular to improve their accuracy. Both the Minuteman II and Minuteman III have had these 'guidance system upgrades', and as a consequence their accuracy has been substantially improved.

In Europe, the deployment of the Pershing II missile is now complete, and the programme of deployment of the ground-launched cruise missiles is proceeding on schedule. Extra Pershing II missiles and warheads are being purchased over and above the number needed for European deployments: it seems that the USA has it in mind to deploy these particularly accurate missiles in other theatres.

If the Administration's budget request for the Strategic Defense Initiative (SDI) is accepted by the Congress, then it is on the way to becoming a very large programme. The budget request for FY 1987 is $4.9 billion, which is 75 per cent higher than the figure granted for the present fiscal year; for FY 1988 the budget request goes up to $6.3 billion. This is clearly now ranked by the Pentagon as one of its higher priority programmes; in the current fiscal year, budget authority for the SDI was specifically exempted from the proposed Gramm-Rudman-Hollings expenditure cuts. The idea for the SDI did not come from the Pentagon—the initiative was from outside the military. However, the Defense Department has now adopted the idea with great enthusiasm.

On the Soviet side, US intelligence estimates suggest that, between now and the mid-1990s, most of the existing Soviet land-based missile force will be replaced. The significant change is towards mobile missiles: it is suggested that by the end of this process some 40 per cent of the Soviet land-based missiles and nearly 25 per cent of the warheads on them will be deployed in a mobile mode. The deployment of these new mobile missiles has begun, with some 45 SS-25s

being deployed during 1985. The initial deployment of the new SS-24s is expected to be in silos during 1986, but with deployment on rail-mobile launchers in 1987. These missiles are replacing the SS-11s, SS-13s and SS-17s. Apart from these missiles, again according to US intelligence, there are three additional ICBM models or modifications under development.

The Soviet Union is continuing to complete one new Delta IV or Typhoon submarine each year, equipped with missiles which can reach the United States without there being a need to leave Soviet territorial waters. Soviet bombers are being equipped with air-launched cruise missiles—though this programme appears to be proceeding fairly slowly. The new Blackjack bomber is now expected by US intelligence to be operational in 1988 or 1989; it is true that US intelligence has heralded the arrival of this bomber on a number of occasions—in 1983 it was expected to enter service in 1986 or 1987—and there has been a long series of revisions to the expected deployment date.

More SS-20 missiles are reported as having been deployed during 1985; these new deployments seem to have been entirely east of the Urals. Testing has begun of a follow-on to the SS-20 (designated the SS-28).

These are illustrations only of US and Soviet developments in progress in the nuclear weapon field. Britain, France and China also have active programmes for upgrading and extending their nuclear weapon systems: in all three countries this seems likely to lead to substantial increases in the number of nuclear warheads. In France in particular nuclear weapon programmes have high priority, with some 30 per cent of expenditure on equipment going to nuclear forces. French ballistic missile submarines are being refitted with the M4 missile. This missile carries from one to six independently targeted warheads; the number of warheads on the submarine fleet will now be multiplied many times.

The problem of arms control is not simply to reduce a static number of warheads, but rather to try to arrest a massive programme which has a powerful momentum.

IV. Chemical weapons

Chemical weapons, unlike nuclear weapons, are not matters of great public concern. This is unfortunate. Ten years ago, there seemed to be strong barriers preventing the use or further development of chemical warfare agents. Now these barriers seem not to be holding any longer.

On the production side, the main event in 1985 was the decision of the United States Congress to authorize the production of the new binary chemical weapons. In the two previous years the Congress had turned down the Administration's request for approval of production. This time, the Administration prevailed. It is true that there are conditions attached to the decision—for example, that the North Atlantic Council should give some approval to the programme. Further, actual final assembly of the munitions is not due until October 1987. However, it will not now be easy to hold the programme back, unless in the course of the next year some spectacular advances are made in the Geneva negotiations. So, after 17 years during which

the United States produced no filled chemical munitions, now the process will probably start again.

These new weapons are intended for possible use in Europe. West European governments, particularly in Britain and FR Germany, have come under strong pressure from some military sources to accept the idea of chemical rearmament. So far, the indications are that neither government wishes to have stockpiles of the new binary munitions on its soil.

The reports about Soviet chemical warfare capabilities come entirely from Western intelligence sources; the Soviet Union itself says that these are military secrets. These Western reports provide detailed accounts of Soviet production centres, and of 16 different weapons which deploy chemical warheads. However, these reports are accompanied by admissions that US intelligence has inadequate knowledge of Soviet capabilities in this field.

The discovery that Iraq possessed chemical weapons has led to a reassessment of the number of countries which may possess them. There are now a number of statements, again mainly originating from US intelligence reports, suggesting that between 13 and 16 nations have some chemical weapon capabilities. It is probably reports of this kind which lie behind the tentative agreement between the United States and the Soviet Union to hold talks on ways to prevent chemical weapon proliferation.

There is no doubt that in 1984 Iraq used chemical weapons in its war with Iran. There seems little doubt that it did so again in March 1985, and there were further complaints in February 1986. This time the United States Government named Iraq as a culprit, and the UN Secretary-General also issued a statement carrying an implicit condemnation of Iraq. The UN Security Council—for the first time—in March 1986 explicitly named Iraq as the guilty party in the use of chemical weapons in the war with Iran.

The evidence clearly shows that Iraq was guilty of violating its ratification of the Geneva Protocol. With the 'yellow rain' accusation made against the Soviet Union, it is another matter. The publicly available evidence here is now seen to be inadequate to support the charges that mycotoxin weapons supplied by the Soviet Union were used in Laos and Kampuchea. The US charge should be withdrawn. The refusal of the USA to withdraw an accusation for which it can now provide no warrant may give rise to doubts about other US allegations of treaty violations.

V. Arms control

It ought to be possible, during 1986, to reach an agreement in at least one of the forums where arms control issues are discussed. It is seven years since any agreement of substance was signed. Those seven years have been years of worsened international relations and accelerating military preparations. It is time to arrest this deterioration.

It is important, in the main countries concerned with arms control issues, that there should be strong central direction over the whole field of the various negotiations. Particularly in the United States, in the absence of such central direction, inter-agency disputes may make the negotiating process virtually

impossible. Also, in many countries there is a great need to increase the number of civil servants working on arms control issues. There are large bureaucracies essentially engaged in planning new weapon developments and so accelerating the technological arms race. By comparison, the numbers of those engaged in thinking of ways to constrain this process are small.

Unfortunate prominence has been given, in recent years, to accusations of treaty violations. The arms control compliance record of both the United States and the Soviet Union has, on the whole, been good. The central provisions of the main treaties have been kept. When the process of treaty formulation comes to a stop, as it has done since 1972, and at the same time there is competitive technological change in military systems, both sides tend to push up against the limits of treaty formulations. It ought to be possible to find ways of dealing with accusations referring to these 'grey areas', without putting in question the whole arms control structure.

There are indications, in a number of negotiations, that the Soviet Union may be more willing than before to accept some on-site inspection as part of the process of checking compliance; this should help to ease the problem.

This section considers, first, the negotiations about nuclear weapons, and a comprehensive test ban. It then reviews and comments on the other sets of negotiations in progress.

Nuclear weapons

The negotiations about nuclear weapons are essentially political, and are now largely divorced from military reality. This is symbolized by the joint statement of President Reagan and General Secretary Gorbachev, made in November 1985, that a nuclear war cannot be won and therefore must never be fought. The negotiators do not seriously ask themselves whether, in certain military situations, particular nuclear weapons might be needed. Although each side accuses the other of making preparations for a first strike, neither side really believes this. In the negotiations nuclear weapons are essentially treated as a kind of counter or token, which indicates to the player some unit of political power. Each side is primarily concerned with the fear of being seen by the rest of the world to be in some sense inferior.

It is therefore important that both sides should see that there are world-wide political gains to be made from an agreement. Fortunately, there is still world-wide concern about nuclear weapons. Public opinion surveys suggests that, while the fear of war has come down from a high point in 1983, fear of nuclear weapons has not come down in the same way. The signing of the Treaty of Rarotonga, establishing a nuclear-free zone in the South Pacific, is another indication of continued concern.

Intermediate-range nuclear missiles

In the negotiations about nuclear weapons, it seems that the discussions about intermediate-range nuclear forces have the best chance of success. This is for two reasons. First, there is a new Soviet offer which in many ways resembles

one the United States put forward two years ago. Second, these negotiations do not depend on a simultaneous agreement on strategic defence.

The new Soviet offer is to eliminate all intermediate-range nuclear missiles west of the Urals—the number of SS-20s located there is assumed to be 243—in exchange for the elimination, or withdrawal, of the US Pershing II and ground-launched cruise missiles which are being installed in Europe. There is also a suggestion that the shorter-range missiles installed in the GDR and Czechoslovakia after 1983 as counters to the new US missiles might also be withdrawn. The conditions stated are that 'the United States should undertake not to transfer its strategic and medium-range missiles to other countries, while Britain and France should pledge not to build up their respective nuclear arsenals'.

This new Soviet offer goes a long way towards the US proposal for a 'zero option'. The difference is that the US zero option proposal required the Soviet Union to eliminate all SS-20s throughout the USSR, and of course in the US proposal there were no requirements imposed on either France or Britain.

The Soviet SS-20s east of the Urals will be one of the problems in the negotiations. Their number has risen considerably, and there will probably be a demand for a cut in that number. The question of the mobility of these missiles comes into the argument here. It seems that the Soviet Union is willing to dismantle the infrastructure for these missiles in the western part of the Soviet Union; if that were the case, then they could not be reintroduced rapidly, since prepared sites are required for them. The Soviet Union will also no doubt argue that Pershing II and cruise missiles could also be rapidly reintroduced into Western Europe, and that in the Asian theatre it needs a counter both to Chinese missiles targeted on the Soviet Union and also to US nuclear weapon systems in Asia. It will draw attention to the possibility that the USA could deploy Pershing II missiles elsewhere than in Europe: this could only be somewhere in Asia.

Different parts of the US Administration will take different views about the Soviet offer. There will be those who will wish to negotiate seriously, arguing that the medium-range missiles in Europe are likely to be a continual irritant; if opposition parties come to power in some of the countries where they are located, then there will be increased pressure for their removal. On the other hand, it is probable that the US Department of Defense will not want to withdraw them. There is always military reluctance to withdraw weapons once they have been deployed.

There will, of course, be great difficulty over the Soviet requirement that Britain and France should pledge not to build up their nuclear arsenals. Both countries have programmes under way for doing just that. It is just conceivable—though unlikely—that the British Government might be prepared to accept a low limit for the number of warheads which it intends eventually to deploy on its new Trident submarines; it may in any case not plan to deploy the maximum number of which the Trident D5 missile is capable. So far, it has refused to make any statement about the number of warheads it intends to deploy.

However, it is very hard to conceive that the French Government would

accept any limit on its nuclear weapon plans. France is in the process of installing multiple warheads on its submarine-launched ballistic missiles, which will result in a big increase in the total number of warheads which it deploys. The Soviet Union must be aware that the chance of getting any French pledge is virtually nil; if the USSR insists on that requirement, then the negotiations could founder on this issue.

At a time when both the USA and the USSR have on the table proposals for substantial reductions in the number of offensive strategic weapons, it does not seem unreasonable to suggest that France and Britain should be prepared to join the arms control process in some way, and should agree not to increase further the number of their nuclear warheads targeted on the Soviet Union.

Strategic offensive nuclear weapons

On strategic offensive weapons, although there is a certain surface similarity between the proposals of the two sides, the chances of any early agreement seem slim. This is first and foremost because of the problem posed by differences over the Strategic Defense Initiative. There seems no reason to doubt that the Soviet Union will refuse to reach an agreement on strategic offensive weapons unless it obtains some constraint—over and above those existing at present—on the development of strategic defensive systems. Equally, it is very difficult to see the present US Administration agreeing to any such constraint. It is clear from the latest budget request that the SDI programme has been given high priority. This disagreement over defensive weapons has all the appearance of a deadlock, although either side could move towards a compromise.

SDI

The intensity of the debate about the US Strategic Defense Initiative is welcome. In the past, major new nuclear weapon developments have come about with virtually no public discussion. Sometimes this was because the matter was deliberately concealed from the public gaze; this was true of a number of the nuclear weapon decisions taken in Britain. Sometimes in the past there has been little debate because military matters were considered to be the exclusive province of the military. Now, fortunately, that is no longer so.

Two general principles should influence any judgement on the Strategic Defense Initiative. First, the long experience of the development of new weapon systems is that they do not contribute to stability: they contribute to a technological arms race. Second, unilateral decisions about new military deployments do not in the long run add to security. They simply lead to a military reaction from the other side.

It is thus *prima facie* likely that, if the United States proceeds beyond the point of research with the Strategic Defense Initiative, it will make an arms control agreement on strategic offensive weapons most unlikely. There seems no prospect at all that the Soviet Union would be willing to join in some agreed move towards some future mix of offensive and defensive weapons: and this idea would only work if there were such an agreement. If the United States

persists in proceeding unilaterally with the programme and is unwilling to accept any constraints on it, then one can expect the Soviet Union in due course to react in such a way as to maintain its offensive strategic capability.

It is clear that this is what the United States would do, if it believed that the Soviet Union were developing an effective defensive system against ballistic missiles. The US Secretary of Defense has said that 'even a probable territorial defence [against ballistic missiles] would require us to increase the number of our offensive forces and their ability to penetrate Soviet defenses to assure that our operational plans could be executed'.[1]

As part of an agreement on offensive weapons, therefore, it is reasonable to expect some guarantee against the sudden break-out into testing or deployment of defensive systems beyond that permitted in the ABM Treaty. This is not a new idea: it was the signing of the ABM Treaty in 1972 which made the SALT I Agreement on offensive strategic weapons possible. It is not possible, at the present stage of arms control, to write into a treaty a verifiable prohibition on research. However, there are a number of possibilities. One is to have a no-test agreement. This would have to apply to the testing of new land-based as well as space-based ABM systems, and also to the testing of anti-satellite weapons—since the technologies of anti-satellite and anti-ballistic missile systems are so similar.

Alternatively, it would be possible to strengthen the present limitations which are in the ABM Treaty on the development and testing of ballistic missile defence systems. An additional protocol could be agreed which bans the development, testing and deployment of all ABM systems, land-based as well as mobile, and which clearly applies to ABM systems of every kind. If the idea of ballistic missile defence is a bad idea, then this must be true of land-based systems as well as space-based systems. This issue is not really about space-based weapons. It is about weapons, whether space-based or land-based, which can attack either satellites or ballistic missiles. Another possibility is to extend the period of notice which each party is bound to give before withdrawing from the ABM Treaty, so as to reduce the risk of a sudden break-out.

Other difficulties

There are other difficulties as well. The United States considers that it is negotiating about missiles and aircraft with a range greater than 5500 km. The Soviet Union is concerned to limit all nuclear weapon systems which can reach the territory of the other side: and thus wishes to include in the negotiations many nuclear weapon systems which the United States does not include. This is partly the old argument about forward-based systems which has been one of the difficulties in US–Soviet negotiations on nuclear weapons right from the beginning.

The United States is particularly concerned to limit the Soviet large land-based missiles, in particular SS-18s. Here, however, the gap between the two sides is not unbridgeable. The USA wishes to limit the number of warheads on ICBMs to 3000. The Soviet Union wishes to limit the number of warheads

on any single system to 3600. Clearly if this were the only issue it could be negotiated. The USA in its proposal also specifies a limit on total throw-weight. The Soviet Union does not suggest any such limit—but in fact its proposals would bring its total throw-weight close to the maximum figure which the USA wishes to have written into any treaty.

The Soviet Union wishes to ban all cruise missiles with a range greater than 600 km. Both sides have missiles of this kind; but it is probably true that the United States leads in technological development in this category of weapons.

Rather surprisingly the US proposal includes a ban on mobile ICBM systems. This is a strange proposal—only two years ago the idea of moving to mobile single-warhead systems was recommended as highly stabilizing. Since the Soviet Union has already begun to replace older ICBMs with new mobile systems this is a proposal which it might find difficult to accept in the first stage.

Since these are essentially political negotiations, there is not much point in arguing about the strategic logic of particular propositions. So far as military security is concerned, either side could accept the other's proposals *in toto*, and both sides would gain in security thereby. The nuclear balance is not sensitive. There is no military need for parity. A large number of bargains could be reached which would serve to enhance the security of both parties. The fear of a first strike, which both sides profess in criticizing the proposals of the other side, is not a genuine fear—in that neither side would ever rationally choose to attempt it.

Both sides have indicated that they are interested in halving the number of strategic warheads. Further, both sides have also indicated a long-term objective (less long-term in the case of the Soviet Union) of a world in which all nuclear weapons have been eliminated. Both sides, therefore, have put forward—as the desired end of the negotiations—not some stable balance of nuclear weapons, but rather a nuclear weapon-free world.

It would be wrong to be disparaging about such an objective; however, it would also be premature at this stage to concentrate on the problems which might arise in a nuclear weapon-free world. The immediate need is to start the process of reduction, and to stop the constant process of 'modernization'.

The problem posed, therefore, is not the problem of trying to devise some stable system of nuclear weapon confrontation. It is the problem of devising a process of reduction which does not lead to gross instabilities on the way. If both sides are seriously interested in reduction, this should not be too difficult: marginal superiorities or inferiorities in nuclear weapon numbers or capabilities have no military or political significance.

However, in considering alternative routes of reduction, it may be useful to maintain a bias against those nuclear weapons normally considered to be most dangerous: accurate forward-based systems with short flight-times or short detection-times, and accurate multi-warhead missiles, where one missile on one side can eliminate a number of missiles on the other side.

A comprehensive test ban

The Soviet Union declared a unilateral moratorium on nuclear weapon testing, initially to last from 8 August 1985 to the end of the year; it was then extended to the end of March 1986. It indicated it was ready to accept international inspection of the test sites, and that it was ready to negotiate on a comprehensive test ban. The other nuclear weapon powers have failed to respond.

By refusing either to join the moratorium or to re-open negotiations on a comprehensive test ban, both the USA and the UK have put themselves, morally, in a very weak position. As far back as 1963, both countries signed the Partial Test Ban Treaty, whose preamble includes these words: 'Seeking to achieve the discontinuance of all test explosions of nuclear weapons for all time, determined to continue negotiations to this end . . .'. This determination is cited again in the preamble to the Non-Proliferation Treaty of 1968—both the USA and the UK signed that treaty as well.

It is hard to see how the USA and the UK can claim that they are 'determined to continue negotiations to this end' when—over two decades after they have declared their determination—they refuse to negotiate.

The USA has recently become more open than the UK about the fact that it is not prepared to negotiate because it wishes to continue testing. The UK tends still to fall back on arguments about verification issues. However—particularly with the very considerable advances that have been made in detection capability, together with the Soviet offer of on-site inspection—this has little content. In any case, verification is an appropriate subject for negotiations.

The United States and the United Kingdom should now withdraw their objections, and allow the Conference on Disarmament at Geneva to proceed to multilateral negotiations on the draft of a treaty. China appears to be prepared to join a working group whose objective is to draft a treaty. Within this framework, trilateral talks can also be conducted, if the three powers previously engaged in tripartite negotiations—the USA, the USSR and the UK—wish to do so.

A comprehensive test ban would be a significant impediment to the development of new types of nuclear warhead. There is no reason to suppose that it would provide any technological advantages to the Soviet Union. Indeed it is generally accepted that the United States is more advanced than the Soviet Union in warhead design.

Other negotiations: Europe

There may be some movement this year in the negotiations which cover arms control issues in Europe.

At Stockholm, it is reasonable to hope for an agreement of some kind in time for the third review of the CSCE process (Conference on Security and Co-operation in Europe) which is due to meet in Vienna in early November 1986. One of the obstacles—concerning the area of application—seems to have been removed. In 1981, the Soviet Union offered to apply any agreed confidence-building measures (CBMs) 'to the entire European part of the

USSR, provided the Western states, too, extended the confidence zone accordingly'. There has been a good deal of argument about the naval activities in the seas around Europe which should be notified, to meet this requirement that the confidence zone should be extended 'accordingly'. General Secretary Gorbachev has now suggested that the question of naval activities should be postponed until the next stage of the conference.

One question at the Stockholm Conference is whether there will be minimal agreement, or something more. The components of a minimal agreement would be a reduced ceiling for notification of manoeuvres and movements (obligatory notification rather than voluntary); an annual calendar of such activities; obligatory invitations to observers, and some limited right for requests of inspection; a 'dedicated' system of communication between members; and a reaffirmation in some form of a commitment on the non-use of force in Europe. The neutral and non-aligned group of countries, which in many ways acts as a broker between NATO and the WTO at this conference, wishes also to add some constraints, such as a limit on the size of manoeuvres and a limit on their number. The addition of some constraints would certainly strengthen any agreement. The NATO side is more reluctant than the WTO side on the constraints issue.

The existence of the neutral and non-aligned group of states makes an agreement at Stockholm more likely. If in the final analysis this group puts forward a draft treaty which one bloc is willing to accept but which the other bloc rejects, then this will strongly suggest which of the two blocs is being more obdurate.

At the Vienna negotiations on Mutual Force Reductions there also seems to be some chance of a first, rather symbolic, phase of an agreement—after 13 years of negotiations. Over a long period the NATO side was unwilling to accept the WTO's figures for the number of their troops in the central region, and wanted an agreement on the data before reductions could begin. They have now set aside that demand. Both sides now agree that there should be an initial withdrawal of Soviet and US troops, and they also agree that the number of Soviet troops withdrawn should be greater than the number of US troops. These proposed initial withdrawals are essentially symbolic (not to say ridiculously small)—the NATO suggestion is for reductions of around 17 000 troops, out of total ground forces on both sides together of nearly one and a half million. The problem of agreement centres essentially now on the problem of verification. Once the troops have been withdrawn, a process must be set in motion to ensure that the troops withdrawn are not reintroduced, and to verify the numbers remaining. If, after this process, it is accepted by both sides that there is rough parity in forces in the central region, that should make the negotiation of further reductions much easier.

If there is some success at either the Stockholm or Vienna negotiations, or both, the question then will be—what next? The ambition should certainly be to go beyond small manpower reductions, and notification of manoeuvres and movements. In some form, negotiations should move on to consider substantial reductions in numbers of weapon systems, and the creation of areas free of offensive weapons on either side of sensitive borders in Europe.

Geneva: chemical weapons

At the Conference on Disarmament in Geneva, there is only one subject which is being seriously discussed with a view to drafting a treaty—and that is chemical weapons. The discussions of a comprehensive test ban, and of outer space issues, are not negotiations; some useful background papers are forthcoming, but there is no prospect at present that either of these sessions could move towards the formulation of a treaty.

On chemical weapons, some progress was made in the course of 1985. There does exist an agreed structural framework for a convention; but the text so far worked out contains many alternative formulations as well as important gaps which remain to be filled. The assessment has to be that there is still a good way to go before there is an agreed draft.

There is another development in Europe which may bear fruit at some time in the future: the negotiations that have been proceeding at the party-political level between the two German states on a European chemical weapon-free zone. The parties to the negotiations were the Socialist Unity Party (SED) on the Eastern side, and the Social Democratic Party (SPD) on the Western. In July 1985 they produced the outline of an agreement to establish a zone free of chemical weapons in Europe—initially the two German states and Czechoslovakia. As yet this proposal is not subject to any governmental negotiations, though both the German Democratic Republic and Czechoslovakia have suggested this. The initial reaction of Western governments has not been favourable. However, given the slow progress of negotiations on a world-wide ban, there may be increasing interest in regional arrangements. The idea seems to have been found attractive by the West German public.

The approach to arms control issues

Implicit in the whole idea of a Yearbook of World Armaments and Disarmament is the assumption that the technological arms race is damaging to world security, and that if it could be brought under control this would contribute a great deal to a more stable world order. Some of the ideas on which the Yearbook's approach is based are set out here.

1. The much-used quotation from Salvador de Maderiaga—'Nations don't distrust each other because they are armed; they are armed because they distrust each other'—is an inadequate statement of the relationship between armaments and distrust. There is a reciprocal relationship. The buildup of weapon systems itself creates distrust. An agreement that constrains or reduces weapon systems helps to create trust. Indeed some arms control agreement between the major powers is now a necessary condition for reconstructing a modicum of confidence between them.

2. For the world as a whole; as military expenditure goes up, security goes down: that is, the risk of war rises. Security is not something that can be bought by military spending.

3. A country cannot increase its security by unilateral decisions to increase its military strength unless such action is clearly seen by potential adversaries to be defensive and non-provocative. Otherwise, unilateral decisions by one side are

normally followed by unilateral decisions by the other: the net effect of these decisions will again be to reduce security.

4. The vast majority of new weapon developments are destabilizing in the long run—that is, they reduce security and increase the risk of war. An assessment of their effect on security (and on the chances for arms control) must obviously include the likely reactions of those nations threatened by the new weapons.

5. The military sector is not a passive sector; it is not simply an executive authority. The vast military-research-industrial complexes which now exist in most industrial nations are powerful in their own right in the political system. It is not that they behave differently from other bureaucratic establishments. On the contrary they behave in the same way: that is, they are concerned to find justification for their demands for increased resources.

6. Their demand for increased resources is based on their presentation of the threat. They need to persuade their country that it is dangerously threatened by an adversary. The presentation of the threat is naturally biased—with a combination of selected material and worst-case analyses. The military sector has the advantage that it has a near-monopoly of the information on the basis of which the threat is assessed. This gives it a great advantage over civil bureaucracies.

7. Military research establishments are an independent force in the promotion of the technological arms race.

> Once massive funds are voted for weapon research, and once there are large permanent establishments doing nothing but weapon research, it is inevitable that further improvements will be made and inevitable that new fields of warfare will be explored. Once some weapon improvements has been discovered it is often inferred, without direct evidence, that a potential enemy would have made the same discovery, and that therefore it is dangerous not to take the next step, the actual development of the weapons. Weapon research proliferates in another way as well: each new weapon spurs the development for counter-weapons . . . Here again, there does not have to be evidence that the enemy already possesses the weapon for which counter-measures are being devised: it is sufficient to assume that sooner or later he will do so.[2]

8. The process of the past 40 years has been described (by Professor Kennan) as the process of 'the militarisation of international relations'. This is a view of the world as an arena for contest—primarily the great contest between the United States and its allies on the one hand and the Soviet Union and its allies on the other. That contest is pictured essentially in military terms, of military inferiority or superiority. International security requires a different world, in which international relations are not dominated by ideas of military contest. The move to a more secure and stable world requires substantial dismantling of the very large military sectors which now exist in the industrial world.

Notes and references

[1] US Department of Defense, *Annual Report to the Congress, Caspar W. Weinberger, Secretary of Defense, Fiscal Year 1985*, p. 190.

[2] SIPRI, *SIPRI Yearbook of World Armaments and Disarmament 1968/69* (Almqvist & Wiksell: Stockholm, 1969), pp. 94–5.

2. Public opinion on peace and war

EYMERT DEN OUDSTEN

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

Arms control issues in general, and nuclear weapon issues in particular, are increasingly argued before the bar of public opinion. There is a two-way relationship. Politicians now spend a great deal of time in trying to influence public opinion—indeed in some cases public relations is their main preoccupation. The United States and the Soviet Union are both concerned to influence public opinion in Western Europe on arms control issues; the Soviet Union in particular has paid much more attention to this in recent years than it did before. In turn, of course, if—in spite of efforts at persuasion—a policy proves to be very unpopular with the public, it may eventually be changed.

There are now many more public opinion polls on questions of peace and war than there used to be. This chapter reports on some of the general trends in Western countries, and then looks in particular at public opinion on these issues in the United States, the Federal Republic of Germany and Britain.

There is one general caution. When opinions are not supported by sufficient knowledge, they tend to be unstable. They can vary considerably with the wording of the question and the nature of the information given when the questioner introduces the subject. Small differences in wording can sometimes change what appears to be majority approval to majority disapproval.[1] Conclusions can be more firmly drawn when questions which are phrased in different ways obtain basically the same pattern of replies.

II. Concerns in the West

In the Western world, there was an increase in the fear of war and the fear of nuclear weapons between the autumn of 1982 and 1983. 1983 was the year when the negotiations about intermediate-range nuclear forces broke down; it was probably the nadir of US–Soviet relations.

Since 1983, it seems that the fear of war has been receding; on the other hand, concern about nuclear weapons has stayed nearly as high as it was in 1983 (table 2.1).

In all the countries covered in the surveys, with the exception of Spain, the fear of war is lower than it was in 1983. In the autumn of 1983, 42 per cent of respondents in the Western world listed the threat of war among their greatest concerns. By the middle of 1985, this figure had fallen to 32 per cent. Spain was the one exception: more people expressed concern about the threat of war in 1985 than in 1983. Spain has surprisingly high figures for concern about these matters.

Table 2.1. The 'threat of war' and 'fear of nuclear weapons', 'among the greatest concerns for yourself and your country', 1982–5

Figures are the percentage of respondents naming them. Totals may add up to more than 100 per cent owing to multiple answers given.

	Threat of war					Fear of nuclear weapons				
Country	Sep. 1982	Mar. 1983	Oct. 1983	May 1984	May 1985	Sep. 1982	Mar. 1983	Oct. 1983	May 1984	May 1985
FR Germany	25	16	28	14	14	32	42	38	15	25
France	42	34	44	47	36	18	19	26	26	28
Italy	42	44	55	56	42	21	33	35	39	37
Japan	—	36	42	35	36	—	28	34	32	38
Netherlands	32	33	37	—	—	49	47	49	—	—
Norway	37	31	36	30	33	40	42	38	31	26
Spain	42	48	39	49	44	27	29	30	33	42
UK	28	26	31	40	25	28	32	29	43	32
USA	23	25	45	32	32	18	20	37	28	31
Weighted averages[a]	*30*	*30*	*42*	*36*	*32*	*23*	*27*	*35*	*30*	*33*

[a] Weighted by population.

Sources: *The Impact of Technological Change in the Industrial Democracies* (Atlantic Institute for International Affairs/Harris Polls: Paris, 1985), pp. 7–8; *The Impact of Technological Change in the Industrial Democracies* (Louis Harris Intl: Paris, June 1985), Section III.

This assessment—that people in the West are rather less afraid of war now than they were two years ago—is borne out by other polls. There is a poll which at the turn of each year asks people whether they expect the coming year to be relatively troubled or relatively peaceful on the international scene.[2] There is always a degree of pessimism—more people say 'troubled' than 'peaceful'—but at the beginning of 1985 respondents were much less pessimistic than at the beginning of 1984. The same poll asks people's opinion about the chances of a world war breaking out in the next 10 years—whether they consider there is a more than 50 per cent chance of this happening. In every one of 13 Western countries, the percentage of people who were pessimistic about the chances of a world war fell between the beginning of 1984 and the beginning of 1985.

Fear of nuclear weapons has not abated in the same way. In Japan, France and Spain the percentage of respondents naming it 'among their greatest concerns' was higher in the 1985 survey than in any of the previous four surveys. Taking the eight countries together, there has been no significant change since 1983, with about a third of the respondents ranking fear of nuclear weapons among the greatest concerns for themselves and their country (see table 2.1).

Quite probably, it was the dominance of nuclear arms control questions at the November 1985 summit meeting which has kept the nuclear weapon issue in the forefront of popular attention.

III. European views on the Geneva negotiations

The US Information Agency commissioned a survey in six countries on European opinions about US–Soviet negotiations at Geneva early in 1985. The

poll gave figures both for the general public and also for the better educated public. The general impression given by the replies is one of scepticism—with the better educated rather more sceptical than the general public as a whole.

The question was asked whether the respondents thought that an agreement in Geneva was likely. The general public was fairly doubtful (table 2.2). The better educated were more doubtful. Among them about twice as many thought an agreement unlikely as thought it likely. A majority—which was bigger for the better educated than for the general public as a whole—thought it would take longer than two years, with a significant minority volunteering the reply 'never'.

There was also a good deal of scepticism about the sincerity either of the USA or the USSR: the question asked was whether they were making a genuine effort to reach a serious arms reduction agreement. The general public gave the United States the benefit of the doubt by a small margin: the better educated were evenly divided on the issue. However, on average, people did not have confidence that the United States would protect their own country's interests in the negotiations. As usual, the better educated were more sceptical than the general public.

Among the general public a sizeable majority doubted the Soviet sincerity; but in this case, the better educated were somewhat less sceptical than the average. The general view was fairly emphatically expressed that, if no agreement were reached, both parties were to be blamed.

The survey asked in particular questions about attitudes to the verification of arms control agreements. By a large majority, respondents approved of the US 'insistence on adequate means of verification of arms control agreements'. They were then asked whether they considered that it would be possible to work out a nuclear arms control agreement which would be completely verifiable. The general public was evenly divided on this question; the better educated did not, on balance, believe complete verifiability was possible. Among those who thought it would not be possible, a majority—again greater for the better educated—took the view that the United States should accept an arms control agreement even if it were not completely verifiable.

IV. Public opinion in the United States

There is a clear and unmistakable trend in the United States: a trend which has moved against increases in military spending. In the early 1980s, there was a big majority—up to 70 per cent—in favour of higher military outlays. By mid-1985, that figure was down to 14 per cent (figure 2.1). One incidental consequence is that, whenever matters of cost are brought into questions about particular weapon programmes, the proportion of disapproval rises sharply.

Although most respondents believe that the military threat from the Soviet Union poses a 'real, immediate danger', the majority also considers that there is at present a rough equality in military power and also in nuclear weapons (table 2.3). Further, when asked whether the United States should aim for equality or superiority in military power *vis-à-vis* the Soviet Union, there is some endorsement for equality. There is an ambivalence here. It is also

Table 2.2. Replies to polls on arms control issues in six European countries, 1985[a]

Figures are the percentage of respondents indicating these replies.[b]

Questions	Replies		
1. How likely do you think it is that the US–Soviet decision to resume arms control negotiations will result in an agreement to reduce nuclear weapons?[c]	Very or fairly likely	Very or fairly unlikely	Do not know
Total public:	39	55	6
Better educated:	32	65	3
2. Do you believe that the US is or is not making a genuine effort to reach a serious arms reduction agreement with the Soviet Union?	Genuine effort	No genuine effort	Do not know
Total public:	46	39	15
Better educated:	45	46	9
3. What about the Soviet Union? Do you believe that the Soviet Union is or is not making a genuine effort to reach a serious arms reduction agreement with the US?			
Total public:	28	52	20
Better educated:	37	50	13
4. How much confidence do you have that in its negotiations with the Soviet Union the US will protect (survey country's) interest?	Great deal/fair amount	Not very much	None at all
Total public:	40	35	16
Better educated:	36	39	22
5. If no agreement is reached in the near future, who in your opinion will be mainly to blame: the US or the Soviet Union?	USA	USSR	Both (volunteered)
Total public:	10	22	53
Better educated:	12	17	59

6. Lack of trust is one reason why the superpowers have not been able to reach an arms control agreement in recent years. The US insists that any arms control agreement with the Soviet Union must include provisions for adequate means of verification. That is, provisions which will permit each side to check that the other side is keeping the agreement. Do you approve or disapprove of this US insistence on adequate means of verification of arms control agreements?	Agree	Disagree	Do not know
Total public:	68	10	22
Better educated:	76	11	13
7. Do you think that it will be possible to work out a nuclear arms control agreement which will be completely verifiable?	Possible	Not possible	Do not know
Total public:	41	39	20
Better educated:	37	55	8
8. If you consider it not possible (see question 7), should or should not the US be willing to accept an arms control agreement even if it would not be completely verifiable?	Yes	No	Do not know
Total public:	49	32	19
Better educated:	65	22	13

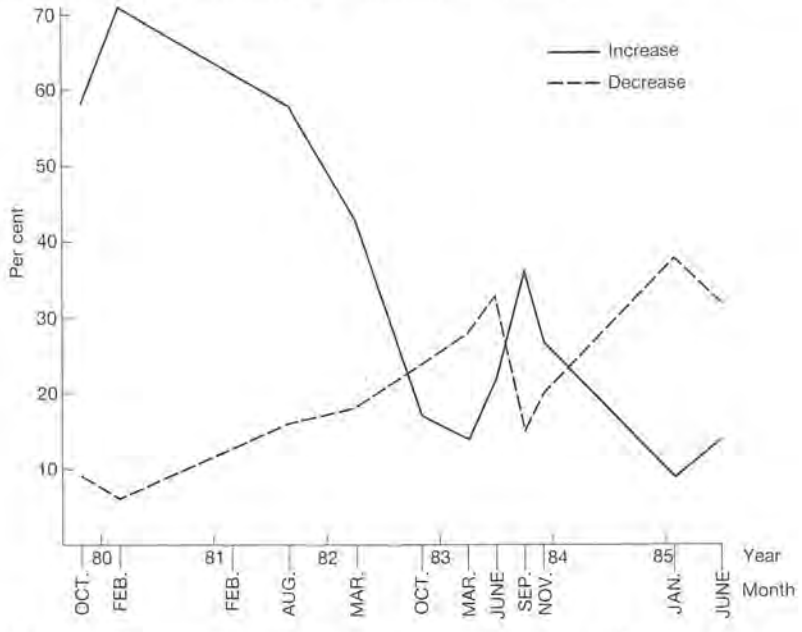
[a] The six surveyed countries were Belgium, Britain, Denmark, FR Germany, Italy and the Netherlands. The surveys took place between 12 Feb. and 3 Mar. 1985.

[b] Figures are averages, weighted by population, for all six countries. The percentages of respondents indicating 'no opinion' on the questions are not always included in this table, but can be inferred from the 100% total.

[c] Questions asked only of those who had heard of the Jan. 1985 talks between Secretary of State Shultz and Foreign Minister Gromyko.

Source: Spencer, C. S., *Europeans Predominantly Pessimistic on Arms Talks* (US Information Agency: Washington, DC, 8 Apr. 1985).

Figure 2.1. Replies to the question: 'Do you favor increasing or decreasing the present defense budget, or keeping it the same?', 1979–85[a]



[a] The remaining percentage of respondents answered in favour of keeping it the same, or had no opinion. See also table 2.3, question 1.

Source: *The Harris Survey*, 22 July 1985.

possible to ask the question in a way which leads to a very emphatic endorsement of superiority. When the question was put: 'In determining America's strength in the future, say, 25 years from now, how important do you feel is building the strongest military force in the world', four people out of five replied in 1984 that it was either very important or fairly important.

There are other questions in this area of nuclear weapons which elicit responses from which contradictory conclusions could be drawn. Respondents, by a substantial majority, endorsed the view that the USA and the USSR had so many nuclear weapons that it did not really matter which country had more. However, when asked which of the following increases the chances of nuclear war more—a continuation of the nuclear arms buildup or the USA falling behind the USSR in nuclear weaponry—the number choosing the second of these two options exceeded the number choosing the first.

In general, respondents in the USA were more favourably disposed to the US Strategic Defense Initiative (SDI) than were people in Europe. First of all, there was a much greater belief that such a system could work. Second, if simple straightforward questions were asked—whether the people were for it or against it—then the majority tended to express themselves in favour. However, if money is brought into the question, and there is any reference to 'billions of dollars', then that tends to swing the answers to the negative.

Tables 2.3. Replies to polls on arms control issues in the United States, 1980–5

Figures are the percentage of respondents indicating these replies.[a]

Questions	Polls	Replies		
1. In general, do you favor increasing or decreasing the present defense budget or keeping it the same as it is now?		Increase	Decrease	The same
	Harris, Feb. 1980:	71	6	21
	Harris, 28 June 1985:	14	32	52
2. Do you believe that the military threat from the Soviet Union is constantly growing and presents a real, immediate danger to the US, or not?		Yes	No	No opinion
	CBS News/NYT, 2 Jan. 1985:	52	39	9
3. Right now, would you say the US is superior in military strength to the Soviet Union, or is about equal in strength, or is not as strong as the Soviet Union?		Superior	About equal	Not as strong
	CBS/NYT, 2 Jan. 1985:	17	46	29
	CBS/NYT, Apr. 1983:	12	36	42
	CBS/NYT, Jan. 1980:	14	34	42
4. At the present time, which nation do you feel is stronger in terms of nuclear weapons, the US or the Soviet Union—or do you think they are about equal in nuclear strength?		USA stronger	USSR stronger	Equal
	Gallup, 15 Feb. 1985:	24	23	44
5. Do you think the military strength of the US should be superior to the Soviet Union, should be about equal in strength, or does not the US need to be exactly as strong as the Soviet Union?		Superior	About equal	Not as strong
	CBS/NYT, 2 Jan. 1985:	37	50	7
	CBS/NYT, Jan. 1981:	52	39	4
6. Do you think the US and the Soviet Union already have so many nuclear weapons that it does not matter anymore which country has more or do you think further increases in nuclear weapons could give one country a real advantage over the other?		Does not matter	Gives one advantage	No opinion
	CBS/NYT, 2 Jan. 1985:	60	29	11
7. In your opinion, which of the following increases the chances of a nuclear war more: a continuation of the nuclear arms buildup here and in the Soviet Union, or the US falling behind the Soviet Union in nuclear weaponry?		Arms buildup	US falling behind USSR	No opinion
	Gallup, 15 Feb. 1985:	41	43	16

Table 2.3. *contd.*

Questions	Polls	Replies		
8. Ronald Reagan has proposed developing a defensive nuclear system in space that would destroy incoming missiles before they reach the US; a system some people call 'Star Wars'. Do you think such a system could work?		Yes	No	No opinion
	CBS/NYT, 2 Jan. 1985:	62	23	15
9. From what you know about it, do you think that building the so-called Star Wars defense system in space is a good or a bad idea?		Good idea	Bad idea	No opinion
	Yankelovich, 3 Mar. 1985:	51	35	14
10. All in all, do you favor or oppose spending billions of dollars for the US to develop a laserbeam and particlebeam anti-nuclear missile defense system in outer space and on the ground?		Favor	Oppose	No opinion
	Harris, 3 Mar. 1985:	39	56	5
	Harris, Apr. 1983:	36	58	6
11. In your opinion, would the US's developing this system (Star Wars) or a space-based defense system against nuclear attack increase or decrease the likelihood of reaching a nuclear arms agreement with the Soviet Union?		Increase	Decrease	No difference (volunteered)
	Gallup, 25 Jan. 1985:	47	32	13
12. Once it looked as though we were capable of defending against today's nuclear weapons, the Russians would then go all-out to develop brand new kinds of nuclear and other weapons we could not defend against.		Agree	Disagree	No opinion
	Harris, 2 Mar. 1985:	75	20	5
13. Soviet leader Gorbachev has offered to cut Soviet long-range nuclear weapons by 50% if the US will stop research on President Reagan's SDI/Star Wars. Is that a fair trade or not?		Fair	Bad idea	Do not know enough
	Harris, 23 Oct. 1985:	10	37	52
14. What if the US were able to continue research on Star Wars, but agreed not to actually deploy that spacebased defense system, in return for major Soviet reductions in long-range nuclear weapons. Is that a fair trade-off?	Harris, 23 Oct. 1985:	27	24	47

15. All in all, do you feel that the situation where the US and the Soviet Union both know that any use of nuclear weapons will result in instant retaliation has helped to keep the peace in the world or not?		Has helped	Has not helped	No opinion
	Harris, 2 Mar. 1985:	74	21	5
16. Having each side capable of blowing up the other is not such a bad way to keep the peace.		Agree	Disagree	No opinion
	Harris, 2 Mar. 1985:	41	55	4
17. If the US and the Soviet Union were to sign an agreement to limit nuclear weapons, do you think the US would live up to its share of the agreement?		Yes	No	No opinion
	CBS/NYT, Jan. 1985:	71	19	10
18. If the US and the Soviet Union were to sign an agreement to limit nuclear weapons, do you think the Soviets would live up to their share of the agreement?	CBS/NYT, 2 Jan. 1985:	24	59	17
	CBS/NYT, June 1979:	26	55	19
	CBS/NYT, June 1978:	21	64	16
19. Do you think Ronald Reagan really wants an arms control agreement with the Soviet Union now, or not?	CBS/NYT, 2 Jan. 1985:	73	18	9
20. Do you think the Russian leaders really want an arms control agreement with the US now, or not?	CBS/NYT, 2 Jan. 1985:	36	51	13
21. Do you think the Soviet Union has violated the arms control treaties it has had with the US?	CBS/NYT, 2 Jan. 1985:	67	11	22
22. Do you think it is possible to negotiate a fair arms control agreement that the Soviet Union will live up to?	CBS/NYT, 2 Jan. 1985:	48	39	13
23. Gorbachev looks like the kind of Russian leader who will recognize that both the Soviets and the Americans can destroy each other with nuclear missiles, so it is better to come to verifiable arms control agreements.		Agree	Disagree	No opinion
	Harris, 5 Sep. 1985:	79	18	3
	Harris, Apr. 1985:	74	17	9

[a] The percentages of respondents indicating 'no opinion' are not always included in this table, but can be inferred from the 100% total.

Sources: Releases from various US polling companies; see list at the end of this chapter.

On balance, respondents took the view that SDI would make it more likely that the Soviet Union would come to an arms control agreement. At the same time, however, they also said that the Soviet Union was very likely to respond either with countermeasures or by developing its own system and that an arms race would be set off. When they were asked whether the SDI proposal should in some sense be 'traded in' in exchange for reductions in strategic offensive weapons, the majority said that they were not well-enough informed to answer the question.

President Reagan put forward the development of defensive weapons as a long-term alternative to mutual assured destruction; and questions have been asked about the doctrine of deterrence. Here again the replies varied with the way in which the question was formulated. One question asked whether mutual assured destruction had helped to keep the peace—'Do you feel that the situation where the United States and the Soviet Union both know that any use of nuclear weapons will result in instant retaliation has helped to keep the peace in the world or not?'. Nearly three-quarters of the respondents said that it had helped to keep the peace. A different formulation produced a different answer. People were asked whether they agreed or disagreed with the statement: 'Having each side capable of blowing up the other is not such a bad way to keep the peace'; in this case the majority disagreed with that proposition.

On more general questions on arms control, the public, perhaps not surprisingly, expressed strong pro-US and anti-Soviet sentiments. For example, when asked whether the USA and the USSR would live up to their share of any agreement to limit nuclear weapons, 71 per cent said that the USA would do so, and 59 per cent said that the USSR would not. In very much the same way, 73 per cent said that they believed that President Reagan really wanted an arms control agreement with the Soviet Union, while 51 per cent said that they thought the Soviet leaders did not really want an arms control agreement with the United States. A large majority believed that the Soviet Union has violated the arms treaties that it has had with the USA—67 per cent saying 'yes' as against 11 per cent saying 'no'.

Those answers indicate a considerable measure of distrust of the Soviet Union and its sincerity. In general, certainly in the first half of 1985, not many people seemed to think there was much chance of a successful arms control agreement at Geneva. This was very much in line with the opinion of people in Europe. However, there are other questions which elicited a more favourable response. For example, more people said 'yes' than 'no' to the question: 'Do you think it is possible to negotiate a fair arms control agreement that the Soviet Union will live up to?'. Particularly in the second half of the year, there seems to have been what one might call a 'Gorbachev' factor. For example, respondents were asked for their agreement or disagreement with this proposition: 'Gorbachev looks like the kind of Russian leader who will recognize that both the Soviets and the Americans can destroy each other with nuclear missiles, so it is better to come to verifiable arms control agreements'. In successive polls, about three-quarters of the respondents agreed with this proposition.

V. Public opinion in FR Germany

The West German public seems rather more favourable to arms control ideas than the public in the United States. This is shown by their replies both to questions which raise the subject in general, and also to questions which discuss particular issues. These are the main points which emerge from various polls taken during 1985 (table 2.4).

1. Respondents were given the choice of three different ways to preserve peace and security in Europe—with a strong NATO to counter the Warsaw Pact; with an arms limit by NATO and the Warsaw Pact; and by dissolving NATO and the Warsaw Pact and the creation of a nuclear weapon-free zone in Europe. Over half of the respondents preferred the second of these—an arms limit by NATO and the Warsaw Pact. One person in seven preferred the dissolving of the blocs and the creation of a nuclear weapon-free zone.

2. After the announcement of the Soviet moratorium on nuclear weapon tests, a question was asked on this subject. Nearly three-quarters of the respondents favoured a complete test ban to come into force immediately, and one-quarter were in favour of a temporary test ban as a first step in the right direction. Only 4 per cent considered that the decision was a propaganda gimmick by the Soviet Union.

3. A question was also asked on the proposal from the German Democratic Republic—if negotiations should be opened on a chemical weapon-free zone in Central Europe. Those in favour of such negotiations outnumbered those opposed to them in the ratio of over 3 to 1.

Whereas 1983 and 1984 were years for the discussion of the deployment of intermediate-range US missiles in Western Europe, 1985 was the year for discussion of the Strategic Defense Initiative, or Star Wars. So far as FR Germany was concerned, the main question was whether there should be West German participation in the research programme. This question was asked a number of times during 1985. Throughout the year, there was a majority against participation. But whereas at the beginning of the year the opposition to participation appeared very strong, with over 70 per cent of respondents opposed to the idea, by the middle of the year that figure had come down to just under 50 per cent (figure 2.2). It stayed around that figure in other surveys taken later in the year, and the percentage of respondents in favour of participation stayed at around 30 per cent.

On balance, West German public opinion seemed to be opposed to the idea of SDI, though not by a wide margin. When asked if in their view space-based ballistic missile defence (BMD) would increase the danger of war or not, 34 per cent thought the danger would be increased, while only 11 per cent thought that it would be decreased. 53 per cent thought that there would be no change. Then in another questionnaire, respondents were given the choice of two opinions: one was that the result of US space-based BMD would be that the arms race would be heated up; the other was that it would force the Soviet Union to make concessions at the negotiations and would consequently lower its armaments. 45 per cent thought that the arms race would be heated up; 30 per cent that the Soviet Union would be forced to make concessions.

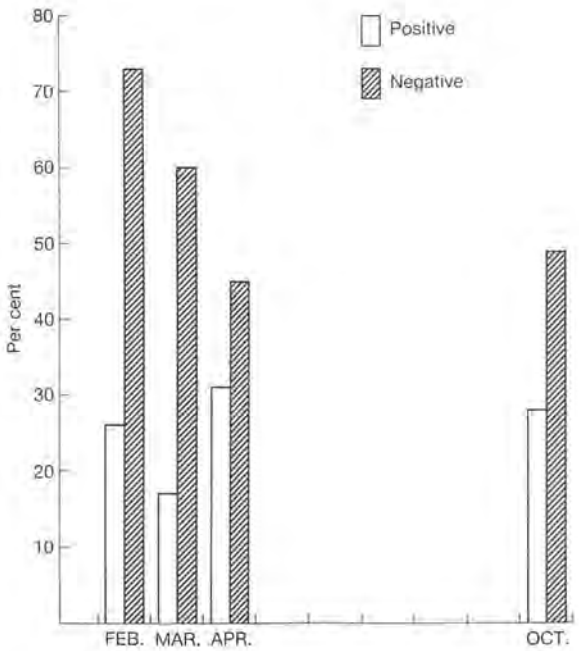
Table 2.4. Replies to polls on arms control issues in the Federal Republic of Germany, 1985

Figures are the percentage of respondents indicating these replies.

Questions	Replies			
1. In Europe the NATO and the Warsaw Pact are facing each other. There are three different ways to preserve peace and security in Europe, which one do you prefer? a. With a strong NATO to counter the Warsaw Pact b. With an arms limitation by NATO and the Warsaw Pact c. With the dissolving of NATO and the Warsaw Pact and the establishment of a Nuclear-Weapon-Free Zone d. No opinion (INFAS, July 1985)	a 26	b 52	c 15	d 7
2. The Soviet Union has lately announced it will stop testing nuclear weapons until 1 January 1986. The USA consider postponing their underground nuclear tests for some time. What is your opinion on nuclear tests? a. A complete and comprehensive nuclear test ban should be established immediately in the East and West. b. A temporary test ban is a first step in the right direction. After considering their security interests the atomic powers should take further measures toward nuclear arms limitation. c. The present discussion is nothing but a Soviet propaganda-trick. She hopes to achieve nuclear superiority this way. The West should in no way fall into this trap. d. No opinion. (INFAS, Aug. 1985)	71	24	4	1
3. East Germany has recently proposed to the West German Government that negotiations might be opened on a Chemical-Weapon-Free Zone in Central Europe. Should the West German Government accept this offer or reject it? (INFAS, Oct. 1985)	Accept 56	Reject 18	No opinion 26	
4. The US plan to have a space-based defence system that should be capable of preventing enemy missiles from reaching their targets. Do you think that this plan will a. increase the danger of a war b. decrease the danger c. that nothing will change d. no opinion (INFAS, Feb. 1985)	a 34	b 11	c 53	d 2
5. There are different opinions on the American SDI. Which is closest to your opinion: a. The American missile defence will force the Soviet Union to expand their armaments. Thus only the arms race will be accelerated, or b. Because of the American SDI the Soviet Union will be forced to give in at the negotiation table and reduce her armaments c. No opinion (INFAS, Oct. 1985)	a 45	b 30	c 25	

Sources: Institut für angewandte Sozialwissenschaft, Bad Godesberg, FR Germany, various releases from 1985.

Figure 2.2. Replies to questions on West German participation in the SDI programme, 1985[a]



[a] The remaining percentage of respondents answered that they had no opinion or had not heard of SDI. The polls were taken by EMNID (Feb.), INFAS (Mar.), Forschungsgruppe Wahlen (Apr.) and INFAS (Oct.).

VI. Public opinion in the United Kingdom

In the various surveys on peace and war issues conducted in the United Kingdom, two conclusions are supported by a number of polls, and by large majorities. The first is that the United Kingdom should stay in NATO. The second is that NATO should move to a no-first-use of nuclear weapons policy (table 2.5).

On other nuclear weapon issues, the conclusions are more ambiguous, and again provide an example of the way in which different wordings can produce different answers on the same issue.

On the cruise missile issue, a majority said that the missiles should be sent back to the United States. However, of those in favour of sending them back, nearly one-half indicated they would be willing to accept them with a dual-key arrangement. Further, when the Soviet SS-20s were brought into the question, a majority said that the missiles should not be removed unless the Soviet Union dismantled its SS-20 missiles. Respondents were evenly split on the removal of all US nuclear bases from British territory.

There were mixed replies, also, on nuclear weapons in the UK's defence strategy. When the question was, 'Do you support or oppose a British defence

Table 2.5. Replies to polls on arms control issues in the United Kingdom, 1985

Figures are the percentage of respondents naming these replies.[a]

Questions	Polls	Replies		
1. Should Britain continue to be a member of NATO?		Yes	No	No opinion
	25 Sep. 1985:	76	13	11
2. Should Britain obtain an agreement from NATO not to be first to use nuclear weapons in the event of a war breaking out?	25 Sep. 1985:	66	18	16
3. Should Britain send the cruise missiles back to the US?	25 Sep. 1985:	52	39	9
4. In the case of wanting to send them back, 52%: Would you accept this siting of cruise missiles in Britain if the British Government had more control over their use e.g., through a dual-key arrangement?	25 Sep. 1985:	42	46	12
5. Do you think that Britain should or should not remove cruise nuclear missiles from this country, whether or not the Soviet Union dismantles its SS-20 nuclear missiles?		Should	Should not	No opinion
	9 Oct. 1985, for Policy Research Associates:	35	52	12
6. Should Britain remove all American nuclear bases from its territory?		Approve	Disapprove	No opinion
	25 Sep. 1985:	45	46	9
7. Do you support or oppose a British defense policy based on the possible use of nuclear weapons?		Support	Oppose	No opinion
	25 Sep. 1985, for CND:	36	46	14
8. Should Britain's defence be based on not having nuclear weapons?		Approve	Disapprove	No opinion
	25 Sep. 1985:	36	55	9
9. Do you think that Britain should or should not continue to possess nuclear weapons as long as the Soviet Union has them?		Should	Should not	No opinion
	9 Oct. 1985, for Policy Research Associates:	68	26	6

10. Would you approve or disapprove of the following policy for Britain's defence: we should cancel the Trident submarine missile program but retain a minimal nuclear deterrent.

	Approve	Disapprove	No opinion
9 Oct. 1985, for Policy Research Associates:	45	39	16

11. Do you think that Britain should or should not buy the Trident submarine-launched missile system at a cost of 11 bln?

	Should	Should not	No opinion
25 Sep. 1985, for CND:	22	64	14

12. How much confidence do you have in the ability of the US to deal wisely with the present world problems?

	Very great/considerable	Little/very little	None at all
Oct. 1985:	28	50	15
Jan. 1985:	20	58	16
Nov. 1984:	27	52	16

13. Do you approve or disapprove of the role the Soviet Union is now playing in world affairs?

	Approve	Disapprove	No opinion
Oct. 1985:	18	59	23
Jan. 1985:	17	62	21
Nov. 1984:	9	73	18

14. Do you approve or disapprove of the role the US is now playing in world affairs?

Oct. 1985:	36	48	16
Jan. 1985:	35	47	18
Nov. 1984:	34	49	17

15. Do you think the Russians can generally be trusted to keep to their agreements on nuclear arms or not?

	Can be trusted	Cannot be trusted	No opinion
Nov. 1985:	22	64	14
July 1985:	24	61	15
Apr. 1985:	25	59	16

16. Do you think that the US can generally be trusted to keep their agreements on nuclear arms or not?

7 Nov. 1985:	30	56	14

17. Do you think that the Star Wars project, which attempts to shoot down enemy nuclear missiles before they hit their target, makes war more or less certain?

	More	Less	No opinion
Nov. 1985:	28	35	25
July 1985:	36	32	19
Apr. 1985:	30	29	21
Jan. 1985:	35	37	14

Table 2.5. *contd.*

Questions	Polls	Replies		
18. If Britain is given the opportunity of joining with the US on research into defensive systems against a Russian missile attack, do you think Britain should or should not take part in this research?		Should	Should not	No opinion
	Nov. 1985:	52	37	11
	July. 1985:	56	35	9
	Apr. 1985:	48	39	13
19. Space should be kept free of all weapons.		Agree	Disagree	No opinion
	30 Jan. 1985:	75	16	9
20. The Russians will try to match or get around any American weapons in space, leading to a new arms race.	30 Jan. 1985:	78	7	15
21. If the US goes ahead with its plans to put nuclear weapons in space, then Britain's own nuclear weapons will lose their value entirely.	30 Jan. 1985:	52	27	21

[a] The percentages of respondents indicating 'no opinion' are not always included in this table, but can be inferred from the 100% total.

Source: *Social Surveys Ltd* (Britain's Gallup Institute: London, 1985).

policy based on the possible use of nuclear weapons?', a small majority voted for 'oppose'. When the question was put the other way, 'Should Britain's defence be based on not having nuclear weapons?', a majority disapproved of non-nuclear defence. When the Soviet Union was brought into the question, 'Do you think that Britain should or should not continue to possess nuclear weapons so long as the Soviet Union has them?', a large majority voted for the retention of those weapons.

A small majority in favour of cancelling the Trident programme turned into a large majority when the cost (£11 billion) was included in the question.

Respondents have little confidence in the superpowers. Most people declared that they had little or no confidence in the 'ability of the US to deal wisely with present world problems', and there has been no change in the last year. The disapproval of the USSR is greater than the disapproval of the USA—but here there has been a significant change, with approval rising and disapproval falling in recent years.

Respondents said that, in their view, neither the Soviet Union nor the United States could be trusted to keep its agreements on arms control. The distrust of the Soviet Union was greater: but the margin was not large.

On the Strategic Defense Initiative, the British public seems rather less negative than the West German public. On balance, a small majority considered that the development might make war less certain; and there was also a majority for joining in the US research programme. However, respondents were very much in favour of 'keeping space free of all weapons'. Further, most people thought that the development would set off a new arms race, and that a consequence of the programme would be that Britain's own nuclear weapons would lose their value entirely.

VII. The SIPRI data bank on public opinion

All the questions cited in this chapter, as well as those mentioned in appendices A of the *SIPRI Yearbooks 1984* and *1985*, are stored in the SIPRI data bank on public opinion polls. The total number of questions stored is about 2000, from over 1000 polls.

For each question, the following data are recorded: date when the poll was taken; country where it was taken; the source that published the results; the sample size; the research organization; the text of the question (in English); the text of the answer, categories and the distribution in percentages of the answers; and the breakdown per sub-group of the answers.

The period covered is 1945 to the present (January 1986), with most of the material taken from the period since 1980.

All NATO countries are included, as well as Japan and several European non-aligned countries. No figures are available from Eastern Europe or the Soviet Union. The sources publish polls in several different languages, but predominantly in English. In principle, no poll with a sample size lower than 900 respondents is accepted for the data bank.

All the questions and answers in the polls have been translated into English, with the text in the original language on file. All questions are assigned one or

more keywords, from a vocabulary of 70 standardized keywords. In addition to the computerized poll data, SIPRI also keeps a bibliography of opinion poll publications, with about 200 entries of recent publications in this field.

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[2] Gallup International, survey made at the end of 1984 in 27 countries, reported in Crespi, L. P., 'Worldwide trends in optimism versus pessimism about the prospects for 1985' (US Information Agency: Washington, DC, 1985).

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Part II. Nuclear and space weapons

3. Nuclear weapons

Prepared by the *Nuclear Weapons Databook* staff, Washington, DC, and SIPRI.*

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

In 1985, for the first time in many years, there was some sense of movement in nuclear arms control talks. Since March, when the Geneva negotiations on nuclear and space arms opened (the first such negotiations since December 1983), both the USA and the USSR have put forward several new arms reduction proposals, culminating in both superpowers offering cuts of 50 per cent in strategic nuclear forces. Both nations also called for the complete elimination of nuclear weapons as their ultimate arms control objective.

Nevertheless, while the words were about reductions, the actions were about increases. During 1985 both the United States and the Soviet Union proceeded with qualitative improvements in their nuclear forces. The first weapons of the Reagan Administration's Strategic Modernization Program (announced in October 1981) began reaching the field. This 'modernization' plan calls for deploying thousands of new nuclear weapons of all kinds before the end of the century. In the Soviet Union, the first ever mobile intercontinental ballistic missile (ICBM), the SS-25, was deployed; US intelligence suggests that this may be the beginning of a major transformation of the Soviet ICBM arsenal. In France, deployment of MIRVed (equipped with multiple independently targetable re-entry vehicles) submarine-launched ballistic missiles (SLBMs) began, the first such capability outside the superpowers. In Britain and China, programmes are proceeding to increase the numbers of nuclear warheads, missiles and aircraft.

Since the Geneva summit meeting between President Reagan and General Secretary Gorbachev, it appears that there is general agreement to cut strategic weapons by 50 per cent and conclude an agreement on intermediate-range nuclear forces (INF). The United States and the Soviet Union have each presented ambitious 'long-term visions' of completely abolishing nuclear weapons. The Reagan Administration seeks the goal through defensive systems which, it suggests, could make nuclear weapons 'impotent and obsolete'. In January 1986 General Secretary Gorbachev presented a three-stage programme calling for the elimination of nuclear arms by the year 2000. Although new ground was broken, especially in the area of verification, the Soviet proposal remains contingent on a ban on developing, testing or deploying strategic defences.

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It is an open question whether the negotiations will proceed fast enough to prevent the impending deployment of the next generation of nuclear weapons. Numerous problems present serious obstacles to a successful outcome. Debate on compliance issues swept through a sharply divided Reagan Administration which decided, for the time being, to continue to comply with both the SALT II (Strategic Arms Limitation Talks) Treaty and the 'restrictive' interpretation of the Anti-Ballistic Missile (ABM) Treaty. But the USA has yet to decide how to respond to alleged Soviet violations of the two treaties. One possible US response would be to take specific 'proportionate' acts of its own. Any such policy would be both controversial and likely to further erode an already fragile arms control regime.

Perhaps the most elusive question of all concerns strategic defence programmes. Success at Geneva seems to hinge on a seemingly unlikely US–Soviet agreement on strategic defences, with both sides insisting that it is the key to reductions in nuclear arms: the USA demands the right to pursue its Strategic Defense Initiative (SDI) programme, and the USSR demands an end to it.

A nuclear weapon test ban continued to attract attention and support during 1985. The issue is discussed in chapters 6 and 19. The Soviet Union initiated a nuclear test moratorium from August to December 1985, and extended it to the end of March 1986, indicating that it is ready to negotiate a comprehensive test ban (CTB). Neither the United States nor the United Kingdom is prepared to re-open CTB negotiations, nor have they joined the moratorium.

This chapter examines the nuclear weapon developments of the five nuclear weapon states in 1985, and the related arms control activities most likely to affect those nuclear forces. It discusses several treaty compliance issues that arose during the year, and provides a description and explanation of the various arms limitation proposals that were made.

II. US nuclear weapon programmes

A combination of factors, including concerns over the mounting federal budget deficit, and revelations of the waste and fraud among defence contractors, caused the US Congress to cut military budget requests sharply during 1985. Early in the year there was a congressional consensus to freeze the military budget, and most of the year was spent arguing whether that meant funding the Pentagon at the fiscal year (FY) 1985 level with or without compensating for inflation. Congress chose to compensate for inflation and approved a total budget of $289.4 billion for the Department of Defense (DoD) and $7.6 billion for the Department of Energy (DoE).

By the end of 1985, the changed mood about federal spending in general and Pentagon spending in particular was evident in the passage of the Balanced Budget and Emergency Deficit Control Act, better known as the Gramm–Rudman–Hollings bill. If fully implemented, it could have a profound effect on future military budgets. Its impact on the FY 1986 budget will result in $278.5 billion for DoD and $7.2 billion for DoE nuclear warhead activities.

ICBMs

The year saw little change in the US land-based missile force (see table 3.1). The programme of Titan II missile deactivation and silo dismantlement continued. At the end of 1985, 17 Titan II ICBMs remained, with the final missiles to be retired by mid-1987.

A programme to improve the accuracy of the Minuteman III missiles was begun in FY 1982 and is scheduled to end in FY 1987 at a cost of $13 million. At the end of 1985, improvements to approximately 400 of the 550 Minuteman IIIs had been completed. The programme will identify accuracy error sources in missile computer software and hardware, and either eliminate them or compensate for them. A separate programme for the 450 Minuteman II missiles, over the period FY 1984–9, is replacing worn-out parts in the guidance system. These guidance system upgrades have resulted in a 38 per cent improvement in accuracy for the Minuteman II and a 25 per cent improvement for the Minuteman III.[1] Beginning in April 1985, a six-year programme was initiated to modify existing Minuteman launch and control facilities to extend their service lifetime to the turn of the century. The programme, named Rivet Mile, will cost almost a half a billion dollars.[2]

The MX missile remained highly controversial throughout 1985. Two major political battles continued: the first in March over releasing funds from the 1984 budget to buy 21 missiles, and the second over the ultimate size of the programme. In March 1985 President Reagan issued a report addressing several issues related to the need for the MX,[3] which started the process by which Congress would have to vote to release $1.5 billion from the FY 1985 budget to purchase 21 MX missiles. As Congress stated in the FY 1985 budget bill, missiles would not be bought unless the issue passed four subsequent votes of approval, which it did between 19 and 28 March.[4]

Although successful in March, President Reagan's MX programme suffered a serious setback during the summer when Congress limited the total number of missiles to 50 deployed in existing Minuteman III silos. Any further deployments could come about only if the President proposes and the Congress approves a more survivable basing mode.[5]

Having previously studied and rejected more than 30 MX basing modes, the US Air Force began once again to examine new variations emphasizing hardening and mobility. A new mobile scheme reportedly being explored by the Air Force Ballistic Missile Office is called 'carry hard'. This basing mode envisions the MX and its launcher encased in a cement capsule being hauled by a truck among silos filled with water. The capsule is put in a silo and the water is pumped into the truck. One estimate to harden 100 MX silos puts the cost at $20 billion.[6]

Three MX flight-tests were conducted during 1985, on 30 May, 23 August and 13 November. The August test, the 9th in the overall series of 20, was the first test from a silo.

For FY 1986, Congress approved the full Administration request of $624.5 million to continue design and development work on the small ICBM (SICBM), the Midgetman. The missile has always been more a creation of

Table 3.1. US strategic nuclear forces, 1986

Weapon system				Warheads		
Type	No. deployed	Year deployed	Range (km)	Warhead × yield	Type	No. in stockpile
ICBMs						
Minuteman II	450	1966	11 300	1 × 1.2 Mt	W-56	480
Minuteman III	550	1970	13 000	3 × 170 kt/	W-62	825
				335 kt	W-78	1 000
Titan II	17	1963	15 000	1 × 9 Mt	W-53	25
Total	**1 017**					**2 330**
SLBMs						
Poseidon	288	1971	4 600	10 × 40 kt	W-68	3 300
Trident I	360	1979	7 400	8 × 100 kt	W-76	3 200
Total	**648**					**6 500**
Bombers						
B-52G/H	263	1955	16 000	8–24[a]	[a]	4 733
FB-111	61	1969	4 700	6[a]	[a]	360
Total	**324**					**5 093**
Refuelling aircraft						
KC-135	615	1957	..	..	..	..

[a] Bomber weapons include five different nuclear bomb designs with yields from 70 kt to 9 Mt, ALCMs with selectable yields up to 200 kt, and SRAMs with a yield of 200 kt. FB-111s do not carry ALCMs or the 9-Mt bomb.

Sources: Cochran, T. B., Arkin, W. M. and Hoenig, M. H., *Nuclear Weapons Databook, Volume 1: US Forces and Capabilities* (Ballinger: Cambridge, MA, 1984), updated in *Bulletin of the Atomic Scientists*, Aug./Sep. 1984; Joint Chiefs of Staff, *United States Military Posture for FY 1987*; authors' estimates.

Congress than something the Administration and the Air Force have enthusiastically supported. Although Administration and Pentagon support sounded firm, questions began to be raised about the missile's cost and capabilities. A General Accounting Office (GAO) report identified numerous challenges that must be met and overcome.[7] At year's end an Air Force report on the SICBM, due on 1 October, was still not ready, reportedly owing to Pentagon uncertainties about the missile's place in the overall modernization programme and fears that its huge cost might devour funds from other programmes, especially SDI.[8]

Throughout the year mixed signals were given by the Administration concerning whether mobile intercontinental missiles should be promoted or banned. Initially the Reagan Administration appeared to agree with the 1983 Scowcroft Commission conclusion that small, mobile, single-warhead missiles would be less vulnerable and could contribute to stability, and that the Soviet Union and the United States should move towards substituting them for fixed ICBMs.

The President, in a speech to the European Parliament on 8 May, accused the Soviet Union of 'undermining stability and the basis of nuclear deterrence' by going forward with its new MIRVed SS-X-24 mobile ICBM, which he said was 'clearly designed' to give the USSR a first-strike capability. In November the USA proposed a ban on all mobile ICBMs in its arms control offer at Geneva (see figure 3.1).

Strategic submarine programmes

The Trident submarine and missile programmes continued during the year. The 13th Trident submarine was authorized, while the 7th, the *USS Alaska*, began sea trials on 18 September; the 8th, the *USS Nevada*, was launched on 14 September; and the 6th, the *USS Alabama*, prepared for its first operational deployment in early 1986.

The *Alaska*'s sea trials forced the Reagan Administration to decide whether or not to comply with the SALT II Treaty. President Reagan decided to comply with the treaty for the time being and ordered one Poseidon SSBN (nuclear-powered ballistic-missile submarine) to be deactivated and dismantled.[9] The decision deferred a final choice on compliance and imposed certain stipulations on future US activities, leaving the commitment to the treaty still fragile.

The Trident II SLBM programme went through another year with its budget intact and virtually free of criticism. The Navy has yet to state publicly how large a fleet it wants, thus making it difficult to compute costs and determine the impact that the counterforce capabilities of the Trident II missiles will have on the strategic situation. It is anticipated that some 4000 warheads could be fielded for the Trident II.[10]

Strategic bomber programmes

The strategic bomber programmes are among the most costly of President Reagan's nuclear weapon buildup, totalling over $100 billion. During the year Congress provided $5.1 billion to buy the final 48 B-1B aircraft. The debate

over whether to produce more than the agreed 100 B-1B bombers continued to remain just below the surface. The huge amount of money that is likely to be requested for the Advanced Technology Bomber (Stealth) in 1986, coupled with the economic consequences of abruptly halting B-1B production, will probably force the question in 1986 of buying more B-1Bs.[11] On 27 June the first operational B-1B was delivered to the Strategic Air Command (SAC). Two days later it went to Dyess Air Force Base, Texas, where it officially joined the SAC inventory. Crew selection, training flights and base preparation continued throughout the year to prepare the first wing for its September 1986 operational capability.

Some details about the Stealth bomber came to light during the year. It is generally believed that the first production funds, some $4.5 billion, will be requested in the FY 1987 budget. Having consumed $2.4 billion over the past four years, and with a possible request of $8 billion in FY 1988, the Stealth bomber programme is rapidly becoming very expensive. The programme calls for a prototype to be flown in late 1987/early 1988, probably at Edwards AFB, California, with a squadron of 18 operational in 1992. The total number is estimated to be 132, costing $50–75 billion. Senator Barry Goldwater, Chairman of the Senate Armed Services Committee, said the bomber was designed in the shape of a flying wing. Congress has been authorizing money for Stealth without knowing very much about what the total cost might be or about its performance characteristics.[12] Some evidence of the operational mission conceived for the Stealth (or possibly B-1B) bomber came to light in a remark by General Bennie Davis, former Commander-in-Chief of SAC, when he said that an 'advanced state-of-the art bomber offers the best potential for dealing with the growing threat posed by Soviet relocatable weapon systems'.[13] Current nuclear war plans call for 'enduring' forces which in this instance would mean that, after penetrating Soviet borders, Stealth bombers would roam above the countryside, hunting mobile SS-24 and SS-25 ICBMs along with other targets.

The last of five B-52G bomber wings carrying air-launched cruise missiles (ALCMs) was made operational in December 1984. Throughout 1985 preparations were made to begin outfitting four B-52H wings with ALCMs. The last wing would be operational at the end of 1986. The conversion of the 120th cruise missile-carrying bomber (probably some time in the fall of 1986) will present another SALT problem to the Administration, since ALCM-capable heavy bombers above that number must be counted against the 1320 MIRV launcher ceiling of SALT II.[14] The first of the more sophisticated 'stealth' versions, called the Advanced Cruise Missile (ACM), will probably be deployed in 1987 or 1988.

A programme to augment the current short-range attack missile (SRAM) with a longer-range, more accurate missile, called SRAM II, moved forward during 1985, with planned deployment set for 1992. In addition to the SRAM II's primary mission of defence suppression, the missile could also be used to destroy relocatable targets.

Theatre nuclear forces

During 1985 US ground-launched cruise missiles (GLCMs) and Pershing II missiles continued their scheduled European deployments, with the completion of the deployment of 108 Pershing II launchers/missiles in the Federal Republic of Germany in December. By the end of the year, 128 GLCMs were also deployed at three bases: Greenham Common, UK; Sigonella, Italy; and Florennes, Belgium. Sigonella continued to be an 'interim base' pending the completion of construction at Comiso. Deployment of the first flight of GLCMs in FR Germany is scheduled for March 1986. The missiles will reportedly be deployed at Hahn Air Base pending the completion of construction at Wüschheim (Hasselbach).

Although the issue of reloads for the Pershing II seemed to be settled, and there was a slight decrease in the number of missiles and nuclear warheads planned for production, extra Pershing II missiles and warheads are being purchased nonetheless. The 'total quantity required has been reduced', according to congressional testimony, because of 'operational consideration precluding the need for the full previously planned procurements'.[15] According to Army Secretary John Marsh, 'a CONUS [Continental US] reserve is deemed necessary to be able to provide the JCS [Joint Chiefs of Staff] with a worldwide mission flexibility and because the number forward deployed is far short of the recognized requirement'.[16] These missiles are to be stored in the USA 'in case they have to be used in other places or for replacements, in addition to the 108 that [the USA] would have in Europe'.[17]

In other developments related to non-strategic nuclear forces, it was revealed that the new F-15E Dual Role Fighter, which is planned to be deployed in 1989 as an augmentation of the currently deployed air defence F-15 aircraft, 'will be capable of delivering most current and future conventional and tactical nuclear munitions', and will carry the B-61 nuclear bomb.[18] Deployment of the B-61 nuclear bomb for US and NATO F-16 and Tornado aircraft continued during the year, replacing the older and less versatile B-28 and B-43 bombs. Debate about the nuclear follow-on to the Lance missile continued during the year. According to congressional testimony, 'The Army does not currently plan to develop nor integrate a nuclear warhead for the JTACMS [Joint Tactical Missile System]',[19] but NATO's Supreme Allied Commander, Europe (SACEUR) General Bernard Rogers did announce plans to build a nuclear Lance missile follow-on (see table 3.2).

In October 1983 NATO ministers, meeting at Montebello, Canada, agreed on a plan of reductions and 'modernizations' to the NATO nuclear weapon stockpile (the Montebello decision). During 1985 significant steps were taken to implement the decision, which called for the withdrawal of 1400 nuclear warheads from Europe by 1988 as part of the compensation for long-range modernization but also approved the modernization of short-range nuclear forces (see table 3.3). At the Luxembourg meeting of the NATO Nuclear Planning Group in May 1985, a specific plan was agreed to reduce NATO's nuclear stockpile to 4600 warheads as required by the Montebello decision. The reductions will include: (*a*) withdrawal and phasing out of all (approx-

Table 3.2. US theatre nuclear forces, 1986

Weapon system				Warheads		
Type	No. deployed	Year deployed	Range (km)	Warhead × yield	Type	No. in stockpile
Land-based systems:						
Aircraft						
[a]	2 000	. .	1 060–2 400	1–3 × bombs	[a]	2 800
Missiles						
Pershing II	108	1983	1 790	1 × 0.3–80 kt	W-85	125
GLCM	128	1983	2 500	1 × 0.2–150 kt	W-84	150
Pershing 1a	72	1962	740	1 × 60–400 kt	W-50	100
Lance	100	1972	125	1 × 1–100 kt	W-70	1 282
Honest John	24	1954	38	1 × 1–20 kt	W-31	132
Nike Hercules	56	1958	160	1 × 1–20 kt	W-31	250
Other systems						
Artillery[b]	4 300	1956	30	1 × 0.1–12 kt	[b]	2 422
ADM (medium/special)	210	1964	. .	1 × 0.01–15 kt	W-45/54	210
Naval systems:						
Carrier aircraft						
[c]	900	. .	550–1 800	1–2 × bombs	[c]	1 000
Land-attack SLCMs						
Tomahawk	100	1984	2 500	1 × 5–150 kt	W-80	100
ASW systems						
ASROC	. .	1961	10	1 × 5–10 kt	W-44	574
SUBROC	. .	1965	60	1 × 5–10 kt	W-55	285
P-3/S-3/SH-3	630	1964	2 500	1 × <20 kt	B-57	897
Naval SAMs						
Terrier	. .	1956	35	1 × 1 kt	W-45	100

[a] Aircraft include Air Force F-4, F-16 and F-111, and NATO F-16, F-100, F-104 and Tornado. Bombs include four types with yields from sub-kt to 1.45 Mt.

[b] There are two types of nuclear artillery (155-mm and 203-mm) with four different warheads: a 0.1-kt W-48, 155-mm shell; a 1- to 12-kt W-33, 203-mm shell; a 1-kt W-79, enhanced-radiation, 203-mm shell; and a 1- to 10-kt W-79 fission warhead.

[c] Aircraft include Navy A-6, A-7, F/A-18 and Marine Corps A-4, A-6 and AV-8B. Bombs include three types with yields from 20 kt to 1 Mt.

Sources: Cochran, T. B., Arkin, W. M. and Hoenig, M. H., *Nuclear Weapons Databook, Volume 1: US Forces and Capabilities* (Ballinger: Cambridge, MA, 1984), updated in *Bulletin of the Atomic Scientists*, Aug./Sep. 1984; Joint Chiefs of Staff, *United States Military Posture for FY 1987*; authors' estimates.

Table 3.3. US European nuclear modernization, 1986–92

Weapon system (warhead)	As of 1986	Withdrawals[a]	As of 1992
Stored in Europe			
Pershing II	108	–	108
Pershing 1a	100	180	100
GLCM	128	–	464
Bombs	1 730	–	1 730
Lance	690	–	690
Honest John	132	200	–
Nike Hercules	250	680	–
8-inch (W-33)	930	730	200
8-inch (W-79)	–	–	200[b]
155-mm (W-48)	730	580	150
155-mm (W-82)	–	–	200
Atomic demolition munitions	–	370	–
Depth bombs	190	–	190
Total in Europe	4 988	2 740	4 032
Committed to Europe[c]			
Poseidon	400	–	400
Carrier bombs	360	–	500
Bombs	600	–	800
Depth bombs	140	–	140
Lance	380	–	380
8-inch (W-79) ER	325	–	325
Atomic demolition munitions	100	–	100
Total committed	2 305	–	2 645
Total	**7 293**	**2 740**	**6 677**

[a] Withdrawals in accordance with the NATO modernization decision of 1979 (equal withdrawals for deployments); the Montebello decision of 1983 (1400 additional withdrawals); and (other) anticipated changes in artillery stockpiles.

[b] Deployment of non-enhanced-radiation warheads in Europe.

[c] Warheads committed to Europe or planned for storage in Europe (does not include tactical naval nuclear weapons).

Source: Authors' estimates.

imately 370) ADMs (atomic demolition munitions) from the Federal Republic of Germany and Italy (this occurred during 1985); (*b*) phasing out all (approximately 500) Nike Hercules missile warheads (at the end of the year, all US Nike Hercules systems, consisting of 16 batteries, 144 launchers and some 110 nuclear warheads, had been withdrawn from Europe and a substantial portion of the Greek Nike Hercules force had also been withdrawn); (*c*) phasing out all remaining nuclear-armed Honest John missiles (some 200 warheads) in Greek and Turkish forces (during 1985, some of these warheads were reportedly withdrawn); and (*d*) reduction and modernization of nuclear artillery shells.

In the continuing drama of nuclear artillery modernization, the congressional guidelines discussed in the *SIPRI Yearbook 1985* continued to hold: (*a*) no more than 925 new artillery projectiles can be produced; (*b*) the military must determine the mix of 155-mm and 203-mm shells within this ceiling; (*c*) no new 203-mm enhanced-radiation (ER) warheads can be built beyond the 325

already produced by October 1984; and (*d*) the cost of the overall programme cannot exceed $1.2 billion.

Although SACEUR General Rogers was successful in tying the withdrawal of nuclear warheads to nuclear modernization, the congressional constraints on new nuclear artillery production have strongly influenced NATO's planned nuclear force structure. Prior to modernization, there were some 1660 US nuclear artillery warheads in Europe. Although a one-for-one replacement was never anticipated, the 925-warhead constraint, with 325 203-mm enhanced-radiation warheads already built, means that only some 600 warheads will be available (and some of those will be sent to South Korea or assigned to the US Marine Corps).

It is estimated that only some 400 new 155-mm and 203-mm nuclear artillery shells will be sent to Europe during 1986–92, a reduction of some 1200 from the current stockpile. Coupled with the forced withdrawal of all ADMs from Europe, as table 3.3 shows, there will be only about 4000 nuclear warheads in Europe after the weapons currently anticipated are deployed. This is in contrast to the 4600-warhead ceiling which was created by the Montebello decision and the NATO 1979 nuclear modernization plan. The difference of 600 warheads may be made up by increases in the number of bombs deployed in Europe or new weapons such as an air-to-surface stand-off missile.[20]

The question of whether and when to deploy cruise missiles was a major political issue throughout the year in Belgium and the Netherlands. After months of debate and uncertainty, Prime Minister Martens announced to the Belgian Parliament (on 15 March) that Belgium would accept the first 16 of a scheduled 48 GLCMs. Less than three hours after the announcement, US C-5 and C-141 military transport aircraft began delivering the missiles and their warheads to Florennes Air Base (some 70 km south-east of Brussels). Five days later the Belgian Chamber of Deputies approved the deployment by a 116–93 vote, and on 23 March the Senate approved it by a 97–69 vote.

On 1 June 1984 the Netherlands Parliament established a set of conditions under which they would deploy their share of GLCMs. The main element was that, if the USSR had on 1 November 1985 more than the number of SS-20s that they had on 1 June 1984, the Netherlands would deploy GLCMs, although two years later than originally planned. On 1 November 1985 Prime Minister Lubbers announced that the Netherlands would accept 48 GLCMs with deployment beginning in 1988. To counterbalance the decision, the Prime Minister also announced that, when the cruise missiles are deployed, the Netherlands will discontinue two of its NATO nuclear missions. These are the 32 nuclear-certified Netherlands Air Force F-16s of Squadrons 311 and 312 at Volkel Air Base and the 13 nuclear-certified Netherlands Navy P-3C Orions of Squadron 320 at Valkenburg Air Base. As a result of the 1983 Montebello decision, the two other Dutch nuclear tasks, those involving atomic demolition munitions and Nike Hercules air defence missiles, will be eliminated. The Netherlands Army Lance missile unit at Havelteberg and the 8-inch artillery unit at t'Harde were retained.

Although not strictly a 'theatre' nuclear weapon, the US sea-launched cruise missile (SLCM) programme continues as a high priority for the Reagan

Administration. As of January 1986, some 100 nuclear land-attack SLCMs were deployed on attack submarines and surface ships, including the two renovated battleships *Iowa* and *New Jersey*. The programme retains its goal of 3994 SLCMs, of which 578 will be the nuclear land-attack variant. Over 200 ships and submarines will be capable of carrying the SLCM by the mid-1990s (see *SIPRI Yearbook 1985*, chapter 1). The USA continues to exclude SLCMs from any of its arms control proposals, and refuses to consider them for negotiation.

III. Soviet nuclear weapon programmes

The USSR continued to make technical and qualitative improvements to its operational nuclear forces in 1985. Strategic force improvements included initial deployments of mobile SS-25 ICBMs and preparations for initial deployments of SS-X-24 ICBMs and SS-NX-23 SLBMs on the new Delta IV Class strategic missile submarines (see table 3.4). Additional SS-N-20 SLBMs were also deployed, and the shift towards an ALCM-equipped bomber force continued with additional deployments of the Bear H with the AS-15 missile. Improvements were made in all areas of theatre nuclear forces as well.

The US intelligence community downgraded the estimated capabilities of certain Soviet weapon systems. The estimated range of the Backfire bomber was reduced by approximately one-third, and the estimated accuracy of the SS-19 ICBM was reduced by more than one-third. Previous intelligence estimates of these two weapons strongly influenced the debates about ratifying the SALT II Treaty and the hypothetical vulnerability of the US land-based missile force. Also, with respect to the Soviet short-range missile force, the intelligence community shifted its emphasis from nuclear to conventional capabilities.

The following Soviet actions were taken in 1985 to comply with various arms control treaties:[21] (*a*) retirement of 70 SS-11 ICBMs to compensate for the deployment of 45 SS-25s;[22] (*b*) conversion of 15 Bison bombers to tankers (the Soviet statement on the tanker conversions was not accepted by the USA since conversion could not be verified by external characteristics) and destruction of 15 other Bisons (these were placed in full view at an airfield and had their tail sections cut off) and retirement of at least 10 older Bear bombers to compensate for deployment of Bear H bombers; (*c*) possible placement of SS-16 ICBMs in storage;[23] and (*d*) continuing retirement of Yankee Class submarines from the strategic submarine forces as new Typhoon and Delta IV Class submarines were introduced.

Numerous command changes within the Soviet military were made in 1985 owing to the ongoing reorganization of the Soviet Armed Forces, the consolidation of power of General Secretary Gorbachev, and the advanced age of several top military leaders. The most important changes were: a new Commander-in-Chief for the Strategic Rocket Forces (SRF)—General Yuri Maximov, formerly district commander for Central Asia, replacing Marshal Vladimir Tolubko, head of the SRF since 1972;[24] the apparent establishment by Marshal Nikolai Ogarkov, former Chief of the General Staff, of a new Western

Table 3.4. Soviet strategic nuclear forces, 1986

Weapon system				Warheads	
Type	No. deployed	Year deployed	Range (km)	Warhead × yield	No. in stockpile[a]
ICBMs					
SS-11 Mod 1	30	1966	11 000	1 × 1 Mt	32– 60
Mod 2	360	1973	13 000	1 × 1 Mt	380– 720
Mod 2/3	60	1973	10 600	3 × 250–350 kt (MRV)	190– 360
SS-13 Mod 2	~60	1972	9 400	1 × 600–750 kt	63– 120
SS-17 Mod 3	150	1979	10 000	4 × 750 kt (MIRV)	630– 1 200
SS-18 Mod 4	308	1979	11 000	10 × 550 kt (MIRV)	3 200– 6 200
SS-19 Mod 3	360	1979	10 000	6 × 550 kt (MIRV)	2 300– 4 300
SS-X-24	. .	1986	10 000	8–10 × 550 kt (MIRV)	. .
SS-25 Mod 1	45	1985	10 500	1 × 550 kt	47– 90
Total	**1 373**				**6 800–13 000**
SLBMs					
SS-N-5	39	1963	1 400	1 × 1 Mt	41– 47
SS-N-6 Mod 1/2	304	1967	2 400	1 × 1 Mt	480– 550
Mod 3		1973	3 000	2 × 200–350 kt (MRV)	
SS-N-8	292	1973	7 800	1 × 800 kt–1 Mt	310– 350
SS-N-17	12	1977	3 900	1 × 1 Mt	13– 14
SS-N-18 Mod 1/3	224	1978	6 500	3–7 × 200–500 kt	710– 1 900
Mod 2		1978	8 000	1 × 450 kt–1 Mt	
SS-N-20[b]	80	1983	8 300	6–9 × 350–500 kt	500– 860
SS-N-23[b]	32	1985	7 240	7 × 350–500 kt	240– 270
Total	**983**				**2 300– 4 000**

Bombers						
Bison	18–33	1956	8 000	2 × bombs	36–	130
Bear A/B/C/G	90	1956	8 300	2–4 × bombs/ASMs	240–	480
Bear H	40	1984	8 300	4 × ALCMs	160–	320
Total	**138–163**				**440–**	**930**
Refuelling aircraft [c]	125-140	. .	. .	. .		. .
ABMs						
Galosh	32	1964	750	1 × 3–5 Mt	32–	64
SH-08	(68)	1985	. .	1 × . .	68–	140
Total	**100**				**100–**	**200**

[a] Figures for numbers of warheads are low and high estimates of possible force loadings (including reloads). Reloads for ICBMs are 5 per cent and 100 per cent, and for SLBMs 5 per cent and 20 per cent extra missiles and associated warheads. Half the SS-N-6s are assumed to be Mod 3s, and SS-N-18 warheads are assumed to be 3 or 7 warheads. Bomber warheads are force loadings and force loadings plus 100 per cent reloads. It is assumed that 30 Bear Gs are now deployed (4 warheads each). All warhead total estimates have been rounded to two significant digits. Warhead estimates do not include down-loading for single-warhead SS-17 Mod 2, SS-19 Mod 2 or SS-18 Mod 1/3 missiles, which could be deployed, nor lower estimates for the SS-18 force, which includes some Mod 2 missiles with 8 or 10 warheads.

[b] Includes SLBMs potentially carried on 1 Typhoon Class and 2 Delta IV Class submarines on sea trials.

[c] Includes Badger and Bison A bombers converted for aerial refuelling, with 15 possible new Bison conversions claimed by the USSR.

Sources: Authors' estimates derived from: Arkin, W. M. and Sands, J. I., 'The Soviet nuclear stockpile', *Arms Control Today*, June 1984, pp. 1–7; Department of Defense, *Soviet Military Power*, 1st, 2nd, 3rd, 4th editions; NATO, *NATO–Warsaw Pact Force Comparisons*, 1st, 2nd editions; Berman, R. P. and Baker, J. C., *Soviet Strategic Forces: Requirements and Responses* (Brookings Institution: Washington, DC, 1982); Defense Intelligence Agency, *Unclassified Communist Naval Orders of Battle*, DDB-1200-124-84, May 1984; Joint Chiefs of Staff, *United States Military Posture for FY 1987*; Gordon, M. R., 'U.S. says Soviet complies on some arms issues', *New York Times*, 24 Nov. 1985, p. 18; Senate Armed Services Committee/Senate Appropriations Committee, *Soviet Strategic Force Developments*, S. Hrg. 99–335, June 1985; background briefing by senior US Administration official, 8 Oct. 1985; Hutchinson, R., 'USSR now has 100 ABM launchers', *Jane's Defence Weekly*, 2 Nov. 1985, p. 959; Polmar, N., 'The submarine enigmas', US Naval Institute *Proceedings*, Jan. 1986, p. 129; interviews with US DoD officials, Apr. and Nov. 1985; Sands, J. I., 'A review of *Soviet Military Power 1985*', Nuclear Weapons Databook Working Paper no. 85-2, July 1985.

TVD (theatre of military operations) that may prove to have some authority over the Warsaw Pact;[25] and a new Commander-in-Chief for the Navy—Admiral Vladimir Chervanin (formerly Chief of the Main Naval Staff and one of two First Deputy Commanders-in-Chief of the Navy, replacing Fleet Admiral of the Soviet Union Sergei G. Gorshkov, Commander-in-Chief of the Navy since January 1956).[26]

ICBMs

The start of what could be a significant shift in Soviet land-based missile forces began in 1985 as the first mobile land-based ICBMs entered service. According to an unclassified summary of a recent US National Intelligence Estimate (NIE) on Soviet Strategic Forces, presented to Congress on 26 June 1985,[27] some 90 per cent of the current Soviet land-based missile force will be replaced by the mid-1990s. Just as significantly, some 40 per cent of the missiles and nearly 25 per cent of the warheads in the force will be mobile based. These warheads are projected to account for nearly one-seventh of all Soviet strategic warheads at that time (see table 3.5).[28] Specific changes during 1985 in the Soviet land-based missile force were: the deployment of SS-25s and a compensating deactivation of SS-11s, the preparation for deployment of SS-X-24s, and continued research and development of three new or improved ICBMs. The number of ICBMs declined slightly with these developments, as did the number of warheads (although the number of warheads will increase to some 7000 as SS-24 missiles are deployed) (see table 3.4). Restructuring the Soviet land-based missile force could represent as significant a change as MIRVing did in the mid- to late-1970s.

At the SALT Standing Consultative Commission (SCC) meeting in late April 1985, the Soviet Union informed the US delegation that 20 SS-11s were being removed and 18 SS-25s were being deployed.[29] While the US intelligence community still had not agreed that SS-25 deployments had begun by the end of the summer,[30] Defense Secretary Weinberger officially confirmed the deployment of 27 missiles in late October.[31] The US Department of Defense reported that, by the end of 1985, 45 SS-25s were deployed in five regiments of 9 missile launchers each, with a compensating reduction of 50 in the number of SS-11 missiles.[32] Twenty additional SS-11s have been retired, probably in preparation for an additional 18 SS-25s.[33] While at least three SS-25s have been tested from a modified SS-13 silo, the USA apparently no longer believes that the SS-25 is replacing the SS-13.[34] However, the USSR is expected to retire most, if not all, SS-11 and SS-13 missiles even if they are not required by arms control limitations to do so.[35]

The SS-X-24 is expected to begin deployment in 100 SS-17 silos in 1986, with deployment of rail-mobile launchers at Plesetsk expected in 1987.[36] Three additional ICBM models or modifications are also under development, all expected to be flight-tested in the period 1986–90. These include a new liquid-fuelled, silo-based heavy ICBM to replace the SS-18, a new version of the SS-X-24, and a new version of the mobile SS-25, which could have a MIRVed payload option. These missiles are likely to have better accuracy and

greater throw-weights than their predecessors.[37] Contrary to some accounts, these missiles have not been given designations, and their exact nature and roles are unconfirmed. The 1985 NIE predicted that, in the absence of arms control agreements, more than 1000 SS-25s and nearly 600 SS-24s could be operational by the middle of the next decade, with the ratio of fixed to mobile SS-24s expected to be roughly two-to-one. The liquid-fuelled follow-on to the SS-18 is expected to replace all current SS-18s by the middle of the 1990s. At that time, this missile could account for 5000 warheads, some 38 per cent of the projected Soviet ICBM warhead force and 25 per cent of Soviet strategic warheads (see table 3.6).

In 1984 it was noted that the US Department of Defense presumed that all 308 SS-18s were modernized to the newest modification, with each missile carrying 10 warheads.[38] It now appears that this statement was in error, since the Defense Department believes that some SS-18s appear to be Mod 2s with 8 or 10 warheads, not Mod 4s.[39] It was alleged in 1985 that the current land-based missile warhead totals were much above the reported 6300 level because SS-18 missiles could be deployed with 14 warheads.[40] As Secretary Weinberger noted during a press conference, the USSR has 'more warheads than 10 on some of their missiles. They've got them manufactured. Whether or not they actually put them on or not is a matter of whatever they perceive would be required in any kind of situation that faced them. It is a quantitative difference'.[41] The belief that the SS-18 carries more than 10 warheads stems from the missile's large throw-weight and evidence from three tests—in late 1978, early 1979 and 1983—in which 10 re-entry vehicles were released and the bus 'dipped' or altered course additional times, simulating the release of re-entry vehicles.[42] However, a Defense Intelligence Agency (DIA) official stated in April 1985 that the SS-18 has in fact not been tested with more than 10 warheads and that it 'would be a very risky enterprise' for the missile to carry more than 10 warheads.[43]

Also noteworthy is the revised assessment by the US intelligence community of the accuracy of the SS-19, although the DIA reportedly dissented to this reassessment in a footnote to the NIE. The improved accuracies of the SS-18 and SS-19 missiles were central to the view that the United States faced a 'window of vulnerability' because the USSR was capable of destroying the US land-based missile force. The alleged accuracy of the missiles was also used to justify the need for the MX, which would, it was argued, offset the Soviet lead in prompt hard-target destruction capability and correct the perception that Soviet accuracies were improving without a corresponding improvement in US missile accuracy. The new NIE reportedly reduced the previously estimated accuracy by more than one-third, extending the CEP (circular error probable) from 300 to 400 metres.[44]

Strategic submarine programmes

The Soviet strategic submarine force continues to include 62 modern nuclear-powered submarines. The third Typhoon Class SSBN has entered service, and a fourth Typhoon and two Delta IV Class submarines (launched in

Table 3.5. Soviet theatre nuclear forces, 1986

Weapon system				Warheads	
Type	No. deployed	Year deployed	Range (km)	Warhead × yield	No. in stockpile[a]
Land-based systems:					
Aircraft					
Backfire	144	1974	3 700	2–3 × bombs or ASMs	288
Badger	287[b]	1955	4 800	2 × bombs or ASMs	480
Blinder	136[b]	1962	2 200	1 × bombs or ASMs	136
Tactical aircraft[c]	2 885	. .	700–1 000	1–2 × bombs	2 885
Missiles					
SS-20	441[d]	1977	5 000	3 × 250 kt	1 323–2 205
SS-4	112(<)	1959	2 000	1 × 1 Mt	112
SS-12 Mod 1/2	120	1969/78	800–900	1 × 200 kt–1 Mt	120
Scud B	600	1965	280	1 × 100–500 kt	1 200
SS-23	. .	(1985)	350	1 × 100 kt	. .
Frog 7	406	1965	70	1 × 10–200 kt	406–1 218
SS-21	224	1978	120	1 × 20–100 kt	224– 672
SS-C-1B[e]	100	1962	450	1 × 50–200 kt	100
SAMs[f]	. .	1956	40–300	1 × low kt	. .
Other systems					
Artillery[g]	2 700	1974	10–30	1 × low kt	. .
ADMs	. .	. .	. .	. .	. .
Naval systems:					
Aircraft					
Backfire	132	1974	3 700	2–3 × bombs or ASMs	264
Badger	220	1961	4 800	1–2 × bombs or ASMs	480
Blinder	35	1962	2 200	1 × bombs	35
ASW aircraft[h]	204	1965	[h]	1 × depth bombs	204
Anti-ship cruise missiles					
SS-N-3	264	1962	450	1 × 350 kt	264
SS-N-7	96	1968	56	1 × 200 kt	96
SS-N-9	224	1969	111	1 × 200 kt	224
SS-N-12	120	1976	500	1 × 350 kt	120

SS-N-19	88	1980	460	1 × 500 kt	88
SS-N-22	36	1981	111	1 × 200 kt	36
Land-attack cruise missiles					
SS-N-21	. .	1986	3 000	1 × . .	. .
SS-NX-24	(12)	(1986)	<3 000	1 × . .	. .
ASW missiles and torpedoes					
SS-N-14	300	1968	50	1 × low kt	300
SS-N-15	. .	1972	40	1 × 10 kt	. .
SUW-N-1/FRAS-1	10	1967	30	1 × 5 kt	10
Torpedoes	. .	1957	16	1 × low kt	. .
Naval SAMs[i]					
SA-N-1	65	1961	22–32	1 × 10 kt	65
SA-N-3	43	1967	37–56	1 × 10 kt	43
SA-N-6	33	1981	65	1 × 10 kt	33
SA-N-7	9	1981	28–52	1 × 10 kt	9

[a] Estimates of total warheads are based on minimal loadings of delivery systems.
[b] There are some 360 Badger and Blinder strike variants, approximately two-thirds of which are Badgers.
[c] Nuclear-capable tactical aircraft models include MiG-21 Fishbed L, MiG-27 Flogger D/J, Su-7 Fitter A, Su-17 Fitter C/D/H, Su-24 Fencer and Su-25 Frogfoot.
[d] Includes 36 launchers currently unlocated by the USA.
[e] Land-based anti-ship missile.
[f] Nuclear-capable land-based SAMs probably include SA-1, SA-2, SA-3, SA-5 and SA-10 missiles.
[g] Artillery includes M-1981 2S5 152-mm SP gun, M-1976 152-mm towed gun, M-1975 203-mm SP gun, M-1975 240-mm SP mortar and a new howitzer/mortar (probably 152-mm) assigned to airborne and air assault units. An additional 4000 M-1973 2S3 152-mm SP howitzers and older 152-mm towed guns have a potential nuclear capability, as do the 152-mm guns deployed on Sverdlov Class cruisers.
[h] Includes 94 Be-12 Mail (range 2000 km), 50 Il-38 May (range 2500 km), and 60 Tu-142 Bear F aircraft (the Bear F has a range of 8300 km, although it is used in theatre ASW roles). All ranges represent unrefuelled combat radius.
[i] The SA-N-1, SA-N-3 and SA-N-6 are believed to have a definite nuclear capability and the SA-N-7 a possible nuclear capability. Numbers deployed are the number of launch arms (e.g., two twin launchers equals four launch arms) deployed on ships. Overall, there are more than 3300 SAMs of these four types deployed on 70 ships of 11 classes.

Sources: Arkin, W. M. and Sands, J. I., 'The Soviet nuclear stockpile', *Arms Control Today*, June 1984, pp. 1–7; Polmar, N., *Guide to the Soviet Navy*, 3rd edition (US Naval Institute: Annapolis, MD, 1983); Department of Defense, *Soviet Military Power*, 1st, 2nd, 3rd, 4th editions; NATO, *NATO–Warsaw Pact Force Comparisons*, 1st, 2nd editions; Defense Intelligence Agency, 'A guide to foreign tactical nuclear weapon systems under the control of ground force commanders', DST-1040S-541-83 (secret, partially declassified), 9 Sep. 1983; Statement of Rear Admiral John L. Butts, USN, Director of Naval Intelligence, before the Seapower and Force Projection Subcommittee, Senate Armed Services Committee, 26 Feb. 1985; Joint Chiefs of Staff, *United States Military Posture for FY 1987*; Polmar, N., 'The submarine enigmas', US Naval Institute *Proceedings*, Jan. 1986; *Field Artillery Journal*, Jan.–Feb. 1985; Gordon, M. R., 'Pentagon reassesses Soviet bomber', *New York Times*, 1 Oct. 1985, p. A8; interviews with US DoD officials, Apr. and Nov. 1985; Sands, J. I., 'A review of *Soviet Military Power 1985*', Nuclear Weapons Databook Working Paper no. 85-2, July 1985.

Table 3.6. 1985 NIE estimate of Soviet strategic warheads for 1994

Type/ weapon system		Per cent of launchers, by type	Per cent of warheads, by type	No. of warheads[a]	Per cent of total warheads[a]
ICBMs		*100*	*100*	10 400–12 850	*61.6–64.5*
New ICBM	fixed	*20.8*	*38.3*	4 000– 4 950	*23.7–25.0*
SS-24	fixed	*26.0*	*31.6*	3 300– 4 050	*19.4–20.8*
	mobile	*11.3*	*13.7*	1 400– 1 750	*8.4– 9.0*
SS-25	mobile	*29.4*	*8.6*	900– 1 100	*5.3– 5.7*
SS-19	fixed	*12.5*	*7.8*	800– 1 000	*4.8– 5.1*
SLBMs		*100*	*100*	4 200– 5 650	*25.8–27.1*
New SSBN		*3.1*	*7.2*	300– 400	*1.8– 1.9*
Typhoon		*13.6*	*30.8*	1 300– 1 750	*8.0– 8.4*
Delta III/IV		*27.2*	*49.2*	2 050– 2 800	*12.7–13.3*
Delta I/II		*27.8*	*6.4*	275– 350	*1.7– 1.8*
Yankee		*28.3*	*6.4*	275– 350	*1.7– 1.8*
Bombers		*100*	*100*	1 600– 2 350	*9.7–11.2*
Bear H		*34.2*	*43.9*	700– 1 030	*4.3– 4.9*
Blackjack		*48.9*	*52.5*	840– 1 235	*5.2– 5.9*
Old Bear		*16.9*	*3.6*	60– 85	*0.4*

[a] The low estimates in these columns reflect adherence to the SALT II limits through 1990; the high estimates are the NIE estimates for the case of a break-out from the SALT II Treaty in 1986.

Source: Authors' calculations, derived from testimony of Robert M. Gates, Chairman, and Lawrence K. Gershwin, National Intelligence Officer, National Intelligence Council, before a joint session of the subcommittees of the Committee on Armed Services and the Committee on Appropriations of the US Senate, *Soviet Strategic Force Developments*, Senate Hearing 99-335, 26 June 1985, pp. 6–13.

1984) have begun sea trials.[45] When the SS-NX-23s become operational in 1986 on the Delta IVs and soon thereafter on Delta IIIs, these Soviet SSBNs will be able to target the entire United States without having to travel several hundred kilometres out into the Greenland Sea.[46] Two Yankee I SSBNs and the last remaining Hotel II SSBN have been removed from service to compensate for the new deployments in accordance with the SALT I Interim Agreement. Overall, the current strategic submarine force now carries 983 SLBMs armed with approximately 2500 warheads.[47] This total includes 13 Golf II Class submarines with 39 SS-N-5 missiles and some of the Yankee I Class submarines with SS-N-6 missiles assigned theatre missions, and a Hotel III and Golf III Class most probably assigned to missile trials and training.[48]

The development of survivable, long-range submarine-launched ballistic missiles that can strike the United States from waters contiguous to the Soviet Union is a significant trend in Soviet strategic forces. This trend will continue as Delta IV and Typhoon SSBNs are being completed at the rate of about one per year, and the pace of change will accelerate as SS-NX-23 missiles are retrofitted to the Delta III SSBN force. Additionally, a new class of strategic missile submarine is expected to enter the force in the early 1990s, a replacement for the SS-N-20 on Typhoon submarines is expected to begin flight-testing in the near future, and a missile in the same class as the SS-NX-23 will probably be tested in the 1980s. The NIE estimated in 1985 that, by 1994, SLBM warheads will account for about 26 per cent of all strategic warheads, with half of the

SLBM warheads carried by Delta III and Delta IV submarines, about one-third carried by Typhoon submarines, and the remaining 16–17 per cent evenly split between Yankee, Delta I and II and the new class of submarine (see table 3.6).

Testimony given in 1985 by Admiral Watkins, US Chief of Naval Operations, indicates that the USSR uses a two-crew system for its SSBNs, the first time such a fact has been made public.[49] Previously, it was assumed that the relatively low percentage of Soviet on-station SSBNs was due in part to the fact that the Soviet Union used a single crew for its SSBNs. Given the transition towards longer-range SLBMs, a two-crew system could lead to a large shift in the on-station percentage of Soviet SSBNs.

Strategic bomber programmes

The number of Soviet strategic bombers remained approximately the same in 1985 although the number of deliverable weapons increased with the addition of ALCM-equipped Bear H squadrons. Bear H bombers now reportedly conduct routine intercontinental training to points off the North American coasts.[50] Integration of the ALCM into the Soviet bomber force is reportedly progressing at a slower rate than anticipated. The bomber force continues to have a low alert rate—no bombers are considered to be on standby alert.

It is now believed that the new Blackjack bomber, which was in 1983 expected to enter service in 1986–7, may be operational in 1988 or 1989.[51] The Blackjack will almost certainly carry the AS-15 ALCM, and will probably also be designed for low-altitude high-subsonic penetration of air defences. Both the Blackjack and Bear H are expected to carry improved variants or follow-ons of the AS-15, which are expected by the 1990s.[52] Bison and older Bear bombers are expected to be phased out of service, and the ALCM-equipped bomber force is expected to sustain a fivefold increase by the middle of the decade. At that time, ALCMs are expected to account for some 10 per cent of all Soviet strategic warheads (up from just over 3 per cent today; see tables 3.4 and 3.6).

Strategic defence developments

The Soviet Union continued to upgrade the operational ABM (anti-ballistic missile) system around Moscow in 1985. Since the early 1980s, the system has been expanded to include the full 100 launchers allowed under the limits of the 1972 ABM Treaty. The first new silo launchers for the SH-08 endo-atmospheric missiles, armed with a low-yield nuclear warhead, became operational in 1985, complementing the remaining force of Galosh ABM-1B exo-atmospheric missiles.[53] The Galosh missiles may be replaced by the SH-04 exo-atmospheric missiles; and the new Moscow ABM system, with 100 silo-based endo- and exo-atmospheric nuclear-armed interceptors, could be fully operational by 1987.[54] It is believed that the ABM silo launchers will have the capability of one reload/refire per silo, although the reload/refire time is unclear.[55] The ABM Treaty prohibits 'automatic or semi-automatic or other similar systems for rapid reload' of the permitted launchers, and the existing

evidence is ambiguous as to whether the Soviet Union has a system for rapid reload.[56]

In October 1985, the USA released a report which primarily restated previously released data supporting the contention that the Soviet Union may be preparing an ABM defence of its national territory while also proceeding apace with research and development (R&D) of advanced defences against ballistic missiles.[57] According to this and other US reports, the Soviet Union has embarked on a multi-faceted non-nuclear defensive R&D programme that has made progress in several advanced defence technology areas. This progress, the USA claims, could lead in the next few decades to operational defensive systems, including deployments of: (*a*) high-energy lasers for ground- and space-based anti-satellite (ASAT) missions and ballistic missile defence (BMD), air defence of high-value strategic targets and theatre forces, point defence of ships at sea, and airborne lasers in several roles; (*b*) particle-beam weapons for space-based ASAT and BMD missions; (*c*) ground- or space-based radio-frequency weapons for ASAT or, perhaps, BMD missions; and (*d*) long- and short-range, space-based kinetic-energy systems for BMD, point defence of satellites or space defence, or ASAT missions.[58]

Many of these specific contentions are necessarily speculative, given that all of these activities are being pursued mostly in long-term R&D programmes. The existence of some of the programmes has been publicly confirmed by Soviet officials. General Nikolai Chervov, often a spokesman for the Soviet Defence Ministry, has noted that the present ABM systems 'are becoming outdated [and] need to be replaced and in this respect, there is research being done in our country'.[59] He acknowledged that laser experiments to locate and detect satellites are being carried out from Sary-Shagan.[60]

Theatre nuclear forces

The modernization programme for Soviet theatre forces continued in 1985. Deployments continued, and research and development of follow-on systems progressed in all areas. There are many unresolved questions about Soviet theatre forces: for example, the degree of nuclearization of dual-capable aircraft, missile and artillery systems. In virtually all areas, the USA believes that the USSR, while not de-emphasizing nuclear capabilities, is focusing more on improvements in conventional capabilities. For instance, the USA believes that tactical aircraft are increasingly being given conventional interdiction roles, and the new short-range ballistic missiles are designed to enhance their conventional missions.

Long-range theatre missiles

After new deployments of SS-20 missiles virtually ceased during 1984, 1985 was a period of almost frenetic activity. The USSR continued to retire SS-4 missiles and has renewed deployments of SS-20 missiles. Although 112 SS-4s were in service as of mid-1985,[61] all remaining missiles are expected to be retired during 1986.

The latest count on the SS-20 is 441, 36 of which are not currently located by

the USA.[62] As reported in the *SIPRI Yearbook 1985*, the first two new deployments above the 387 level occurred in late 1984.[63] By 2 April 1985, the number of SS-20s deployed was 414,[64] rising to 423 by late June,[65] and to 441 by September.[66] The number of operational SS-20 missiles facing Europe was reported to have been reduced from 297 to 243 in November, following promises made by General Secretary Gorbachev in Paris on 3 October 1985 to reduce the number of missiles on standby alert. However, the USSR reportedly only dismantled the SS-20 garages at the sites and has not destroyed the missiles.[67] The SS-25 deployments at Yurya have resulted in shifted deployments throughout the Soviet Union of SS-20 regiments and launchers, and whereas detailed information was possible about SS-20 deployment locations in the past, almost on a regimental basis, such detail was not available in January 1986. The overall SS-20 force is expected to grow to over 450 by 1987,[68] despite partial or complete deactivation of some bases in the western USSR to reduce the number targeted against NATO and to convert to the SS-25.

A new modification of the SS-20 is currently being deployed. The accuracy of the new modification reportedly represents an almost threefold improvement over that of the original 1977 version. Additionally, the yield of the primary warhead has been re-evaluated by US intelligence to be 250 kt, not 150 kt, per warhead. The USA also believes that there may be either a 75-kt modification or selectable-yield capability down to that level, in addition to a warhead as large as 600 kt.[69] The 1985 NIE apparently backtracked on the question of reload capability for the SS-20. Although the DIA dissented, the 1985 NIE gave the SS-20 only an 'estimated reload capability', whereas earlier it was considered certain. Apparently, in previous years the intelligence community underestimated the rate of launcher production which, given its missile production estimates, led to an overestimation of the number of missiles per launcher. The follow-on to the SS-20 was also reportedly designated in 1985 as the SS-28.[70] It was first tested in 1984 and is expected to feature improved lethality and accuracy.[71]

The expected introduction date of the SSC-X-4 ground-launched cruise missile has been pushed back again, this time to 1990, five years later than originally expected.[72] It is also believed that another large, land-based, long-range GLCM, a version of the SS-NX-24, is under development.

Tactical rockets, missiles and artillery systems

The buildup of tactical nuclear systems continued in 1985, with new emphasis given to the conventional aspects of the dual-capable systems. This buildup included the continued deployment of new short-range missiles, ongoing phase-out of Frog and Scud missiles, and upgrade of the SS-12 Scaleboard. Improvements in guidance and control, warhead capabilities and accuracies for the Soviet shorter-range missiles are expected over the next few years.[73]

It is now known that the so-called SS-22 is a modification of the SS-12 Scaleboard, designated SS-12 Mod 2, rather than a new missile. The Scaleboards are assigned to the Front level, with a brigade of 12–18 launchers.

It has a range of about 900 km, which is a little longer than the Pershing 1a (740 km). There are a total of 120 launchers, with continued new forward deployments in the German Democratic Republic and Czechoslovakia. It is believed that the SS-12 Mod 2, like the SS-12 Mod 1, is perhaps only a nuclear system, and not dual-capable. It has replaced the SS-20 as the primary Soviet theatre nuclear strike weapon in the Far East, enabling the SS-20 to be concentrated primarily against Chinese fixed targets.

The SS-21 has totally replaced Frogs in all divisions at the highest readiness level (Category I). The missile is believed to be much more accurate and have almost double the range (120 km) of the Frog 7 (70 km), thereby representing an upgrade equivalent to the US upgrade from the Honest John to the Lance missile. There are a total of 630 SS-21 and Frog launchers. The Frog 7s are considered primarily to have a nuclear role, while the SS-21s are thought to be truly dual-capable, with increased emphasis on conventional missions. The SS-21 was first shown publicly in the 9 May 1985 parade in Moscow commemorating Victory Day over Germany.[74]

Forward Armies and homeland Fronts have Scud missile brigades each with 12–18 SS-1c Scud Bs. The SS-23 missile has still not been introduced in any appreciable numbers, and is now about five years behind its original estimated date of initial operation. There are 600 Scud launchers in total. The Scud Bs are thought to be primarily nuclear weapons, with few conventional capabilities.

US statements about the nuclear capabilities of Soviet artillery systems have become increasingly more definitive. For example, where statements in the 1970s noted that theatre nuclear weapons possibly included artillery systems,[75] statements in the early 1980s note that the new systems are nuclear-capable or have been adapted to fire nuclear projectiles.[76] This is partly due to the large expansion and modernization programme for new artillery systems evident since the late 1970s. There has been a 40 per cent increase in artillery tubes opposite NATO since 1979, as well as the deployment of a fourth artillery battalion in Army level brigades and the deployment of artillery tubes with calibres larger than 130 mm for the first time (beginning in 1982) at the division level. Fourteen per cent of all Soviet Army artillery tubes are now self-propelled, and 70 per cent of these tubes are located opposite NATO.

Five artillery pieces of three different calibres are believed to be capable of firing nuclear projectiles: the M-1981 2S5 self-propelled 152-mm gun, the M-1976 towed 152-mm gun (first seen publicly in the 1985 Victory Day parade[77]), the M-1975 self-propelled 203-mm gun, the M-1975 self-propelled 240-mm mortar, and a new howitzer/mortar (probably 152 mm) assigned to airborne and air assault units.[78] Overall, there are reportedly 7700 tubes of three calibres—152 mm, 203 mm and 240 mm—that have a nuclear capability according to the US Defense Department, although 4000 of these tubes are 152-mm guns (M-1973 2S3 self-propelled 152-mm howitzers and older 152-mm towed guns) which have a questionable nuclear capability.

Theatre and tactical aviation

There are now some 150 Tu-22M Backfire medium-range bombers in Soviet Strategic Aviation. The Backfire is the only Soviet medium-range bomber still

in production; in 1984 and 1985 production was slightly below 30 per year,[79] with new aircraft entering both Strategic Aviation Armies and Soviet Naval Aviation regiments. The overall medium-range bomber inventory has been decreasing since Tu-16 Badgers are being retired at an accelerated rate.

The range of the Backfire bomber is still debated, and the USA continues to estimate that the aircraft has an intercontinental capability. In October 1985, a senior US official noted that the Backfire force 'constitutes . . . a strategic threat to the United States' and included the Backfire force (including those assigned to Soviet Naval Aviation) in a count of Soviet strategic nuclear forces—as did the JCS in January 1986.[80] Just before this pronouncement, however, it was reported that the US intelligence community revised its estimate of the Backfire's range. Previously, the DIA had estimated the unrefuelled range of the aircraft as 5000 km, more than one-third higher than the CIA estimate of 3700 km. With the revision, partly a result of a revised estimate of the aircraft's fuel consumption rate, the DIA's estimate reportedly has moved substantially towards that of the CIA.[81]

The tactical aircraft most often used in military exercises in the nuclear delivery role are the MiG-27 Flogger D/J, the Su-17 Fitter C/D/H, and the Su-24 Fencer. Conversion from the Fitter to the Fencer is now complete with the Group of Soviet Forces in the GDR. Fencers are also being deployed with Strategic Aviation, probably replacing the Badgers that are being retired. The deployment of more helicopters in organic units in the Soviet Army, together with the deployment of more capable tactical SAMs (surface-to-air missiles) at division level, have led the US intelligence community to believe that close-air-support roles are increasingly being removed from new-generation tactical aircraft, which are being assigned interdiction roles.

Naval developments

The expansion of Soviet naval capabilities and areas of operation continued in 1985. The Navy conducted three major naval exercises:

1. The largest Soviet exercise ever held in the Pacific took place in April, involving some 75 per cent of the Pacific Fleet's ships and submarines. The focal point was an attack on a simulated US carrier task force designed to recreate and improve upon the Soviet response to the US Navy's 1984 fleet exercises during which Soviet aircraft flew poorly executed simulated attacks against US carriers.[82]

2. The largest co-ordinated and most active limited-area exercise to date, Summerex 85, took place in the North Sea in July, involving 38 surface combatants, 39 attack submarines, 25 auxiliaries and hundreds of aircraft. The aircraft flew some 275 sorties, the highest number since Okean 75, and the exercise lasted twice as long as a typical exercise in the area.[83]

3. The first amphibious landing in the Pacific since 1978 and the largest to date took place in August in the Kuril and Sakhalin Islands, involving more than 30 submarines and surface ships.[84]

Several naval construction programmes continued in 1985. Soviet non-strategic submarine activities, the highlight of 1984 naval developments, were less prominent during 1985. In the cruise missile-carrying category, a third

Oscar Class submarine was introduced, and this class remains in series production at the rate of roughly one per year.[85] Modification of the Echo II Class to carry the SS-N-12 in place of the SS-N-3 is also continuing,[86] and a former Yankee Class SSBN has been rebuilt as the trials vessel for the SS-NX-24 long-range, land-attack cruise missile, with launch tubes for 12 of these missiles. A new nuclear-powered submarine with up to 24 SS-NX-24 missiles is expected to enter service by the end of the decade.[87] In addition, SS-NX-21 cruise missiles are being fitted to at least one and probably several classes of nuclear attack submarine. The candidates for this missile include at least one former Yankee Class SSBN converted to an SSN (others are laid up or in the process of conversion) and the lead ships of three new SSN designs, the Mike, Akula and Sierra Classes.[88] The *Yankee* and *Sierra* were completed in 1984, and the *Mike* and *Akula* in 1985. None of these ships has yet begun full-scale operations or entered series production, and it is not yet clear whether all of the new designs will enter series production. The 'attack' submarine that the USSR selects will most likely replace Delta and Yankee Class SSBNs on patrol off the US coasts.[89] The only Soviet SSN launched in 1985 was another Victor III Class, the 21st (and possibly last) of this class.[90]

The major Soviet surface ship development in 1985 was the launching of the large-deck aircraft-carrier in December in the Black Sea.[91] The carrier is believed to use both nuclear and steam propulsion and to be fitted with a ramp on its bow (similar to a ski jump) and an angled flight deck. It is now estimated that the ship is about 300 m long with a 65 000 ton displacement. Sea trials could begin as early as 1988 with a limited initial operational capability (IOC) in about 1990. Given the limited Soviet experience with sea-based aviation, the carrier is not expected to be fully operational until about 1995.[92] A second carrier is now under construction at the Nikolayev Shipyard.[93] Other surface ship developments during 1985 include the deployment of additional Sovremennyy and Udaloy Class destroyers, the completion of the overhaul on the first Kiev Class carrier, the continued construction of additional Kirov and Slava Class cruisers, and the autumn transfer of the second Kirov Class cruiser to the Pacific Fleet in the company of a Sovremennyy and a Udaloy destroyer, the first Pacific Fleet deployments for each of these classes.[94] Finally, an additional squadron of Backfire bombers was deployed with Soviet Naval Aviation, and improvements have been made to the deployment base and staging facility at Cam Ranh Bay, Viet Nam, with the addition of a sixth floating dock to the base and permanent fuel storage tanks for aircraft.[95]

IV. Britain

Air Force

Nine squadrons of Tornado dual-capable strike aircraft are now in service, of which six squadrons are forward deployed in FR Germany, with a seventh squadron to join in 1986. November 1985 marked the demise of the Jaguar aircraft in the nuclear strike/attack role in FR Germany, with all those squadrons now operating the Tornado.[96]

The Harrier GR.5 Strike Fighter made its first flight in April 1985 at Dunsfold, England.[97] The RAF has 60 of the nuclear-capable aircraft on order, with initial deployment planned for 1987–8 at RAF Gutersloh, FR Germany.

SSBNs

Submarine squadron number 10, comprising four Polaris submarines, has completed a total of some 170 operational patrols (resulting in an average 54 per cent at-sea availability) since the maiden patrol of *HMS Resolution* in 1968, all supposedly without incident or interruption. Nevertheless, in June 1985 the *HMS Resolution* collided with an 18-m fishing boat while preparing to launch a Chevaline-equipped A3-TK missile at the US Eastern Test Range as part of the qualification procedures necessary for patrols with the new missile.[98] With a fleet of only four Polaris submarines, and a 54 per cent at-sea availability, this means that one or two submarines are on patrol at any one time (1.44 average). In addition, an operating British nuclear-powered submarine can be expected to have several reactor incidents a year, some of which result in loss of power or propulsion.[99] Such accidents could result in Britain having no SSBNs on active patrol or ready to commence active patrol at some given time.

Chevaline

Britain is in the process of modernizing its Polaris SLBMs with the Chevaline 'front end', a combination of warheads, guidance package and penetration aids. The Chevaline-equipped missiles, designated A3-TK, have two MRV warheads with improved accuracy, range and flexibility.

As of September 1984, all the operational at-sea SSBNs (*HMS Renown* and *Revenge*) were equipped with the Chevaline re-entry system, prompting the British Ministry of Defence (MoD) to declare the programme completed.[100] This may have been true in terms of expenditure, with 97 per cent of the total funds already spent,[101] but not in terms of the deployment timetable.

After the test firings in June 1985, *HMS Resolution* became the third submarine to deploy the improved Chevaline A3-TK missile system. As of January 1986 the last boat, the *HMS Repulse*, was still having its third refit, which will be completed during the year. After a further nine-month period, which will include similar test firings at the Eastern Test Range, the boat will be ready for its maiden patrol with the Chevaline system in the spring of 1987.[102] New motors are being fitted to the Polaris/Chevaline missiles to enable them to remain operational until the end of the 1990s.

Trident

Britain is proceeding with its plans to build a new class of submarines that will be equipped with Trident SLBMs (and thus provisionally called the Trident Class). The Trident SSBN force will begin to be introduced in the mid-1990s, and will not be completed before the end of the century.

The request for bids for the first of the new class of SSBNs went out on schedule in October 1984, and the MoD expects to place the order with Vickers

Table 3.7. British nuclear forces, 1986[a]

Weapon system				Warheads	
Type	No. deployed	Year deployed	Range (km)[b]	Warhead × yield	No. in stockpile
Aircraft					
Buccaneer S2	30	1962	1 700	2 × bombs	60
Tornado GR-1[c]	180	1982	1 300	2 × bombs	360
SLBMs					
Polaris A3[d]	16	1968	4 600	3 × 200 kt	48
Polaris A3-TK	48	1982	4 700	2 × 40 kt	96
Carrier aircraft					
Sea Harrier	30	1980	450	1 × bombs	30
ASW helicopters					
Sea King	69	1976	. .	1 × depth bombs	69
Wasp	16	1963	. .	1 × depth bombs	16
Lynx	35	1976	. .	1 × depth bombs	35

[a] 34 Nimrod ASW aircraft, 12 Lance launchers and artillery guns (five regiments) are also certified to use US nuclear weapons.

[b] Range for aircraft indicates combat radius, without refuelling.

[c] 220 Tornado attack aircraft (GR-1) are on order for the Royal Air Force. Some Buccaneer and Jaguar aircraft already withdrawn from bases in FR Germany may be assigned nuclear roles in the UK.

[d] The Polaris A3-TK (Chevaline) is deployed on all 3 operational SSBNs. The *HMS Repulse* is credited with 16 Polaris A3-TK missiles, even though it will be in refit until mid-1986 and will not go on its first patrol with Chevaline until 1987.

Sources: Moore, J. (ed.), *Jane's Fighting Ships 1982–83* (Jane's: London, annual); Taylor, J. W. R., *Jane's All the World's Aircraft, 1982–83, 1983–84* (Jane's: London, annual); Beaver, P., *The Encyclopaedia of the Modern Royal Navy* (London, 1982); British Ministry of Defence, Statement on the Defence Estimates, 1980 through 1985 (Her Majesty's Stationery Office: London, annual); Rogers, P., *Guide to Nuclear Weapons 1984–85* (University of Bradford: Bradford, 1984); British House of Commons, Defence Committee Report, Session 79/80, 23 July 1980; Nott, J., 'Decisions to modernise U.K.'s nuclear contribution to NATO strengthen deterrence', *NATO Review*, vol. 29, no. 2 (Apr. 1981).

for the construction of the first submarine early in 1986. Once this order is placed, the main work on the programme will begin and the expenditure will grow accordingly (only 7 per cent has been spent so far).[103] In 1985 a PWR2 nuclear reactor for the Trident Class submarines (among others) was sent to the Royal Navy's Vulcan facility at Dounreay in Scotland, where it will be operated for four years before being committed to a submarine.[104]

The period of substantial expenditure on the Trident programme has yet to begin. Construction is planned at Faslane and Coulport, Rosyth, the Atomic Weapons Reserch Establishment (AWRE) Aldermaston, and the Royal Ordnance Factory (ROF) Burghfield. Production of the warheads was supposed to start in 1986, lasting 8–10 years, although some delays have already occurred. Fissile material will be taken from Polaris missile warheads as they leave service and will be used for the new warheads.[105]

The communications system for submarines is being updated, possibly with Trident in mind. Of the £22 million to be spent on improving the British very-low frequency (VLF) communications system, £1.7 million was spent by the end of April 1985.[106] Britain has also begun studies of the optimum location for its planned extremely-low frequency (ELF) submarine communications system. This ELF system will improve the Navy's ability to broadcast to the submarine fleet while at greater depth and speed than permitted by a VLF system, thus reducing the risk of detection. The British MoD has chosen a site in the Glen Garry forest of Scotland to install an experimental ELF transmitter beginning in 1986.[107]

V. France

The defence budget

Nuclear weapons received priority once again in the 1985 French defence budget, with 19.9 per cent of the total budget going to nuclear forces, and 30 per cent of the expenditure on equipment likewise going to the nuclear forces. (Over the period 1984–8, 31.7 per cent of the equipment budget is earmarked for nuclear weapon programmes.) The Navy will get more money for new construction, a 13 per cent increase over 1985. This will go to beefing up the French strategic submarine force (Force Océanique Stratégique, FOST), procuring a new nuclear-powered aircraft-carrier, and building three more SSNs.

Nuclear tests

France is determined to continue its nuclear testing in the South Pacific, despite mounting pressure from regional governments, an embarrassing scandal following the sinking of the Greenpeace flagship *Rainbow Warrior* and the gradual collapse of the coral reef where France has been detonating warheads for 20 years (see chapter 6 and *SIPRI Yearbook 1984*, chapter 2).

Nuclear weaponry officially scheduled for testing in 1985 included the TN71 warhead for a new generation of SLBM, the warhead for an air-to-ground

Table 3.8. French nuclear forces, 1986

Weapon system				Warheads		
Type	No. deployed	Year deployed	Range (km)[a]	Warhead × yield	Type	No. in stockpile
Aircraft						
Mirage IVA[b]	16	1964	1 500	2 × 70 kt	AN-22	32
Mirage IVP[c]	9	1986	1 500	1 × 150 kt	ASMP	12
Jaguar A	45	1974[d]	750	1 × 6–8/30 kt	[e]	50
Mirage IIIE	30	1972[d]	600	1 × 6–8/30 kt	[e]	35
Refuelling aircraft						
C-135F/FR	11	1965	. .	. .	. .	. .
Land-based missiles						
S3	18	1980	3 500	1 × 1 Mt	TN-61	18
Pluton	42	1974	120	1 × 15–25 kt	ANT-51	120
Submarine-based missiles						
M-20	80	1977	3 000	1 × 1 Mt	TN-61	80
M-4	16	1985	4 000	6 × 150 kt	TN-70	96
Carrier aircraft						
Super Etendard	36	1978	650	1 × 6–8/30 kt	[e]	40

[a] Range for aircraft indicates combat radius, without refuelling.

[b] The AN-51 warhead is also possibly a secondary bomb for tactical aircraft, and the AN-52 is also possibly a secondary bomb for the Mirage IVA.

[c] A second squadron of 9 aircraft will be operational by the end of 1986, replacing an equal number of Mirage IVA variants (which have already been deducted from the above total of 16). It is assumed that the remaining 16 Mirage IVAs will no longer operate in a nuclear strike/attack mode.

[d] The Mirage IIIE and Jaguar A aircraft were first deployed in 1964 and 1973, respectively, although they did not carry nuclear weapons until 1972 and 1974, respectively.

[e] Warheads include ANT-51, ANT-52 and possibly a third type.

Sources: Laird, R. F., 'French nuclear forces in the 1980s and the 1990s', *Comparative Strategy*, vol. 4, no. 4 (1984), pp. 387–412; Langereux, P., 'Missiles tactiques et engins: cibles français en service, en developpement ou en étude', *Air et Cosmos*, 28 May 1983, p. 180; Defense Intelligence Agency, 'A guide to foreign tactical nuclear weapon systems under the control of ground force commanders', DST-1040S-541-83-CHG 1 (secret, partially declassified), 17 Aug. 1984; International Institute for Strategic Studies, *The Military Balance 1983–84* (IISS: London, annual).

medium-range missile, the ASMP, and that of the Hadès surface-to-surface missile, due to enter service in 1992. French scientists are also believed to be conducting final tests on a neutron bomb.[108]

Army

There has been much speculation about the neutron bomb in the past, as to whether it would ever be deployed, and if so in what form. France ordered feasibility studies on the neutron bomb in December 1976, and by June 1980 President Giscard d'Estaing was able to announce that it had tested such a weapon, although not specifying when or where.[109] It is commonly believed, however, that these tests were concerned with the evaluation of components of the neutron bomb, rather than a test of a complete prototype weapon. In 1983 President Mitterrand said that 'France holds itself ready to mass produce the neutron bomb', 'although the decision to do so has not yet been taken'.[110] Also in 1983, Defence Minister Hernu went further and said that neutron weapons should be ready for the start of the Hadès SSM (surface-to-air missile) programme in 1992 and that the military programme 'permits this decision, but does not anticipate it'.[111] France was still testing and refining the procedure in 1985.

Although a political decision has not yet been made concerning the production or deployment of the neutron bomb, it came a step closer in 1985. In September 1985 the French Army high command revealed for the first time that the primary characteristic of the Hadès SSM, due to replace the Pluton in the 1990s, is 'its ability to satisfy the technical requirements attaching to the use of weapons having minor side-effects',[112] in other words, the neutron bomb.

Air Force

Despite an all-round spending squeeze, the French Air Force is maintaining its intensive re-equipment programme. The Airex-85 manoeuvres in March demonstrated this, as they were the biggest and longest war games since World War II.[113]

Qualification firings of the ASMP air-to-surface missile (ASM) from the Mirage IVP and Mirage 2000N aircraft began, and initial deliveries of production missiles were made in 1985.[114] First operational deployment of the ASMP will take place in May 1986 aboard the reworked Mirage IVP aircraft, with the second and last squadron entering service in late 1986.[115] By this time the number of aircraft will have reached a total of 18.

As for the Mirage 2000N, production deliveries are scheduled to start in 1986, and 36 will be in service by 1988, when the Mirage 2000N will become operational as a replacement (or perhaps supplement) for Mirage IIIE and Jaguar nuclear attack aircraft.[116] After 1988 another 49 Mirage 2000Ns will be delivered.

Modification of the first batch of Super Etendard aircraft to carry the ASMP started in 1984, and approximately 43 such aircraft will be updated before their 1988 ASMP operational deployment date, with another 10 following after 1988.

Together with these improvements to the strike aircraft, the Armée de l'Air has also decided to equip its 11 Boeing C-135F strategic refuelling tankers with new engines. The first reworked aircraft was received in November 1985, designated C-135FR, and all 11 are expected to be back in service by late 1987.[117]

Force Océanique Stratégique

The M4 missile was brought into service aboard the new SSBN *Inflexible* with little fanfare in April 1985. This may have been because of the confusion over whether it was an MRV (multiple re-entry vehicle) or a MIRV system. It appears that France has advanced straight from a single-warhead missile to a MIRV system, bypassing the MRV stage. (Both the Commissariat à l'Energie Atomique and Aérospatiale, responsible for design and production of the warhead and the re-entry vehicle, respectively, declare the M4 to be a MIRVed system.)[118] After a total of 159 operational patrols since the maiden patrol of the *Redoutable* in January 1972[119] and after three models of single-warhead SLBMs, France was ready to deploy the multiple-warhead M4 missile. When the *Inflexible* took to the Atlantic on 25 May 1985 for its maiden operational patrol, it doubled, at one stroke, the total number of warheads carried by the submarine fleet.

The M4 is being successively refitted to four of the five Redoutable Class submarines. The exception is the first boat in the class, the *Redoutable*. Even during this period of refits (1985–92), only two submarines will be out of service at any one time, leaving four available for active patrols, with at least three permanently at sea. In 1985 another submarine, *Le Tonnant*, was taken out of service to be refitted with the M4 missile system. Upon its completion in 1987 this SSBN will be the first to deploy the M4 missile with the improved TN-71 warheads. The TN-71 will be smaller and lighter than the current TN-70, thus extending the range of the M4 from 4000 to 5000 km. New penetration aids and hardening devices have been developed to improve the weapon's ability to survive anti-missile defences. Depending upon its mission, M4s are said to carry from one to six independently targeted warheads.[120]

Future nuclear choices

The recent emphasis on strategic defence issues, such as the US Strategic Defense Initiative and the Soviet ABM modernization programme, has had important effects on the French nuclear policy debate. France initiated the Eureka research programme as a European civil alternative to SDI, sharing some of the same technology pursuits (see chapter 7). The French defence community has begun to debate seriously the future composition of French nuclear forces best suited to cope with a Soviet strategic defence system. Although SDI may be viewed with scepticism in France, the possibility of a similar Soviet programme is seen as representing a potential threat to the credibility of French nuclear forces. Since it considers the prospects for developing a perfect defensive shield against ballistic missiles wholly

unrealistic, France is concentrating on improving the penetrability and effectiveness of its offensive nuclear forces.

The French debate over its nuclear modernization programme has generated interservice disputes, particularly between the Air Force and the Navy. It appears that the Air Force and its planned mobile SX missile will lose this battle to the Navy. In a speech to the French National Defence Studies Institute on 12 November 1985, Defense Minister Quilès disclosed officially for the first time that France will soon rely on a sea-based counterforce doctrine.[121] The centrepiece of this policy is a new push to develop nuclear ballistic missiles that will be targeted on Soviet missile sites. Until now, France has targeted its missiles only on 'soft' targets such as cities.

In his speech the Defence Minister vowed to pursue and enlarge the penetration aids programme which was initiated in 1984 for the improved M4 missile. Quilès also made reference to building a new type of SLBM warhead to be launched from the New Generation class of SSBN, the first of which will enter the fleet in 1994. This also includes a 'stealthy' re-entry vehicle that would be 'almost invisible' to enemy detection systems. Development has also started on weapons that will blind Soviet radars with nuclear explosions.[122] It is unclear whether this programme has any common features with the once planned M5 SLBM package.

VI. China

Chinese nuclear weapon programmes are discussed in chapter 5; only developments in 1985 are dealt with in this section.

China continues to modernize and expand its nuclear forces with the construction of three types of land-based ballistic missile (the CSS-2, CSS-3 and CSS-4) and its new submarine-launched ballistic missile, the CSS-N-3, all at rates of 10–20 per year (see table 5.1, chapter 5).

China conducted numerous missile tests during 1985, particularly of the CSS-2 and CSS-N-3 missiles. On 28 September China successfully launched a CSS-N-3 SLBM from a submerged submarine into the East China Sea. It is not known whether the submarine used was China's single Golf Class test vessel or one of the new Xia Class SSBNs. There are some indications that at least one of the Xia Class submarines began operational patrols in 1985, although China has not announced this explicitly.[123]

While China continues to build about five Tu-16 Badger bombers per year, it is planning to augment the nuclear bomber force in the 1990s. Chinese officials told visiting US aerospace executives that China has begun to design a new supersonic bomber at the Xian aircraft plant in central China.[124]

Although no Chinese nuclear weapon tests were recorded in 1985, Chinese students staged several protests against the continued use of Lop Nor, in Xinjiang Province, as the nuclear test site. A Chinese Foreign Ministry spokesman stated that 'in the present international situation it is necessary to conduct a small number of nuclear tests to safeguard China's security'.[125]

VII. Nuclear arms control

Major developments

During 1985, the outlook for arms control was mixed. On the one hand, both superpowers continued to build new nuclear weapon systems, while accusing the other of violating past arms control agreements. On the other hand, many necessary elements for successful arms control are now in place between Washington and Moscow. Widespread expectations have been created that there will be some serious results: public pressure is strongly in favour of some agreement.

In January 1985 the USA and the USSR agreed to convene negotiations on three arms control topics in one combined set of meetings, thus effectively merging the START (Strategic Arms Reduction Talks) and stalled INF (intermediate-range nuclear forces) talks with space and strategic defence issues. Since they began the negotiations in March, the USA and the USSR have both produced proposals to reduce 'strategic' forces by 'one-half'. It is the first time that both the USA and the USSR agree to this common objective. Following the Geneva summit meeting it appears that both sides also intend to pursue a separate agreement on intermediate-range forces. So the INF talks, as of February 1986, are to some extent independent of progress at the other two negotiations.

The Soviet Union has maintained its position that it will not agree to reduce strategic offensive forces unless there is also an agreement constraining possible developments in defensive forces. The United States remains, so far, unwilling to accept any limitations on its Strategic Defense Initiative, other than those imposed by the existing Anti-Ballistic Missile Treaty, as the USA interprets it.

During 1985 compliance issues were constantly raised in the course of the arms control debate. The United States initially publicized its accusations of Soviet treaty violations and produced a number of reports, stating the details of its allegations.[126]

Amidst much bureaucratic infighting over the appropriate policy on compliance with the SALT II Treaty, US President Reagan announced on 10 June that the USA 'will continue to refrain from undercutting existing strategic arms agreements to the extent that the Soviet Union exercises comparable restraint, and provided that the Soviet Union actively pursues arms reduction agreements in the currently ongoing nuclear and space talks in Geneva'.[127] One element of this compromise decision was that the USA reserved the right to make 'proportionate responses' to any Soviet treaty violations that the USA deems to warrant response. As requested by President Reagan, the Defense Department prepared a two-part secret report entitled 'Responding to Soviet Violations Policy Study' (also known as 'RSVP') that suggested some US options for such responses.

A new compliance issue arose in October 1985, when the Reagan Administration declared a new US interpretation of the ABM Treaty that would permit all but the *deployment* of any new strategic defence system.

However, after much controversy and criticism, Secretary of State Shultz announced that while a 'broader interpretation' of the treaty was 'fully justified', the USA would honour the 'restrictive interpretation of the treaty's obligations'. This decision could be reversed at any time.

SALT II compliance

The SALT II Treaty, signed by the superpowers in 1979, formally expired at the end of December 1985. Although never ratified by the USA (and consequently not ratified by the USSR), each state repeatedly pledged to abide by its provisions, provided the other state did the same.

Currently, the USA has about 2000 operational delivery systems accountable under SALT, whereas the USSR has about 2500, a number which would have been reduced to below the 2250 limit had the USA ratified the treaty. Both parties have taken measures to comply with the provisions of SALT I and II, including deactivating older delivery systems when new ones have been introduced. For example, the USSR and the USA have both deactivated submarines to compensate for new deployments. There is no doubt that the main provisions, setting numerical limits on strategic nuclear weapon systems, have been observed.

On a number of occasions the present US Administration has accused the USSR of not complying with specific SALT II provisions. Its strongest accusation concerns the new Soviet mobile SS-25 single-warhead missile, which Defense Secretary Weinberger called 'an unquestionable violation of Soviet assurances given to us under the SALT II accord'.[128] Under SALT II, both parties are limited to developing and deploying one 'new type' of ICBM. The USSR announced that its one permitted 'new' ICBM is the SS-24 missile with 10 MIRV warheads. But the USA claims that the SS-25, which was first deployed in 1985, constitutes a second 'new' ICBM, thus violating SALT II. The USSR states that the SS-25 is a permitted modification of an earlier Soviet missile, the SS-13. SALT II does permit modification of missiles that were flight-tested before May 1979 if the changes fall within certain percentage limits of missile characteristics such as length, diameter, launch-weight and throw-weight. The USA maintains that even if the SS-25 is a modification of the SS-13, its single re-entry vehicle weighs less than half of the missile's throw-weight, in violation of a treaty obligation. The issue rests on whether the USA knows enough details about both missiles to press its allegations.

A second SALT II compliance question concerns the Soviet Union's commitment not to increase the number of strategic nuclear delivery vehicles (SNDVs) in its arsenal. The United States charged in its 23 December 1985 compliance report that the Soviet Union has deployed SNDVs above the 2504 total deployed when SALT II was signed in 1979. However, according to the US Joint Chiefs of Staff, as of 1 January 1986 the Soviet Union had 2477 SNDVs.[129]

Another issue which has been raised by the US Administration concerns the encryption of telemetric data produced during Soviet missile tests. According to the treaty, national technical means of verification must not be impeded

from assessing missile characteristics which are relevant to the treaty, like throw-weight or the number of warheads. Encryption of telemetry is, however, not prohibited in general, and the USSR has therefore argued that the compliance question could be resolved if only the USA would specify precisely which telemetry data are lacking for verification purposes. The USA refuses to do so on the grounds that this would reveal the capabilities and weaknesses of its intelligence systems.

With the formal expiration of the SALT II Treaty, it is unclear whether the superpowers will continue their official policy of not undercutting specific treaty provisions in 1986. For the USA the problem will again be posed when the eighth Trident submarine is sent on sea-trials, scheduled for May 1986. To stay within the SALT limits, the USA would have to dismantle a compensating number of launchers, probably two Poseidon submarines. Similarly, the USSR has taken action to compensate for its new missile deployments (see section III).

ABM Treaty compliance

The ABM Treaty of 1972 was a companion to the SALT I Interim Agreement, and ABM and SALT compliance issues are interrelated. The ABM Treaty is of indefinite duration but is reviewed every five years and will be up for review in 1987. If the US SDI programme continues beyond a certain level of development and testing of space-based systems, it will contravene the ABM Treaty.

There has been no suggestion that the Soviet Union has violated the main provisions of the treaty, which set out the number of ABM launchers permitted. The primary allegation is that the Soviet phased-array radar near Krasnoyarsk is being built in violation of a treaty provision that requires early-warning radars to be located at the periphery of the national territory and to be oriented outwards. The USA has also asserted that the Krasnoyarsk radar exceeds limits on power output.

The USSR has stated that the Krasnoyarsk radar is not an early-warning radar, but instead is a satellite tracking radar which does not have to comply with the ABM constraints on location, power output and antenna area. However, the radar's orientation, design and physical characteristics show that the radar is designed as an early-warning system, in violation of the ABM Treaty. The Krasnoyarsk radar belongs to a class of 'grey area' systems which might erode the ABM Treaty framework.

The USSR has raised a number of questions regarding US early-warning radars located in Greenland and England, which it states may have ABM potential. These radar systems are being upgraded with phased-array technology, and will have the kind of improved tracking, discrimination and impact prediction capabilities that could contribute to battle management—the very concerns that the USA voices about Krasnoyarsk. However, the USA asserts that, since they are not on its national territory, their capabilities do not fall under the terms of the treaty.

Allegations have also been made that the PAVE PAWS radars being

installed in Georgia and Texas may have such a wide angle coverage that they cannot be considered to fulfil the requirements of the ABM Treaty that they should be oriented outwards from the national territory.[130]

Geneva proposals

Following the meeting between Secretary of State Shultz and then Foreign Minister Gromyko in January 1985, the USA and the USSR agreed to pursue arms control agreements that would: 'End the arms race on earth and prevent one in space; limit and reduce nuclear weapons; and strengthen strategic stability'.[131]

The USA announced its four objectives for the Geneva talks as:

> Radical reductions in the number, and destructive power, of offensive strategic arms; the elimination of intermediate-range forces, or their reduction to the lowest possible equal global limits; a reversal of the erosion of the 1972 Anti-Ballistic Missile (ABM) Treaty . . .; and a discussion of the possibility of both sides moving away from deterrence based solely on the threat of massive nuclear retaliation toward increased reliance on non-threatening defenses, whether ground- or space-based, against nuclear ballistic missiles.[132]

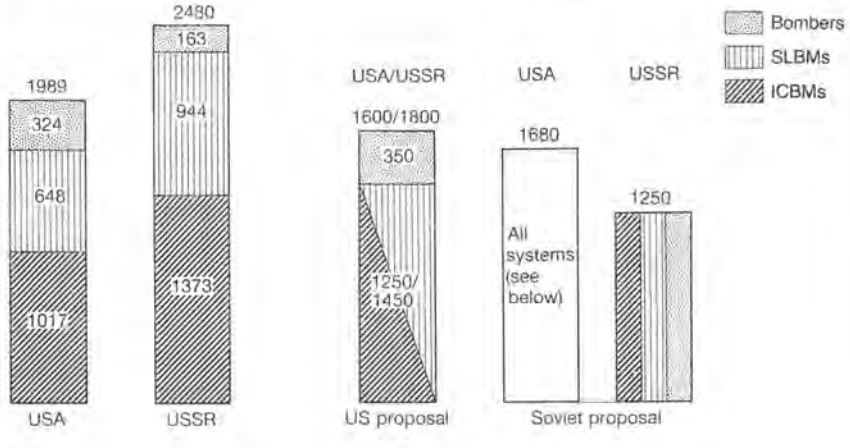
Since the negotiations opened at Geneva, there has been a succession of proposals and counter-proposals. The USA took to the Geneva talks its standing proposals from the START negotiations, which included a limit of 5000 warheads on strategic ballistic missiles and a sublimit of 2500 warheads on ICBMs. On 30 September 1985, Soviet Foreign Minister Shevardnadze presented to President Reagan the first concrete Soviet proposals for Geneva. Meanwhile, General Secretary Gorbachev unveiled many of the points of his new proposal in Paris and sought separate negotiations with France and Britain on their nuclear forces (both governments refused this offer).

On 31 October 1985, President Reagan announced that the USA had formulated a package of counterproposals which was formally presented at Geneva the next day. Reagan described the goals of the new proposals simply as, 'deep cuts, no first-strike advantage, defensive research—because defense is safer than offense—and no cheating'.[133] These offers were something of a compromise between the US START position and the Soviet proposals, although there remain considerable differences.

On 15 January 1986, General Secretary Gorbachev presented a three-stage plan to eliminate nuclear weapons by the year 2000. The first stage, lasting five to eight years, is explicitly concerned with US and Soviet nuclear weapon systems. On strategic offensive weapons, it appears to embody the proposals discussed below and set out in figures 3.1 and 3.2. It includes the requirement that 'the USSR and the USA renounce the development, testing and deployment of space-strike weapons', and also that they both agree to stop all nuclear weapon tests. This proposed first stage does embody a new suggestion on intermediate-range missiles, an important new proposal from the Soviet side.

The second stage, which should start no later than 1990, would bring in other nuclear weapon powers; it would involve, *inter alia*, the elimination of all

Figure 3.1. US and Soviet strategic nuclear weapon systems: launchers



US proposal

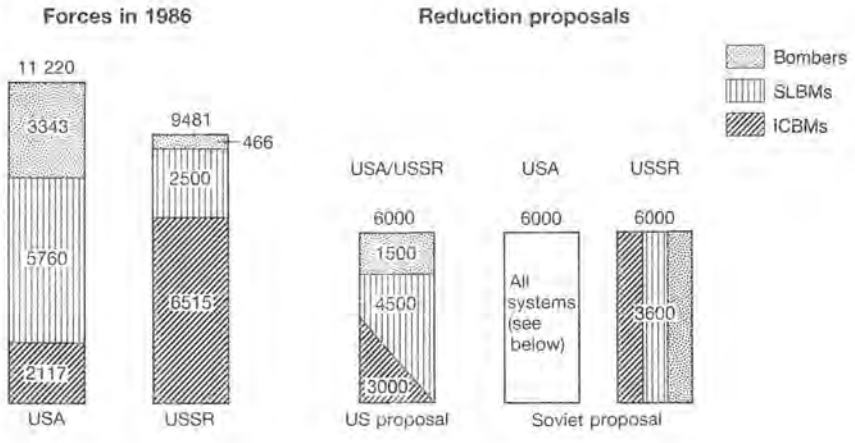
ICBMs and SLBMs would be reduced to an equal level between 1250 and 1450, to be chosen in any combination allowed under the warhead limits. If the USSR accepts this limit on missiles, the USA 'could' accept an equal limit of 350 on 'heavy' bombers (which is higher than the current active US and Soviet 'strategic' bomber totals). Modernization of heavy strategic ballistic missiles (Soviet SS-18s) would be banned, as would any new development or deployment of such missiles. All mobile ICBMs would be banned, including mobile versions of Soviet SS-24s and SS-25s, and the US small ICBM (SICBM) or possible mobile variants of the MX.

Soviet proposal

All 'strategic delivery systems', those able to reach the other's territory, would be reduced by 50 per cent. This would include only Soviet ICBMs, most SLBMs and all 'heavy' bombers (not Backfires), while including all US ICBMs, SLBMs, bombers, Pershing IIs, GLCM launchers and all other nuclear-capable aircraft and missiles able to reach Soviet territory. By Soviet counting, this gives the USA 3360 launchers and the USSR 2504, thus limiting them to 1680 and 1250 launchers, respectively. All cruise missiles with a range over 600 km would be banned, thus cancelling all long-range ALCM, GLCM and SLCM programmes. 'New' delivery systems would be banned, although it is unclear what systems would be included and when the ban would take effect.

Note: All figures assume active systems at full deployment. See tables 3.1 and 3.4 for breakdown.

Figure 3.2. US and Soviet strategic nuclear weapon systems: warheads



US proposal

The number of warheads on ballistic missiles would be limited to 4500, with a sublimit of 3000 on ICBMs, and, if there is agreement on these figures and the 50 per cent throw-weight limits proposed by the USA, equal limits of 1500 would be set on long-range ALCMs (one warhead each). This would bring both sides up to a total limit of 6000 warheads on the systems the USA is willing to limit. It would not limit gravity bombs or short-range attack missiles (SRAMs) on US strategic bombers, nor would it limit SLCMs.

Soviet proposal

Strategic 'nuclear charges' (those warheads that could strike the territory of 'the other' nation) on ballistic missiles, cruise missiles, bombs and other bomber weapons would be limited to 6000, of which no more than 60 per cent (3600) could be carried by any one component of the nuclear forces (ICBMs, SLBMs or bombers). This would include all US warheads on all systems potentially able to strike the USSR.

Note: All warhead figures assume normal loading of available systems. See tables 3.1 and 3.4 for breakdown.

tactical nuclear weapons—those with ranges up to 1000 kilometres. Stage three, beginning no later than 1995, should complete the elimination of nuclear weapons.

For the verification of the destruction of nuclear weapons and associated systems, the Soviet Union suggests a number of measures in addition to national technical means, including on-site inspection and other complementary possibilities.

The present negotiating stance

Figures 3.1 and 3.2 and accompanying text summarize the negotiating proposals of the two sides as of 1 February 1986. Several important issues are discussed below.

1. Although both sides have made proposals for some 'interim' INF agreement, it is clear that they are interested in eliminating these missiles, at least from Europe and perhaps also from Asia. The USA maintains its previous proposal to eliminate all SS-20s, Pershing IIs and GLCMs, the so-called 'zero-zero' option. The new Soviet proposal on intermediate-range missiles in Europe, which was included in General Secretary Gorbachev's statement on 15 January 1986, appears to be a big change from the Soviet Union's previous position. It offers the complete elimination of the SS-20s in the 'European zone' (presumably those located west of the Urals—243 missiles) in exchange for the removal of the US Pershing II and ground-launched cruise missiles from Europe. There remains the question of whether it would include also SS-20s located east of the Urals which are targeted on Europe. Further, it has been suggested that it might also include the removal of the SS-21s and SS-12 Mod 2s from the GDR and Czechoslovakia.[134] There is a stipulation that France and Britain should undertake not to increase their nuclear weapon capabilities. One report suggests that this would mean that the United States should not sell its Trident D5 missile to the United Kingdom. The Soviet Union no longer demands equivalence to the French and British nuclear forces, as it did before. There are reports that the Soviet Union would be willing to make some reductions in its SS-20 missiles facing Asia if such reductions are coupled with cuts in US weapons in the Pacific.[135]

In further elaboration of the offer, it appears that the Soviet Union is willing to dismantle the infrastructure connected with the SS-20s, as well as the missiles and launchers themselves. This would mean that it would not be possible to redeploy them rapidly from the eastern part of the Soviet Union. Further—although this is not yet clear—it appears that this offer on intermediate-range nuclear forces is not dependent on an agreement that the United States forgoes its SDI programme.

2. With respect to 'strategic' offensive nuclear forces, the USA and the USSR appear to have the same objective—6000 warheads. However, this apparent agreement conceals major disagreement about the definition of 'strategic'. The USSR has maintained for decades that it considers any nuclear weapon that can strike its territory to be 'strategic' and that this should be the agreed definition. The USA basically has a range definition that the USSR has

agreed to in the SALT negotiations—any weapon that can be delivered from 5500 km or more is considered 'strategic'. So the similar figure of 6000 warheads on strategic systems covers very different systems according to which definition is used. The Soviet proposal would include *all* US systems potentially capable of striking the USSR: intercontinental-range ballistic missiles and bombers, aircraft and missiles of medium range or less in Europe and in Asia (within range of the USSR), and all nuclear-capable aircraft on aircraft-carriers. (The intermediate-range missiles on either side in Europe are dealt with in the separate proposal for their elimination. The fact that the USSR is engaged in separate INF negotiations with the USA calls into question how far it will push this wider definition of 'strategic'.) Unlike the US proposal, the USSR would also include gravity bombs and short-range attack missiles (SRAMs) in addition to the air-launched cruise missiles (ALCMs) carried on bombers, as well as sea-launched cruise missiles (SLCMs), which make up an increasingly important segment of the US arsenal.

3. The US preoccupation with Soviet heavy ICBMs is seen in several facets of the US proposal: the ICBM warhead limit of 3000, the limit on throw-weight, and the ban on modernizing or replacing the SS-18. Since the Soviet SS-18 force could currently carry a maximum of 3080 warheads, the US proposal requires a cut in this force regardless of what mix of missiles the USSR might choose. The Soviet warhead limit of 3600 on any one component of the strategic forces would permit all 308 SS-18s to remain only if the vast majority of its other ICBMs were scrapped. In any event, the Soviet offer would also bring down its own throw-weight to a level close to the US limit of about 3 million kg.

4. The Soviet proposals continue to emphasize cruise missiles, calling for a ban on all such missiles except ALCMs with a range of 600 km or less. In this regard the USSR is either currently deploying or preparing to deploy several models of long-range cruise missiles, including ALCMs, SLCMs and GLCMs. The USA continues to exclude SLCMs from any of its proposals, although they can hardly be excluded from either the 'strategic' or 'intermediate-range' categories of weapon.

5. Congress generally supported the idea, following the 1983 Scowcroft Commission suggestion, that both superpowers should move from MIRVed, stationary ICBMs to mobile, single-warhead systems such as the US small ICBM (Midgetman). However, in a surprising policy shift the USA now proposes to ban all mobile ICBMs (including the Soviet SS-24 and SS-25, and any mobile versions of the US MX or SICBM), presumably because they are harder than fixed ICBMs to locate and destroy, or to defend against with a strategic defence system.

6. The United States argues that there is no way in which constraints on strategic defence research can be embodied in a treaty, and that in any case the Soviet Union is also heavily engaged in research on BMD systems—research which (unlike the United States) it does not disclose. Further, the United States points out that it has (for the time being) decided to keep SDI within the 'restrictive' interpretation of the ABM Treaty. However, it will certainly continue to argue that the eventual development of defensive systems is a sensible concomitant of a reduction of offensive systems.

These issues demonstrate the need for much work before any success is achieved at Geneva. New ideas and weapon systems are being discussed for the first time, and there is some movement on certain issues. Both sides proclaim their ultimate goal to be the elimination of all nuclear weapons—nuclear disarmament. Although it is encouraging to see both superpowers seriously discussing such a wide array of nuclear weapon reductions, their nuclear weapon programmes have far more momentum than their arms control talks. The time is right for them to match their words with deeds.

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[16] HAC, FY 1986 DoD, Part 2, p. 151 (see note 6).

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[18] SAC, FY 1985 DoD, Part 2, pp. 471–2 (see note 6).

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[22] The initial confirmation of SS-11 retirements came in late Apr. at the SALT Standing Consultative Commission, when the Soviets told the US delegation that they were deploying 18 SS-25s and removing 20 SS-11s (see Pincus, W., 'Moscow says it will honor SALT II missile limits', *Washington Post*, 9 May 1985, p. A-22).

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buildup foreseen', *Defense Week*, 17 June 1985, p. 15), although the number is more likely closer to 60. All SS-16 missiles were produced before the SALT II Treaty was signed. SALT II does not require that the missiles be dismantled, yet support equipment for mobile missiles, such as transporters for warheads, was moved during 1985 on to railcars at Plesetsk, possibly indicating the removal of equipment for the SS-16 missiles from the test site; Gordon (note 21).

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[29] Pincus (note 22).

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[32] Hiatt, F., 'Weinberger urges more for defense', *Washington Post*, 10 Jan. 1986, p. A8. It has been reported that the US intelligence community believes that 10 SS-25 launchers are deployed with each regiment, one of which is always in the field; Samuel, P., 'Big Soviet buildup foreseen', *Defense Week*, 17 June 1985, p. 15, and Samuel, P., 'What you'll hear on the threat', *Defense Week*, 24 June 1985, p. 16. This could explain why 10 SS-11s are being removed for each regiment of 9 SS-25 launchers. An alternative explanation is the deployment of SS-11s in regiments of 10 launchers each.

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[34] Samuel (note 23).

[35] SASC/SAC, S. Hrg. 99–335, p. 57 (see note 27).

[36] Deployment numbers are reported in Samuel (note 23); deployment dates are from SASC/SAC, S. Hrg. 99–335, p. 9 (note 27).

[37] US Department of Defense, *Soviet Military Power*, 4th edition (1985), p. 1 (hereafter cited as *SMP 1985*); SASC/SAC, S. Hrg. 99–335 (note 27); US Department of Defense, *Annual Report to the Congress Fiscal Year 1987*, p. 59 (hereafter cited as DoD, FY 1987). The SS-25 has been reported to be capable of carrying three MIRVs (see, for example, Samuel (note 23)). However, such a capability is inferred from inconclusive estimates of the missile's throw-weight and not from test results (i.e., release or simulated release of warheads).

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4. Space weapons and security

FRANK BLACKABY

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

In 1972 the United States and the Soviet Union signed a treaty on the limitation of anti-ballistic missile systems (the ABM Treaty). In that treaty both states agreed 'not to deploy ABM systems for the defence of the territory of its country'. The signing of this treaty seemed then to be the end of the debate about whether it was desirable to deploy large defensive systems against ballistic missiles.

Now, with the United States' Strategic Defence Initiative (SDI), the debate has been reopened. The purpose of this chapter is to re-examine the strategic and arms control issues which are now raised again; technological issues are discussed in chapter 7, and economic issues in chapter 14.

The first part of the chapter deals with the genesis of the SDI programme; an understanding of the origin is necessary because it explains why there has been some confusion about the rationale of the objectives of the programme. The chapter then considers some of the questions arising—such as the relationship to existing treaties, and the reactions of NATO allies. The Soviet position is then examined. Finally there is a section on arms control consequences, and an assessment.

II. Origins[1]

The re-emergence of defence against ballistic missiles, as an official objective of the United States, can be precisely dated—to President Reagan's televised speech on 23 March 1983 when he said, *inter alia*:

> Let me share with you a vision of the future which offers hope. It is that we embark on a program to counter the awesome Soviet missile threat with measures that are defensive . . . What if free people could live secure in the knowledge that their security did not rest upon the threat of instant US retaliation to deter a Soviet attack, that we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our allies? I know this is a formidable, technical task, one that may not be accomplished before the end of this century. Yet, current technology has attained a level of sophistication where it is reasonable for us to begin this effort. . . I call upon the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete. Tonight . . . I'm taking an important first step. I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles . . . My fellow Americans,

tonight we're launching an effort which holds the promise of changing the course of human history.[2]

This revival of the idea of ballistic missile defence (BMD) was not the result of a careful reappraisal of strategic doctrines. It did not emerge from a process of inter-agency consultation within the US bureaucracy. The idea of BMD had for a long time been out of the mainstream of US strategic thinking. There were, of course, research programmes in being; but there was no forceful intention of working towards the development of a BMD system.

The Strategic Defense Initiative was an idea which came to the President from a small group of outside advisers, and it was launched with virtually no consultation with the State Department or the Pentagon. It was very much a personal vision of the President. The more elaborate rationales now presented are *ex post facto* rationales—the arguments of those who, presented with a *fait accompli*, look for ways of fitting the SDI idea into their own framework of thought.

It is useful to set out in some detail how it was that the idea of SDI came to assume its present dominant position in the official US approach to nuclear arms control issues: for this explains much of the subsequent confusion. The President's interest in the idea of defensive technologies dates back to the period before his election. Lt-General Daniel Graham was a defence adviser to Reagan in the election campaigns of 1976 and 1980. Graham was, and still is, a strong advocate of space-based defence, partly because it would serve to re-establish a certain US superiority over the Soviet Union. 'The kind of superiority we should seek is technological superiority—that is, to have some of our military capabilities in an area where the Soviets, with inadequate technology, cannot challenge us . . . if we challenge them in a technical way—such as with a space-borne defence system—and make them face an entirely different military equation we can quickly restore the balance'.[3] According to Graham, Reagan has never liked the doctrine of Mutual Assured Destruction (MAD), calling it a 'Mexican stand-off'.

After the 1980 election, Graham founded High Frontier, a think tank and lobbying group to promote space-based defence, and four of the President's Californian associates, known as his kitchen cabinet, made financial contributions to this effort. However, later they became more attracted by the ideas of Edward Teller (now Associate Director Emeritus of the Lawrence Livermore National Laboratory) and promoted a series of meetings between him and the President. Teller was also critical of MAD, critical of the ABM Treaty, and in favour of space-based defence. The particular system which he proposed was that of a space-based X-ray laser system powered by a nuclear detonation.

Teller was also an influence on Admiral James Watkins, who persuaded the Joint Chiefs-of-Staff to raise the matter of defensive technologies with the President at a meeting in February 1983. The subject was not then particularly prominent on their agenda; the idea was vague and philosophic in tone, and it was suggested in general as a subject worthy, some day, of further study. However, the President took the Joint Chiefs' idea as an endorsement of his

own leanings; he was particularly enthusiastic about Watkins' rhetorical question: 'Wouldn't it be better to save lives than to avenge them?'[4]

The idea was then taken up by Robert McFarlane, then the President's Deputy National Security Adviser. A few members of staff of the National Security Council were set to think about strategic defence, and then were told to draft the final five minutes of a speech to be delivered on 23 March. The main purpose of the speech was to promote the Administration's proposed 10 per cent increase in the defence budget, which Congress was threatening to cut in half, and most of the speech was taken up with a presentation of the Soviet threat. The final five minutes of the speech was to provide some uplift: the President wanted to say that, long-term, there was a prospect of real peace, and that the shift towards defensive systems offered the possibility of resolving the nuclear dilemma. The staff members working on this part of the speech were told to work in greatest secrecy.

The idea was to bypass Congress, the press and the bureaucracy, on the grounds that the bureaucracy in particular, given half a chance, would strangle the idea at birth. The Chief Scientific Adviser to the President, George A. Keyworth II, was given five days' warning of the decision, after he had indicated that he could support stepped-up strategic defence research. The Secretary of State was given two days, and was precluded from discussing it with the President's arms control adviser, Paul Nitze. The Chief Pentagon scientist, Richard DeLauer, learnt of a proposal which could lead to the most ambitious weapon research programme in history nine hours before its public announcement. Consequently, before the announcement of the decision, there was no significant examination or discussion of a wide variety of questions: Would it contribute to a sound military strategy? Would the Soviet Union consider the idea threatening? What would be the reaction of NATO allies? What would be the relationship to the various treaties which limit defences against ballistic missiles?

All that could be done in the time was for the advisers to insert a few sentences to modify the draft; some of these can tentatively be identified. Thus there is a paragraph that recognizes that the Soviet Union might see this as a first-strike strategy: 'I clearly recognize that defensive systems have limitations and raise certain problems and ambiguities. If paired with offensive systems, they can be viewed as fostering an aggressive policy, and no one wants that.' There is also an awkward clause making some obeisance to treaty obligations and to allied consultations: 'Tonight, consistent with our obligations under the ABM Treaty and recognizing the need for closer consultations with our allies, I'm taking an important first step.'[5]

The rather curious way in which the intensive investigation of a possible BMD system was reintroduced into official US thinking helps to explain some of the subsequent developments. The general appeal of the idea is understandable. It seems to hold out the prospect of providing the United States with that immunity to attack which it once had, but which it lost with the development of intercontinental ballistic missiles. The idea also appeals to those who wish to re-establish some clear US military superiority, and to those who believe that this kind of arms competition can cause great damage to the

Soviet economy. To quote one former US military officer: '*Pax Americana* for the first time would appear in almost perfect form, after SDI deployment was finished. . . The US could compel the Kremlin to disarm unilaterally (the US would need fewer nuclear forces thereafter), disband its alliance system, and free satellite states . . .'[6]

III. Problems of the US position

The initial announcement of the idea of SDI, therefore, left a great many issues unresolved. There is clearly a good deal of disagreement within the US Administration about how they might be resolved, and these disagreements are unlikely to go away. The actual decisions about what should be done, and what should be proposed, stretch out into the distant future, to a time when there would certainly be another President and possibly a different US Administration. It would not be right, therefore, to suggest that there is a fixed and immutable US policy on defensive weapons against ballistic missiles. This section discusses some of these unresolved issues.

Star Wars I and Star Wars II

The President, in his speech, presented a vision of total defence—that is, a defence of people as well as of military installations from nuclear weapons. It is this idea which has popular appeal, and which is illustrated in a television advertisement showing a 'peace shield' being put in place to protect the ordinary citizen. However, it is very doubtful whether such total protection could ever be provided against an adversary who was determined to find ways of penetrating the 'peace shield'. So far, it is only defence against ballistic missiles which has been discussed. A 'peace shield' would of course have to provide protection against all other ways of delivering nuclear weapons, including bombers and cruise missiles. This could require a separate defensive system, which could be at least as costly as the development of ballistic missile defence.

Consequently, there are many proponents of the development of BMD systems who are thinking, not of total defence—Star Wars I—but of defence of missile sites, command centres and other military installations—Star Wars II. This is a different proposition. It is an association of defensive with offensive missiles—essentially the addition of a defensive system to an offensive structure.

Former Secretary of Defense Robert S. McNamara has commented on the distinction between Star Wars I and Star Wars II as follows:

> I do not know any reputable scientist in the United States who believes that Star Wars I is achievable at any time in the next several decades—that is, at any time in the period which bears on the negotiations now under way in Geneva, or bears on the planning of offensive forces by either the Soviet Union or the US. All of the SDI research and all of the SDI deployment now contemplated are deployments in association with offensive forces, and that brings into the discussion the relevant paragraphs in the President's

speech. After the President said 'I call on the scientific community of the US to design an impenetrable shield to render impotent and obsolete offensive forces', he went on to say that if that is not achieved and instead the United States develops a partial defense and adds that to the offense, the Soviets may consider that aggressive 'and no one wants that'. Now that is what we are doing, and that is exactly the way the Soviets are interpreting it.[7]

This combination of offensive and defensive missiles was of course the option which both the United States and the Soviet Union agreed to limit severely when they signed the ABM Treaty in 1972. In the late 1960s, it was the Soviet Union which appeared to be enthusiastic about developing defensive systems; it was the United States which persuaded the Soviet Union that an agreement on offensive systems would be impossible unless there was a firm limit on the defensive side. It was the ABM Treaty that made the SALT I Interim Agreement possible. This is clearly stated in the preamble to the ABM Treaty: 'Considering that effective measures to limit anti-ballistic missile systems would be a substantial factor in curbing the race in strategic offensive arms . . .'.

SDI: a bargaining chip

One of the more plausible *ex post facto* rationales for the SDI proposal runs as follows. It was proving impossible at the Geneva negotiations to persuade the Soviet Union to consider substantial cuts in the number of their offensive missiles. At the same time, it was proving very difficult in the United States to proceed with the modernization of the US offensive missile armoury. This was because of congressional opposition to, and general public distaste for, any nuclear buildup. Thus Congress was cutting back to the minimum the deployment of the MX missile—a missile which had originally been proposed as far back as 1969: this indicated the difficulties the Administration faced. (This part of the rationale is not wholly persuasive. Congress had approved very substantial modernization programmes for the bulk of US offensive weapon systems—that is, for submarine-launched ballistic missiles (SLBMs), for bombers and for cruise missiles. The MX programme was the only programme to suffer a significant cutback, and that was mainly because successive Administrations could not devise a basing mode which was both acceptable and sensible.)

Consequently, in order to bring some pressure on the Soviet Union to change its negotiating position on offensive missiles, it was necessary to change the form of the competition. In putting forward SDI, the Administration shifted the competition to an area where it could exploit the advantages of its ability to engineer new military technology. Further, the Administration would not have the same difficulties with Congress and public opinion, since the development of non-nuclear defensive weapons would not provoke the anti-nuclear weapon lobby to the same extent. This is now presented as the rationale for the decision to intensify research on anti-ballistic missile systems.

According to this rationale, the gambit was successful. The Soviet Union, faced with this new challenge, came forward for the first time with a proposal to

halve the number of offensive nuclear weapon 'charges', on condition that some steps were taken to slow down developments on the defensive missile side. (There is no way of proving, of course, what the reasons were for any particular Soviet arms control approach, or change in that approach. There are other reasons which can be advanced for Soviet policies in this matter.)

The implication of this rationale is, of course, that the bargaining chip should at some point be cashed in. In exchange for an agreement reducing substantially the number of offensive nuclear warheads, the United States should agree to constrain the SDI programme.

The presidential view

The presidential view is clearly different. It envisages an eventual move to the actual deployment of the defensive weapons both by the United States and by the Soviet Union, leading to a state of affairs where both sides abandon offensive nuclear weapons entirely, since they would be 'impotent and obsolete'. The main problem here is that there is really no way of bringing this vision about, unless the Soviet Union is willing to go along with it. Unilateral deployment of defensive systems would simply provoke countermeasures of one kind or another which are virtually bound to make a defensive system inadequate.

The idea is therefore coupled with the proposal to share the technology with the Soviet Union, to open research laboratories to inspection by the other side, and so on—all these offers contingent on a previous substantial reduction in the number of offensive missiles. Thus this proposal—for some joint move towards a defensive-offensive mix of weapons, with the eventual objective of abolishing offensive weapons altogether—is apparently to follow after an agreement to limit offensive systems. At present, together with SDI, the United States is engaged in programmes (described in chapter 3) which will increase considerably the numbers and capabilities of US strategic offensive nuclear weapons.

ABM systems and the treaties

It is clear that, when the initial launching speech was made, not much thought had been given to the problem of the conformity of the suggested programme with existing treaties. The main relevant treaty is of course the ABM Treaty of 1972. Section 1 of Article V of that treaty reads as follows: 'Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based or mobile land-based'. The one deployment permitted, in limited numbers, is the deployment of fixed land-based systems: and it is only for fixed land-based systems that development or testing is permitted. According to the treaty, therefore, there can be no development or testing of ABM systems other than fixed land-based systems.

Some debate has arisen because of the wording of Agreed Interpretation D of the treaty, which refers to the possible creation of ABM systems 'based on other physical principles'. It says that if such systems are created, 'specific

limitations on such systems and their components would be subject to discussion in accordance with Article XIII and agreement in accordance with Article XIV of the treaty'. It is quite clear that this agreed interpretation is aimed at strengthening the restrictions on the kind of *fixed, land-based systems* which may be deployed at the two ABM sites then permitted to each side. It was not intended to weaken Article V's comprehensive prohibition of the development and testing of mobile systems of all kinds.

The meaning of the term 'development', according to the US interpretation, is as follows: 'The obligation not to deploy such systems, devices or warheads would be applicable only to that stage of development which follows laboratory development and testing. The prohibitions on development contained in the ABM Treaty would start at that part of the development process when field testing is initiated on either a prototype or breadboard model'.[8]

Over the years, it has been clear that the United States considered that the ABM Treaty prohibited the development and testing of mobile systems of all kinds. Each year the Administration has published a volume of Arms Control Impact Statements, which sets out what the various arms control treaties prohibit and permit. Each year the Arms Control Impact Statements have repeated the blanket prohibition of Article V, and then have gone on to say: 'The Treaty allows development and testing of *fixed, land-based* ABM systems or components based on other physical principles . . .' (italics added), but points out that such systems may not be deployed 'unless specific limitations on such systems and their components are discussed and agreement is reached to amend the treaty'.[9] This detail about the ABM Treaty is given because there was, during 1985, an attempt by one part of the US Administration—in this case the previous National Security Adviser, McFarlane—to reject the interpretation of the treaty which the US Administration had accepted since 1972 and to argue that the treaty permits the development and testing of all kinds of ABM systems 'based on other physical principles'. The announcement of this 'broad interpretation' brought a considerable reaction from the NATO European countries, and within the United States as well. There had to be a face-saving retreat from this position, in which the Secretary of State said that the USA would remain within the narrow interpretation of the treaty at least for the time being. However, this still leaves open the possibility that at some time in the future the 'broad interpretation' might be brought forward again.

There are two other treaty provisions which are relevant to some of the developments in the SDI programme. Article IX of the ABM Treaty reads as follows (in part): 'each Party undertakes not to transfer to other States, and not to deploy outside its national territory, ABM systems or their components limited by this treaty'. The treaty thus would not permit the United States to deploy an ABM system in Europe. Indeed Agreed Interpretation G goes further, and prohibits the transfer to other states of 'technical descriptions or blue prints specially worked out for the construction of ABM systems and their components limited by the Treaty'. However, the treaty is only concerned with systems to counter strategic ballistic missiles. Anti-tactical ballistic missiles (ATBMs) are not prohibited by the treaty.

Article IV of the Outer Space Treaty, signed in 1967, reads as follows (in part): 'States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner'.

Section 1 of Article I of the Partial Test Ban Treaty, signed in 1963, reads as follows (in part): 'Each of the Parties to this Treaty undertakes to prohibit, to prevent, and not to carry out any nuclear weapon test explosion, or any other nuclear explosion, at any place under its jurisdiction or control:

(a) in the atmosphere; beyond its limits, including outer space'.

The X-ray laser, which is one of the potential ABM weapons being considered, is generated by a nuclear explosion. It clearly could not be either tested or deployed in space without infringing probably three existing treaties.

The NATO allies

A half-sentence was probably inserted at a late date into the initial speech referring to consultation with allies. The reactions of allied governments can be summed up as follows: a lack of enthusiasm for the idea in general; a clear desire to restrict the programme to research, and to uphold a narrow interpretation of the ABM Treaty; a certain interest in some military quarters in the development of anti-tactical ballistic-missile systems, which are not prohibited by the treaty; a fear of being left behind in new technologies with civil applications; and at the same time a wish to get a share of any money that might be going.

There were a number of reasons for lack of enthusiasm in Europe. The development of defensive systems could be seen as a return to the idea of 'fortress America', leaving Europe as a hostage to the Soviet Union. The development of these new technologies would further widen the gap between the military capabilities of the USA and the USSR on the one hand, and the countries of Western Europe on the other. If defensive systems were extensively developed in the USSR as well as in the USA, then the UK and France would be left with a nuclear deterrent of doubtful efficacy and would presumably have to undertake new and costly programmes, looking for countermeasures to possible Soviet defensive systems. The French Government has already said that it will have to start programmes of this kind.

The French Government has been the most categorical in its opposition to the idea of SDI. In an attempt to do something about the possible widening of the technological gap between the United States and Western Europe, France launched the Eureka programme—to be a high-technology civil programme with possible military spin-offs (see chapters 7 and 14). France is not officially co-operating with the US research programme: neither are Australia, Canada, Denmark, Greece or Norway.

The British Foreign Secretary also made a number of sceptical remarks (for which he was curtly rebuked by US Assistant Secretary of Defense Richard Perle). However, the lure of a share in the research funds for SDI has proved to be a powerful attraction. Britain has now signed an agreement on research

co-operation: as a consequence, any official criticism of the SDI programme is likely to be muted.

In FR Germany, the government appears to have in mind an agreement which gives the legal framework for West German private companies and research institutes. No state financing is involved, and it would be considered to be an economic rather than a political agreement.

The US initiative has, of course, prompted questions about the possibilities of the defence of Western Europe against nuclear weapons. Initially, there were some suggestions from the USA that the 'defence shield' would cover Western Europe as well: less is heard about that now. The idea is rather that if Western Europe wishes to develop a defensive system, then the European members of NATO should set up a collaborative project to this end. As in the United States, the idea of the defence of populations in Western Europe seems fanciful. Terminal defence systems for military installations against missiles might be more possible; indeed the Patriot missile is already being developed in a counter-missile mode. However, the cost would be high—and the development of such systems would of course provoke Soviet countermeasures. Further, the Soviet Union has many other ways of delivering nuclear warheads on Western Europe.

IV. The Soviet position

Two questions must be asked about the Soviet position. The first is this: What research is the Soviet Union itself undertaking in ballistic missile defence? (See also chapter 7.) The second is about present and future Soviet reactions to the US SDI programme, and their response to the suggestion of a joint move towards some offensive/defensive weapon mix.

There are the usual formidable problems in coming to any judgement about the Soviet Union's own research programme. The Soviet Union itself publishes nothing—indeed for a long time it did not admit that it had tested an anti-satellite weapon system. The only source of information is from US official sources—and at present the United States has a strong official interest in giving the impression that the Soviet Union is itself far advanced in research in this field.

There is one general statement, made in the US official presentations, which needs some qualification: that 'Soviet efforts in most phases of strategic defense have long been far more extensive than those of the United States'.[10] A great deal of this Soviet expenditure is on air and civil defence. Much more than the United States, the Soviet Union sees itself as ringed by large numbers of hostile aircraft with sufficient range to reach targets in the Soviet Union. These aircraft are based in Western Europe, Turkey, South Korea, Japan and China and on US aircraft-carriers. Further, the United States' long-range bomber fleet is considerably more formidable than that of the Soviet Union. The United States has until recently not considered the threat from the ageing Soviet bombers to be sufficient reason for any comparable expenditure. However, this situation is changing with the deployment of longer-range air-launched cruise missiles on Soviet bombers. The USSR also has French, British and Chinese missiles targeted on its territory. Soviet sources indicate

that existing and evolving Soviet BMD capabilities are primarily concerned with these 'lesser' threats.

The Soviet Union has an operational ABM system around Moscow—the world's only operational system. US sources say that there has been a programme of upgrading since 1980, which *inter alia* has increased the number of launchers to the 100 permitted by the ABM Treaty. The Moscow ABM system is supported by a considerable radar system. Of course, the extension of protection to areas of the Soviet Union outside Moscow would require, with the installation of a great number of new launchers, a break-out from the ABM Treaty. US official sources imply (somewhat tentatively) that the Soviet Union might be preparing for such a break-out: 'The Soviets are also developing components of a new ABM system which are apparently designed to allow them to construct individual ABM sites in a matter of months . . .'.[11] These sources also argue that Soviet radar developments could be part of such an intention. (The specific issue of the Krasnoyarsk radar is discussed in chapter 3.)

These suggested developments are developments of traditional land-based ABM systems. In describing Soviet work in more advanced technologies, US accounts suggest possibilities more than certainties. The United States claims that the Soviet Union has over 10 000 scientists and engineers working on its laser programme: 'It already has ground-based lasers that could be used to interfere with US satellites, and could have prototype space-based antisatellite laser weapons by the end of the decade. The Soviets could have prototypes for ground-based lasers for defense against ballistic missiles by the late 1980s'.[12] The Soviet Union, like the United States, uses lasers for tracking objects in space. Although it would need considerable laser power to destroy a satellite, it would not need much power to damage, or blind, some of the sensors on reconnaissance or early-warning satellites. This would be an infringement of the clauses in both the SALT I and SALT II treaties, by which both parties agree not to interfere with the national technical means of verification of the other side. The United States also suggests considerable Soviet work in particle-beam weapons and kinetic-energy weapons (see chapter 7). However, it concedes that the Soviet Union is behind in remote-sensing and computer technologies.

US statements of potential future Soviet capabilities have in the past often overstated the Soviet Union's eventual accomplishments. It would apear that the Soviet Union has probably been most concerned with development of fixed land-based systems—whether using conventional or advanced technologies. That is, it has been concerned with terminal defence, rather than with those ideas in the SDI programme which suggest space-based weapons to catch intercontinental ballistic missiles in their boost phase.

The second question concerns the Soviet reaction to the President's decision. (The nuances of this reaction are discussed more fully in chapter 13.) It was as indicated by McNamara. The Soviet Union argued that the combination of offensive and defensive missiles was part of a long-term strategy to establish a first-strike capability—the defensive system might be adequate to deal with the Soviet missiles that were left over after a first strike. (Mutual accusations that

the other side is preparing a first strike are part of the stock-in-trade of superpower exchanges.) More generally—and perhaps with more justification—the Soviet Union saw this move as an attempt to re-establish US strategic superiority—much on the lines of the arguments for space-based defence presented by General Graham (see section II). There are plenty of military authorities who refer to space as the 'new high ground' in military affairs, indicating that the country which establishes military pre-eminence in space will thereby achieve a dominating position. Both superpowers, in their competition in strategic weapons, have a major concern: not to be seen to be inferior. Of course what may seem to one side to be the absence of inferiority appears as superiority to the other side.

There is no sign of any Soviet interest in any idea of a joint development of defensive weapon systems, with shared technology: it seems to be a proposal which they have difficulty in taking seriously. In any case, it is something which is not in the time-span of existing negotiations on offensive weapons.

The Soviet Union has therefore made its offer on the reduction of offensive missiles conditional on a constraint (as yet unspecified) on the programme for the development of defensive missiles. (What these constraints might be is discussed in chapter 3.) If the United States is not prepared to make any concessions on the defensive missile side, the Soviet Union—judging by its present stance—seems unlikely to be prepared to reduce its offensive nuclear arsenal. Indeed, if the SDI programme goes ahead without constraint, the Soviet Union is likely to follow one of the following three courses—or possibly a mixture of all three: simply to increase the number of warheads on its missiles, or the number of missiles or other delivery systems; to develop countermeasures in an attempt to defeat the defence; or to intensify its own work on the development of a defensive system. The most probable course seems a mixture of all three reactions.

If the ABM Treaty were no longer observed, SALT I and SALT II constraints would not be observed either. The Soviet Union, if unconstrained by treaties, has the capability for increasing substantially the number of warheads on its heavy intercontinental missiles. If it tripled the number of warheads on the SS-18s, this alone would add some 3000 strategic warheads.

In addition to simply multiplying the number of offensive warheads, a very wide range of countermeasures to defensive systems has been suggested.[13] For example, space mines could be located near to any ABM system which is put into orbit. Weapons whose objective is to catch ballistic missiles in their boost phase can be countered by developing fast-burn boosters, which could burn out at an altitude as low as 80 km and in a time as short as 50 seconds. To reduce the chance of mid-course interception, 'anti-simulation' can be used: warheads can be made to look like decoys, by enclosing both warheads and decoys in balloons. 'It may be difficult for a beggar to dress up to look like a king, but if the king wants to pass unobserved, then he might begin by looking like a beggar.' Then there is always the option of a shift towards other systems of delivering nuclear weapons— cruise missiles in particular—which would need a wholly different (and probably equally costly) defensive system.

Third, there is the option of more rapid development of Soviet defensive

systems. The general Soviet pattern, in the technological arms race, has been to copy what the United States is doing, with a delay in deployment of five to eight years. It is, however, quite possible that the Soviet Union would concentrate on land-based terminal defence systems, and not attempt to develop space-based systems whose objective is to catch US missiles in their boost phase.

V. Arms control consequences: assessment

There are three possible lines of future development with the SDI programme and the negotiations concerning them; they have different consequences for arms control.

The first is that no agreement is reached at Geneva, and US development and deployment of BMD systems proceed unilaterally. The second is that the United States and the Soviet Union come to some new agreement specifying some mix of offensive and defensive weapons, and setting out some course for agreed reductions in offensive weapons and agreed increases in defensive ones. The third possibility is an agreement in Geneva which reaffirms and strengthens the objectives of the ABM Treaty, prohibiting further deployment of ABM systems, and which at the same time makes deep cuts in the number of offensive nuclear strategic systems. Each of these possibilities is considered in turn.

Some of the consequences of a unilateral US decision to develop and deploy ABM systems have been discussed in the section on Soviet policy. The treaty structure constraining nuclear weapon deployment would crumble, leading to an unconstrained competition in both offensive and defensive weapons. One of the many dangers in this development would be the temptations provided for a pre-emptive strike. It is unlikely that a defensive system could be constructed which would be adequate to deal with the first strike of a determined opponent; however, it might be considered to be adequate to deal with those missiles which are left after a first strike has been attempted. In almost any scenario the existence of defensive systems would make it more attractive to strike first—including in such a strike, of course, attacks on the defensive systems of the other side. The result of this course would be greater insecurity for both the United States and the Soviet Union, at much higher levels of military expenditure.

The second possibility is that the USA and the USSR come to some agreement on offensive weapons, together with a revised ABM Treaty which permits some further development and eventual deployment of defensive weapons. This could be accompanied by President Reagan's vision of a sharing of defensive technologies, and opening of research laboratories to inspection by the other side, and so on.

It is not easy to see how this could come about. First of all, the Soviet opposition to this idea seems categorical, and agreement is essential for success. Second, it is very difficult to see how a revised agreement on defensive weapons could be formulated, at least for a very long time. Any combined treaty or pair of treaties, concerning offensive and defensive weapons, would

have to set some qualitative and quantitative limits to both of them. For a number of years it would be uncertain what form defensive weapons might take. It is very hard to see how a treaty could set constraints on unknown systems. However, some treaty to constrain developments in offensive weapons is needed now. If there is no early treaty, there will be a great many new deployments of offensive nuclear weapon systems during the next five years.

The proposals for joint development of defensive systems, and for open laboratories, seem a long way from present realities. There must be large parts of the US Administration, particularly in the Pentagon, who do not take such an offer seriously. Any ABM system would consist of a whole array of different systems. Most of them would incorporate technologies which could be used in many other military applications. The United States would thus be involved in sharing with the Soviet Union, and the Soviet Union would be involved in sharing with the United States, a wide array of different military technologies. Such a development would imply a high degree of confidence between the two powers. Given so high a degree of confidence, there would surely be easier ways of reducing the risks of a nuclear attack than extremely expensive deployments of defensive systems.

The third possibility follows the argument of those who say that—in so far as the objective of the SDI proposal was to get the Soviet Union to consider substantial cuts in the number of offensive weapons—that objective has been achieved, and consequently SDI should now be 'traded in'. The Soviet offer has clearly been made dependent on agreeing at the same time to some steps which would ensure that the SDI programme does not lead to actual deployment. The proponents of this view argue that it makes good sense to trade in a programme which is in any case unlikely to be successful and which will be very costly, in exchange for large reductions in the number of offensive weapons. They point out that there is very little chance that the Soviet Union would agree to any such reduction, if it were faced with the possibility of the deployment of a substantial number of defensive weapons at some time in the future.

If the Soviet offer on reducing offensive weapons is judged to be a reasonable one, there will be pressure on the US Administration from Congress to accept some restrictions on the SDI programme. There will also be pressure from the NATO allies. Lord Carrington, Secretary-General of NATO, was no doubt expressing their view when he wrote:

> One point that will need a convincing answer already seems to be emerging: the argument that you cannot commit yourself irrevocably to a substantially reduced number of offensive weapons unless you have a pretty good idea of what the other side's defences are likely to be.
>
> In other words, it may be sensible to explore the possibility of some form of reassurance or negotiated safeguard against a sudden breakout into strategic defence by the other side. Concern about such a breakout has always seemed at least as much an American as a Soviet point.[14]

There will also be strong pressures against any agreement of this kind. The

President himself seems deeply committed to an SDI programme, and he will certainly have the support of the Pentagon. Then, as the SDI programme continues, it will acquire a momentum of its own. Once a programme of the SDI scale gets into the budget system, there is strong pressure to do something with it. If the SDI programme goes ahead as planned, it will cost tens of billions of dollars just in the 'research' phase. The argument then will be that all this money will be wasted if there is no deployment.

At first, the big US defence contractors may have thought work on SDI a somewhat doubtful proposition, liable to cancellation. However, now virtually all of them—Boeing, Lockhead, Rockwell, Hughes Aircraft, McDonnell Douglas, TRW, LTV Aerospace and Teledyne Brown—have obtained some share of the SDI budget for research and development, and are building up SDI divisions in their administrative structures. Their pressure will be to move on from research and development to actual production, and lobbies will be financed to this end.

Financial considerations may also serve to mute criticism from the NATO allies. To adapt a saying of General Patton, 'If you pull them by the purse strings, their hearts and minds will follow'.

However, this third possibility—to combine an agreement reducing offensive weapons with an agreement blocking any further deployment of defensive weapons—seems the only sensible course. The possible elements of an agreement on the defensive weapon side are these:

1. Agreement that the ABM Treaty, as it stands, prohibits the development and testing of mobile ABM systems.

2. The USA and the USSR in 1974 signed a protocol to the ABM Treaty, limiting ABM deployment to one site only. The preamble to that protocol reads (in part): 'Proceeding from the premise that further limitation of anti-ballistic missile systems will create more favourable conditions for the completion of work on a permanent agreement on more complete measures for the limitation of strategic offensive arms'. This is indeed the case. Pressure should be put on the USA and the USSR to agree on an additional protocol which bans all ABM deployment and development, including land-based missiles. This would require the dismantling of the existing system around Moscow, and would stop development and testing of land-based systems as well as mobile systems. If ABM development and deployment is a bad idea, the sensible thing is to stop it altogether.

3. A separate agreement which prohibits the development and testing of anti-satellite (ASAT) systems. Otherwise it would be too easy to conduct ABM development and testing under the guise of anti-satellite work. The Soviet Union had declared a moratorium on the testing of anti-satellite weapons. The US Congress also has now imposed a ban on US tests of anti-satellite weapons against targets, unless the Soviet Union conducts a test. This ban is valid up to October 1986.

4. At present, either party can withdraw from the ABM Treaty by giving six

months' notice. The two parties to the treaty could agree to lengthen this period—to three or five years—as a safeguard against a break-out.

5. It would be desirable to associate these moves with new negotiations to reach an agreement on a comprehensive test ban. This would stop further development of the X-ray laser weapon—a weapon which is particularly objectionable since its deployment would involve putting nuclear weapons into orbit.

6. At this stage, it is difficult to formulate arms control measures which go further than a prohibition on testing, in constraining military research and development. The problem of verification is always mentioned here. However, there are probably ways of monitoring some forms of research—for example, research into high-powered laser techniques. In the long run it may well be necessary to look for more ambitious arms control possibilities, which go further to curb military R&D—one of the main driving forces behind the technological arms race.

A combination of measures of this kind on the defensive weapon side should open the path for an agreement to halve the number of offensive strategic warheads.

Notes and references

[1] Section II draws extensively on the research of Frank Greve, in the Washington Bureau of the *Philadelphia Inquirer*, whose account was published in the *Philadelphia Inquirer*, 17 Nov. 1985.

[2] *Congressional Quarterly, Weekly Report*, vol. 41, no. 12 (26 Mar. 1983), p. 629.

[3] Interview in *US News and World Report*, Oct. 1980.

[4] Quoted in Greve (note 1).

[5] *Congressional Quarterly* (note 2).

[6] 'Jack Swift', the pseudonym for a former US military officer with long experience in analysing the US/Soviet military balance, in *Defense and Foreign Affairs Daily*, vol. 14, no. 224 (19 Nov. 1985).

[7] McNamara, R., Statement made at the SIPRI International Conference on Space Weapons and Security, June 1985.

[8] *Fiscal Year 1984 Arms Control Impact Statements*, Apr. 1983, p. 133.

[9] See note 8.

[10] *Soviet Strategic Defense Programme*, US Department of Defense and Department of State, Oct. 1985.

[11] See note 10.

[12] See note 10.

[13] See Garwin, R. L., 'Enforcing BMD against a determined adversary?', in a forthcoming SIPRI publication: Jasani, B. (ed.), *Space Weapons and International Security*.

[14] Lord Carrington, 'NATO in the new year: stick to the Reagan formula', *International Herald Tribune*, 28–9 Dec. 1985.

5. Chinese nuclear weapons: an overview

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Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

Although the People's Republic of China has possessed nuclear weapons since 1964, its impact as a nuclear weapon power is relatively unstudied and unknown. Yet numerous developments suggest that China's nuclear forces should be carefully examined. China is the only nuclear weapon state that has engaged in armed combat with the Soviet Union. China is the only developing country that has a full 'triad' of nuclear forces that can threaten the two nuclear superpowers, the USA and the USSR, and aside from them is the only other country with intercontinental-range ballistic missiles. China has territorial claims and border disputes with a number of countries, including the USSR; it may be more likely than any other nuclear weapon country to engage in armed conflict. China and the USSR have positioned huge military forces along their common border, roughly one-half and one-quarter of their total forces, respectively. China's split from the Soviet Union (in 1960) and subsequent realignment with the USA (beginning in the early 1970s) have completely changed the nature of the 'East–West' competition and caused the USSR to shift much of its military might towards China: today this includes roughly 750 'theatre' nuclear missiles and hundreds of nuclear-capable aircraft deployed towards China. For its part, China possesses some 170–230 ballistic missiles and some 120–150 bombers capable of striking the USSR.

It is unclear what path China will take as a nuclear power. Some recent evidence suggests that China may decide to pursue a much broader and more flexible nuclear force posture because it doubts the credibility of its own weapons. Should this prove to be the case, it could spur yet another regional arms race and further destabilize an already dangerous region. The prospects for arms control that includes Chinese nuclear weapons appear, for the first time, to be suitable for discussion: China has long maintained that only after the USA and the USSR cut their arsenals by one-half will China enter into discussions with all the nuclear weapon nations to pursue disarmament—China's professed goal. Now the superpowers are both proposing such cuts in their nuclear arsenals.

The time has come to include China in the debate on arms control and security issues. People should start considering the many questions about China's role as a nuclear weapon nation and the possibilities for arms control; otherwise China will remain the unnoticed nuclear power, and will play an increasingly important, perhaps destabilizing role in world nuclear affairs. This chapter explains the background, development and deployment of China's nuclear forces and the role they play in the arms race. As such it is meant to be

an initial examination, intending to suggest some areas of inquiry and to prompt more research on the subject.

Background and context

China is the most recent nuclear weapon nation and also the most obscure to the West. Less is known about Chinese nuclear forces than about those of the other four nuclear weapon nations: the USA, the USSR, Britain and France. This is due primarily to the extensive secrecy that surrounds all aspects of Chinese nuclear weapons; all matters concerning Chinese nuclear forces are officially considered secret in China. One must therefore rely on occasional US official statements, or the infrequent and usually vague material appearing from Chinese sources. Before the US–Chinese rapprochement, the US Government habitually reported the developments in Chinese nuclear capabilities. More recently it appears that the USA is trying to break that habit by remaining publicly silent. None the less, even though China possesses a relatively small total number of warheads, they can be considered the most significant after those of the USA and the USSR. It is hard to imagine a nuclear conflict involving either Britain or France without the United States. Not so for China: it could become engaged in a war against the USSR without the involvement of any of the other nuclear weapon powers. None of these other three nuclear weapon states shares a land border with the USSR, nor have they engaged in armed conflict with it. China has.

Perhaps the most significant development in the US–Soviet cold war was China's split from the Soviet Union in 1960 and its subsequent development of nuclear forces. When the vision of a monolithic Communist bloc dissolved, it changed the entire nature of the East–West competition. Where once the USA feared a Chinese 'threat', it now sees China assuming the vital role of keeping a check on the Soviet military in the Far East. The USA perceives that, as long as China and the USSR remain military adversaries, the USSR cannot afford to redeploy its forces from the Far East to Europe, even in a war. James Kelly, the principal Department of Defense official responsible for US–Chinese military policy, told Congress that the USA and China had 'a legacy of mutual suspicion from almost thirty years of considering one another enemies', but that the current US goal is 'an enduring defense relationship' with China.[1] China's role as a nuclear weapon nation is thus far more important than is apparent from a simple tally of its atomic arsenal.

Sino–Soviet relations

In 1969, a series of border disputes and armed clashes between China and the USSR led to a tense military situation that threatened war. It is widely rumoured that the USSR approached the USA secretly to test the idea of a joint nuclear attack against China, which the USA promptly reported to China. Although no war broke out, the military buildup that followed has led, according to Kelly, to 'the largest single concentration of forces along any bi-national border', which includes Soviet deployment of 'over 750 intermedi-

ate and short-range surface-to-surface missiles ranging from the SS-20 to battlefield tactical systems'.[2]

Although Sino–Soviet relations have eased considerably since the early 1970s, China still considers the USSR its main enemy. Representatives of both nations have met sporadically over the years, attempting to normalize relations. But official Chinese policy is that three Soviet obstacles preclude any such normalization. These three obstacles are: the Soviet invasion of Afghanistan, Soviet support for the Vietnamese invasion of Cambodia, and the massive buildup of Soviet military forces along China's border. In the past few years China has become increasingly concerned about the Soviet deployment of SS-20 missiles in the Far East (over 170), which the USA reports 'has become a major issue in Sino–Soviet normalization talks'. Until the USSR removes these obstacles, China will continue to view the USSR as its main adversary.

While most observers consider that China possesses nuclear weapons for purely defensive or minimal deterrent purposes, it is unclear what path China will take in the future. Since the early 1980s, Chinese officials have regularly emphasized the importance of nuclear forces. In an article in *Red Flag* in March 1983, defence minister Zhang Aiping called for greater Chinese concentration on nuclear weapon programmes.[3] Under China's 'four modernizations' the military has been given the lowest priority, but nuclear weapons are considered separately and have the highest priority of all military programmes.[4] China's current military reorganization plan calls for cutting regular troops by one million men, reducing overall military spending and restructuring the military districts and command system. But this massive shift in the military will not reduce China's nuclear role or capabilities; it will improve them. China will spend less money on the regular ground forces while streamlining the command and fighting structures, thus releasing proportionately more resources for nuclear forces. A recent article in *Beijing Review* boasted that: 'The strategic missile corps is the youngest of the various military branches. Every year a large number of university graduates are enrolled in its combat and scientific research units. The nucleus of its officer corps is now made up of highly trained specialists, and 85 percent of the service's officers and engineering and technical staff are college graduates.'[5]

II. Policy and history

Analysts have ascribed a wide range of motives and policies to China's nuclear forces, from 'minimum deterrence' to 'nuclear warfighting'. China began its quest for nuclear weapons by claiming that it had to break the nuclear 'monopoly' of the two superpowers. While no reliable or comprehensive official statements explain its nuclear strategy, China has frequently issued a fairly simple set of pronouncements about its nuclear policies. Foreign Minister Wu Xueqian repeated them to the United Nations in 1984:

> The Chinese Government and people always stand for nuclear disarmament. The small quantity of nuclear weapons China possesses is solely for the purpose of self-defence. We have solemnly declared time and again that at no time and in no circumstance will China be the first to use nuclear weapons and that it unconditionally undertakes not to

use nuclear weapons against non-nuclear states and regions. China has never participated, nor does it intend to participate in the nuclear arms race or shirk its responsibility in regard to nuclear disarmament.[6]

Although many such declarations have been proffered for public consumption, they do not tell the whole story.

One important characteristic of Chinese nuclear thinking and planning is the tension between the traditional Chinese theory of warfare, 'people's war', as espoused by Mao Zedong (since refined to suit current thinking), and theories of nuclear warfare. 'People's war' traditionally emphasized mass mobilization of an armed militia to fight a prolonged war of attrition that China could uniquely win. No adversary could ever hope to win a guerrilla war against one billion widely dispersed, armed and resolute Chinese. Mao insisted that people, not weapons, would make the decisive difference, and derided nuclear weapons as 'paper tigers'. China has often stated that it has no ambitions to occupy 'even one inch of foreign soil' while asserting that no country could occupy as much of China. But long-range nuclear missiles do not readily fit into such a theory of defence or warfare; they are inherently intended for attacking foreign territory, even if in 'self-defence'. As it has improved the capability and flexibility of its nuclear forces, China has implicitly adopted the 'logic' of nuclear deterrence as its mode of nuclear thinking, while shunning the traditional reliance on 'people's war'.

It is unclear what official Chinese thinking is on nuclear weapons, or whether there is one unified line. Official literature and texts do not explain Chinese policies in terms of deterrence, but instead use terms like 'people's war under modern conditions', 'self-defence', 'counter-attack', and so on. Nie Rongzhen, the leading figure responsible for the nuclear weapon research and development programme, said: 'To get rid of imperialist bullying . . . we had to develop these sophisticated weapons. At least then, we could effectively counterattack if China were subjected to imperialist nuclear attack.'[7] It is not possible to discern from Chinese accounts whether nuclear weapons are considered as tools for political prestige, as weapons to be used in war, or both.

One can discern some salient features of Chinese nuclear thinking from the forces that China has deployed. Given the massive nuclear capabilities of the Soviet Union in the Far East, Chinese defence officials clearly realize the possibility that any war with the USSR could involve Soviet nuclear attacks on China. Hence Chinese statements that its nuclear weapons 'will no doubt strengthen the country's ability to defend itself and to effectively strike back'.[8] There has been increasing emphasis in the 1980s on the importance of the role of nuclear weapons in China's military posture.

China has built ballistic missiles that all have the potential range for striking the Soviet Union, if deployed close enough. It is possible that China has deployed some of its missiles out of effective range of the USSR, but there is no available evidence that this has been done. The newest additions to China's arsenal have been intercontinental ballistic missiles (ICBMs) that can reach Moscow and submarine-launched ballistic missiles (SLBMs) that can survive an adversary's first strike. With the introduction of ICBMs, China is capable of striking any area of the Soviet Union, and its shorter-range nuclear forces hold

more than 100 regional targets at risk. According to the US Joint Chiefs of Staff, China has compensated for the size of its arsenal:

> An innovative deployment strategy poses severe targeting problems for any potential aggressor. Survivability of some portion of the ballistic missile force is virtually guaranteed through launch unit mobility, hardened storage for launchers, concealment practices, and dispersal in mountainous terrain. If the Soviets launched a nuclear attack on China, they would do so knowing that they would suffer significant damage in retaliation.[9]

It appears that there is a growing Chinese debate on nuclear strategy and doctrine that remains to be concluded. On the one hand there are the advocates of nuclear minimalism, who believe that severely strained resources and remote prospects of nuclear war determine the slow pace and scale of China's nuclear ambitions. On the other hand there are those who doubt that China's limited 'strategic' nuclear arsenal is a credible threat to prevent a Sino–Soviet war, especially a limited war. This line of thinking leads to the desire for distinctly 'tactical' weapons that would be suitable for options short of resorting to the longer-range weapons. As with other aspects of nuclear weapons, very little information is available on such policy issues. It appears that China has adopted a *de facto* deterrence policy that is expected to be expandable as China's nuclear forces are 'modernized'.

History

China's nuclear weapon history began with its dependence on the Soviet Union in the mid- to late-1950s for scientific and technical assistance to develop its military and particularly nuclear forces. China modelled its own military forces and R&D establishment after those of the USSR. In a 1957 agreement on science and defence co-operation, the Soviet Union agreed to help China build its military forces, and it appears they agreed (at least implicitly) to share their nuclear weapon designs and technology with China. In his memoirs, Nie Rongzhen, a Marshal and the former Vice Premier of the State Council in charge of science and technology (and thus the nuclear weapon programme), admits that the agreement covered 'such new technologies as rockets and aviation', but that 'the Soviets wanted to leave China at a stage where we could only replicate what they made, keeping us dependent and several steps behind their own development'.[10] However, it became clear to China that the USSR did not intend to share its nuclear warhead design or technology. This was perhaps the chief cause of the Sino-Soviet split in 1960.[11] In the end, Soviet assistance proved too good to be true, and China learned a bitter lesson: never depend on another country for China's security. Thereafter, China implemented a strong policy of self-reliance in the military and nuclear weapon fields, and set out to produce its own nuclear forces. China has succeeded in this regard, despite its deficits in technology and scientific expertise.

Soviet assistance did result in the transfer of many important military technologies to China, including virtually all of China's early missile, aircraft and submarine designs. While China designed all its initial nuclear weapon

Table 5.1. Chinese nuclear tests, 1964–85[a]

Date	Type[b]	Estimated yield[c]	Comments
16 Oct. 1964	AT	20 kt	First nuclear test, tower-mounted, fission weapon, used U-235
14 May 1965	AT	25–30 kt	Air-dropped by Tu-4 Bull
9 May 1966	AT	200–400 kt	Air-dropped by Tu-16 Badger, some thermonuclear material used
27 Oct. 1966	AT	20–40 kt	First test of armed missile, used U-235
28 Dec. 1966	AT	200–500 kt	Tower-mounted, thermonuclear material used
17 June 1967	AT	2–4 Mt	First successful thermonuclear test, air-dropped by Tu-16 Badger
24 Dec. 1967	AT	15–25 kt	Air-dropped by Tu-16 Badger, used thermonuclear material, perhaps a partial failure
27 Dec. 1968	AT	3 Mt	Airburst, dropped by Tu-16 Badger, fusion weapon, used plutonium
22 Sep. 1969	UG	20–30 kt	First underground test
29 Sep. 1969	AT	3 Mt	Air-dropped by Tu-16 Badger
14 Oct. 1970	AT	3 Mt	Air-dropped by Tu-16 Badger
18 Nov. 1971	AT	20 kt	Tower-mounted
7 Jan. 1972	AT	10–20 kt	First test believed to be under 20 kt
18 Mar. 1972	AT	20–200 kt	Probably closer to 200 kt
26 June 1973	AT	2–3 Mt	Air-dropped
17 June 1974	AT	200–1000 kt	—
26 Oct. 1975	UG	< 20 kt	May have been as low as 2–5 kt
23 Jan. 1976	AT	< 20 kt	May have been as low as 2 kt
26 Sep. 1976	AT	20–200 kt	—
17 Oct. 1976	UG	10–20 kt	—
17 Nov. 1976	AT	4 Mt	Largest test to end of 1985, carried by missile
17 Sep. 1977	AT	< 20 kt	—
15 Mar. 1978	AT	< 20 kt	—
14 Oct. 1978	UG	5–50 kt	—
14 Dec. 1978	AT	< 20 kt	—
16 Oct. 1980	AT	200–1000 kt	Possibly China's last atmospheric test
6 Oct. 1983	UG	20–100 kt	—
3 Oct. 1984	UG	15–70 kt	—
19 Dec. 1984	UG	5–50 kt	—

[a] All nuclear tests have taken place at Lop Nor, China's only nuclear test site in Xinjiang Province.

[b] AT = atmospheric, UG = underground.

[c] Yield estimates from various sources (see below); the US DoE gives yield or yield-range estimates for 25 tests.

Sources: US Department of Energy, 'Foreign nuclear detonations through December 31 1983', computer printout from DoE Nevada Operations Office; Swedish National Defence Research Institute (FOA), various estimates; Gelber, H., *Nuclear Weapons and Chinese Policy*, Adelphi Paper no. 99 (International Institute for Strategic Studies: London, 1973), pp. 36–7; Hahn, B., 'PRC submarine-launched ballistic missile development', US Naval Institute *Proceedings*, Oct. 1979, p. 134; and *Asian Security 1981* (Research Institute for Peace and Security: Tokyo, 1982), p. 103.

delivery systems after Soviet models, it had to design its own nuclear warheads. Several recent Chinese accounts describe some details of this decision.[12] In discussing the 1960 decision to build China's own nuclear weapons, Zhang Aiping, the current Minister of Defence, indicated that, 'At the time there were differing views on whether to develop nuclear weapons and to produce an atomic bomb.' Mao Zedong reportedly sent Aiping to investigate the feasibility and was informed that 'as long as there was resolve to do so, we were fully capable of producing an atomic bomb in two years'. The report adds that,

'A meeting of the Secretariat, presided over by Comrade Deng Xiaoping, supported this view. The CCP Central Committee decided that Premier Zhou Enlai should personally tackle this work.'[13]

China proceeded to design a nuclear bomb that it successfully tested on 16 October 1964. Two years later it succeeded in testing its first missile armed with a nuclear warhead which exploded above the nuclear test site at Lop Nor. In June 1967 China tested its first hydrogen bomb, only 32 months after its first nuclear test. Chinese officials truthfully boast: 'Our development of nuclear weapons is the fastest in the world.'[14] By 1 January 1986, China had conducted 29 nuclear weapon tests, varying in yield from low kiloton to about four megatons (see table 5.1).[15] From these tests China has produced some 300–400 nuclear weapons of at least five different yields and designs, both fission and fusion. This fact shows that a nuclear weapon stockpile can be developed with a relatively small number of nuclear tests. China is not a signatory to the 1963 Partial Test Ban Treaty and tested nuclear weapons in the atmosphere through 1980. In 1984 Zhang Zhishan, the former commander of the nuclear testing centre at Lop Nor, stated: 'At present, China is mainly carrying out underground nuclear tests', thus leaving open the possibility of future atmospheric tests.[16]

It should be mentioned that until the early 1980s, China's nuclear 'industry' had been entirely directed at military production, that is, nuclear weapons and related programmes. In January 1985, a senior Chinese official characterized the Ministry of Nuclear Industry as 'a department exclusively specializing in making weapons', and that the entire nuclear production system 'only served military purposes'.[17] Only recently has China decided to develop a civilian nuclear power industry, while maintaining the priority to fulfil military production needs. Li Wen, an official of the Ministry of Nuclear Industry, reported in 1984 that China's nuclear industry had 'grown in strength, and formed a relatively complete nuclear industrial system' entirely as a result of developing nuclear weapons.[18]

III. Nuclear forces

China maintains a relatively small arsenal of nuclear forces, estimated to contain between 300 and 400 warheads, that are structured in a 'triad' of land-based missiles, bombers and submarine-launched missiles. Most of China's nuclear forces (see table 5.2) consist of ballistic missiles with ranges varying from 1000 km to beyond 12 000 km. All but a few of these ballistic missiles can only reach targets in the Asian theatre. Perhaps 10 missiles each with limited and full intercontinental range can strike targets throughout Europe or North America, respectively. All Chinese nuclear missiles currently carry only one warhead each, but China may choose to pursue MRV (multiple re-entry vehicle) or MIRV (multiple independently targetable re-entry vehicle) technologies in the future, especially for reasons of economy and increased targeting capability.[19] China also maintains a bomber force of over 100 aircraft of three designs for which roughly 100 to 150 bombs are presumed

Table 5.2. Chinese nuclear forces, 1986

Weapon system				Warheads	
Type	No. deployed	Year deployed	Range (km)	Warhead × yield	No. in stockpile
Aircraft[a]					
Tu-4 Bull (B-4)	10–30	1966	6 100	1–4 × bombs[b]	10–30
Il-28 Beagle (B-5)	10–20	1974	1 850	1 × bombs	10–20
Tu-16 Badger (B-6)	100	1966	5 900	1–3 × bombs	100
Land-based missiles[c]					
CSS-1 (DF-2)	40–60	1966	1 100	1 × 20 kt	40–60
CSS-2 (DF-3)	85–125	1972	2 600	1 × 2–3 Mt	85–125
CSS-3 (DF-4)	~ 10	1978	7 000	1 × 1–3 Mt	20
CSS-4 (DF-5)	~ 10	1980	12 000	1 × 4–5 Mt	20
Submarine-based missiles[d]					
CSS-N-3	26	1983	3 300	1 × 200 kt–1 Mt	26–38

[a] All figures for these bomber aircraft refer to nuclear-capable versions only. Hundreds of these aircraft are also deployed in non-nuclear versions.

[b] Yields of bombs are estimated to range from below 20 kt to 3 Mt.

[c] Perhaps 30 SRBMs (DF-1s) were deployed in 'theatre support' roles, although they are presumed to be inactive. Some of the MRBM and IRBM missiles are assigned to 'regional nuclear roles'. China has tested a number of warheads with yields from 2 to 20 kt for possible tactical roles.

[d] Two missiles are presumed to be available for rapid deployment on the Golf Class submarine (SSB). Additional missiles are being built for new Xia submarines.

Sources: Joint Chiefs of Staff, *Military Posture (annual report) FY 1978, 1982, 1983*; Department of Defense, *Annual Report for 1982*; Defense Intelligence Agency, *Handbook on the Chinese Armed Forces*, Apr. 1976; Defense Intelligence Agency, 'A guide to foreign tactical nuclear weapon systems under the control of ground force commanders', DST-1040S-541-83-CHG 1 (Secret, partially declassified), 17 Aug. 1984; Godwin, P. H., *The Chinese Tactical Airforces and Strategic Weapons Program: Development, Doctrine, and Strategy* (Air University, Maxwell AFB, AL, 1978); Washburn, T. D., *The People's Republic of China and Nuclear Weapons: Effects of China's Evolving Arsenal* ADA 067350 (NTIS, 1979); US Congress, Joint Economic Committee, *Allocation of Resources in the Soviet Union and China* (annual hearing) 1976, 1981, 1982, 1983; Anderson, J., 'China shows confidence in its missiles', *Washington Post*, 19 Dec. 1984, p. F11.

to be available. The last, and most recent, leg of China's strategic triad is its force of nuclear-powered ballistic missile submarines (SSBNs) and the SLBM developed for those SSBNs. Development of this submarine force has been slow, hampered by technical difficulties in solid fuel production and nuclear power reactors for submarines.[20] While China successfully tested the launch of an SLBM in 1982, it is not clear whether any of its missile submarines have begun operational patrols yet, or whether they are still undergoing operational testing.

It is possible that many of its shorter-range systems are available or intended for tactical battlefield use. Several tests of low-yield warheads (see table 5.1) and field training exercises that simulated the use of tactical nuclear weapons suggest that China has a capability to produce weapons exclusively for such purposes.[21] The US Defense Intelligence Agency (DIA) has stated that atomic demolition munitions (ADMs) 'may be used' by China.[22] Each of the components of China's nuclear forces is described below after a brief examination of Chinese nuclear command and control.

Command and control

China, like other nuclear weapon nations, keeps tight control over its nuclear forces. The guiding principle of Chinese command and control is that 'the Party controls the gun'. All orders concerning nuclear weapons come directly from Beijing. In 1977 the Joint Chiefs of Staff gave the following description of the Chinese command structure: 'Command is centralized in Peking with the Central Communist Party's Military Commission interposed between the Politburo Standing Committee (the "Central Authorities") and the military high command agencies. With the military commission as the nucleus, the military chain of command is being organized to facilitate central control from Peking to main force units.'[23] Traditionally, it is assumed that the Chairman of the Central Committee of the Chinese Communist Party (CCP) has the final authority to order the use of nuclear weapons. The Military Commission of this Central Committee (also known as the Central Military Commission, or CMC) is the highest political decision-making body for military and nuclear weapon matters; its Chairman has also been the Chairman of the CCP Central Committee, and its membership is drawn from the Politburo.

China maintains its nuclear forces in a separate command structure from all other forces of the People's Liberation Army (PLA), the generic term for all of China's armed forces, including land, air and naval forces. From roughly 1964 until 1984, it is believed that all Chinese nuclear weapons were controlled by the Second Artillery Corps, an echelon considered equal in the command structure to the Air Force, Navy and other support branches.[24] In 1984 China first reported that its nuclear weapons were controlled by a new 'strategic missile wing', which is assumed to be the successor command to the Second Artillery Corps, with at least as much responsibility as the latter.[25] This change may reflect China's increasingly long-range nuclear forces and the incompatibility of controlling 'strategic' forces from an 'artillery corps'.

Orders to the nuclear forces could follow two paths: a standard one in peacetime, or a streamlined one for crisis. After consideration and approval by the political authorities (CCP Central Committee), peacetime orders would be issued by the CMC to the General Staff Department (the operational department directly subordinate to the CMC), which would issue an operational order to the relevant Military Region commander in whose region the nuclear forces were situated. The Military Region commander would then issue the order to the 'strategic missile corps' unit in his region. In time of crisis a streamlined process could be used by the CMC, which can communicate directly with the strategic missile corps. The General Staff Department has a separate directorate for the strategic missile corps (nuclear forces), thus assuring that separate lines of command, control and communication (C^3) are always maintained from Beijing to China's nuclear forces.[26]

Chinese military officials are pursuing modernization efforts of their C^3 system as well as the nuclear forces they support. The Joint Chiefs of staff noted in 1977 that China was moving to 'achieve a rapid, flexible and secure command-control-communications capability for crisis management'.[27] One Chinese report, in discussing the need to modernize C^3 equipment for modern

war conditions, noted that since China's 'ICBMs have only a little more than 10 minutes countdown time', China's military 'must have an automatic, computerized countdown, communications and command system'.[28] China's interest in acquiring foreign electronics technology and the resources it puts into its own massive electronics industry indicate that China places a high priority on modernizing its military C^3 system.

Land-based missiles

As of 1986 China has four models of land-based ballistic missiles, known in the West by their US designations: CSS-1, CSS-2, CSS-3 and CSS-4 (CSS stands for Chinese Surface-to-Surface). It appears that China designates these missiles DF-2, DF-3, DF-4 and DF-5 respectively (DF stands for Dong Feng which may be translated as 'East Wind'). Apparently the DF-1 was an earlier model of a short-range ballistic missile (SRBM) no longer in service.[29] China's land-based missile characteristics are as follows.

CSS–1: China first began to deploy the CSS–1 medium-range ballistic missile (MRBM) in 1966. It was the missile used that year in the first test of a ballistic missile armed with a nuclear warhead, China's fourth nuclear test. In this test, the CSS-1 was launched from the Schuangchengzi launch area in China's north-central Gansu Province, and the warhead detonated 1750 km down-range at Lop Nor, China's nuclear weapon test site in the Gobi desert.[30] The yield of the CSS-1 warhead is thought to be about 20 kt, which is the same as the test warhead. The CSS-1 has a range of about 1000 km.[31] According to the US Joint Chiefs of Staff (JCS), 'The CSS-1 MRBM can reach targets in the Eastern USSR, peripheral nations, and some US bases in the Far East. The deployed force has not increased significantly since 1972.'[32]

CSS-2: China's intermediate-range ballistic missile (IRBM), the CSS-2, has a range of roughly 2500 km.[33] According to the DIA, the CSS-2 is 'a native-designed, single-stage, storable liquid system'.[34] DIA has further stated that although the CSS-2 deployment 'provides the PRC with the capability to apply strong political and military pressure against countries such as Japan and India, the system is probably intended for relatively large population targets in central and eastern Russia'.[35] It was first deployed in 1972, and the total number of operational missiles has remained roughly between 65 and 85. The DIA has estimated that CSS-2 missiles have been produced at a rate of about 20 per year for the period 1977–81.[36]

China has maintained over 100 MRBM/IRBMs since the early 1980s, and they comprise all but about 20 of its land-based nuclear ballistic missiles. Although these missiles are considered by the USA to have the strategic role of threatening retaliation against the Soviet Union in the event of a Soviet nuclear attack on China, the JCS have also noted that 'Deployment patterns and minimum range capabilities of these systems indicate that China has the capability and intends to employ some of these missiles in a theater support role.'[37] Both missiles have also been credited with a 'possible missile refire capability'.[38] China has taken considerable measures to ensure that these ballistic missiles would not be vulnerable to a surprise attack. According to the

JCS, 'The majority of the mobile MR/IRBM launch units will likely be dispersed to take advantage of terrain and camouflage and remain concealed during an enemy's first strike.'[39]

CSS-3: In 1976 China began flight testing the CSS-3, its first 'intercontinental' ballistic missile.[40] The CSS-3 is unique in its 7000-km range; it falls somewhere between an IRBM and an ICBM, so it has been designated a 'limited-range ICBM' by US defence officials.[41] It is China's first multiple-stage missile, using liquid fuel and carrying a single warhead estimated to be 1–3 Mt in yield. It was apparent to the USA as early as 1976 that CSS-3 deployment would be quite limited and, even with a maximum range of 7000 km, the DIA reported to Congress that year that it could 'reach targets in European Russia' but not Moscow.[42] It was the first Chinese missile deployed in silos, and since only 5–10 missiles have been reported operationally deployed, it is widely assumed to have been a precursor to a full-range ICBM (one that could strike the Soviet capital).[43]

CSS-4: China's longest-range missile, the CSS-4, began to be developed in about 1970. Much of the technology followed directly from the CSS-3 programme results. While the missile was tested within China's borders on reduced-range test flights, its first public appearance came with two test flights over the Pacific Ocean in May 1980.[44] For such ocean tests China built a fleet of naval support ships to assist in telemetry, tracking, recovery and patrol operations. The CSS-4 is estimated to have a range of over 12 000 km, which gives it the capacity to strike not only Moscow, but any target in the Soviet Union, Europe or North America.[45] It is believed to carry a multi-megaton warhead, perhaps 4–5 Mt. Interestingly, the USA has reported that China has only deployed 'a few' of the CSS-4 missiles, between 5 and 10, probably in hardened silos. In 1982 the DIA estimated that China was producing 15 'ICBMs' per year (presumably CSS-3s and CSS-4s) from 1977 to 1981. But in 1983 the same calculation was re-estimated at 10 missiles per year from 1978 to 1982.[46] China could have produced far more of the missiles than has been the case but has chosen to limit the programme for unstated reasons. Although China has historically stressed research and development over production of sophisticated weapon systems, observers disagree in their interpretation of the very limited deployments. Some suggest that China does not want to provoke either the USA or the USSR by deploying more ICBMs, while others presume that China has simply chosen to invest its limited economic resources in the most survivable nuclear forces—submarines. The DIA reported in 1984 that 'not all the decisions concerning new missiles to be developed in the next twenty years have been made'.[47] Perhaps China has built some 50 extra missiles but has not yet decided whether to deploy them as operational missiles or to use them as space launch vehicles. Whatever the reason, it is not for lack of nuclear materials, technology or interest in nuclear weapons.

Bombers

Bombers provided China with its first nuclear delivery capability, and were used to drop at least 8, perhaps as many as 15, nuclear test 'devices'.[48] There are

three types of aircraft currently available for nuclear bombing missions: the Tu-4 Bull, the Il-28 Beagle and the Tu-16 Badger, all modelled after Soviet designs (thus the designation of Western names for Soviet models) to which China made changes. It appears that the Chinese names for these bombers are transliterated by the West as B-4, B-5 and B-6, respectively. All three models of bomber are of, at best, 1950s vintage, although China started producing them more recently. The Tu-16 Badger and the Tu-4 Bull are intermediate-range bombers, and the Il-28 Beagle is of medium range. Their characteristics are briefly described below.

China's primary nuclear bomber is the Tu-16 Badger, which China began producing in 1968.[49] Roughly 100 Badgers are in the force, and China was still producing them in 1982. With its combat radius of 3000 km and a bomb-carrying capacity of 4500 kg, the Badger 'can reach virtually all of the Soviet Union and US allies in Asia, but its capability to penetrate air defense systems is poor'.[50] According to the Joint Chiefs of Staff, 'About 50 Soviet urban-industrial areas east of the Urals are within its range.'[51]

While the Il-28 Beagle is the most numerous Chinese bomber, with over 400 deployed, it is not known how many are currently configured for nuclear weapon missions; one official source estimates that it may be 'a small portion' of the Il-28 force.[52] DIA testimony indicates that Beagles 'have been assumed to be available as strategic weapon carriers' since 1974.[53] The Beagle is capable of carrying 3000 kg of bombs to a combat radius of 1000 km. The JCS have reported that: 'Staging from I1-28 capable airflields closest to the border areas would permit strategic operations against portions of the Soviet Union, all of South Korea, almost all of Vietnam, and parts of India. The limited range of the aircraft suggests that it also might be used in a theater support role within the PRC.'[54]

The Tu-4 Bull is the oldest of the Chinese bombers and its obsolescence makes it 'only marginally suitable for strategic attack operations'.[55] China had 13 Bulls available for nuclear delivery in 1966.[56] The Bull has a combat radius of about 3300 km and can carry a payload of 4500 kg. The DIA has testified that the Bull 'could be used to drop a nuclear weapon', although its primary role is considered to be conventional.[57]

All told, China has some 110–150 nuclear-capable aircraft, but may be preparing to expand or modernize this force. There have been frequent but unconfirmed reports that one of China's fighter aircraft, the F-9, is nuclear-capable. In 1985, Chinese officials revealed that they were beginning to design a new supersonic bomber to augment or replace the existing fleet. US visitors were given tours of an aircraft design and production factory said to be responsible for the new bomber as well as the Tu-16 Badger.[58] If China does build such a bomber it would undoubtedly be better able to penetrate air defences than the current fleet, and could figure in a Chinese programme to counteract a potential Soviet strategic defence system.

Submarines

China's most difficult nuclear weapon development programme has been its SSBN force and its complementary SLBM, the CSS-N-3. The SSBN, designated the Xia Class by the West and reportedly the Daqingyu Class in China, has been under various stages of development for nearly 15 years, and the SLBM was first tested after 10 years of development.[59] In April 1981, China launched its first Xia Class submarine and the following year launched its first successful SLBM test missile from under water.[60]

Two technology hurdles were primarily responsible for causing such long delays: designing and testing a reliable nuclear power reactor for the submarine's propulsion plant, and developing solid fuel for the missile. China built two Han Class nuclear-powered attack submarines to develop nuclear propulsion designs and operations. Their success with the nuclear generators in those Han Class submarines proved that China could design and run a reliable nuclear-powered submarine fleet. China has one Golf Class ballistic-missile submarine (conventionally powered) that was assembled in 1964 from Soviet components. It has been used as a test and training vessel for ballistic missiles and submarine crews, and was used to launch the first submerged test of the CSS-NX-3 SLBM (the 'X' is for experimental) on 12 October 1982. The Golf Class submarine may also be available as an operational submarine in a crisis, since it can launch two CSS-N-3 missiles.

As with its other nuclear weapon programmes, China is eager to announce that it has an SLBM capability, but leaves the details to speculation. Since the USA has not publicly released any official estimates of China's SLBM capabilities, there have been no authoritative public accounts of its basic characteristics. It is believed that China has already built two Xia Class SSBNs and is building a small fleet of them, with perhaps three more currently under construction. (Estimates vary from 6 to 12 submarines for the total programme.) The first Xia went on sea trials in 1983 and may still be serving training and testing missions, although Chinese officials reportedly have suggested that it is already 'operational'.[61] Since China has very little experience operating SSBNs it will take some time to settle into a routine. It is quite probable that the first two submarines are armed with operational missiles and could be used if needed.

In order to develop a workable ballistic missile for an SSBN programme, China had first to manufacture a reliable solid fuel. Liquid fuels work well enough for land-based missiles if there are procedures and facilities for safe storage, transfer and loading of fuel, but they are volatile and dangerous to handle under the best of circumstances. China never pursued liquid fuel as an option for submarine-launched missiles. Once China succeeded in producing a suitable solid fuel, it was able to use it with an appropriate missile designed and developed from the CSS-3 programme. China's CSS-N-3 missile (the 'N' stands for naval) is a two-stage missile that carries a single warhead estimated to have a yield between 200 kt and 1 Mt. Although the missile has not been tested at full range, it is believed to have a range of 3300 km. The JCS estimated in 1979 that

the CSS-N-3 would probably be 'comparable in size and capability to the early US POLARIS missile'.[62]

Other nuclear weapons

As mentioned above, many of China's shorter-range nuclear systems could be used for 'non-strategic' roles, what the US military calls 'theater support' or 'tactical' missions. There are indications that China may be considering building, or may already have built, a stockpile of distinctly 'tactical' nuclear weapons for less than all-out nuclear warfare.[63] In 1976 the DIA reported that China may have built a number of atomic demolition munitions.[64] These nuclear land mines could be used on Chinese territory to prevent an invading force from using the most suitable routes, by closing mountain passes, creating forest fires, and so on. In 1982 the PLA conducted a huge military exercise some 700 km south of the Chinese–Mongolian border, and detonated a simulated tactical nuclear airburst, complete with mushroom cloud. The local newspaper carried a photo with the caption 'An "atomic bomb" exploding deep in the ranks of the "enemy"'.[65]

It is apparent that some Chinese military officials advocate building a force of distinctly 'tactical' nuclear weapons because they fear that China's 'strategic' weapons are not sufficient to dissuade the USSR from launching a 'limited' nuclear attack and invasion of China. If China does build a stockpile of such weapons it could spur greater nuclear arms competition between China and the USSR, which could only reduce their security, increase their tensions and diminish the prospects for arms control in the region.

IV. Conclusion

It appears that China is putting its nuclear eggs in the submarine basket and not continuing to increase the numbers of CSS-3 or CSS-4 missiles. If this is the case, China is concentrating on the survivability of its strategic nuclear forces, which may be both cheaper and more suitable to its retaliatory posture than trying to improve the accuracy or number of land-based missiles. If the Soviet Union pursues some widespread ballistic missile defence (BMD) programme, it will cause China to review its nuclear forces and consider whether fundamental changes are necessary. China has already denounced the US Strategic Defense Initiative, claiming that it will upset the 'balance' between the two nuclear superpowers and thus provoke a new and dangerous round of the arms race.[66] But China is the one country that will most acutely see any such defensive system as undermining its own nuclear forces and 'credibility'.

China may soon see an advantage in pushing both superpowers on arms control, especially on measures to prevent them from proceeding with BMD systems. China's first disarmament-related draft resolution to the United Nations called for peaceful space research and for the prevention of an 'arms race in outer space'.[67] Now that both the USA and the USSR are discussing such measures and have both proposed cuts in their own nuclear forces of about

one-half, China should become more actively involved in the arms control dialogue and process.

Chinese arms control policy has consistently been professed to pursue 'genuine disarmament'. China's disarmament ambassador to the UN stated in 1984:

> China's position with regard to nuclear disarmament and the prevention of nuclear war is well known. We have always stood for the complete prohibition and the thorough destruction of all nuclear weapons and take this to be the fundamental way to prevent a nuclear war. We have proposed that the superpowers possessing the largest nuclear arsenals take the lead in halting the testing, refinement and production of nuclear weapons and reach an agreement on reducing by half their existing nuclear weapons and means delivery of all types; and that thereafter a widely representative international conference be convened with the participation of all nuclear-weapon states to negotiate the general reduction of nuclear weapons by all nuclear-weapon states.[68]

If this is a sincere policy, then the time may be right for multilateral co-operation on nuclear arms reductions by all five nuclear weapon nations, the only way to approach a regime of comprehensive arms control and disarmament.

China is considered by many to have limited nuclear ambitions. But the pattern of nuclear weapon deployments, developments and policy statements suggests that China may fall into the same dilemma as the other four nuclear weapon nations: perpetually 'modernizing' their nuclear forces to overcome imagined deficiencies. If such a situation prevails, China will find it difficult to find a final point to establish some putative minimum deterrent. Instead, China may feel the need continually to improve its nuclear forces and demonstrate that they are sufficient to prevent any Soviet attack, or to retaliate if the USSR does attack. If the USSR chooses to develop or deploy some form of widespread strategic defence system, it would further encourage China to make greater strides toward some elusive nuclear sufficiency. The result of this process could produce a new regional arms race that makes arms control and war prevention efforts far more difficult.

Notes and references

[1] James A. Kelly, Statement before the House Foreign Affairs Subcommittee on East Asian and Pacific Affairs, 5 June 1984.

[2] Kelly (note 1).

[3] Reported in Weisskopf, M., 'China's defence chief calls for emphasis on nuclear weapons', *Washington Post*, 4 Mar. 1983, p. A-17; 'Going nuclear', *The Economist*, 12 Mar. 1983, pp. 46–7.

[4] The US Central Intelligence Agency has estimated that China spent 50 per cent of its military research and development funds on nuclear weapon programmes from 1965 to 1979. See Sutter, R., 'Chinese nuclear weapons and American interests', Congressional Research Service (CRS), 27 Sep. 1983, p. 12.

[5] Xiong Zhengyan, 'PLA marches toward modernization', *Beijing Review*, 6 May 1985, p. 21.

[6] *China Daily*, 29 Sep. 1984, cited in Institute for Defense and Strategic Analysis (IDSA), *News Review on China, Mongolia, the Koreas*, Oct. 1984, p. 272.

[7] Nie Rongzhen, 'How China develops its nuclear weapons', excerpts from his memoirs, *Beijing Review*, 29 Apr. 1985, p. 17.

[8] Xiong Zhengyan (note 5), p. 20.

[9] US Joint Chiefs of Staff, *United States Military Posture for FY 1982* (annual report, hereafter cited as JCS, FY xx) (US Government Printing Office: Washington, DC, annual), p. 108.

[10] Nie Rongzhen (note 7), p. 16.

[11] Nie Rongzhen (note 7) reports that Sino–Soviet relations were already so bad in July 1960 that he wrote a report to the Central Committee suggesting that China take a more independent and self-reliant stand. By August all Soviet 'technical experts' had left China, thus forcing the independent Chinese research programme. Nie considered the withdrawal 'a turning point in the history of our scientific research', for which Mao Zedong commented 'Khrushchov should be awarded a one-ton medal'.

[12] In connection with the 20th anniversary of China's first nuclear weapon test, a number of articles have appeared in the Chinese press. See for example, Nie Rongzhen (note 7); and Guo Weicheng and Zhang Shusheng, excerpts of the article 'Review and prospects of the modernization of the national defence: on a visit with Defence Minister Zhang Aiping', as reported by BBC's *Summary of World Broadcasts*, Part 3, 5 Oct. 1984, cited in IDSA (note 6), p. 273.

[13] Guo Weicheng and Zhang Shusheng (note 12).

[14] Radio broadcast by Li Wen, of the Ministry of Nuclear Industry, 15 Oct. 1984, documented in Joint Publications Research Service (hereafter JPRS), *Worldwide Report: Nuclear Development and Proliferation*, JPRS-TND-84-029, 27 Nov. 1984, p. 2 (US Department of Commerce, National Technical Information Service).

[15] In 1977, the Joint Chiefs of Staff reported that China had 'recently conducted a 4 megaton test, their largest to date'. JCS, FY 1978, p. 31 (see note 9).

[16] Guo Cheng, 'A visit to Lop Nor nuclear testing ground', *Zhongguo Xinwen She*, 15 Oct. 1984, translated in JPRS-TND-84-027, 2 Nov. 1984, p. 5.

[17] Li Peng, Vice Premier of the State Council, in a report in *Jingji Ribao*, 24 Jan. 1985, p. 2, documented in JPRS-TND-85-004, 26 Feb. 1985, pp. 21–3.

[18] Li Wen, 'After the rising of China's first mushroom cloud', radio report on *Beijing Domestic Service*, 15 Oct. 1984, documented in JPRS-TND-84-029, 27 Nov. 1984, p. 3.

[19] Some commentators have suggested that China's successful deployment in 1982 of three separate satellites from a single booster demonstrates the ability to master MIRV technology. While the two technologies are quite similar they require different levels of technology and testing, and thus one should not infer too much from the satellite success. There is no evidence that China has ever tested any MIRV technology as such on an ICBM launcher, an absolute requirement before deploying a MIRV system. For a good discussion of MIRV technology and development see York, H., *The Origins of MIRV*, SIPRI Research Report no. 9 (SIPRI: Stockholm, Aug. 1973).

[20] US Congress, Joint Economic Committee (JEC), Hearings on the *Allocation of Resources in the Soviet Union and China*, 1981, Part 7, p. 156 (annual hearings, hereafter cited as JEC, ARSUC, year, part).

[21] At least 7 of China's 29 nuclear tests have resulted in yields below 20 kt. See 'China shows it has tactical atomic weapon', *Washington Times*, 14 July, 1982, p. 5.

[22] US Defense Intelligence Agency (DIA), *Handbook on the Chinese Armed Forces*, Report no. DDI-2682-32-76 (US Government Printing Office: Washington, DC, 1976), p. 3–15.

[23] JCS, FY 1978, p. 118 (see note 9).

[24] US Central Intelligence Agency, 'Military organizations of the People's Republic of China', wall chart CR80-10320, Apr. 1980.

[25] 'China gives details of new missile forces', *Jane's Defence Weekly*, 10 Aug. 1984, p. 223; 'China's nuke strategy', *New York Post*, 13 June 1984, p. 34.

[26] Wagner, D. W. and Barlow, D. G., 'National defense', chapter of *China: A Country Study*, Department of the Army Area Handbook Series, DA Pam 550-60 (US Government Printing Office: Washington, DC, 1981), p. 465. Numerous reference works offer good, if disparate descriptions of Chinese command and control. See, for example, DIA (note 22).

[27] JCS, FY 1978, p. 118 (see note 9).

[28] (No author), 'Integration of millet plus rifles with modernization . . .', translated by the Foreign Broadcast Information Service (FBIS), US Department of Commerce, 23 Jan. 1978, p. E-4, cited in Swanson, B., 'An introduction to Chinese command, control and communications', *Signal*, May/June 1978, p. 52.

[29] JEC, ARSUC 1976, Part 2, pp. 95–6 (see note 20); DIA, 'A guide to tactical nuclear weapon systems under the control of ground force commanders', Report no. DST-1040S-541-83-CHG 1, 17 Aug. 1984 (secret, partially declassified), p. 79.

[30] Hahn, B., 'PRC submarine-launched ballistic missile development', US Naval Institute *Proceedings*, Oct. 1979, p. 133.

[31] US Department of Defense, *Annual Report of the Secretary of Defense to the Congress for FY 1982* (annual report, hereafter cited as DoD, FY xx) (US Government Printing Office: Washington, DC, annual), p. 48.

[32] JCS, FY 1978, p. 31 (see note 9).

[33] DoD, FY 1982, p. 48 (see note 31).
[34] DIA (note 22), p. 8–2.
[35] See note 34.
[36] JEC, ARSUC 1982, Part 8, p. 109 (see note 20).
[37] JCS, FY 1978, p. 86 (see note 9).
[38] JCS, FY 1982, p. 109 (see note 9).
[39] JCS, FY 1983, p. 117 (see note 9).
[40] JCS, FY 1978, p. 31 (see note 9).
[41] DoD, FY 1982, p. 48 (see note 31).
[42] JEC, ARSUC 1976, Part 2, p. 94 (see note 20).
[43] See note 34.
[44] See Sutter (note 4), p. 19.
[45] It should be noted that the Moscow ABM (anti-ballistic missile) system is believed to be capable of preventing China from successfully attacking Moscow with its current ICBMs.
[46] JEC, ARSUC 1982, Part 8, p. 109; JEC, ARSUC 1983, Part 9, p. 179 (see note 20).
[47] DIA, 'Chinese ballistic missile systems: trends and projections', Report no. DST-1000S-226-84 (secret, partially declassified), 17 Feb. 1984, p. 47.
[48] JCS, FY 1982, p. 109 (see note 9); Gelber, H., *Nuclear Weapons and Chinese Policy*, Adelphi Paper no. 99 (International Institute for Strategic Studies: London, 1973), pp. 36–7. Information is available for only the first 15 tests, so bombers could have been used for many of the following atmospheric tests.
[49] JCS, FY 1978, p. 32 (see note 9).
[50] JCS, FY 1980, p. 60; JCS, FY 1982, p. 109 (see note 9).
[51] JCS, FY 1978, p. 86 (see note 9).
[52] JCS, FY 1982, p. 109 (see note 9).
[53] JEC, ARSUC 1976, Part 2, p. 96 (see note 20).
[54] JCS, FY 1978, p. 32 (see note 9).
[55] JCS, FY 1980, p. 60 (see note 9).
[56] JEC, ARSUC 1976, Part 2, p. 96 (see note 20).
[57] JEC, ARSUC 1976, Part 2, p. 94 (see note 20).
[58] Covault, C., 'Chinese design supersonic bomber, plan joint efforts to build momentum', *Aviation Week & Space Technology*, 15 July 1985, pp. 61–6.
[59] JEC, ARSUC 1982, Part 8, p. 111 (see note 20).
[60] It was widely reported that China's first ocean test-launch of the CSS-NX-3 missile resulted in the destruction of the launching submarine. These reports were false, and may have been politically motivated.
[61] Jacobs, G., 'China's submarine force', *Jane's Defence Weekly*, 9 Feb. 1985, p. 224.
[62] JCS, FY 1980, p. 60 (see note 9).
[63] See Wang, R. S., 'China's evolving strategic doctrine', *Asian Survey*, Oct. 84, pp. 1040–55.
[64] DIA (note 22).
[65] 'China shows it has tactical atomic weapon', *Washington Times*, 14 July 1982, p. 5.
[66] See Zhuang Qubing, 'United States prepares for "Star Wars"', *Beijing Review*, 5 Oct. 1984, also excerpted as 'Space and strategic defence: a Chinese view', in *Survival*, vol. 27, no. 1 (Jan./Feb. 1985), pp. 35–8.
[67] *China Daily*, 28 Oct. 1984, translated in IDSA, *News Review on China, Mongolia, the Koreas*, Nov. 1984, p. 315.
[68] *Hong Kong Standard*, 11 May 1984, translated in IDSA, *News Review on China, Mongolia, the Koreas*, June 1984, p. 130.

6. A comprehensive test ban and nuclear explosions in 1985

FRANK BLACKABY and RAGNHILD FERM

Section I of this chapter provides background material to the discussion of a comprehensive test ban.[1] *Sections II and III give an account of the nuclear explosions and related issues of 1985. Superscript numbers refer to the list of notes and references at the end of the chapter.*

I. A comprehensive test ban

There is now substantial international pressure on the United States and on the United Kingdom to re-open negotiations on a comprehensive ban on nuclear weapon tests. At the 1985 Review Conference of the Non-Proliferation Treaty, all the nations represented except two expressed deep regret that a comprehensive test ban treaty (CTBT) had not been concluded (the two exceptions were the United States and the United Kingdom). The presidents or prime ministers of six nations (Argentina, Greece, India, Mexico, Sweden and Tanzania) have also made this proposal a priority, and have offered the services of seismological stations on their territory to strengthen guarantees against cheating. The Soviet Union—responding in part to suggestions put to it from *inter alia* the US Center for Defense Information—declared a moratorium on testing from 6 August 1985 to 1 January 1986, which was in January extended to 1 April 1986. It urged the United States to join in the moratorium and to resume negotiations on a comprehensive test ban. In December 1985 the USSR indicated that, if the United States would agree to join a moratorium, it would allow foreign inspectors at its nuclear test sites to ensure that the moratorium was being observed.

This section provides background material to the discussion of this issue, with some history of the negotiations; statistical material on the tests conducted up to January 1986; comments on the problems of verification; and an assessment of the importance of a comprehensive test ban.

History[2]

In November 1958 the United States, the Soviet Union and the United Kingdom began negotiations on a test ban and agreed on a moratorium, to be reconsidered annually. In December 1959 President Eisenhower officially terminated the US moratorium by declaring, 'we consider ourselves free to resume nuclear weapons testing', but indicated that the United States would make an announcement before resuming testing. However, the United States did not resume testing at that time. In February 1960 France conducted its first nuclear weapon test and followed with three more. In September 1961 the Soviet Union resumed testing, citing the French tests and 'increased aggressiveness of NATO' as the reasons. It did not announce the resumption in

advance. The Soviet programme included the test with the biggest yield yet recorded—58 megatons. The United States resumed testing two weeks later.

Negotiations began again after the Cuban crisis, which proved to be a powerful catalyst. In June 1963 President Kennedy declared a moratorium on atmospheric nuclear tests; and the following month the Partial Test Ban Treaty (PTBT) was signed by the USA, the USSR and the UK, banning tests in the atmosphere, in outer space and under water. The treaty committed its parties to seek 'to achieve the discontinuation of all test explosions of nuclear weapons for all time'.

In 1974 the USA and the USSR signed the Threshold Test Ban Treaty (TTBT), restricting the yield of tests to no more than 150 kilotons. The treaty provides for the exchange of geological, seismic and other data to allow calibration of both countries' test detection networks. Two years later the US–Soviet Peaceful Nuclear Explosions Treaty (PNET) was signed, similarly restricting the yield of underground tests, but for non-military purposes. However, neither treaty has entered into force because the United States refused to ratify them. Both countries, however, have said they would abide by the general prohibition; but, in the absence of ratification, there has been no exchange of data.

The USA, the USSR and the UK re-started negotiations for a comprehensive test ban treaty in 1977 and by 1980 had come a long way. The negotiating parties had agreed to accept a number of tamper-proof seismic monitoring stations on their territory, which would provide data to the other participants in the treaty, and had also agreed in principle to on-site inspections to resolve suspicious events. Negotiations were still in progress when the US Administration changed in November 1980. The Reagan Administration discontinued the negotiations and in 1982 gave firm indications that it had no interest in resuming them, since a CTBT was only a distant goal.

The 40-nation Conference on Disarmament (CD) at Geneva has a comprehensive test ban on its agenda. It cannot make any progress towards drafting a treaty, given the US and British opposition to the negotiations. The CD has, however, been a forum where background papers on verification and other CTB issues have been presented.

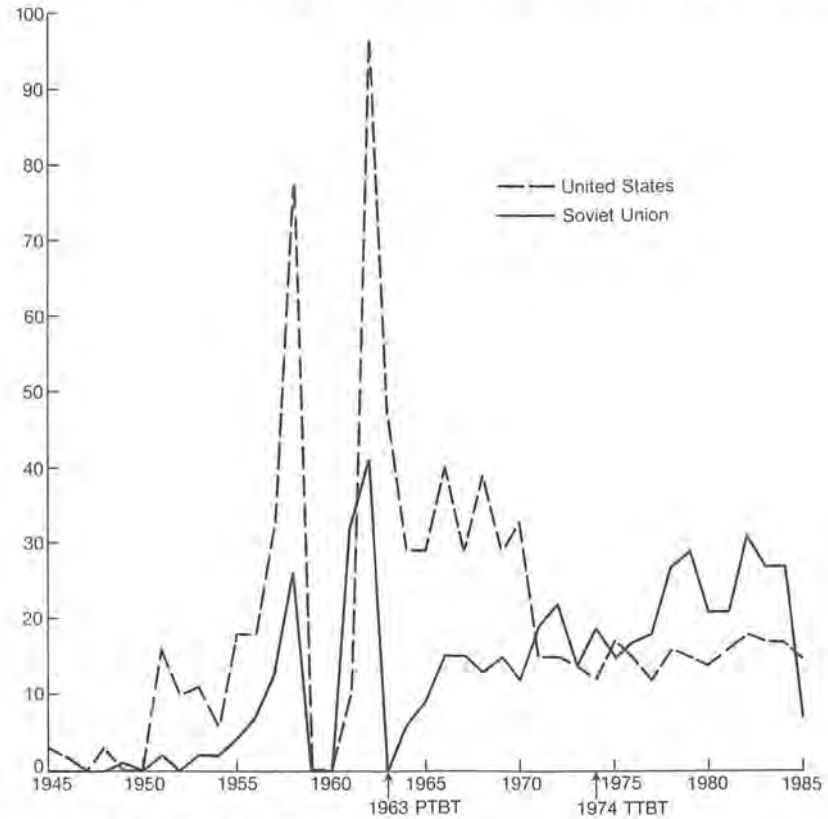
Statistics and their implication

Figures 6.1–6.3 present statistical data about the nuclear explosions conducted by the United States and the Soviet Union. The general conclusion is that the two treaties—the Partial Test Ban Treaty and the Threshold Test Ban Treaty—have not put any significant constraint on the number of tests, nor on the development of new types of nuclear weapon.

Since the Partial Test Ban Treaty came into force, the annual average number of weapon tests has been higher than before the treaty, for both the United States and the Soviet Union. However, it is probably true that the ban on tests in the atmosphere did something to slow down the development of warheads for purposes of generating special electromagnetic pulse (EMP) effects. In the absence of the ban, there might well have been more intensive

development of nuclear weapons for that particular purpose, as well as tests of possible countermeasures to EMP effects.

Figure 6.1. Numbers of US and Soviet nuclear explosions conducted during 1945–85



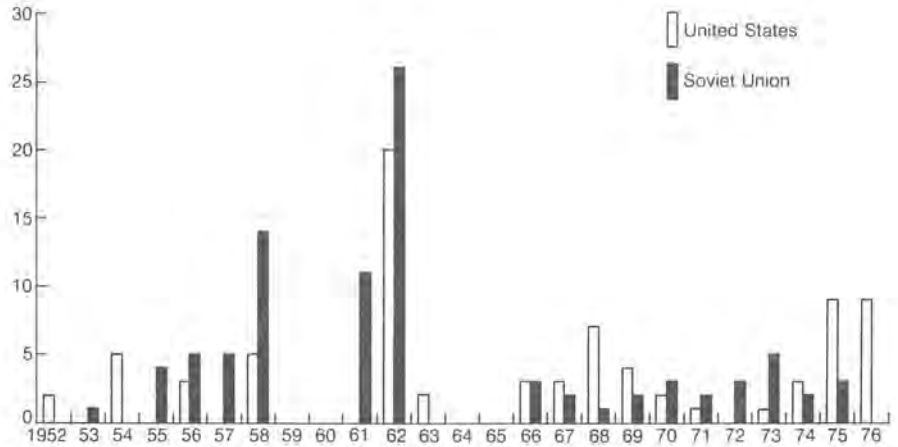
Source: Tables 6A.3–6A.4. See note *b*, table 6A.3.

Equally, the Threshold Test Ban Treaty does not seem to have been much of a handicap. Figure 6.2 plots the number of tests in the 1952–76 period which exceeded the TTBT limit of 150 kt. (Not all tests are included, since about 100 tests on either side could not be ascribed a reasonably precise yield.) At the beginning of the 1960s there were a number of high-yield tests; after 1966 there were on average about five a year. Then, in the two-year period from the signing of the TTBT to the time when it was to have come into force (in 1976), the USA conducted a somewhat more intensive programme of high-yield testing. However, in general the number of tests in excess of 150 kt has been small since 1962.

Figure 6.3 makes the same general point: it shows the number of nuclear explosions in different yield ranges during the period 1945–76—again, with about 100 tests on either side omitted because of incomplete information. The bulk of the testing—in this period when there was no limit on the size of the

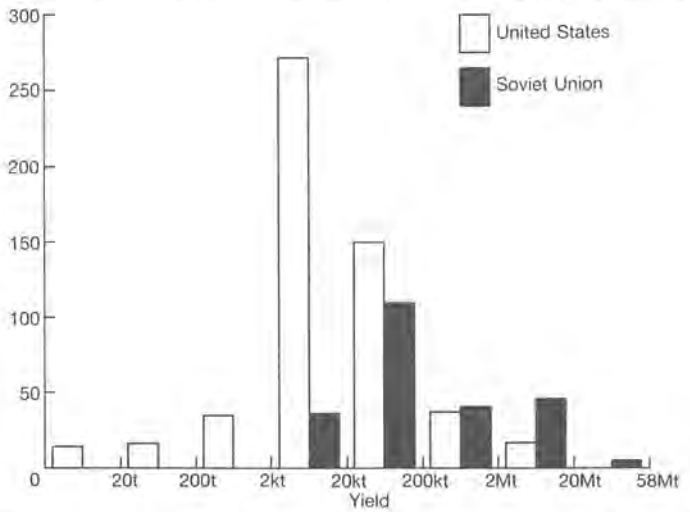
explosions—was in the yield range 2–200 kt. Observing the limits of the TTBT has not prevented either the United States or the Soviet Union from developing nuclear warheads with yields much greater than 150 kt.

Figure 6.2. Numbers of US and Soviet nuclear explosions with yields above 150 kt, 1952–76



Sources: Dahlman, O. and Israelson, H., *Monitoring Underground Nuclear Explosions* (Elsevier: Amsterdam, 1977); and US Department of Energy, 'Announced United States Nuclear Tests July 1945 through December 1982', Jan. 1983.

Figure 6.3. Numbers of US and Soviet nuclear explosions in eight yield ranges, 1945–76



Sources: Dahlman, O. and Israelson, H., *Monitoring Underground Nuclear Explosions* (Elsevier: Amsterdam, 1977); and US Department of Energy, 'Announced United States Nuclear Tests July 1945 through December 1982', Jan. 1983.

The Soviet moratorium

It has been claimed by the USA that the Soviet moratorium came after a particularly intensive test programme.[3] This is not the case. Up to the time of the moratorium, from 1 January to 6 August 1985, 7 Soviet tests were recorded (6 of these at the weapon test site at Semipalatinsk), as against 11 (8 at weapon test sites) in the same period of 1984 and 13 (6 at weapon test sites) in that period of 1983. There is no evidence that the 1985 tests completed any particular programme.

On the US side, it has been suggested that there was a strong military requirement for completing further test series for MX, Trident II and enhanced radiation warheads. In fact these warheads or their designs already existed and had already been extensively tested.

It is true, however, that a moratorium would have interrupted further development of the Excalibur X-ray laser, which is one of the possible components of the Strategic Defense Initiative (SDI). If such a weapon were to be developed, it would require the explosion of a nuclear bomb in outer space to produce X-ray beams for destroying missiles and satellites: underground tests are being conducted at the Nevada site for the possible development of this weapon. For example, the explosion on 28 December 1985 was reported to be a detonation of a hydrogen bomb buried in a boxcar-sized canister.[4] There has been great emphasis on the non-nuclear characteristics of SDI research efforts. For this and other reasons, it could well be that the X-ray laser, involving as it does the potential explosion of a nuclear weapon in space, may be dropped from the SDI programme.

A comprehensive test ban

What would be the effect of a permanent and comprehensive test ban? First, it would have great political significance, even with only three of the five nuclear weapon powers as parties. The non-nuclear weapon states in general give this measure high priority. This is shown by the debate at the Review Conference of the Non-Proliferation Treaty, and also by the annual discussion of disarmament issues at the UN General Assembly. It would serve to strengthen the non-proliferation regime: once the United States, the United Kingdom and the Soviet Union had ratified such a treaty, pressure could be exerted on France and China and on the 'near nuclear weapon' states to do the same. It would be a powerful impediment to any state which wanted to become a nuclear weapon power. At least one non-signatory of the Non-Proliferation Treaty has indicated that it might accede to the treaty if a CTB were concluded.

So far as the nuclear weapon states are concerned, there are two main questions: In what way would the reliability of the existing nuclear weapon stockpile be affected? How far would the development of new types of nuclear weapon be inhibited?

In 1979 and 1980, when negotiations on a comprehensive test ban seemed promising, the opposition which came from the major research laboratories in the United States was significant—indicating clearly that a test ban would restrict what they could do. Scientists from the laboratories indicated that

reliability tests were needed; indeed they argued that it would not be possible confidently to replicate even existing types of warhead. 'It is literally impossible to prevent changes in materials and workmanship quality and standards, or even specifications and working drawings over an extended period of time. We have no way of knowing the effect of subtle changes . . . without performing a nuclear proof test'.[5]

However, other scientists argue that nuclear tests are not needed to check reliability. On the other hand, proponents of a CTB argue that it would be a good thing, not a bad thing, if the US and the Soviet governments were to become less certain about the actual performance of their nuclear warheads: it would discourage any ideas of a first strike.

How far would a comprehensive test ban stop the development of new types of nuclear weapon? That is, after all, the main objective of a ban. There seems no good reason to doubt the testimony of scientists engaged at, for example, the Lawrence Livermore National Laboratory, that tests are still needed for this purpose. The director of that laboratory recently testified:

> We have yet to develop, let alone visualize, a facility which is capable of replacing nuclear tests. It is extremely difficult to simulate the extreme conditions within an exploding nuclear weapon: velocities of a million miles an hour, temperatures of ten million degrees, and time scales of a few billionths of a second . . .[6]

In addition, French experts stated in 1985 that, regarding their programme, some 20 tests are needed for developing each new type of nuclear warhead.[7]

What would happen in the longer term, with a CTB, would depend a great deal on progress in other fields of arms control. There is no doubt that researchers, if employed to do so, would further develop techniques for testing nuclear devices which did not involve exploding them. Whether the military would ever have full confidence in a weapon which had not actually been tested is another matter.

It is the United States and the United Kingdom which are opposed to negotiations. Would a CTB leave them in some way lagging behind the USSR in warhead technology? There is no reason to think so: on the contrary, there is evidence that US warheads on strategic systems have a higher yield-to-weight ratio than comparable Soviet systems. The United States is not lagging behind in warhead technology.

In sum, a CTB would be politically very important, and also militarily a great deal more significant than the two treaties—the Partial Test Ban Treaty and the Threshold Test Ban Treaty—which at present exist. The psychological effect would be important as well: a CTB would be hailed as a major advance in the general campaign against nuclear weapons.

Verification

Difficulties with verification are not the reason for the US and British refusal to re-open negotiations on a CTB. If verification were the problem, then the sensible thing would be to negotiate a treaty. The negotiations which were broken off, in November 1980, were not broken off on the issue of verification.

Indeed in July 1980 the three powers made a joint report to the Committee on Disarmament (CD) in which they said:

> The three negotiating parties believe that the verification measures being negotiated—particularly the provisions regarding the international exchange of seismic data, the committee of experts, and on-site inspections—broke significant new ground in international arms limitation efforts and will give all treaty parties the opportunity to participate in a substantial and constructive way in the process of verifying compliance with the treaty.[8]

There have been many improvements in the techniques of nuclear test detection, and new offers have been made on the issue of inspection. The reason for the US refusal to negotiate is that the US Administration considers that the security of the United States is best enhanced by the rapid development and testing of new nuclear weapons.

However, although verification is not the main issue, it tends always to be put forward as a major obstacle. There are two separate issues here. One is the verification of a comprehensive test ban. The second concerns US allegations that the Soviet Union, although it has agreed to observe the limits of the unratified Threshold Test Ban Treaty, has in fact conducted tests above the 150-kt limit and therefore is not to be trusted in these matters.

There are many Western seismologists who do not support this US allegation. For example, Professor Lynn Sykes, Professor of Geological Sciences at Columbia University, testified as follows before a subcommittee of the US House of Representatives Committee on Foreign Affairs:

> It is now universally accepted that the correct methodology for estimating yields must take into account the geological and geophysical properties of the outer 100 miles of the earth directly beneath various testing areas as well as the properties of the rocks immediately surrounding each explosion. All of the main Soviet testing areas are on old geological terranes while US data come mainly from Nevada, a region of recent earth movements and volcanic activity. If these factors are not accounted for, the estimated yields of USSR tests are too large. I and many others have long argued that the United States Government is not using the correct formula for converting the size of seismic waves generated by Soviet explosions into yields. The allegations that the USSR has violated the TTBT are based, in my estimation and that of many seismologists, solely on an incorrect calibration formula. When the correct methodology is used, it is evident that the Soviet Union has not cheated on the Threshold Treaty. It, like the United States, has conducted many weapon tests since 1976 close to the 150 kiloton limit. In addition the USSR has complied with the Peaceful Nuclear Explosions Treaty (PNET) by not detonating peaceful explosions above 150 kilotons.[9]

In any case, by refusing to ratify the two treaties (the TTBT and the PNET), the United States deprives itself of data which would considerably enhance its verification capabilities. Both treaties call for an extensive exchange of data, after ratification.

The other question concerns the verification of a CTB. Since the negotiations were broken off in 1980, there have been further advances in seismology, and a number of new seismic stations are now operating. Further, any comprehensive test ban could be accompanied by tamper-proof seismolog-

ical stations on the territory of the parties, and possibly by on-site inspections. All these measures would improve considerably the capabilities of identifying nuclear explosions.

A number of physical characteristics help in the discrimination between earthquakes and nuclear explosions.

> Explosions and earthquakes are very different phenomena. An explosion takes place in a very short time in a relatively small region and imparts a strong outward compressional impulse to the earth in all directions simultaneously. On the other hand an earthquake is a more slowly developing phenomenon which usually involves the release of seismic stresses over a large volume of the earth and which has a highly directional, that is unsymmetrical, pattern of seismic radiation.[10]

Seismological networks can locate each event to an accuracy of 10–20 km and can usually ascertain the depth. (All nuclear explosion testing has been confined to the upper 2.4 km of the earth.) Since only about 7 per cent of the world's earthquakes occur in or near the Soviet Union, and since most of them occur at depths greater than 12 km (the limits of modern drilling technology), only a small number of events could be confused with underground nuclear explosions in the Soviet Union. Then the excitation of seismic waves of various frequencies and kinds is different for earthquakes and underground explosions.

There seems a reasonably wide agreement that if there were a CTB, together with the additional seismological stations which would be installed after such a treaty was signed, then nuclear explosions could be verified down to 1 kt; many seismologists suggest lower figures.[11]

Opponents of the treaty suggest various ways in which a signatory might cheat. On possible cheating, the main question to ask is a political rather than a technical one. A nation which cheated on a CTB by conducting a nuclear weapon test would run a significant risk of detection and exposure. This would be extremely damaging to that nation's world reputation, and would quite possibly lead to the disintegration of the treaty. The only circumstance in which cheating might be considered worthwhile would be one in which conducting a test brought about a very important military advantage. Given the enormous size of the stockpiles of nuclear weapons on both sides, it is very difficult to see how any single test could deliver a militarily significant advantage—particularly as any radical new weapon would certainly need a series of tests.

One suggestion—indeed perhaps the only serious suggestion of ways in which a CTB could be evaded—is that tests could be conducted in large cavities, so that the seismic signal would be much reduced. However, would it be worthwhile for any nation to run the risk of detection? For satellite surveillance would certainly add to the detection risk, since 'the volume of rock that must be excavated to fully decouple an explosion of about 8 kilotons is approximately equivalent to the volume of the largest Egyptian pyramid'.[12]

II. Nuclear explosions in 1985

According to preliminary figures, the total number of nuclear test explosions conducted in 1985 was 31. This figure is the lowest obtained for more than 10

years, owing most probably to the Soviet test moratorium, which was in effect for nearly the last five months of the year. The United States conducted 15, the Soviet Union 7,[13] and France 8 tests. The United Kingdom has not officially announced any tests in 1985, but, according to a US Department of Energy spokesman, the 'Kinibito' test conducted on 5 December was a joint British–US explosion.[14] (British tests have since 1962 been conducted jointly with the United States at the Nevada test site.) China did not conduct any tests in 1985 (see appendix 6A).

None of the US or Soviet explosions in 1985 were reported to have exceeded the yield limit of 150 kt established by the Threshold Test Ban Treaty and Peaceful Nuclear Explosions Treaty. According to New Zealand seismologists, on 8 May France conducted its largest (150-kt) test since the start of the French underground test programme in 1975.[15] The remaining seven French tests had yields of between 5 and 50 kt.

While all the nuclear weapon states show varying degrees of secrecy regarding their testing programmes, the USSR does not report anything at all about its nuclear explosions.

The United States improved its capability to monitor Soviet tests when a new, small aperture array, NORESS (Norwegian Regional Seismic Array System), was added to the NORSAR (Norwegian Seismic Array) in 1984–5. NORSAR, a joint US–Norwegian installation, is designed to detect seismic events occurring at tele-seismic distances—3000–10 000 km—and NORESS is designed to detect weak seismic events occurring at distances of less than 3000 km.[16] When the NORSAR/NORESS system receives information of a Soviet explosion, it immediately transmits it via satellite to an analysis centre in the United States. The United States has since 1950 relied on seismological devices run by the Air Force Technical Applications Center and placed in more than 30 countries to detect underground explosions.

US experts are also working on new methods of detecting nuclear tests, such as radar that can detect disturbances in the upper atmosphere caused by the EMP from nuclear explosions. The technique of using microphone arrays to monitor very-low-frequency sound waves sent into the upper atmosphere by nuclear explosions is also being explored.[17]

According to a US Arms Control and Disarmament Agency (ACDA) spokesman, the USA does not announce all the Soviet tests it detects. It has been alleged that the reason for not doing so is so as not to reveal the level of sensitivity of US detection devices.[18]

The US Department of Energy announced nearly all the US nuclear tests conducted between 1975 and 1982. In 1982 a policy not to announce some of the US tests was adopted by the Reagan Administration: the large explosions are still reported, but smaller tests—tests which the Soviet Union might not detect—are not. The Natural Resources Defense Council, a private research group in the USA which has based its estimates on seismic data and other sources, argues that 12–19 US tests were secretly conducted from 1982 to the end of 1984.[19]

French nuclear tests are always made public by New Zealand seismological stations, one of which is at Rarotonga, Cook Islands, only about 2050 km west

of the French testing site on Mururoa. The French Government usually neither confirms nor denies the information. The main purpose of the testing programme, however, is made known by French authorities.

China does not report its test activities: various seismological observatories in the West announce the Chinese tests they detect.

III. Test-related issues in 1985

In July 1985 French secret service agents sank the ship *Rainbow Warrior* in the harbour of Auckland, New Zealand. One man aboard the ship was killed. The ship was owned by the Greenpeace organization and was intended to sail into the Pacific test zone to protest against French tests and possibly find out whether the sea surrounding the island of Mururoa was polluted by radioactivity. When details of the Greenpeace affair were made known, the head of the DGSE (Direction générale de la sécurité extérieure), the French external intelligence service, was dismissed, and the Defence Minister later resigned. The scandal brought the issue of French testing in the South Pacific even more into the public eye.

On a trip to the region in September the French President invited the heads of state of the South Pacific Forum countries to visit the Mururoa test site. The invitation was immediately rejected by New Zealand and Australia. New Zealand has for the past few years had a firm anti-nuclear policy. Australia—the main promoter of the 1985 Rarotonga Treaty, which among other things forbids nuclear testing in the region (see chapter 21)—has also over the years demonstrated its strong opposition to the French testing policy. Since June 1983 Australia has suspended uranium exports to France.

On 24 October 1985 civilian observers were for the first time allowed to attend an explosion at Mururoa: the French Prime Minister, members of the National Assembly, the French Defence Minister and a number of journalists were invited. They were informed by experts at the test site that the tests would have to continue for the coming decades, at a rate of eight tests a year.[20]

On 22 December 1985 the first known Chinese public demonstration against nuclear tests took place. The 400 protesters—students at universities in Beijing—handed a written protest to the leaders of the Communist Party. The students were from the Xinjiang region in western China where the Lop Nor testing site is located.[21]

Liability for harmful effects of tests

The Royal Commission appointed by the Australian Government in July 1984 to investigate British atmospheric nuclear tests that were conducted in Australia in the 1950s and 1960s concluded its work in December 1985.[22] The report reviews the handling of the British testing programme in Australia and is very critical of both the Australian Government and British authorities. The decision to allow British tests to be conducted in Australia was taken by the Australian Prime Minister, without reference to the cabinet or to Australian scientists. The Australian Government stated that it had been 'placed in a

position where it was forced' to accept British assurances about the safety aspects of the tests.

The Commission recommended that all the test sites in Australia be cleaned up immediately and that the costs be borne by the British Government. It concluded that the Australian Government should compensate both armed forces personnel and civilians who were affected by radioactive fallout, and that the aboriginal population should receive compensation for the loss of the use of their land.

Another case involved the United States: between 1946 and 1958 the USA conducted 70 atmospheric or underwater nuclear tests in the South Pacific, 23 of them at the Bikini atoll (belonging to the Marshall Islands, a US trust territory). The inhabitants of the atoll were forced to move to other islands to make way for the tests. The area was severely contaminated by radiation, and the atoll is still, after more than 30 years, not clean enough for human habitation: in May 1984 exiles from the Bikini atoll filed a suit against the US Government, requiring it to make the atoll safe. In an agreement reached in the US District Court in Hawaii in March 1985, the US Government agreed to pay for rehabilitation of the atoll: scientists have suggested that the topsoil should be removed and palm trees and other vegetation planted.[23]

Notes and references

[1] Material for section I was also provided by Bhupendra Jasani, Allan M. Din and Richard W. Fieldhouse.

[2] For the early history of the test ban, see SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1972* (Almqvist & Wiksell: Stockholm, 1972), pp. 389 et seq.

[3] This accusation was also made in 1958, when, on 31 March, the Soviet Union passed a decree stopping tests. On 8 Apr. President Eisenhower accused the Soviet Union of making this proposal just after it had completed 'a series of tests of unprecedented intensity'. This accusation was also not supported by the figures: see SIPRI (note 2), p. 391.

[4] *Washington Post*, 29 Dec. 1985.

[5] Donald Kerr, Director of the Los Alamos Laboratory, and Robert Thorn, Deputy Director of the Lawrence Livermore National Laboratory, in a letter to Representative Henry J. Hyde, quoted in *Congressional Quarterly*, 5 Oct. 1985, p. 1998.

[6] Testimony before the US House of Representatives, Sep. 1985, quoted in *The Times*, 27 Dec. 1985.

[7] *Le Monde*, 25 Oct. 1985.

[8] Tripartite Report to the Committee on Disarmament, 31 July 1980.

[9] Lynn R. Sykes, Testimony before subcommittee on Arms Control, International Security and Science Committee on Foreign Affairs, US House of Representatives, 8 May 1985.

[10] Krass, A., SIPRI, *Verification, How Much is Enough?* (Taylor & Francis: London, 1985), p. 67.

[11] As long ago as 1972, it was possible to conclude that 'for underground testing in hard rock, we can assume that the USA and USSR are in a position to achieve a detection threshold of about 1 kt'. SIPRI (note 2), p. 416.

[12] Sykes (note 9).

[13] One of the Soviet tests took place outside the military test sites, which may indicate that it was used for civil engineering purposes.

[14] Announced by the US Department of Energy.

[15] *Australian Foreign Affairs Record*, vol. 56, no. 5 (7 May 1985), p. 469.

[16] Conference on Disarmament document CD/599.

[17] *Washington Post*, 10 Aug. 1985.

[18] *Christian Science Monitor*, 20 Aug. 1985.

[19] Natural Resources Defense Council, *Unannounced US Nuclear Weapons Tests, 1980–1984*, Working Papers, Nuclear Weapons Databook (Washington, DC, Jan. 1986).

[20] See note 7.

[21] *International Herald Tribune*, 24–5 Dec. 1985.
[22] *The Report of the Royal Commission into British Nuclear Tests in Australia: Conclusions and Recommendations* (Australian Government Publishing Service: Canberra, 1985).
[23] *Financial Times*, 14 Mar. 1985.

Appendix 6A. Nuclear explosions, 1945–85

Table 6A.1. Revised list of US nuclear explosions in 1984

Date[a]	Latitude (deg)	Longitude (deg)	Region	m_b[b]
31 Jan.	37.113 N	116.122 W	Nevada	..
15 Feb.	37.221 N	116.181 W	Nevada	5.4
1 Mar.	37.066 N	116.046 W	Nevada	..
31 Mar.	37.146 N	116.084 W	Nevada	4.8
2 May	37.189 N	116.016 W	Nevada	..
16 May	37.091 N	115.994 W	Nevada	..
31 May	37.103 N	116.048 W	Nevada	6.0
20 June	37.000 N	116.043 W	Nevada	..
12 July	37.183 N	116.018 W	Nevada	..
25 July	37.268 N	116.411 W	Nevada	..
2 Aug.	37.017 N	116.008 W	Nevada	..
30 Aug.	37.090 N	115.998 W	Nevada	..
13 Sep.	37.087 N	116.071 W	Nevada	5.5
2 Oct.	37.076 N	115.989 W	Nevada	..
10 Nov.	37.000 N	116.017 W	Nevada	..
15 Dec.	37 N	116 W	Nevada	5.7
20 Dec.	36.979 N	116.006 W	Nevada	..

[a] The dates in tables 6A.1 and 6A.2 are all according to Greenwich Mean Time.
[b] m_b (body wave magnitude) indicates the size of the event; the data have been provided by the Hagfors Observatory of the Swedish National Defence Research Institute (FOA).

Table 6A.2. Nuclear explosions in 1985 (preliminary data)

Date[a]	Latitude (deg)	Longitude (deg)	Region	m_b[b]
USA				
15 Mar.	37.058 N	116.045 W	Nevada	4.9
23 Mar.	37.180 N	116.089 W	Nevada	5.8
2 Apr.	37.095 N	116.032 W	Nevada	5.9
6 Apr.	37.201 N	116.207 W	Nevada	..
2 May	37.253 N	116.325 W	Nevada	5.8
12 June	37.248 N	116.489 W	Nevada	5.5
12 June	37.008 N	116.084 W	Nevada	..
26 June	37.124 N	116.122 W	Nevada	4.4
25 July	37.297 N	116.438 W	Nevada	5.3
17 Aug.	37.002 N	116.043 W	Nevada	..
27 Sep.	37.090 N	116.002 W	Nevada	4.6
9 Oct.	37.209 N	116.152 W	Nevada	..
9 Oct.	37 N	116 W	Nevada	..
16 Oct.	37.110 N	116.121 W	Nevada	4.6
28 Dec.	37.238 N	116.473 W	Nevada	5.3
USSR				
10 Feb.	49.869 N	78.818 E	E Kazakhstan	7.2
25 Apr.	49.907 N	78.932 E	E Kazakhstan	6.9
15 June	49.878 N	78.888 E	E Kazakhstan	7.2
30 June	49.854 N	78.693 E	E Kazakhstan	7.1
18 July	65.965 N	40.754 E	European USSR[c]	5.5
20 July	49.951 N	78.847 E	E Kazakhstan	6.8
25 July	49.862 N	78.099 E	E Kazakhstan	5.3

Table 6A.2. *contd.*

Date[a]	Latitude (deg)	Longitude (deg)	Region	m_b[b]
UK[d]				
5 Dec.	37 N	116 W	Nevada	5.8
France				
30 Apr.	22 S	139 W	Mururoa	..
8 May	21.836 S	139.057 W	Mururoa	..
3 June	22 S	139 W	Mururoa	..
7 June	22 S	139 W	Mururoa	..
24 Oct.	22 S	139 W	Mururoa	..
26 Oct.	21.800 S	138.951 W	Mururoa	..
24 Nov.	22 S	139 W	Mururoa	..
26 Nov.	22 S	139 W	Mururoa	..

[a] The dates in tables 6A.1 and 6A.2 are all according to Greenwich Mean Time.

[b] m_b (body wave magnitude) indicates the size of the event; the data have been provided by the Hagfors Observatory of the Swedish National Defence Research Institute (FOA).

[c] May be part of a programme for peaceful uses of nuclear energy in view of its location outside the known testing sites.

[d] This test was a joint US–British test.

Table 6A.3. Estimated nuclear explosions 16 July 1945–5 August 1963 (the signing of the Partial Test Ban Treaty)

a = atmospheric
u = underground

Year	USA		USSR		UK		France		Total
	a	u	a	u	a	u	a	u	
1945	3	0							**3**
1946	2[a]	0							**2**
1947	0	0							**0**
1948	3	0							**3**
1949	0	0	1	0					**1**
1950	0	0	0	0					**0**
1951	15	1	2	0					**18**
1952	10	0	0	0	1	0			**11**
1953	11	0	2	0	2	0			**15**
1954	6	0	2	0	0	0			**8**
1955	17[a]	1	4	0	0	0			**22**
1956	18	0	7	0	6	0			**31**
1957	27	5	13	0	7	0			**52**
1958	62[a]	15	26	0	5	0			**108**
1949–58, exact years unknown			33						**33**
1959	0	0	0	0	0	0			**0**
1960	0	0	0	0	0	0	3	0	**3**
1961	0	10	32	0	0	0	1	1	**44**
1962	38[a]	58	40	1	0	2	0	1	**140**
1 Jan.–5 Aug. 1963	4	25	0	0	0	0	0	2	**31**
Total	**216**	**115**	**162**[b]	**1**	**21**	**2**	**4**	**4**	**525**

[a] One of these tests was carried out under water.

[b] The total figure for Soviet atmospheric tests includes the 33 additional tests conducted in the period 1949–58, for which exact years are not publicly available.

Table 6A.4. Estimated nuclear explosions 6 August 1963–31 December 1985

a = atmospheric
u = underground

Year	USA		USSR		UK[a]		France		China		India		Total
	a	u	a	u	a	u	a	u	a	u	a	u	
6 Aug.–31 Dec.													
1963	0	18	0	0	0	0	0	1					**19**
1964	0	29	0	6	0	1	0	3	1	0			**40**
1965	0	29	0	9	0	1	0	4	1	0			**44**
1966	0	40	0	15	0	0	5	1	3	0			**64**
1967	0	29	0	15	0	0	3	0	2	0			**49**
1968	0	39[a]	0	13	0	0	5	0	1	0			**58**
1969	0	29	0	15	0	0	0	0	1	1			**46**
1970	0	33	0	12	0	0	8	0	1	0			**54**
1971	0	15	0	19	0	0	5	0	1	0			**40**
1972	0	15	0	22	0	0	3	0	2	0			**42**
1973	0	14	0	14	0	0	5	0	1	0			**34**
1974	0	12	0	19	0	1	7	0	1	0	0	1	**41**
1975	0	17	0	15	0	0	0	2	0	1	0	0	**35**
1976	0	15	0	17	0	1	0	3	3	1	0	0	**40**
1977	0	12	0	18	0	0	0	6	1	0	0	0	**37**
1978	0	16	0	27	0	2	0	7	2	1	0	0	**55**
1979	0	15	0	29	0	1	0	9	0	0	0	0	**54**
1980	0	14	0	21	0	3	0	11	1	0	0	0	**50**
1981	0	16	0	21	0	1	0	11	0	0	0	0	**49**
1982	0	18[b]	0	31	0	1	0	5	0	0	0	0	**55**
1983	0	17	0	27	0	1	0	7	0	1	0	0	**53**
1984	0	17	0	27	0	2	0	7	0	2	0	0	**55**
1985	0	15	0	7	0	1	0	8	0	0	0	0	**31**[c]
Total	**0**	**474**	**0**	**399**	**0**	**16**	**41**	**85**	**22**	**7**	**0**	**1**	**1045**

[a] Five devices used simultaneously in the same test are counted here as one explosion
[b] Two devices used simultaneously in the same test are counted here as one explosion.
[c] The data for 1985 are preliminary.

Table 6A.5. Estimated nuclear explosions 16 July 1945–31 December 1985

USA[a]	USSR	UK[a]	France	China	India	Total
805	562	39	134	29	1	**1570**

[a] All British tests from 1962 have been conducted jointly with the United States at the Nevada Test Site. Therefore, the figure for US tests is actually higher than indicated here.

Sources for tables 6A.1–6A.5

The figures in the tables represent the high estimates of numbers of tests given in the following sources: US Department of Energy, 'Announced United States Nuclear Tests July 1945 through December 1982', Jan. 1983; US Department of Energy, 'Foreign nuclear detonations through December 31 1983', computer printout from DoE Nevada Operations Office; Swedish National Defence Research Institute (FOA), various estimates; Cochran, T. B., Arkin, W. M., Hoenig, M. M. and Norris, R. S., *Nuclear Weapons Databook, Vol. 2. US Nuclear Warhead Production* (Ballinger: Cambridge, MA, 1986) (draft); press reports.

7. The military use of outer space

BHUPENDRA JASANI

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

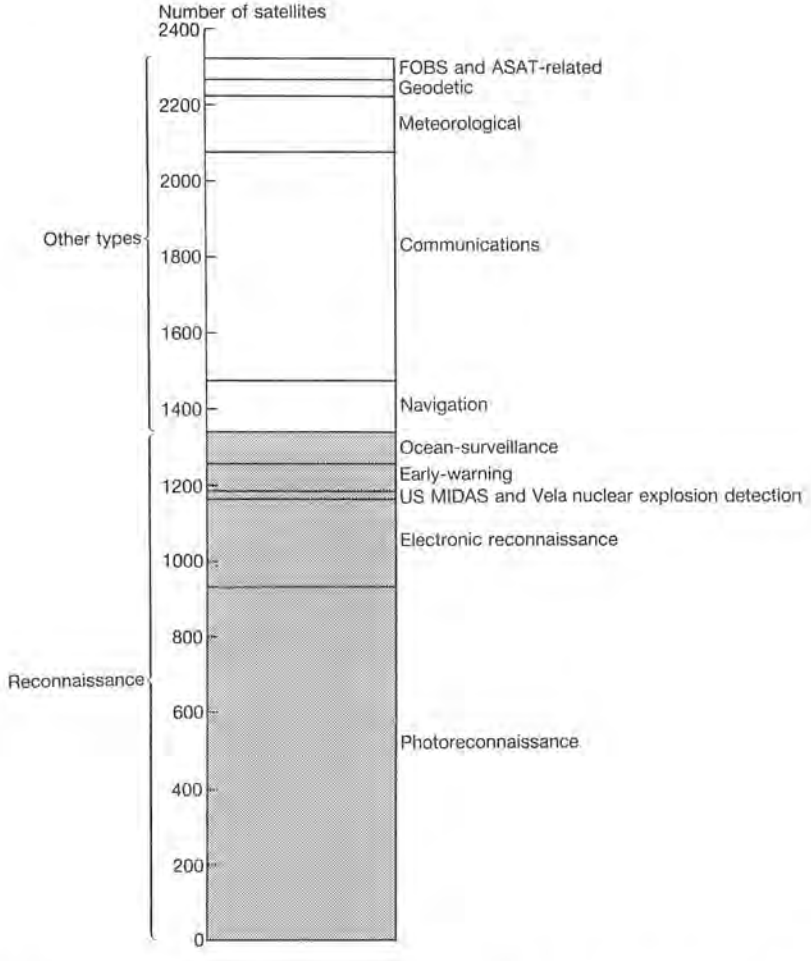
The pace at which advances in the military use of space are made is accelerating. The first two and a half decades of the space age were dominated by the introduction and increasing use of military satellites orbiting the earth. These spacecraft, launched mainly by the USA and the USSR, contribute greatly to the accuracy with which lethal weapons can be navigated to their targets after they have been identified by reconnaissance satellites; they can predict weather conditions, not only to facilitate bombing but also to contribute to improved missile trajectory through the atmosphere, thereby improving accuracy; they can be used to determine the positions of potential targets with great precision; and they can provide better centralized command and control of military forces. By the end of 1985, 2314 military satellites had been launched. The numbers of military satellites and their different missions are shown in figure 7.1, and satellite launches in 1985 are listed in appendix 7A.

The military use of satellites is but one aspect of the militarization of outer space: the other is the development, testing and even deployment of weapons which could damage or destroy satellites in orbit. Because of the military importance of satellites, this development began almost immediately after the first satellite was launched. A further dimension was added when the USA announced its programme to begin intensive research in defensive weapons to counter strategic ballistic missiles. The present status of development in both anti-satellite (ASAT) and ballistic missile defence (BMD) weapons is described below.

II. ASAT weapons

In October 1957 the first artificial earth satellite, Sputnik 1, was launched by the USSR. Exactly two years later, the USA successfully tested an aircraft-launched anti-satellite missile that would carry a nuclear warhead. These early tests were carried out using B-42 aircraft. However, they were discontinued, and missiles with nuclear warheads for ASAT use were eventually deployed on the ground, until about 1975, when they were dismantled. Around 1972 interest in air-launched ASAT weapons was rekindled. The current US F-15 ASAT weapon is a revival of the old B-42 weapon resulting from improvements in guidance technology so that a non-nuclear warhead can be used. Such a non-nuclear device is called a kinetic-energy weapon (KEW) or impact weapon.

Figure 7.1. Number of military satellites of different types launched between 1958 and 1985



ASAT kinetic-energy weapons can be propelled either by chemical rockets or by electromagnetic forces. The F-15 ASAT weapon is an example of the former. It consists of a two-stage short-range attack missile (SRAM), with an Altair booster, mounted with an infra-red heat-seeking warhead. The aircraft and missile part of the system was flight-tested on 21 January 1984: no target was involved, but the missile was aimed at a point in space to demonstrate the ability of the SRAM to get the warhead to its target. The second flight of the warhead was conducted on 13 November 1984: while the warhead was not aimed at a specific target, its infra-red guidance system was tested against a star. (Some 35 previous tests had been conducted during which the operations of surveillance systems, command and control, and an F-15 aircraft with its ASAT missiles were shown to function under various operational conditions.[1])

On 13 September 1985 the F-15 ASAT system was tested against a real

target, the Solewind P78-1 satellite (launched in February 1979). It was chosen as the test target because it was still functioning and could therefore aid in determining whether the interception was successful: on interception, at about 500 km, the miniature homing vehicle (MHV) ceased to transmit, and the Solewind stopped sending its telemetry to the ground receiving station. It took some one and a half hours for the ASAT warhead (the MHV) to reach its target. Over most of its journey, the Altair booster, using its inertial guidance system, directed the MHV close to the target. The MHV was also made to rotate at about 20 revolutions per second to stabilize its trajectory, and it reached a speed of about 10 km/s before shattering the Solewind satellite. It has been reported that the satellite broke up into over 100 pieces.[2] (The final terminal guidance depended on the infra-red sensors mounted on the MHV.)

On 13 December 1985 two instrumented balloon targets were launched. These were designed to emit long-wavelength infra-red radiation which could be varied to simulate different Soviet targets. It is interesting that, soon after the launch of these targets, the US House of Representatives and the Senate Conference Committee recommended a ban on further testing of the ASAT weapon against targets until October 1986, unless the Soviet Union begins testing its ASAT weapon. The ban was in the form of an amendment to the FY 1986 funding bill.[3]

The 1986 cost estimate of the MHV/F-15 ASAT programme is $4080 million.[4] This includes $1400 million for development, $2640 million for procurement and $40 million for military construction. The funding is for 40 F-15 aircraft and 28 sets of aircraft equipment.

The Soviet ASAT system could be categorized as a rocket-propelled KEW. In October 1967 the USSR signed the Outer Space Treaty; a year later, the first of 20 tests was conducted. Rather than using a rocket-propelled warhead, orbiting satellites destroyed the target either by direct impact or by exploding nearby. The ASAT satellite need not be in the same orbit as the target spacecraft and is guided to the target either by a radar or by an infra-red sensor. While the tests carried out so far have used a modified SS-9 intercontinental ballistic missile (ICBM) to reach targets at a range of 2000 km in 60–66° orbital inclinations, there is no reason why other ranges and inclinations could not be used. The important deficiency of such a system is the long time needed for interception: it takes up to three hours from the time of launch until the interception of a target.

While the Soviet Union has not conducted any ASAT tests since June 1982, it has not officially announced a moratorium on such tests (as it did for nuclear weapon tests in August 1985 and January 1986). In its 1983 Draft Treaty proposal to the United Nations, the USSR seems to have offered an ASAT test moratorium. Article 2 of the proposal states: 'In accordance with the provisions of article 1, States Parties to this Treaty undertake: (4) Not to test or create new anti-satellite systems and to destroy any anti-satellite systems that they may already have'.[5]

Other ASAT technologies being considered are space mines, high-power radio-frequency weapons and high-energy laser weapons. The last two fall in the category of directed-energy weapons (DEW). Space mines would be

orbited within lethal range of target satellites and would be commanded from the ground to explode and destroy the target. While space mines are considered only as ASAT weapons, the two DEWs are also thought to be useful as defensive weapons and are being investigated under the US Strategic Defense Initiative (SDI) programme. The fact of similar technology is not the only link between offensive ASAT and defensive BMD weapons: the other link is that, once defensive weapons are deployed, the opponent may develop or already have developed ASAT weapons to destroy them. Moreover, defensive platforms may also carry ASAT weapons as a defence against the opponent's space-based ASAT weapons.

III. US BMD weapons

After President Reagan's SDI speech in 1983, much of the early debate on defensive weapons focused on defence against ICBMs. The problems of defence against cruise missiles, bombers, submarine-launched ballistic missiles (particularly from short ranges) and tactical missiles have not been addressed in any depth. Thus, we are a long way from making nuclear weapons 'impotent and obsolete'. Here, only a brief indication is made of the types of weapon being considered. Some details are also presented about weapons which may be developed in the near future.

The trajectory of a ballistic missile is divided basically into four phases. The *boost phase* lasts for up to about 300 seconds for today's ICBMs and up to 200 seconds for SLBMs, during which time a vehicle containing multiple nuclear warheads, inertial guidance systems, a computer with target data, and decoys and penetration aids is put into a ballistic trajectory. The missiles reach heights of about 100 km. In the second phase, called the *post-boost phase*, the 'bus' containing the above elements is deployed in its mid-course trajectory at heights of about 180–750 km. This phase lasts for 10–300 seconds. The third phase is the *mid-course phase*, lasting for about 600–900 seconds for ICBMs and 420–600 seconds for SLBMs, during which time the warheads and decoys are deployed and travel in a ballistic trajectory in free flight. The last phase is the *terminal phase* which may last for about 300 seconds. The missiles and warheads could be detected, tracked and intercepted by various types of sensor and weapon placed either on the ground or in different orbits. This is referred to as a multi-layered defence system.

The defensive system would have to cope with some 8000 warheads among as many as 300 000 light decoys such as balloons, chaff and aerosols, and up to some 150 000 heavy decoys which might even include pieces of the bus.

The US SDI programme is basically divided into four areas: Surveillance, Acquisition, Tracking and Kill Assessment (SATKA); defensive weapons; systems concepts/battle management; and survivability, lethality and key technologies.[6]

The SATKA programme

SATKA involves upgrading existing sensor technologies as well as new developments. The aim is to develop BMD technologies for boost-phase surveillance, mid-course tracking, and terminal-phase tracking and discrimination. While, for the boost phase, surveillance sensors would be mainly space based, mid-course and terminal-phase surveillance and tracking would be accomplished by ground-based radars together with air- and space-borne radars and optical sensors. Active sensors such as radars and lasers and passive optical sensors such as infra-red devices are therefore being investigated. For example, the ship-based, phased-array Cobra Judy radar is currently operational as a forward surveillance system for Soviet re-entry tests in the North Pacific and Kamchatka Peninsula regions.[7] The Cobra Judy radar operates in conjunction with the Cobra Dane phased-array radar based on Shemya Island (one of the Aleutian Islands off Alaska).

Another device being investigated is based on a laser tracking system. For example, on 19 June 1985 a low-power laser beam was aimed at a mirror, 20 cm in diameter, placed in a window of the space shuttle, STS 51G. However, owing to an error in computations the test was unsuccessful since the shuttle was facing away from the beam. In a second attempt, on 21 June 1985, the beam tracked the space shuttle. A 4-watt argon-ion laser was used in another series of tests (16 July, 27 September and 10 October 1985). This time the laser beam was aimed at a two-stage Terrier-Malemute sounding rocket.[8] The laser was based at the Air Force Maui Optical Site on Mount Haleakala, and the rocket was fired from the Navy Pacific Missile Range. The significance of this test was the use of the so-called phase-conjugate mirrors. In such a system, mirrors are constructed in such a way that the distortions introduced in the laser beam owing to the atmosphere through which it traverses are automatically corrected. The above test demonstrated the principle of phase conjugation.

Another area of development in sensors is the imaging radar technology to provide, in real time, discrimination between re-entry vehicles and decoys. This would be achieved probably by measuring the physical dimensions of the objects being surveyed and determining their speeds. There may also be characteristic radar signatures for different types of object. The task of discrimination becomes considerably easier during the terminal phase since most if not all of the decoys are then burnt up in the atmosphere (they are not hardened objects like the re-entry vehicles carrying the nuclear warheads). Among the imaging radars, the synthetic aperture radar (SAR) is the most powerful tool being developed. The SAR has been successfully operated onboard the US Seasat satellite launched on 27 June 1978.

Among the optical devices, passive infra-red sensors and active laser radars are being investigated to perform essentially three tasks: collection of data on the infra-red exo-atmospheric and high endo-atmospheric signatures of both ballistic missile components and re-entry vehicles; development of laser imaging devices; and infra-red studies of the natural background radiation. The latter will consist of the development of models and computer codes to predict the spectral, spatial, temporal and brightness characteristics of the

natural background against which the target re-entry vehicles would have to be discriminated. Among the laser imaging devices, a variety of large but lightweight optics components are being investigated. The ability to perform mid-course tracking, discrimination and designation with such lasers is also being investigated.

Considerable progress has been made in infra-red sensor technology, which has received added impetus from the SDI programme, particularly in the field of focal plane surveillance, acquisition, tracking and kill assessment systems. Some of the important elements of such sensor devices are wide field-of-view optical systems, large arrays of nuclear-hardened detectors and associated signal processing electronic computers. For example, charge-coupled devices (CCDs) using gallium arsenide or lead selenide have made considerable strides. The trend in CCD image-sensor array technology is to develop small sensors (27 × 27 μm) with higher densities, that is, a large number of sensors per square centimetre, in order to achieve high resolution.[9]

The SAKTA programme also includes boost surveillance and tracking systems, and space surveillance and tracking experiments. The Optical Surveillance Experiment is an advanced project: it consists of the current Airborne Optical Adjunct (AOA) programme under the US Army Ballistic Missile Defense Systems Command. Funding for these and other SATKA programmes is summarized in table 7.1.

Table 7.1. Funding for the SATKA programme

Figures are in US $m.; years are fiscal years.

Technology	1985	1986	1987
Radar discrimination technology	29.90	74.10	98.46
Imaging radar	15.30	45.80	122.96
Optical discrimination	133.70	198.70	192.31
Imaging laser technology	28.30	127.00	188.75
IR sensor technology	57.80	151.40	157.83
Boost surveillance and tracking systems	38.00	131.10	302.91
Space surveillance and tracking systems	37.00	136.00	267.13
Optical surveillance experiment	117.00	191.64	167.98
Terminal imaging radar experiment	6.00	74.60	93.00
Space-based imaging experiment	—	5.80	11.09
Common technology and architecture	82.95	250.20	272.50
Total	**545.95**	**1 386.34**	**1 874.92**

Source: Bosma, J. T. and Whelan, R. C., *Guide to the Strategic Defense Initiative* (Pasha Publication: Arlington, VA, 1985), p. 47.

Boost-phase surveillance is essentially accomplished by space-based infra-red detectors onboard the Defense Support Program (DSP) satellites placed in geosynchronous orbit (about 36 000 km). In this and in other areas, R&D has been going on for a long time: for example, FY 1984 funding for a number of US BMD-related programmes is shown in table 7.2. The corresponding proportion of funding for the SDI SATKA programme is also shown in the table. It can be seen that about 25 per cent of SATKA-related funding had been committed under other programmes even before SDI was conceived.

Table 7.2. Proportion of SATKA-related funding in total SDI funding, FY 1984

Figures are in US $m.

Programme	FY 1984 funding	
	Total SDI	SATKA-related
Army:		
BMD advanced technology	152.9	82.0
BMD system technology	316.3	172.4
DARPA:		
Defense research sciences	108.6	6.3
Strategic technologies	205.5	31.2
Experimental evaluation of innovative technologies	283.6	10.0
Air Force:		
Geophysics	40.0	5.1
Missile surveillance technologies	7.7	7.7
Advanced warning system	20.8	20.8
Space surveillance technologies	22.5	22.5
Defense Nuclear Agency	321.6	8.5
Total	**1 479.5**	**366.5** (c. *25%*)

Source: Bosma, J. T. and Whelan, R. C., *Guide to the Strategic Defense Initiative* (Pasha Publication: Arlington, VA, 1985), p. 61.

Another technology being investigated to discriminate nuclear warheads from decoys incorporates nuclear or atomic particle accelerators. The method is based on the fact that when high-energy atomic or nuclear particles hit an object, nuclear reactions take place and produce several different types of secondary radiation. The number and type of secondary radiation produced depend on the type of target. Thus, in theory, the secondary radiation—produced as a result of, for example, an interaction between a beam of neutral particles and the warheads and decoys—are detected and their characteristics measured. It may be possible to discriminate the warheads from decoys during their post-boost and mid-course trajectory with this information. The technique is being investigated at the US Los Alamos National Laboratory:[10] under the White Horse programme, an accelerator has been developed to produce a beam of neutral particles. A tight, high-current beam of charged particles or ions is produced in the accelerator and injected into a pre-accelerator device. Before the charged beam leaves the final accelerator, it must be neutralized so that it will not be affected by the earth's magnetic field (and thereby travel in a straight line). The pre-accelerator device is one in which the negatively charged particles or ions are efficiently accelerated using a so-called radio-frequency quadrapole (RFQ). The RFQ, first developed by Soviet scientists, uses radio-frequency power to accelerate the charged particles. An advantage of this technique is the compact size of the device.

Defensive weapons

'Defensive weapons' can be grouped into two basic types—directed-energy and kinetic-energy weapons. They have been described in some detail elsewhere,[11] so only recent advances are reported here.

Kinetic-energy weapons

KEWs are the most common type of weapons used in warfare but their speeds have been limited to, for example, 1 to 2 kilometres per second (km/s) (conventional rifles and cannons). KEWs considered under the SDI programme are qualitatively different: they are non-nuclear devices propelled to greater energies by either chemical rockets or electromagnetic forces. The re-entry vehicles to be intercepted may themselves be travelling at speeds of some 8 km/s so that an interceptor travelling in the opposite direction would have a relative velocity greater than 8 km/s. In the early 1960s the USA developed experimental anti-ballistic missile (ABM) boosters with very high acceleration capabilities. For example, the Boeing's high-acceleration booster experiment (HIBEX), developed in 1964, achieved velocities of some 2.5 km/s.[12] However, these devices had inaccurate guidance systems, so nuclear warheads (for example, low-yield enhanced-radiation warheads) were used. With the development of infra-red terminal guidance techniques, the use of non-nuclear warheads became possible and made KEWs more attractive.

The US Army has two programmes under which it is developing chemical-rocket propelled non-nuclear interceptors. One is the Homing Overlay Experiment in which a long-wavelength, infra-red-guided non-nuclear warhead has been tested.[13] In another, the Small Radar Homing Interceptor Technology (SRHIT) programme, a missile is being developed for interception of nuclear warheads within the atmosphere. A millimetre-wave radar scans a segment of the view in front of the missile and feeds data to a small computer for guidance parameters. On 20 January 1984 the SRHIT was first tested for stability and performance in an unguided ballistic trajectory. On 15 March SRHIT made an unsuccessful flight, but on 29 November 1984 the missile guided itself to a point in the atmosphere.

Impetus to the development of the second category of KEWs, electromagnetic railguns, has largely come from the research on impact fusion. This field deals with the study of the equations of states—that is, the properties of matter under extremely high temperatures and pressures. Knowledge of these is important for designing nuclear weapons and building up computer codes related to nuclear weapon designs. Under a programme in the USA, an electromagnetic railgun was used to accelerate a tantalum disc to a velocity of about 3 km/s,[14] and a magnetic flux compression-type electromagnetic railgun[15] accelerated a tantalum disc to a velocity of about 11 km/s.

In another railgun test, a Lexan projectile was accelerated to a speed of 4.2 km/s in the railgun[16] and penetrated through 0.64 cm thick rolled steel. With greater velocities, projectiles have penetrated much thicker steel plates (1.27 cm): in these devices, the projectile is pre-accelerated to a velocity of about 1.2 km/s in a 1-m long single-stage helium-gas gun before injecting it into the railgun.

It has been reported that considerable advances have been made under the US Army and Defense Advanced Research Projects Agency (DARPA) railgun programme: in a test, a projectile (weighing 300 g) was accelerated to a velocity of 4.2 km/s.[17]

Directed-energy weapons

DEWs are basically of three types: high-energy laser, particle-beam and radio-frequency weapons. Only lasers and radio-frequency weapons are considered below. As for particle-beam weapons, while the technology is not as advanced as that for lasers, their use as warhead-discriminating devices has recently been suggested.[18] In principle, the power level of the neutral particle beam is much lower than that required for a beam weapon, thus making its deployment in space easier to accomplish. However, this may not be so simple since the fraction of the secondary radiation reaching a detector is small, necessitating the use of highly sensitive and large detectors and probably high-intensity neutral particle beams.

DEW developments have thus focused on high-energy laser (HEL) weapons. Four major types of high-energy laser are being investigated: (*a*) chemical lasers powered by, for example, a chemical reaction between hydrogen and fluorine, operating in the mid-infra-red, or chemical reactions between oxygen and iodine emitting light at 1.3 μm wavelength; (*b*) excimer lasers using krypton fluoride (0.25 μm wavelength); (*c*) free-electron lasers; and (*d*) X-ray lasers.

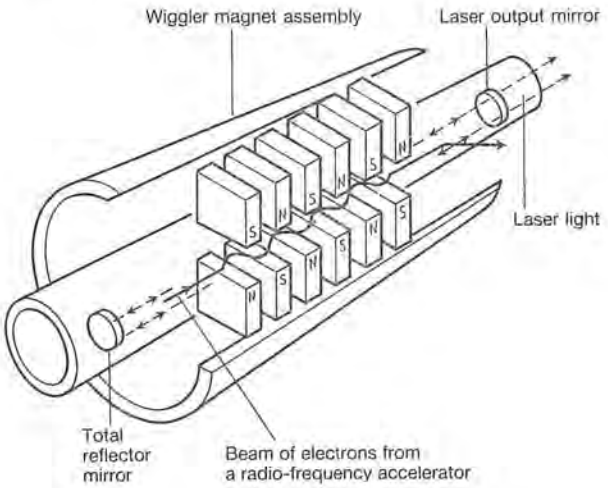
Under the US Alpha laser project, a hydrogen fluoride chemical laser has been developed to emit light at 2.7 μm wavelength and a power output of 2MW. This Mid-Infrared Advanced Chemical Laser (MIRACL) was part of the US Navy's Sea Lite programme which, after it was cancelled, was turned into a facility for lethality tests under the SDI programme.

Among the laser weapon developments, the X-ray laser has perhaps been the most controversial because it depends on the use of a nuclear explosion to power it. There has been considerable pressure in the US Senate to ban the testing of X-ray laser devices. For example, Senator John R. Kerry proposed a ban on the 'development, test or evaluation involving an explosive device which uses fissionable material',[19] but it was defeated. The House of Representatives had previously proposed postponement of some recent tests of X-ray lasers.[20] Despite these efforts it was reported that on 28 December 1985 an X-ray laser was tested in an underground explosion named Goldstone.[21] The yield of the weapon was reported to be between 20 and 150 kt.

Progress has been recently reported on a laser which is fundamentally a new concept: the free-electron laser (FEL). It is called a free-electron laser since the electrons are not bound to the atoms or molecules of a lasing medium, as in conventional lasers. In an FEL, a beam of electrons passes through a magnetic field in a device called a 'wiggler' (see figure 7.2). By varying the electron velocity in the magnetic field, the frequency of vibration of the electrons can be controlled, resulting in a laser light with a wavelength which could be varied from the infra-red through the visible, to the near ultraviolet. The FEL could be regarded as an extension of microwave radar tube technology to optical frequencies.

Since the laser light from the FEL can be tuned to operate in the infra-red, visible and ultraviolet wavelengths, its potential use as a weapon becomes

Figure 7.2. The principle of a free-electron laser



important since such an FEL could be earth- and/or space-based. Moreover, the possibility of high efficiency also exists (around 20 per cent). This could be achieved if the laser light produced could be bounced back and forth through the wiggler, causing it to interact with the electron beam so that the laser light becomes progressively stronger. By about 1983 a considerable increase in the efficiency of FELs was demonstrated.[22] Peak power levels of some 1000 MW, and an average power level of more than 20 MW and repetition rates of several thousand pulses per second, have been achieved.[23] It must be realized, however, that problems still exist with mirrors for use in the ultraviolet region.

High-power radio-frequency weapons

HPRF weapons, which include high-power microwave (HPM) weapons, are weapons capable of producing intense beams of radio-frequency radiation (wavelengths of 1 mm or longer) that can damage a target satellite or missile by jamming or actually physically destroying their electronic equipment. Another way of causing damage is to heat the target, for example a satellite, to a sufficiently high temperature for it to cease functioning.

One advantage of an HPRF weapon is that it can be based on the ground since microwaves can propagate through clouds or in space. However, a ground-based HPRF may be limited in its power level since beyond a certain energy density of the beam (about 1 joule/m^2)[24] absorption and destruction of the beam occur as a result of a phenomenon called the dielectric breakdown. It has been reported that, at the FEL facility at the Lawrence Livermore National Laboratory, microwaves at wavelengths of 8.8 mm were produced with a power level of 100 MW at 35 GHz.[25] This is expected to be scaled up to 70 GHz at 4.4 mm radiation wavelength. Other elements of the SDI programme—

survivability and lethality—are important to consider here since some tests have already begun in this area. The question of lethality is discussed below.

Lethality

The objective of the survivability, lethality and key technologies programme is to determine initially the effects of lasers on a wide variety of targets. On 6 September 1985 the MIRACL chemical laser system, based at the White Sands Missile Range in New Mexico, was used to destroy the second stage of a fixed Titan I missile placed on the ground about 1 km away from the laser.[26] Such tests are of course conducted in a controlled environment and are therefore not in any sense tests of the actual capabilities of DEWs.

It is also useful to note here that the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems (the ABM Treaty) allows research on ballistic missile defence (BMD) systems and that the limitations do 'not apply to ABM systems or their components used for development of testing . . . located within current or additionally agreed test ranges' (article IV). According to the Agreed Interpretations and Unilateral Statements regarding the ABM Treaty, 'the current US ABM test ranges are at White Sands, New Mexico, and at Kwajalein Atoll' (paragraph B).

The above is a brief summary of some of the elements of the US SDI programme; there is no doubt that the USSR is also engaged in similar activities, but not as much information is available. However, what little is known is considered below.

IV. Soviet strategic defence programmes

On 16 August 1985 the USSR requested the inclusion in the agenda of the 40th session of the United Nations General Assembly of an item entitled International Co-operation in the Peaceful Exploration of Outer Space under Conditions of its Non-militarization.[27] Here it is stated that 'the only rational choice fit for the space age . . . must be a decision to prevent the militarization of outer space and to preserve it for peaceful activities'. In 1985, for the first time, recognition has come from the Soviet Union that it also has been involved in the kind of military activities described in section I above. For example, it has been recognized that 'the communications, navigation, early warning and other satellites . . . are being used by both sides . . .'.[28] Such military use of outer space is acceptable to the USSR, even though it has had a profound effect on war-fighting doctrines. By 'militarization' is meant 'weapons' only, so considerable efforts by the USSR in the arms control process have recently been focused on the prevention of 'space strike weapons'.

In the US–Soviet negotiations on nuclear and space arms in Geneva, the USSR has declared that, 'As a first step . . . the sides should, for the entire duration of the negotiations, set a moratorium on the development (including research), testing and deployment of space strike weapons . . .'.[29] From this it may be inferred that the Soviet Union is also engaged in SDI-type research and development since 'space strike weapons' have been defined as 'weapons to

destroy objects in space and to launch attacks from space against objects in the atmosphere and on Earth, including the creation of a large-scale anti-missile system with space-based components'.[30]

Second, 'moratorium' may be taken to mean a temporary halt of or delay in ongoing programmes. While not much detail on such Soviet programmes is available, some knowledge is gained from the scientific literature and from material published by the USA. These details are described below.

Conventional BMD

The Soviet conventional ballistic missile defence system consists of an operational system around Moscow. Since 1980 the USSR has upgraded this system as much as is allowed by the ABM Treaty. Initially it formed a single-layer defensive system made up of 64 reloaded launchers and the so-called Dog House and Cat House battle-management radars constructed at four sites south of Moscow.[31] These are tracking and guidance radars to be operated in conjunction with the Galosh interceptor. The upgraded system will be a two-layer defence system consisting of 100 ABM interceptor launchers permitted by the ABM Treaty. The modified Galosh interceptors will be silo-based high-acceleration missiles capable of engaging nuclear warheads within the atmosphere. A set of 11 large ballistic missile early-warning radars called Hen House radars are deployed on the periphery of the Soviet Union. The other element of the early-warning system is satellites.

During the ABM Treaty negotiations, it was recognized that ballistic missile early-warning radars can detect and track warheads, thus adding considerably to the ABM capability of the nation possessing them. Therefore, the two sides agreed that such radars must be placed on a nation's periphery and looking outwards only. This would mean that early-warning radars would not be able to track incoming warheads once they have passed the radars. However, the USSR is constructing six more Hen House-type phased-array radars with improved accuracy for tracking ballistic missiles. Five of these either duplicate or supplement the coverage of the Hen House system. The sixth, under construction at Abalakova near Krasnoyarsk in central Siberia, has recently raised considerable debate because the radar is situated some 750 km away from the nearest border and is facing away from the border towards the mainland mass of the USSR. It appears to close the gap that is left by the existing radars. Such a radar would violate the terms of the ABM Treaty. The Soviet Union has explained the radar by saying that it is a satellite tracking system. However, its technical characteristics and appearance resemble other Pechora-type radars. The latter types have been acknowledged by the Soviet Union as being early-warning radars.[32]

Directed-energy weapons

Soviet interest in DEWs and particularly in laser weapons dates back at least to 1962.[33] In 1967 a weapon application of a carbon dioxide laser was described.[34] It has recently been reported that the Soviet Union has admitted to conducting laser 'experiments and tests' against satellites in orbit.[35] One of the important

elements of such weapons is the power supply. The Soviet Union is supposed to have developed a magneto-hydrodynamic power generator producing some 15 MW of electric power in short bursts. Moreover, a so-called Pavlovskii generator has been installed at Sary-Shagan: this device uses thermonuclear explosions conducted underground. It is at Sary-Shagan that Soviet laser and particle beam weapon research is being carried out. In fact most of the Soviet ABM-related R&D takes place at this site.

The Soviet Union has also been interested in radio-frequency weapons for some time: for example, over 1 MW at 100 GHz has been obtained.[36] The beams are generated when a beam of electrons is injected along a metal tube in which a strong magnetic field is maintained along its axis. The velocity of the beam together with the action of the magnetic field result in electrons travelling through the tube in a helical (spiral) path generating a beam of microwaves.

Kinetic-energy weapons

One type of Soviet KEW has already been mentioned: anti-satellite satellites. It has been reported that in the 1960s the USSR developed an experimental gun that could propel heavy metal particles at speeds of some 25 km/s in air and over 60 km/s in vacuum.[37]

It is clear from the above that both the USA and the USSR have been engaged in research in defensive weapons since signing the ABM Treaty in 1972. However, what has happened in the USA since 1983 is that the programme has been directed under a single office, resulting in a considerably new impetus. Whether such programmes will technically achieve a defensive system for whole populations is debatable, and the answers will not appear for some time to come. However, SDI concepts have created political turmoil in Europe within the NATO alliance. One result is the creation of the French Eureka project, which is considered below.

V. Eureka

On 26 March 1985 the other NATO countries were formally invited to join the USA in its SDI research programme. France, perceiving this as a potential threat not only to its policy of independent nuclear deterrence but also to the competitiveness of the high-technology industries of Western Europe, proposed in April 1985 a European Research Co-ordination Agency, or Eureka.

Eureka was initially seen by many as a counter-proposal to the US SDI programme, despite the reported announcement by Foreign Minister Dumas that the programme was not directly related to SDI, which he called 'a vast military program with civilian implications'. Eureka, he said, was a 'vast, long-range civilian program with military implications'. This, however, must be viewed against what President Mitterrand said, speaking to the Netherlands Parliament on 7 February 1984: that if Europe launched 'its own manned space station, allowing it to observe, transmit and consequently avert all possible threats, it would have taken a big step towards its own defence'. In this speech

he also hinted at a possible European missile defence system, which was confirmed more specifically in November 1985.[38]

The Eureka programme was recently adopted by the foreign and research ministers of 18 West European countries[39] during discussions in Hannover, FR Germany, on 6–7 November on co-operation in high technology under the Eureka initiative. While the actual amounts have not been announced, Britain and FR Germany have agreed to contribute some of the government funds allocated to their existing industrial development. The Netherlands will also contribute about $8.5 million annually. France has committed just below $125 million for 1986. The amounts should be compared with the US SDI budget of about $2.7 billion for 1986. (On 6 December 1985, Britain signed a government-to-government Memorandum of Understanding to participate in the US SDI programme.)

The Eureka programme

While a clear, detailed description of individual items in the programme is yet to emerge, five specific areas of research have been proposed by France: computers, telecommunications, robotics, materials and biotechnologies under the headings of Euromatic, Eurobot, Eurocom, Eurobio and Euromat.[40]

Euromatic includes the development of large digital computers (30 Gigaflops, i.e. 30×10^9 floating decimal point operations per second) to carry out simulations required in the design of complex systems (possibly including nuclear weapons). With the floating decimal point, it is possible to work with the highest possible accuracy or precision using a large number of digits. The projected completion date is 1992. Highly parallel computers with greater capacities and synchronous multi-processors for digital analysis, and signal and image processing are also slated for completion by about 1992. All of these would require experts in software. It is proposed that a European Software Design Centre to co-ordinate work on R&D, data transfer and information technology be established.

Another area under this programme is the development of artificial intelligence systems with symbol processors (1 Gigalips maximum power, i.e. 10^9 logical inferences per second) for applications in, for example, aviation and aeronautics. Ordinarily a computer does not 'learn' from its operations. With a logical inference capability, it learns from an operation and remembers and uses this in the next operation with considerably improved results, particularly if capabilities in the Gigalip range are reached. Among the electronic components, the development of flexible micro-processors, memory units up to 64 megabits and high-speed gallium arsenide circuits are envisaged.

Eurobot consists of three sub-programmes: third-generation robotics, automated factories and lasers, the latter of which is of interest. Basically, four types of laser are identified: CO_2, CO, excimer and free-election lasers. The aim is to develop high-efficiency, high-power lasers with high-penetration and/or high-collimation capabilities. In fact, the Dornier System in FR Germany has proposed construction of an FEL under the Eureka programme. Some of the expected characteristics of these lasers are indicated in table 7.3.

Table 7.3. Lasers to be developed in European countries under the Eureka programme

Laser type	Power output (KW)	Wavelength (μm)	Efficiency (per cent)
CO_2	50	10	. .
CO (continuous)	5	5.2–5.5	*>20*
Excimer, using:			
KF or XeF	>1	. .	. .
Free-electron	several kilowatts	. .	. .

Source: Based on the French report *Eureka, The Technological Renaissance of Europe*, June 1985.

Eurocom will create computerized information networks linking research groups by means of, for example, satellites and optical fibres. The system will also include video communications.

The Eurobio component of the Eureka programme involves plant genetic engineering to improve plant strains, and bio and medical engineering. The Euromat component is to develop new materials for use in a high-efficiency industrial turbine.

While Eureka is gathering momentum, France and the Federal Republic of Germany have also expressed interest in developing an anti-tactical ballistic missile (ATBM) system. In fact, during the meeting between Chancellor Kohl and President Mitterrand in December 1985, the FRG and France established a joint planning institution to consider a European Defence Initiative (EDI) based on an ATBM system. It is interesting to note that the Airborne Optical Adjunct programme now being pursued under the SDI SATKA project could serve as a forward-deployed sensor for ATBM systems. This would mean that, since the ABM Treaty does not deal with ATBMs, the AOA could be tested and even deployed. A favoured interceptor is based on KEWs. Moreover, some of the technologies, particularly computers, under consideration in the Eureka programme would be suitable for applications in any future EDI based on ATBMs.

However, one of the problems with any type of interceptor for nuclear warheads is whether it can destroy a warhead before its nuclear detonation process begins. For example, a US technique called 'salvage fusing' is used in which the warhead is designed to initiate its nuclear detonation as soon as the re-entry vehicle experiences impact from landing on the ground or on collision with the KEW. US nuclear warheads reportedly use accelerometers and timers that can start the detonation process when the warhead decelerates on atmospheric re-entry. The timer is then set to start nuclear detonation on ground impact or in response to a signal from a barometric or radar proximity fuse in the nose of the warhead.

One way of counteracting this detonation process is to focus a high-intensity beam of electromagnetic radiation onto the warhead. This may defuse the nuclear explosive by irradiating the fissile material or damaging the chemical detonator. If the former method of fusing is employed, the interception by an ATBM system might possibly alter the effects of the nuclear detonation (depending upon the altitude at which the interception occurs). The

subsequent blast, radiation, thermal and fallout effects will still devastate the intended targets for very low tropospheric interceptions. Conversely, upper stratospheric interceptions would result in much less direct damage, but the fall-out and EMP effect would be markedly increased.

If salvage fusing is not assumed, one could imagine destroying the warhead (e.g., using a KEW) without the subsequent nuclear detonation. However, it has been suggested that such interceptions might disperse enough plutonium into the atmosphere to cause severe health hazards.[41] To investigate these possible hazards, a typical scenario might involve 15 000 kg of Pu-239 contained in the theatre nuclear forces in and near Europe (specifically the Soviet TNF). This mass is to be dispersed throughout the area bounded by 5°W to 15°E longitude and 45°N to 55°N latitude (about 2×10^6 km^2). The entire mass of plutonium is assumed to be about 1 μm AMAD (activity median aerodynamic diameter) and is considered to be inhaled into the lungs of the inhabitants within the area of interest. The approximate rate at which the Pu-239 is taken out of the breathable air is 10 mm/s and the average breathing rate of humans is 2×10^{-4} m^3/s. Combining these factors, the mass of Pu-239 that might be inhaled by persons in the area of interest is

$$\frac{(15\ 000\ \text{kg})\ (2 \times 10^{-4}\ \text{m}^3/\text{s})}{(2 \times 10^6\ \text{km}^2)\ (10\ \text{mm/s})} = 0.15\ \mu\text{g}$$

A 1982 UNSCEAR publication[42] specifies a value of 16 μGy/Bq or 37 mGY/μg as the committed dose per unit intake of insoluble Pu-239 (by inhalation). Thus, the committed dose per person would be (0.15 μg) (37 mGy/μg) = 6 mGy. The annual limit for radiation workers given in an ICRP publication[43] is 25 mGy. Therefore, the short-term mortality rate would not be raised significantly among the populations within the area in question. The long-term effects (such as the incidence of lung cancers) would certainly be increased.[44]

VI. Conclusions

Technological momentum is being generated in the USA and in the USSR for defensive weapons based both on the ground and in outer space. In Western Europe, ground-based ATBM technology is being seriously considered. It can be seen that the Eureka programme has some important elements common to the US SDI efforts: they are artificial intelligence, fifth-generation computers, sensors, and space and laser technologies. Thus while Europe may develop high technology and claim that it is for civilian purposes, its military implications will be considerable. Moreover, it must be realized that industrial concerns like Matra of France and Fiat of Italy, while among the participants of the first adopted Eureka programmes, are on record as also being interested in participating in the US SDI project.

Eureka undoubtedly has and will gather much momentum (see chapter 14) because European participation in the SDI programme can be only very limited. There are problems of technology transfer since nearly all SDI technologies are militarily critical. The USA may also be constrained in

transferring such technologies to Europe by the 1972 ABM Treaty: article IX states that 'each party undertakes not to transfer to other States, and not to deploy outside its national territory, ABM systems or their components limited by this Treaty'. Moreover, according to paragraph G of the Agreed Statements related to the treaty, 'article IX of the Treaty includes the obligation of the US and the USSR not to provide to other States technical descriptions or blue prints specially worked out for the construction of ABM systems and their components limited by the Treaty'.

However, on the 'broader interpretation' of the treaty which was put forward by one part of the US Administration (discussed in chapter 2), it could be argued that these constraints would not apply to systems based on 'different physical principles'. Further, it is important to remember that the ABM Treaty applies to defensive systems against strategic missiles and not to tactical short-range missiles. Also, the treaty does not prohibit research, and it is only a bilateral agreement. Moreover, it is interesting to note that by and large the Assembly of the Western European Union (WEU) supports SDI, and France is an active member of the WEU. The Netherlands supports Eureka and has committed some funds to the project; and yet, Eureka may develop into a military programme similar to SDI, which they do not support. This indicates a somewhat confused situation in Europe.

At present, SDI is a research programme and Eureka is presented as one. However, research usually results in testing and then deployment of systems. The question one needs to ask is, have we really reached a stage when reliance on offensive systems could be changed into dependence on defensive ones? Should we not be considering just reducing offensive weapons anyway?

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Appendix 7A. Tables of satellites launched in 1985

Tables 7A.1–7A.10 were prepared in collaboration with G. E. Perry, MBE, and members of The Kettering Group.

Table 7A.1. Photographic reconnaissance satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				
USAF T-34D	28 Aug. 2220	– –	– –	Possible KH-11 failure;[a] only one satellite, 1984-122A (launched on 3 Dec. 1984) appears to be in orbit; all others have decayed; the last one, 1982-111A, decayed on 21 Aug. 1985 after a lifetime of 1000 days
USSR				
Cosmos 1616 (1985-02A)	9 Jan. 1048	65 90	172 358	Lifetime 54 days; high resolution; fourth generation
Cosmos 1623 (1985-05A)	16 Jan. 0824	70 92	349 415	Lifetime 14 days; medium resolution
Cosmos 1628 (1985-12A)	6 Feb. 1102	73 92	355 415	Lifetime 14 days; medium resolution
Cosmos 1630 (1985-17A)	27 Feb. 1117	65 90	175 333	Lifetime 55 days; high resolution; fourth generation
Cosmos 1632 (1985-19A)	1 Mar. 1048	73 89	209 267	Lifetime 14 days; high resolution
Cosmos 1643 (1985-26A)	25 Mar. 1005	65 90	223 294	Lifetime 207 days; fifth generation?; second long-lived high resolution; the first, Cosmos 1552 (1984–45A), had a lifetime of 173 days; no signals received by Kettering Group
Cosmos 1644 (1985-27A)	3 Apr. 0838	80 92	349 415	Lifetime 14 days; medium resolution
Cosmos 1647 (1985-31A)	19 Apr. 1410	67 89	167 315	Lifetime 53 days; high resolution; fourth generation
Cosmos 1648 (1985-32A)	25 Apr. 0936	82 89	183 237	Lifetime 11 days; high resolution
Cosmos 1649 (1985-36A)	15 May 1243	73 92	356 415	Lifetime 14 days; medium resolution
Cosmos 1653 (1985-38A)	22 May 0838	82 90	259 273	Lifetime 14 days; high resolution; Earth resources
Cosmos 1654 (1985-39A)	23 May 1243	65 90	173 343	Lifetime 29 days; fourth generation; exploded on 21 June 1985
Cosmos 1657 (1985-44A)	7 June 0755	82 90	258 274	Lifetime 14 days; high resolution; Earth resources
Cosmos 1659 (1985-46A)	13 June 1229	73 92	357 415	Lifetime 14 days; medium resolution
Cosmos 1663 (1985-52A)	21 June 0755	82 90	259 273	Lifetime 14 days; high resolution; Earth resources; data received by Priroda (Nature) Station

Table 7A.1. *contd.*

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
Cosmos 1664 (1985-54A)	26 June 1243	73 91	224 379	Lifetime 9 days; high resolution
Cosmos 1665 (1985-57A)	3 July 1214	73 90	225 290	Lifetime 14 days; high resolution
Cosmos 1668 (1985-60A)	15 July 0629	70 90	230 281	Lifetime 14 days; high resolution
Cosmos 1671 (1985-65A)	2 Aug. 1146	73 89	228 258	Lifetime 14 days; high resolution; TF
Cosmos 1672 (1985-67A)	7 Aug. 0950	82 90	258 273	Lifetime 14 days; high resolution; Earth resources
Cosmos 1673 (1985-68A)	8 Aug. 1019	65 89	198 271	Lifetime 42 days; high resolution; no signals received by Kettering Group
Cosmos 1676 (1985-72A)	16 Aug. 1522	67 90	166 342	Lifetime 59 days; high resolution; no signals received by Kettering Group
Cosmos 1678 (1985-77A)	29 Aug. 0810	82 90	258 273	Lifetime 14 days; high resolution; Earth resources; data received by Priroda (Nature) Station
Cosmos 1679 (1985-78A)	29 Aug. 1146	65 90	173 338	Lifetime 50 days; fourth generation; high resolution
Cosmos 1681 (1985-80A)	6 Sep. 1048	82 89	219 227	Lifetime 13 days; high resolution; Earth resources; data received by Priroda (Nature) Station
Cosmos 1683 (1985-83A)	19 Sep. 1019	73 92	356 414	Lifetime 15 days; medium resolution
Cosmos 1685 (1985-85A)	26 Sep. 1117	73 92	356 415	Lifetime 14 days; medium resolution
Cosmos 1696 (1985-95A)	16 Oct. 0922	70 90	230 281	Lifetime 14 days; high resolution; TF
Cosmos 1699 (1985-101A)	25 Oct. 1453	67 90	166 336	Lifetime 59 days; high resolution; fourth generation
Cosmos 1702 (1985-106A)	13 Nov. 1229	73 92	356 414	Lifetime 14 days; medium resolution; TF
Cosmos 1705 (1985-111A)	3 Dec. 1214	73 92	356 415	Lifetime 14 days; medium resolution
Cosmos 1706 (1985-112A)	11 Dec. 1453	67 90	167 334	In orbit at the end of Dec. 1985; fourth generation; high resolution
Cosmos 1708 (1985-115A)	13 Dec. 0735	82 90	256 273	Lifetime 14 days; high resolution; Earth resources; data received by Priroda (Nature) Station
Cosmos 1713 (1985-120A)	27 Dec. 1702	63 91	216 398	In orbit at the end of Dec. 1985; no signals received by Kettering Group
People's Republic of China				
China 17 (1985-96A)	21 Oct. 0502	63 90	171 386	Lifetime 17 days; a hemispherical capsule (diameter 1.4 m) returned to Earth on 26 Oct. 1985

[a] 'US in launch of apparent KH-11 satellite', *Aerospace Daily*, vol. 134, no. 43 (30 Aug. 1985), p. 342; and *Aviation Week & Space Technology*, vol. 123, no. 10 (9 Sep. 1985), p. 15.

Table 7A.2. Possible electronic reconnaissance satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				
USA 8 (1985-10B)	25 Jan. 1955	28 612	341 34 670	Transfer orbit, leading to a geosynchronous orbit
USSR				
Cosmos 1626 (1985-09A)	24 Jan. 1648	83 98	631 664	Lifetime 60 years
Cosmos 1633 (1985-20A)	5 Mar. 1536	83 98	637 658	Lifetime 60 years
Cosmos 1656 (1985-42A)	30 May 1453	71 102	807 861	Satellite manoeuvred extensively from 51° to 66° and finally to 71° orbit like Cosmos 1603
Cosmos 1666 (1985-58A)	8 July 2346	83 98	633 666	Lifetime 60 years; replaced Cosmos 1633[a]
Cosmos 1697 (1985-97A)	22 Oct. 0712	71 102	849 854	Final orbit similar to Cosmos 1603 and 1656 but new launch profile placed payload directly into this inclination; payload probably not so large as other two
Cosmos 1674 (1985-69A)	8 Aug. 1200	83 98	632 664	Lifetime 60 years; replaced Cosmos 1536
Cosmos 1703 (1985-108A)	22 Nov. 2219	83 98	635 666	Lifetime 60 years; replaced Cosmos 1674
Cosmos 1707 (1985-112A)	12 Dec. 1550	83 98	635 665	Lifetime 60 years; replaced Cosmos 1515
Cosmos 1714 (1985-121A)	28 Dec. 0936	71 95	164 843	Lifetime 60 years; launch profile similar to that of Cosmos 1697 but failed to attain desired orbit

[a] The new constellation of six heavy Elint satellites (providing global coverage) at 60°-plane spacing has evolved during the year with the status on 1 Jan. 1986: Cosmos 1703, 1626, 1666, 1544, 1606 and 1707.

Table 7A.3. Ocean-surveillance and oceanographic satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USSR				
Cosmos 1625 (1985-08A)	23 Jan. 1955	65 89	111 368	Lifetime 1.43 days; possible EORSAT; failed to achieve circular orbit[a]
Cosmos 1646 (1985-30A)	18 Apr. 2136	65 93	429 443	EORSAT; still functioning on 31 Dec. 1985
Cosmos 1670 (1985-64A)	1 Aug. 0531	65 90	252 263	RORSAT; nuclear-powered reactor; moved into higher orbit on 28 Oct. 1985
Cosmos 1677 (1985-75A)	23 Aug. 2234	65 90	251 263	RORSAT; moved into high orbit
Cosmos 1682 (1985-82A)	19 Sep. 0126	65 93	429 443	EORSAT; still functioning on 31 Dec. 1985

[a] Cosmos 1607, RORSAT, moved to high orbit on 1 Feb. 1985 after failure of Cosmos 1625 to attain 93 min circular orbit.

Table 7A.4. Possible early-warning satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USSR				
Cosmos 1658 (1985-45A)	11 June 1424	63 717	588 39 734	Replaced Cosmos 1481
Cosmos 1661 (1985-49A)	18 June 0029	63 728	572 40 266	Same orbital plane as Cosmos 1604 but different ascending node
Cosmos 1675 (1985-71A)	12 Aug. 1507	63 717	596 32 729	Replaced Cosmos 1581
Cosmos 1684 (1985-84A)	24 Sep. 0112	63 718	580 39 762	Replaced Cosmos 1586
Cosmos 1687 (1985-88A)	30 Sep. 1912	63 707	606 39 197	Replaced Cosmos 1409
Cosmos 1698 (1985-98A)	22 Oct. 2024	63 717	603 39 725	Replaced Cosmos 1541
Cosmos 1701 (1985-105A)	9 Nov. 0824	63 718	632 39 710	Replaces Cosmos 1675

Table 7A.5. Meteorological satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USSR				
Meteor 2-12 (1985-13A)	6 Feb. 2150	83 104	939 961	
Meteor 3-01 (1985-100A)	24 Oct. 0238	83 110	1 227 1 251	First of a new series of meteorological satellites in a higher orbit
Meteor 2-13 (1985-119A)	26 Dec. 0155	83 114	939 962	

Table 7A.6. Communications satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				
USA 9 SDS 10 (1985-14A)	8 Feb. 0614	63 713	400 39 700	Thought to be Satellite Data System SDS 10 providing polar communications for the US Strategic Air Command aircraft, a link in the control of USAF satellites and a relay for KH-11 photoreconnaissance satellites
Leasat 3 (1985-28C)	12 Apr. 1355	3 1 439	35 604 36 067	Launched by STS-51D but failed to attain correct orbit; was captured by the crew of STS-51I on 31 Aug. 1985, repaired and redeployed on 1 Sep. at 15.07 hrs and attained its final orbit
Leasat 4 (1985-76D)	27 Aug. 1102	13 783	6 986 36 551	Ejected from space shuttle STS-511 on 29 Aug.; Hughes Communications Services lost contact with the satellite on 6 Sep. 1985
USA 11 (1985-92B)	3 Oct. 1522	– –	– –	Dual payload launched from space shuttle STS-51J; thought to be DSCS 3
USA 12 (1985-92C)	3 Oct. 1522	– –	– –	
GLOMR (1985-104B)	30 Oct. 1702	– –	– –	GLOMR previously to have been deployed from STS-51B
USSR				
Cosmos 1624 (1985-06A)	17 Jan. 1800	74 101	785 807	Store-dump communications satellite; replaced Cosmos 1570
Cosmos 1629 (1985-16A)	21 Feb. 0755	1 1 448	35 903 36 132	Possibly military communications satellite placed at 88°E longitude
Cosmos 1634–Cosmos 1642 (1985-23A-H)	14 Mar. 0112	83 118	957 1 495	Octuple launch

Table 7A.6. *contd.*

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
Molniya 1-64 (1985-74A)	22 Aug. 1926	63 718	657 39 696	Replaced Molniya 1-61
Cosmos 1680 (1985-79A)	4 Sep. 0712	74 101	784 807	Possible store-dump communications satellite; replaced Cosmos 1538
Molniya 1-65 (1985-99A)	23 Oct. 0043	63 718	631 39 731	Replaced Molniya 1-58; only Molniya launched from Tyuratam in 1985
Cosmos 1700 (1985-102A)	25 Oct. 1550	1.5 1 434	35 672 35 832	First Soviet geostationary satellite to be stationed at 95°E longitude, one of the locations announced for the proposed Satellite Data Relay Network (SDRN)[a]
Molniya 1-66 (1985-103A)	28 Oct. 1717	63 718	508 39 857	Replaced Molniya 1-56

[a] Special Section, no. SPA-AA/343/1484, Annex 2, *IFRB Circular No. 1484* (International Frequency Registration Board), 1 Sep. 1981.

Table 7A.7. Navigation satellites launched in 1985[a]

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				
Transit 19 (Oscar 24) (1985-66A)	3 Aug. 0336	90 108	1 005 1 253	Also known as SOOS (Stacked Oscar On Scout)
Transit 20 (Oscar 30) (1985-66B)	3 Aug. 0336	90 108	1 005 1 263	
USA 10 (1985-93A)	9 Oct. 0253	63 718	19 822 20 541	Eleventh GPS (Navstar 11) in a network of 18 satellites
USSR				
Cosmos 1627 (1985-11A)	1 Feb. 1938	83 105	958 1 018	Replaced Cosmos 1448; No. 1
Cosmos 1634 (1985-22A)	14 Mar. 0112	83 105	957 1 008	Replaced Cosmos 1513; No. 6
Cosmos 1704 (1985-110A)	28 Nov. 1326	83 105	965 1 005	Replaced Cosmos 1598; No. 3
Cosmos 1709 (1985-116A)	19 Dec. 0853	83 105	965 1 073	Replaced Cosmos 1610; No. 2

[a] In 1985 tests of triple GLONASS satellites, Cosmos 1650–1652 and Cosmos 1710–1712 were launched. New launch profile placed payloads directly into this inclination.

Table 7A.8. Possible geodetic satellites launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				
Geosat (1985-21A)	13 Mar. 0155	108 101	760 817	US Navy geophysical and geodetic satellite; radar altimeter deployed to map the ocean surface

Table 7A.9. US anti-satellite weapon targets launched in 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				Canister holding balloons (instrumented target vehicles, ITV) which, on deployment, will inflate to 1.83 m diameter target for F-15-launched ASAT weapon; the length of the cannister is 1.07 m and diameter 0.46 m
USA 13 (ITV-1) (1985-114A)	13 Dec. 0224	37 95	319 768	
USA 14 (ITV-2) (1985-114B)	13 Dec. 0224	37 95	315 772	

Table 7A.10. Manned space flights during 1985

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
USA				
STS-51C (1985-10A)	25 Jan. 1955	29 90	300 300	Crew of 5; flight lasted 3 days, 2 hrs, 33 min; first complete DoD shuttle mission; payload probably an early-warning satellite (1985-10B) with electronic reconnaissance function as well
STS-51D (1985-28A)	12 Apr. 1355	29 92	315 461	Crew of 7; flight lasted 6 days, 23 hrs, 56 min; launched Canadian communications satellite Telesat 9 and US Navy communications satellite Leasat 3
STS-51B (1985-34A)	29 Apr. 1605	57 92	344 360	Crew of 7; flight lasted 7 days, 9 min; carried Spacelab 3; launched US Nusat (Northern Utah Satellite) for air traffic control; a DoD payload GLOMR (Global Low Orbiting Message Relay) planned for deployment but failed to leave its cannister; see STS-61A
STS-51G (1985-48A)	17 June 1131	29 92	356 392	Crew of 7; including 1 French and 1 Saudi Arabian; flight lasted 7 days, 1 hr, 39 min; launched Mexican domestic communications satellite (to be stationed at longitude 113.5°W), Arab communications satellite (to be stationed at longitude 26°E), US domestic communications satellite (to be stationed at longitude 125°W) and a free-flying experiments platform 'Spartan'; a laser reflector as a part of the SDI programme was deployed to test the tracking ability of a ground-based laser; first attempt on 19 June failed but the second one on 21 June was a success
STS-51F (1985-63A)	29 July 2107	50 91	312 320	Crew of 7; flight lasted 7 days, 22 hrs, 45 min; carried Spacelab 2 but did not separate
STS-51I (1985-76A)	27 Aug. 1102	29 92	314 449	Crew of 5; flight lasted 7 days, 18 min; launched Australian domestic communications satellite Aussat-1, US communications satellite (at longitude 128°W), US Navy military communications satellite
STS-51J (1985-92A)	30 Oct. 1522	29 94	476 515	Crew of 5; flight lasted 4 days, 45 min; launched two military communications satellites DSCS 3 series

Country, satellite name and designation	Launch date and time (GMT)	Orbital inclination (deg) and period (min)	Perigee and apogee heights (km)	Comments
STS-61A (1985-104A)	30 Oct. 1702	57 91	322 333	Crew of 8; including 2 West Germans, 1 Dutch; flight lasted 7 days, 45 min; carried the West German Spacelab DI, the first of series of dedicated West German missions; launched a US DoD GLOMR satellite
STS-61B (1985-109a)	27 Nov. 0029	29 91	323 383	Crew of 7; including 1 Mexican; flight lasted 6 days, 21 hrs, 4 min; launched: Morelos 2, a Mexican domestic communications satellite; Aussat 2, an Australian domestic communications satellite to be placed at longitude 164°E in geostationary orbit; RCA US Ku-band communications satellite to be stationed at longitude 81°W; and OEX (Orbiter Experiment) for testing onboard experimental digital autopilot software
USSR				
Soyuz T13 (1985-43A)	6 June 0643	52 91	298 334	Soyuz T13 docked with Salyut 7 with a crew of 2—Dzhanibekov and Savinykh; flight deviation of the former was 112 days, 3 hrs, 12 min, that of the latter 168 days, 3 hrs, 51 min; Savinykh returned in T14
Soyuz T14 (1985–81A)	17 Sep. 1243	52 91	272 326	Soyuz T14 docked with Salyut 7 with a crew of 3—Vasyutin, Grechko and Volkov; flight durations of Vasyutin and Volkov were 64 days, 21 hrs, 52 min; that of Grechkov was 8 days, 21 hrs, 13 min; Grechkov returned in T13

Part III. CBW and new military technology

8. Chemical and biological warfare: developments in 1985

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Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

This chapter records developments in the field of chemical and biological warfare (CBW) during 1985, supplementing similar reviews published in the past four *SIPRI Yearbooks*.[1] A more comprehensive and fully documented version is published as Number 6 in the SIPRI monograph series *SIPRI Chemical & Biological Warfare Studies*.[2] The perspective is again that of a Western observer, and the primary focus continues to be on developments affecting the prospects for world-wide CBW disarmament. The information cut-off date is 31 December 1985.

The theme underlying each of the previous annual reviews sets the order of the present one: the international regime of CBW arms control which people are trying to extend is simultaneously and increasingly threatened by renascent military interest in CBW. The clearest expressions of that threat are in the reports of violations and in the expanding programmes of chemical-warfare (CW) armament in certain parts of the world. How these two threats, respectively, developed during 1985 are described in the first two parts of the review. The final part describes efforts made during the year to strengthen the regime.

II. Alleged infractions of the CBW arms control regime

During 1985, as in previous years, there were allegations of non-compliance with the CBW arms control regime. They are reviewed below: first, allegations of activities of a kind outlawed by the 1972 Biological Weapons Convention, and then allegations of use of CBW weapons. The fact of a particular allegation being noted in no way implies that SIPRI endorses it; SIPRI has no independent capacity for checking the truth or falsehood of such reports. Very probably, some of the allegations recorded have no basis whatever in reality. The reason for including all such reports is that it gives some indication of the importance of the issue in the public mind: it also illustrates the need for impartial international means of verification. Denials are of course also reported.

Allegations of activities proscribed under the 1972 Biological Weapons Convention

Table 8.1 summarizes all the reports received during 1985 which allege activities of a kind outlawed by the 1972 Biological and Toxin Weapons Convention. The countries implicated were El Salvador, North Korea, the Soviet Union and the United States. Of these countries, all but North Korea have been the subject of identical or closely similar allegations in earlier years.

Table 8.1. Allegations during 1985[a] of activities outlawed by the 1972 Biological Weapons Convention

Country implicated	Activity alleged	Source of allegation
El Salvador[b]	Possession of 'bacteriological bombs'	Reports alleging use (see table 8.2)
North Korea[b]	Development of 'bacteriological weapons'	A 'Japanese expert' quoted in the South Korean press
Soviet Union	Maintaining an 'offensive biological warfare program and capability'	President of the USA; US Defense Intelligence Agency; Soviet defector; purported details given in press leaks of secret 1983 and 1984 US Government documents
United States	Developing 'biological weapons'	TASS and other Soviet press organs

[a] Excluding repetitions during 1985 of prior-year allegations recorded in earlier *SIPRI Yearbooks*.

[b] Not a party to the Biological Weapons Convention.

Articles V and VI of the Convention provide mechanisms whereby investigations may be initiated. No attempts were made to use them during 1985. This may perhaps be taken as a test of the seriousness with which the reports should be viewed, although it must be recalled that neither El Salvador nor North Korea is a party to the treaty.

Allegations of use of CBW weapons

Table 8.2 summarizes the reports received during 1985 which allege use of chemical or biological weapons. The countries implicated were Angola, El Salvador, Indonesia, Iraq, Nicaragua, the Soviet Union, Thailand and Viet Nam. Again, SIPRI is in no position to state whether any of these reports are true or false. Under UN General Assembly resolution 37/98D, the Secretary-General is empowered to investigate, with the assistance of qualified experts, any CBW-use complaint that may be lodged with him and which he is able to recognize. It seems that no such complaints were made during 1985. The Secretary-General did, however, act under his own initiative to investigate the new reports of Iraqi chemical warfare.

Table 8.2. Allegations during 1985[a] of use of CBW weapons

Alleged user and occasion	Period of alleged use	Weapons allegedly used	Source of allegation
Indonesian forces in East Timor	Oct. 1984	'Chemical weapons'	FRETILIN
Nicaraguan forces[b] against contra guerrilla forces	Dec. 1984	'Lethal yellow rain'	Nicaraguan Christian Democratic Front
	Jan. 1985	'Poison gas' sprayed from Mi-24 helicopter	A contra commander speaking in Washington
Salvadorean armed forces in the eastern region of El Salvador	Since Dec. 1984	'Bacteriological bombs'	A Salvadorean doctor
	Early 1985	Sulphuric acid	A refugee
Vietnamese forces[c] operating against Khmer resistance forces in the Thai/ Kampuchean border region	Dec. 1984	Artillery-delivered incapacitant (not deadly, not tear gas)	KPNLF
	Dec. 1984/ Jan. 1985	Lethal gas shell	Khmer Rouge
	Feb. 1985	Phosgene and hydrogen cyanide in 2.75-in. rockets	Thai Army (see text)
	Feb. 1985	'Toxic chemicals' in 107-mm rockets	Khmer Rouge
Thai forces firing into Kampuchea	Feb. 1985	'Toxic shell'	Official Phnom Penh news agency
Soviet forces[d] in Afghanistan	Early 1985	'Chemical attacks'	US Government official[e] before a Senate committee
	Oct. 1985	'Chemical weapon'[f] delivered by MiG-21	Unidentified Western diplomats in Delhi and Islamabad
Iraqi forces[g] in the Gulf War	Mar.–May and Nov. 1985	46 air, artillery and mortar attacks using nerve, blood, blister and choking gases	Iranian Government (see text)
Angolan (Cuban/Soviet) forces against UNITA positions	Sep./Nov. 1985	'Napalm and toxic bombs' dropped by An-26 and MiG-23 aircraft	UNITA

[a] Excluding repetitions during 1985 of prior-year allegations recorded in earlier *SIPRI Yearbooks*.

[b] The Nicaraguan Government has denied these allegations.

[c] These allegations have been denied by the governments of Viet Nam and Kampuchea.

[d] The Soviet Government has vehemently denied all allegations that its forces have used toxic weapons in Afghanistan, and has frequently reiterated the allegation that 'counter-revolutionary rabble' have themselves used such weapons, supplied by the USA.

[e] The official stated, however, that the reports had not been confirmed.

[f] Thirty Afghan Army deaths as well as civilian casualties were said to have resulted. The incident reportedly occurred in Wardak Province.

[g] The Iraqi Government has denied these allegations.

The Gulf War CW reports, 1985

During 1984 an investigatory team dispatched by the UN Secretary-General to Iran had conclusively verified that mustard-gas bombs, and perhaps tabun nerve-gas bombs also, had been used in at least one of the war zones in the Iran–Iraq border region. But the political expediencies of the Gulf War had protected Iraq from formal condemnation and sanction. That had caused commentators around the world, not least in the developing countries, to observe that the political costs of resorting to poison-gas warfare might not, after all, be considerable.

On 12 March 1985, within a few hours of the opening of the long-expected Iranian offensive across the Hoveyzeh marshes (Operation Badr), the official Iranian news agency announced that Iraq intended to use chemical weapons; the following day it announced that Iraq had done so. Over the next four weeks, according to Iranian reports,[3] there were 32 further attacks in which 4600 Iranians were killed or injured by CW weapons. (The figure quoted by Iranian authorities for CW casualties during 1984 had been 3500.) Reports of further Iraqi CW attacks continued to come from Tehran during April and May. There was also a report of an attack in November.

As in previous years, the Iranian Government took steps to persuade the outside world of the truth of its reports. It invited foreign reporters to interview alleged CW casualties in a Tehran hospital, and sent some 70 Iranians apparently suffering from CW injuries to hospitals in Europe.

On 26 March, US Secretary of State George Shultz raised the matter with the Iraqi Foreign Minister. The following day, the US Government announced publicly and condemnatorily its conclusion that Iraq had indeed been using CW weapons; the UN Secretary-General, too, issued a statement carrying an implicit condemnation of Iraq. The Iraqi Ambassador to the UN stated at a press conference that his country had been accused falsely.

The UN Secretary-General commissioned a Spanish physician, who had been a member of the previous year's investigatory mission, to prepare a report on the new allegations, which he did by examining Iranians who had been sent to hospitals in Britain, Belgium and FR Germany. His principal conclusion was that chemical weapons had indeed been used during March 1985. The UN Secretary-General transmitted the report to the Security Council on 17 April, making it public two days later. On 25 April, the President of the Security Council issued a statement on behalf of the Council's members. The statement accepted the findings of the Secretary-General's report and strongly condemned the renewed use of chemical weapons.[4] However, as in its 1984 statement, the Security Council stopped short of an outright condemnation of Iraq, although this time it identified 'Iranian soldiers . . . in the war between Iran and Iraq' as the victims of the chemical weapons.

The publicity accorded in the news media to the statement by the Security Council was substantially overshadowed by the stories which were by then being published, with attribution to US Government and other sources, and against vehement Iranian denials, that Iran was preparing itself to retaliate in kind—an option which the Iranian Government had publicly renounced in

1984 but which, since March 1985, senior Iranian figures had been hinting at taking up.

As is noted in table 8.2, Iranian authorities alleged that Iraq had employed a wide variety of different CW weapons. From the UN report and from other accounts, there was little doubt that mustard gas had been involved in whatever had happened. It seemed that other agents might have been involved too, but it was not clear which ones. Evidence of a sort existed for lewisite, tabun and an agent such as hydrogen cyanide. Iranian medical authorities clearly believed that a CW agent not previously used in the Gulf War had been used in 1985, the combination of rapid lethality, non-persistency (meaning no environmental samples) and great irritancy which this agent reportedly displayed had suggested a substance such as cyanogen chloride.

There is no doubt that Iraq resorted to chemical warfare against Iran in 1984. The 1985 reports are not conclusively verified, but Iraq's record hardly suggests that they are unfounded.

From the information currently available, it is uncertain what military benefits Iraq might have gained from CW, if any. Reports that Iraq, under Chilean licence, has been planning to build a factory for anti-personnel cluster bombs may perhaps be significant.

Yellow Rain

Against Soviet counter-accusations, and against sustained Soviet and Vietnamese denials, the US Government continued, during 1985, to reiterate its belief that toxic weapons had been used by Soviet forces in Afghanistan and by Vietnamese forces, with Soviet assistance, in Laos and Kampuchea. The toxic agents believed to have been involved included certain toxins, namely trichothecenes of a kind that may be found among the secondary metabolites of some mould fungi. Involvement of such mycotoxins, or any other toxin, would imply violation of the 1972 Biological Weapons Convention. It was the assessment of the US Government that the toxic-warfare incidents, the earliest of which it believed to have been in 1976, had been declining since 1982 and by early 1985 had apparently stopped altogether. The President told the Congress in February that there had been no confirmed chemical or toxin attacks in Afghanistan, Kampuchea or Laos during 1984;[5] such attacks as were later said to have occurred during 1985 were stated to be unconfirmed.[6] In December 1985, the President told the Congress that attack reports had 'subsided in 1985'.[7] In short, notwithstanding increasing scepticism among friends of the US Government, Washington held firm during 1985 to its belief about the earlier years, frequently citing those 'Yellow Rain' episodes as evidence of Soviet non-compliance with arms control agreements.

Throughout all the years of the Yellow Rain allegations, no remnants of toxic munitions had ever been found—this being a major and, to some, decisive gap in the evidence. In February 1985 the Thai Army claimed to have found toxic agents in four unexploded rockets, recovered from areas where Vietnamese forces had been operating. However, the agents allegedly found in the rockets were not toxins, but two traditional CW agents, phosgene and hydrogen cyanide. Washington did not confirm this claim. It was privately

suggested that phosgene and hydrogen cyanide could have been rocket-motor combustion products.

Since their earliest days, the US Government's Yellow Rain charges had stimulated fierce domestic debate in the USA, not least because they immediately became caught up in the issue of whether the United States should or should not be expanding its offensive CW capabilities. This may possibly be the main reason why opinion on the Yellow Rain charges has remained so starkly polarized. Investigative reporting in US news media during the year provided yet more details about the origins and prosecution of the charges—details which, if true (and there seems to be no good reason to doubt them), hardly conveyed a reassuring picture of sound governmental practices. But this and related press reporting merely stimulated bombast and *ad hominem* criticism, not that dispassionate reappraisal—by the Congress, for example—which so clearly seemed to be needed.

The US Administration itself released no new substantive information about the basis of its Yellow Rain charges in 1985. Within the scientific community, debate of the evidence continued vigorously during the year. To those who are competent to judge the assembled arguments, only one conclusion now seems to be tenable: if toxic warfare was indeed conducted in the regions alleged, it is most unlikely that the so-called Yellow Rain had anything to do with it. Officials of the US Administration have now taken to saying more emphatically than before that there exists secret intelligence which supports the charges of past toxic warfare in Laos, Kampuchea and Afghanistan, intelligence which is too sensitive to disclose publicly. It would be wrong to pay any attention to statements of this kind. Matters of international law must be judged on the basis of evidence presented.

III. CW armament

What became known about CW armament programmes during 1985 is reviewed here under three headings: NATO countries, WTO countries and countries outside these alliances. As usual, most of the information is from or about the United States. This circumstance is a consequence of the restrictive information practices of other states; due allowance should be made for it.

The United States and other NATO countries

By the end of 1985, Western countries had moved further in the direction of CW rearmament. After several years of resistance, the US Congress had finally provided President Reagan's Administration with both authorization and funding for resumed production of nerve-gas weapons. Congressional approval was still not complete, however, for the legislation stipulated that the production funds were not to be released before October 1986, and even then only with certain formal endorsements from the political level of NATO. The Congress therefore still has time to modify its decision, a matter which it will be considering within the new funding environment that the Gramm-Rudman-Hollings anti-deficit law will have created (see chapter 12). If the Congress does

not change its mind, other countries in the NATO alliance may find themselves forced to revise their present negative policies towards CW armament.

The budget for fiscal year (FY) 1986, sent to the Congress in February 1985, adopted an approach on CW armament notably different from that of the previous year. Instead of seeking production funds only for 'long lead time' items, it requested everything that would be needed to get production started without opportunity for further congressional delay. Rather more than $1.3 billion was requested for the year's CW programmes, of which about one-seventh would be spent on production of two binary nerve-gas munitions—the M687 155-mm GB2 artillery projectile, and the BLU-80/B (Bigeye) 500-lb VX2 spraybomb—and development of a third, the XM135 warhead for the US Army's and NATO's new multiple-launch rocket system (MLRS). The MLRS warhead would be ready for initial production, it was anticipated, in FY 1988. The expectation was that, during FYs 1986–93, a total of $2.2 billion would be spent procuring these three munitions, exclusive of production-facility costs; the remainder of the CW funds sought in the FY 1986 budget would go mainly to anti-chemical protection, stockpile maintenance and demilitarization (table 8.3).

Table 8.3. The US CW programme: funding sought in the President's budget for FY 1986

Programme element	Request ($m.)
Anti-chemical protection	
Research, development, test and evaluation	391
Equipment and construction	545
Current CW weapon stockpile	
Maintenance and security	64
Demilitarization of items for disposal	132
Binary-munitions programme	
Completion of Bigeye production facilities	109.1
Initial production of Bigeye VX2 spraybombs	43.7[a]
Initial production of 155-mm GB2 projectiles	21.7[b]
Further development of MLRS binary warhead	20.4
Further development of other follow-on munitions[c]	12.5

[a] Sufficient to procure 850 Bigeyes, half for the Navy and half for the Air Force. The following year's programme would provide a further $103.2m. for production of 2615 more Bigeyes.

[b] Information does not appear to have been released about the number of rounds that were to be procured. It was apparently about 40 000 rounds.

[c] One follow-on system mentioned in 1985 congressional testimony was a binary warhead for the Joint Tactical Missile System. A further $1.2m. was to be programmed by the Air Force in FY 1986 for development of binary stand-off weapon concepts, including the idea of attaching a rocket motor to Bigeye.

Source: *Report of the President's Chemical Warfare Review Commission* (the Stoessel Report), (US Government Printing Office: Washington, DC, June 1985).

Under the previous year's defence legislation, the Congress had required the President to establish a blue-ribbon panel of wise men who would review, and make recommendations upon, the CW posture of the United States. This presidential commission was intended as a device for achieving bipartisan

consensus on the future of the binary-munitions programme. It was required to report by 1 April 1985, but in fact its members were not appointed until 11 March. Its chairman, Ambassador Walter Stoessel, was nonetheless able to submit an interim report to the President on 28 April, and a final report on 11 June.[8] This was no mean achievement given the breadth of the commission's inquiries, the extensiveness of its travels and the amount of evidence it took. But the delay in establishing its membership, the known pro-binary leanings of most of the commissioners, the failure of the commission to publish even the unclassified testimony which it took, the staffing of its secretariat with chemical officers, and the fact that its recommendations wholly supported the Administration's existing programmes, raised doubts about its impartiality. Even so, the body of the report, as distinct from its summary and recommendations, contained critical as well as approbatory comment (see table 8.4); given that serious scrutiny of CW issues is rare, it is a pity that the commission was wound up so quickly.

However, most commentators attribute the congressional decisions not to the Stoessel Report but to the exceptionally forceful and skilful lobbying of the Congress by the White House and the Pentagon. The vagaries of US domestic politics during 1985 chanced to favour the binary programme. The key House vote, on 19 June, took place while US news media were dominated by the Shi'ite hijacking to Beirut of an Athens–Rome TWA flight, and the vote undoubtedly provided occasion for demonstrating martial sentiment. Likewise, the end-game in Congress on appropriations took the form of a trade-off between anti-satellite (ASAT) weapon-test funding, which got killed, and binary funding, which passed. The considerations determining the outcome of the various votes seem to have been superficial: 'Bhopal versus the deficit' was how one prominent congressman characterized the 1985 binary proceedings. Administration spokesmen likened the storage hazards of non-binary nerve-gas munitions to a Bhopal-type disaster waiting to happen (notwithstanding the fact that at least one of the binary chemicals, DF, is considerably more toxic than the methyl isocyanate discharged at Bhopal in December 1984).

What the Congress finally passed was about three-quarters of the FY 1986 binary procurement programme as requested. Production money for the Bigeye spraybomb was refused, although money was granted to build its factories. The General Accounting Office had highlighted an array of apparently unresolved technical problems, thus suggesting that a decision on production, let alone funding for production, was premature. The binary appropriations were all made conditional upon the Administration satisfying a range of preconditions. There were two other notable features of the year's CW legislation. One was that it included language which would seem to allow resumption of open-air testing of lethal chemical weapons, an activity which the Congress had proscribed in 1969. The other was that it required destruction of the entire US stockpile of non-binary CW weapons by 30 September 1994; 10 per cent of the stockpile could, however, be retained beyond that date if the production schedule for binary munitions had slipped significantly.

The case for and against binary production had of course been argued in the

Table 8.4. Excerpts from the report of the President's Chemical Warfare Review Commission

Page	Excerpt (*verbatim*)
19	[*Re* the Pentagon calculations that only 28% of the CW agent tonnage currently on hand could be put to any military use at all, and that only 7% substantially meets DoD requirements:] The Commission has reviewed those calculations and believes that they are unduly pessimistic.
20	The Commission has found that rumours of the stored munitions being dangerous or leaking appear to be exaggerated and inaccurate. The number of artillery rounds in which leakage has been found is infinitesimal. . . . All the weapons in Europe are serviceable.
20–1	Nerve agents are widely believed to lose their potency after about 25 years. [The GB stockpile was manufactured during 1952–7; the VX, during 1961–7.] The 1983 tests, however, found only a small diminution in potency, some of which may reflect original manufacturing impurities. . . . The Commission was unable to discover empirical data that show significant loss of potency of the existing nerve agent, either bulk or in munitions.
35	The Commission found the figures on what quantities [of binary munitions] the military requires to be soft and uncertain. . . . More precise thinking and planning from the Department of Defense is needed as to how and in what quantities chemical weapons would be employed tactically.
42	In terms of quantity required [to deter Soviet CW], it has not been demonstrated to the Commission that the number of artillery shells on hand is inadequate. Even if only those containing nonpersistent GB are counted, the quantity is still very substantial. Whether it is large enough of course depends on how many are needed, and current calculations of requirements are not convincing.
45	The argument for binary weapons too often has been misconceived. Proponents . . . have sometimes argued that new chemical weapons are obsolete and outmoded. . . . Yet some of the same individuals point with alarm to the formidable Soviet chemical weapons stockpile—all of which, as far as we know, consists of unitary weapons.
47	If the sole means of deterrence were to be able to force the enemy to the impediment of wearing protective clothing, to a degree this exists now [in the US retaliatory CW capability]. . . . If the means of deterrence includes ability to retaliate effectively throughout the depth of the battlefield, that capability is lacking.
62	In recommending production of binary chemical weapons, the Commission does not deem it essential that they now be deployed in foreign territory. . . . There is no need, nor is it recommended, to seek concurrence of US allies in this production. Discussions by members of the Commission with representatives of a number of allied governments support this conclusion.

Source: *Report of the President's Chemical Warfare Review Commission* (the Stoessel Report), (US Government Printing Office: Washington, DC, June 1985).

language of national security requirements. Senator Nunn, joined by three other senators, published a forceful and influential commentary in support. General Rogers, the Supreme Allied Commander in Europe (SACEUR) and Commander-in-Chief, US European Command (CINCEUR), who, like other senior US military figures, made several public statements in support of CW rearmament during the year, gave the following testimony before the Senate: 'We have a limited chemical capability today but it is inadequate, obsolescent and difficult to store and maintain. In fact, the majority of our worldwide

current stockpile is obsolete, stored in bulk containers, or has no usable delivery means available'. Yet insofar as this implied that NATO lacked the ability to deter Soviet CW in Europe it was an assertion which was not fully endorsed by the Stoessel Commission (see table 8.4). Nor did it appear to be supported by the actual figures for US CW-weapon holdings (see table 8.5).

Table 8.5. US holdings of lethal chemical weapons: estimates from open sources

Item	Number held	Short tons of chemical fill
Munitions now obsolete, deteriorated beyond repair or for weapons no longer in service		
115-mm rockets	480 000	2 500
115-mm gun rounds, land-mines, leakers and unrepairables	320 000	1 400
Bulk agent held for filling new or re-usable munitions		
1-ton drums of non-persistent nerve agent GB	5 700	4 300
1-ton drums of persistent nerve agent VX	2 300	1 800
1-ton drums of mustard gas (persistent)	14 000	12 600
Persistent-agent munitions for ground weapons		
For in-service but obsolescent weapons:		
4.2-in mortar rounds, mustard filled	470 000	1 400
105-mm howitzer rounds, mustard filled	480 000	700
For modern in-service weapons:		
155-mm howitzer rounds, mustard filled	300 000	1 700
155-mm and 8-in howitzer rounds, VX filled	300 000	950
Non-persistent-agent munitions for ground weapons		
For in-service but obsolescent weapons:		
105-mm howitzer rounds, GB filled	900 000	750
For modern in-service weapons:		
155-mm and 8-in howitzer rounds, GB filled	200 000	850
155-mm howitzer rounds, binary GB	*Planned*[b]: *1 200 000*[a]	*5 100*
Aircraft munitions		
For in-service but obsolescent weapons:		
2000-lb spraytanks, VX filled	900	630
For modern in-service weapons:		
500-lb and 750-lb bombs, GB filled	13 000	1 300
500-lb spraybombs, binary VX	*Planned*[b]: *44 000*	*4 100*

[a] In 1983, the Army's acquisition objective for the 155-mm GB2 projectile had been 410 000 rounds. That, however, would have been the objective for equipment of US forces only. Subsequent acquisition targets allowed for the equipment of European NATO forces as well. In March 1984, the Congress was told by the Army that 'the current stockpile of GB artillery munitions represents approximately 20 per cent of our identified requirement' and that the shortfall would be met by acquisition of the 155-mm GB2 round.

[b] The 1985 acquisition objective.

Source: Estimated from collated data published by the US Defense Department.

The Administration continued to maintain that decisions about production of binary munitions could properly be taken ahead and independently of decisions about where the munitions should be deployed; European attitudes towards the programme were therefore immaterial. General Rogers, in a submission to the Congress in his capacity as CINCEUR, noted that the greater part of the existing 'US chemical stockpile is positioned where effective use in

Europe would be delayed' but nevertheless affirmed his support for the Administration's stance: 'there are—and should be—no plans for stationing new binary CW munitions on European soil'. The US Defense Department belief evidently was that once stocks of binary munitions had been built up in the USA, Europeans would agree to accept them into forward deployment.

The final outcome of congressional consideration of the FY 1986 binary-programme budget request did not emerge until the last week of the 1985 session. In 1983 the Congress had authorized the programme but then declined to fund it, and it looked as if the same would happen in 1985, right into December. Unless the Congress decides to de-appropriate binary production monies during its consideration of the FY 1987 defence budget, plant-scale production of binary munitions in the form of 155-mm howitzer projectiles could commence in low volume as early as March 1986. In fact the FY 1986 legislation prohibits any final assembly of binary munitions (as distinct from production of munition components) before October 1987; and the US Army does not plan to demonstrate that its production line can operate as designed until September 1988. The Bigeye production line would have its initial demonstration in 1989. As regards supply of the chemicals to be used in binary munitions, all but one of the leading US chemical corporations have displayed a strong reluctance to become involved.

The Congress attached a variety of significant and not-so-significant provisos to its authorization and appropriation of binary-production funding. Some of these involve the governments of other NATO countries. The authorizing legislation as finally enacted required that the President submit to Congress a report describing 'the results of consultations among NATO member nations concerning the organization's chemical deterrent posture'. This report was to be submitted by 1 October 1986. The consultations were to cover any efforts there might have been 'to initiate a NATO-wide study of equitable and efficient sharing among NATO member nations of responsibilities with regard to deterring the use of chemical munitions in Europe'. But, to this relatively modest requirement in the authorizing legislation, the appropriations legislation added a stipulation which, on the face of it, the Administration may not find easy to satisfy (even though, so it is said, the language originated in the Defense Department). Neither production nor facilitization funds were to be used until the President had certified to the Congress 'that the United States . . . has submitted to [NATO] a force goal stating the requirement for modernization of the United States proportional share of the NATO chemical deterrent with binary munitions and said force goal has been formally adopted by the North Atlantic Council'. Two NATO member states possess CW weapons (France and the USA), but they have not declared the weapons to NATO, meaning that a 'NATO chemical deterrent' as such does not exist. The stipulation by the Congress therefore appears to mean that, until the political leaders of the NATO countries, European as well as North American, formally agree that such a thing should be created, there can be no US production of binary munitions nor any further US spending on factories for them. Pressure is thus being brought to bear on European governments to take decisions they have hitherto been resisting or deferring.

Some of those governments are also under pressure from their own military. For several years now, the issue of CW rearmament has been on the verge of transition up from the military level to the political level of NATO decision. During 1984, two policy issues in particular had been raised for public debate by General Rogers himself.[9] Should not NATO now be expanding its CW retaliatory capabilities so as to reduce reliance upon nuclear weapons as its counter to Soviet chemical weapons? And should not the consultative procedures which the alliance had long ago formalized for deciding upon nuclear weapons release now be extended to chemical weapons? These themes were publicly and repeatedly restated by senior NATO military figures, British, US and West German, including reminders that NATO's agreed defence strategy, as set out in the 1967 'flexible response' document MC 14/3, allowed for CW retaliation-in-kind. Exercise WINTEX/CIMEX, the biennial command-post exercise involving a quarter of a million people in the forces, ministries and governments of NATO countries, took place during the period 26 February–13 March 1985, and once again elicited strongly divergent reactions from the national command authorities when WTO resort to CW was simulated. General Rogers observed that if the Commander-in-Chief of US Army Europe decided to use CW weapons in FR Germany, the only way that Bonn might learn of his decision was by copy of CINCEUR's signal to the President of the United States requesting authorization. SACEUR accordingly called upon the political authorities in NATO Europe to face this issue 'in the next two years'.

In the following month, April, Rogers said that the NATO military authorities had 'submitted a series of questions to the political authorities which we want them to answer so that we have guidance'. He disclosed the existence of that 'series of questions' shortly before NATO defence ministers assembled in Brussels for the meeting of the Defence Planning Committee of the North Atlantic Council. According to NATO officials, the Reagan Administration was aiming to have the meeting declare 'the aging US chemical weapons in Europe to be a shortcoming in allied conventional defenses' and therefore in need of modernization, such as via the binary programme on which the Congress would very soon be voting. But European defence ministers were opposed to joining in any statement which suggested that CW weapons were 'conventional', and no such declaration emerged; nor—it seems—was any comparable sentiment expressed in the Ministerial Guidance agreed at the meeting. However, the 'series of questions' from the military authorities may now be assumed to have established itself within the bureaucratic channels of NATO, requiring action from the political authorities which the new US legislation on the binary programme will further stimulate. Progress on this particular front will presumably be one of the matters addressed in the report which the US Congress has required of the President by October 1986.

In fact, politicians in the leading European NATO countries had not been inactive on the CW issue, although the directions taken seem not to have been the ones hoped for by SACEUR. In FR Germany and Britain, as in other European NATO countries, it is likely that any move towards CW rearmament

would provoke a repetition of the neutron-bomb and intermediate-range nuclear force (INF) discords of the recent past. The 1985 West German defence white paper referred to Soviet CW weapons in several places but, unlike its predecessor in 1983, was silent on the question of NATO CW armament. Although this question was addressed in a position paper on CW weapons which the Federal Defence Ministry made available to the press in March,[10] the paper endorsed a NATO capability in the narrow sense of reprisal, not of retaliation in kind. In June, the binary-authorizing vote in the US House of Representatives coincided with the unveiling of the European chemical weapon-free zone proposal by the ruling East German Socialist Unity Party (SED) and the opposition West German Social Democratic Party (SPD) (see chapter 19). As a consequence, all the West German parliamentary political parties adopted positions firmly opposed to any basing of binaries on Federal soil. In fact General Rogers had assured the chairman of the Bundestag Defence Committee that he had not 'asked for the stationing of additional US chemical weapons in the FRG',[11] although the ranking SPD member of the committee expressed strong doubts about this assurance. The Christian Democrats made statements of support for the binary programme, apparently on two conditions. One was no basing of binaries on federal soil. The other was that existing US stocks of chemical weapons in FR Germany would be withdrawn, once the USA had acquired binary munitions. US Defense Secretary Weinberger had apparently offered an assurance of such withdrawal, only to retract it later.[12]

More information about those US stocks emerged during the year. General Rogers said they constituted a '2–3 day supply'. Unofficially, but on good authority, they were reported to comprise some 435 tons of CW agent (GB and VX nerve gases only, according to an earlier report), all of it held in artillery projectiles—probably about 6500 tons of them. In refutation of allegations made in a television documentary, the Federal Defence Ministry stated that the stocks consisted only of sound and serviceable munitions, that there were no M55 rockets among them, and that there had never been any accidents or leakages. Elsewhere the Ministry stated that there had been US stocks of CW weapons on West German soil since before the founding of the Federal Republic, and that nowadays they were subject to stringent federal inspections.

In Britain, it transpired—from ministerial reactions to a leak of secret Cabinet-level information early in 1985[13]—that the political leadership had been giving close attention to CW policy options during the previous spring and summer. On 2 August 1984, a special Cabinet committee had decided that, as regards CW weapons, there would be no change from the policy of non-armament that had been in place since the late 1950s. This was a decision against Britain either producing CW weapons of its own or providing basing facilities for US ones. On 10 January 1985, the Prime Minister spoke as follows to Parliament: 'There has been no change in government policy since then, nor is any change now proposed. However, as a responsible government, we have a duty to keep defence policy under review in the light of . . . the massive Soviet capability in chemical weapons'.

It was clear that the Thatcher Administration was keeping open its options for future CW policy, including CW armament, although the categorical tone with which it dismissed suggestions that changes were contemplated will increase the political costs of making any such changes. The military pressure for change appeared strong, but the Defence Secretary (then Michael Heseltine) was evidently in opposition to the armed services on the matter. In May he told the Commons Defence Committee that, at least on the question of in-kind versus nuclear retaliation against Soviet CW attack, SACEUR's view was not necessarily the best one; and his defence white paper earlier that month had drawn attention to the fact that the US stocks of CW weapons in Europe were not declared to NATO, thereby implying that SACEUR's call for an alliance policy on CW-release procedures was premature. On the possibility of US CW weapons being based in Britain, one of his ministers had told Parliament in April that 'there are no such facilities being used or designated for this purpose, nor are there plans to store United States chemical weapons in Great Britain'.

In France too there continued to be at least some military pressure for renewed production of CW weapons, but again, at the level of Defence Minister, there was a stated willingness to rely on nuclear countermeasures to CW attack. French officials are said to have estimated that it would take about a year to manufacture militarily significant quantities of chemical weapons.

In Italy, the 1985 Defence White Book stated that the country did not possess CW weapons. Such stocks of CW agents as there were were left-overs from World War II, awaiting destruction. In November 1984, the Foreign Minister had told Parliament that there were no foreign-owned CW weapons in the country.

The Soviet Union and other WTO countries

During 1985, the Soviet Government and its agencies released an unprecedentedly large volume of commentary on CW matters. By far the greater part concerned the situation in other countries, with much commentary on the US binary-munitions programme, on the idea of a European chemical weapon-free zone, and on what was portrayed as an obstructionist attitude on the part of the USA towards the CW disarmament negotiations. Many of these publications quoted Western sources of information, not always accurately. There were instances where the inaccuracies must surely have been intentional.

There was more Soviet commentary than in previous years on the CW posture of the USSR itself. There continued to be open publications on problems of anti-chemical defence, including an article by the general officer commanding the Soviet Chemical Troops on deficiencies in the assimilation of anti-chemical doctrine and equipments.[14] An assertion that the Soviet Union 'is daily producing chemical weapons' was said by the leader of the Soviet delegation at the Conference on Disarmament in Geneva to be a lie.[15] *Izvestia* stated that work on developing binary munitions neither was being nor had ever been conducted in the USSR. It said, too, that the USSR had never

transferred CW weapons to any other country, nor would it do so, even to its allies.[16]

As to possible Soviet responses to the US binary programme, a Defence Ministry general (a CW specialist) said in September 1985: 'The Soviet Union, in replying to the escalation of chemical weapons, will certainly have to think about having a corresponding equivalent. But the Soviet Union is a powerful state which possesses a high scientific, technical and production potential and therefore its equivalent does not have to belong to the chemical sphere. It could take the form of conventional and other types of arms.'[17]

These official Soviet publications (none of which, however, denied that the USSR possessed stocks of CW weapons) stood in sharp contrast to statements about the Soviet CW posture coming from official Western sources, which, as in earlier years, asserted that the USSR was continuing to test, produce and stockpile CW weapons and generally to expand its already 'formidable' capabilities.

The US Defense Secretary's annual report to the Congress, in February, said: 'Although we no longer believe the Soviets intend to use chemical weapons on a massive scale, the selective use against special targets cannot be ruled out'. This assessment evidently had NATO-wide concurrence. The Stoessel Report had this to say:

> The Commission has been informed . . . that, since about 1976, Soviet doctrine on employment of chemical weapons has changed. Prior to that time, the Soviets planned to employ chemical weapons in a 'massed' fashion, in heavy volume along the front line. It now appears that Soviet military thinking calls for a more limited and selective use, emphasizing surprise, sometimes by commando and raider groups as well as by missiles, against key targets in Western Europe: command centers, port facilities, and the highly vulnerable depot areas where prepositioned U.S. military supplies to equip U.S. divisions arriving in Europe are stored.

Concerning Soviet CW force structure, the US Defense Department stated that the 'Soviets have more than 80,000 officers and enlisted specialists trained in chemical warfare, a force that would double in wartime; of this, 45,000 are assigned to the ground forces'. Several additional reviews were published during the year by Western authorities of the activities and function of these Soviet Chemical Troops, the VKhV. On the basis of known VKhV equipment holdings and time-allocations in training exercises, the estimate was published that no more than 10 per cent of the VKhV effort was dedicated to CW tasks;[18] the primary task of the VKhV was rather the radiation dosimetry reconnaissance and fall-out decontamination needed to maximize the effectiveness of Soviet forces operating over a nuclear battlefield.[19]

As to other details of the Soviet CW weapon posture, there were several further official and unofficial Western publications during 1985 which substantially increased the public record of supposedly factual information. Whether these details, summarized below, are true or false, SIPRI is of course in no position to judge. Among the more authoritative publications was a new US Defense Department booklet, *Soviet Chemical Weapons Threat 1985* prepared by the Defense Intelligence Agency, released at the high point of the

congressional debate on binary-munition appropriations. The British Government endorsed it. Its predecessor of October 1983, *Continuing Development of Chemical Weapon Capabilities in the USSR*, had left several prominent gaps in its overall portrayal, some of which the new report now filled. Thus, it included maps purporting to show the general locations of 10 CW agent 'production centers' and 9 'chemical weapon depots' inside the USSR, as well as 32 locations in other WTO countries where 'chemical munitions are reportedly stored in . . . forward areas'—9 in the GDR, 9 in Czechoslovakia, 4 in Poland, 5 in Hungary, 4 in Romania and 1 in Bulgaria; in forward areas, chemical weapons were believed to be 'collocated with conventional weapons'. The CW-weapon research and development programme was believed to extend to 'binary systems'—something that the Stoessel Report had explicitly denied—as well as 'new chemical agents and combinations including ways to render the protective masks, suits and filtration systems of potential enemies ineffective', and 'a variety of toxins'. The report did not venture, however, to put a figure to the total size of Soviet CW agent stocks; and the Stoessel Report had earlier said that 'exact deployments and quantities of Soviet munitions are not precisely known'. SACEUR's British deputy had likewise stated that it was 'very difficult to quantify the stocks'. The British Government, however, seemed to have greater confidence in its estimates: on at least four occasions during 1985, British Government ministers stated that the Soviet chemical weapon stockpile had been assessed to include 'some 300,000 tonnes of nerve agent alone'; they were apparently quoting from the assessment made the previous year by the government's Joint Intelligence Committee.

Information emerged during the year which suggested that, for their supply of CW weapons, Soviet ground and air forces would rely less on stockpiles of chemical munitions and more on the filling in the field of empty munition casings—missile warheads, bombs, artillery shell and the like—from bulk stocks brought up to divisional administrative areas (for example) by special tankers.[20]

In October 1984, an East German military journal had denied the existence of Soviet CW weapon stocks in the German Democratic Republic.

Concerning the types of CW weapon thought to be available to the WTO, the Stoessel Report stated that it was 'clear beyond doubt . . . that the Soviets now deploy chemical warheads on sixteen different modern weapons, including aircraft bombs, howitzer rounds, mortar rounds, land mines, grenades, multiple rocket launchers, free rockets over ground, and tactical ballistic missiles. There also is evidence that Soviet cruise missiles may have been provided chemical warheads.' On this last matter, however, the Senate was told by the senior US Army and Air Force commanders in Europe that 'we have no evidence that any Soviet cruise missiles are deployed with chemical warheads'. The Stoessel Report stated, further, that, 'by the most conservative informed estimates, the Soviet stockpile of chemical munitions is several times as large as the usable portion of the US inventory'.

It might be supposed from the foregoing that the West has detailed knowledge of the Soviet CW posture. Such a supposition would, however, have to be set against the following account in the Stoessel Report: 'The depth

and quality of U.S. intelligence on Soviet chemical warfare capabilities and intentions is not adequate. US intelligence agencies have for years virtually ignored the chemical and biological threat. Lately some improvement is evident, but not enough to provide detailed and up-to-date knowledge of Soviet chemical weapons capabilities'. It is a fact of life that, in areas where uncertainties are great and secrecy high, speculation, conjecture and disinformation can pass unquestioned into the prevailing popular wisdom. One has only to look at the bizarre contradictions displayed in the chronological record of past Western assertions about the Soviet CW posture to judge just how ignorant the West may in fact be.[21] In periods of high international mistrust, this is a situation which allows much scope for propagandists seeking to capitalize on the great emotiveness of CBW.

Countries outside NATO and the WTO

It was observed in *SIPRI Yearbook 1985* that, by the end of 1984, at least 30 states had been said, in one published report or another over the previous decade, to possess CW weapons. It was also observed that some of these reports were certainly false. The government of one of the countries so listed, Peru, lodged a strong protest with SIPRI at being recorded as a possible possessor state. The Peruvian Government has been an advocate of the idea of a Latin American chemical weapon-free zone.

SIPRI Yearbook 1985 also recorded statements by US officials during 1984 that their government believed at least 15 countries possessed CW weapons. During 1985, various authorities have made statements of this kind, with numbers varying between 13 and 16; some sources apparently include Poland, Czechoslovakia and the GDR, and others do not. Full lists of names are not given. One source suggests that Burma, China, Egypt, Ethiopia, Israel, North Korea, Syria and Taiwan are included in the list of possessor states, with Iran and South Korea 'attempting to acquire' the weapons. Libya is apparently regarded as a possibility, but Thailand is not.

The situation regarding the two Korean states attracted widespread notice in May when it was announced that the South Korean Government was planning to make gas masks available to the entire population of the country. In June, the South Korean Defence Minister stated that five North Korean factories were producing 14 tons of CW agent per year, and that up to 250 tons had already been stockpiled. In August there was a report, again from Seoul, that North Korea had recently increased its production of CW agents. In October there was a report from Pyongyang of 10 CW agent plants having been built in South Korea, with US assistance; the report also stated that the USA had recently been shipping 155-mm and 8-in. chemical projectiles into South Korea.

The Iranian Government had declared during 1984 that there would be no retaliation in kind against the Iraqi use of CW weapons in the Gulf War. Government spokesmen repeated this declaration during 1985 but, as the reports of resumed Iraqi CW began in March, the declarations became conditional upon action by the international community. In that month, purported details of the production effort (by conversion of a fertilizer factory,

with assistance from West German and Italian firms) were broadcast by an Iranian opposition group. Shortly afterwards 'American intelligence sources' were quoted to the effect that Iran had moved CW weapons to the front, the weapons having either been manufactured in Iran or supplied by Libya. These reports were fiercely denied by the Iranian Government. On 24 April a spokesman for the US State Department said: 'We are aware that Iran has been seeking to develop a chemical weapons capability, and it may now be in a position to use such weapons'. Further purported details of that capability, including reports of direct Syrian assistance and a report of Iranian efforts to exploit captured Iraqi CW weapons, were published as the year went on. In December an unidentified US official gave the following assessment to the press: 'We believe [the Iranians] have some capability and we believe they have an intent to develop a production capability. We believe they are working toward the development of a production capability'.

The issue of CW weapon proliferation thus became increasingly prominent during 1985. It is not clear whether this was because the weapons really were proliferating, or whether it was merely because allegations to that effect were found to be useful to those making them. It is true that proliferation dangers were cited by the US Administration as one of the reasons for producing binary munitions. Further, the alleged Soviet role in promoting proliferation was included in portrayals of the Soviet CW threat—just as the alleged US promoting role was included in counterpart Soviet commentary. But there were calls for international action to limit proliferation not only in the West, but also in the Soviet Union and in several other non-Western countries.

Moreover, in some of the official Western commentary on the issue, there was recognition that an important motor of proliferation might well lie in the business interests of private corporations. US intelligence officials have reportedly testified that commercial firms were 'becoming highly involved in the rapid spread of chemical weapons to Third World countries'. The involvement was said to be an unwitting one: the requisite chemicals and plant were being bought for what appeared to be legitimate civil applications. The US Government believed that its own firms were under control, but knew of foreign firms that were not. Later in the year, CIA sources were quoted as being especially critical of West German and Swiss firms.

IV. Strengthening the CBW arms control regime

Efforts continued during 1985 to strengthen the CBW arms control regime. There were developments regarding the existing treaties, and further endeavours towards new treaties. The former are noted below. The latter are taken up in the fuller version of this review and in chapter 20.

Since the signing of the 1972 Biological Weapons Convention, the only concrete developments which the Geneva negotiating body—now called the Conference on Disarmament (the CD)—has been able to report in the field of CBW comprise a succession of non-binding agreements on ways forward to the agreed objective of global and comprehensive CW disarmament. In the meantime, various lesser objectives have been mooted elsewhere within the

international community. One, contained in proposals put before the Second Special Session on Disarmament of the UN General Assembly in 1982, has been the idea of supplementing the 1925 Geneva Protocol with compliance-verification machinery. Another has been the idea of regional measures of CW disarmament. A third has been the suggestion of a CW non-proliferation treaty.

By 1985 a sense of pessimism was finding increasing expression in published commentaries on the CW work of the CD, though much of this seems in fact to have been no more than veiled advocacy for particular negotiating positions.[22] In fact, the agreements which the CD was able to register by the end of the year represented a considerable advance. But progress was still a long way short of its goal, the projected Chemical Weapons Convention (CWC), and, to many observers, did not appear to be keeping up with the accelerating pace of countervailing developments, such as those described earlier in this chapter. Attempts turned increasingly towards other means for protecting the CBW arms control regime from further erosion and to alternative ways for enhancing the regime.

Grounds for optimism perhaps exist in the references to chemical weapons contained in the communiqué of 21 November from the Reagan–Gorbachev meeting in Geneva. The two sides 'agreed to accelerate efforts to conclude an effective and verifiable international convention on this matter'; and they would 'intensify bilateral discussions on the level of experts on all aspects of such a chemical weapons ban, including the question of verification'.

The existing CBW arms control treaties

1985 brought the 60th anniversary of the Geneva Protocol, occasion for much reaffirmation of its principles by governments. It also brought new notifications of accessions to the protocol: Bolivia and Peru. The question of procedures for verifying allegations of use was now being considered chiefly within the framework of the CWC negotiations. On 4 December, the Canadian Government presented to the UN Secretary-General a *Handbook for the Investigation of Allegations of the Use of Chemical or Biological Weapons*. This manual had resulted from a co-operative study involving the Department of External Affairs and the University of Saskatchewan.

In the light, especially, of the failure of the international community to implement sanctions of any sort against Iraq following its proven violation of the protocol, SIPRI proposed that the UN General Assembly should request the Secretary-General to make an enquiry among the member states along the following lines: 'What responses are contemplated by the government of a given state to violations of the Geneva Protocol ascertained in accordance with United Nations procedures?'[23]

1985 also brought the 10th anniversary of the entry into force of the 1972 Biological Weapons Convention. There were new ratifications, such as that of Peru, and new accessions, such as that of Bangladesh. Preparations began for the Second Review Conference, to be held during September 1986. They did so amid an increasing volume of published commentary on various supposed shortcomings of the treaty.

The commentary gave particular attention to two aspects of the Biological Weapons Convention. One was the absence of any ban on research directed towards biological or toxin weapons. Although there were, and still are, very good reasons for this, the fact remains that major new areas of scientific inquiry have opened up wherein new BW weapon possibilities may reside. The USA and the USSR have each accused the other of exploiting this supposed loophole. The second and far more substantial worry has been the absence of provision for compliance-monitoring or for fact-finding investigation of suspicious or merely ambiguous activities. This has allowed all manner of non-compliance allegations to acquire credibility, greatly undermining confidence in the treaty regime and, indeed, in arms control generally. Who can say, in the absence of compliance-verification procedures, whether the allegations regarding the Sverdlovsk anthrax outbreak of 1979 or the Yellow Rain episodes were malicious propaganda, disturbing revelation or simply a consequence of heedless reliance upon unreliable intelligence?

Yet, however strong the case may be for reforming the Biological Weapons Convention, the 1986 Review Conference does not now seem to be a propitious opportunity for attempting it. The confrontational environment created by the Yellow Rain affair and by the succession of more general arms control non-compliance charges which the superpowers have been directing at one another can hardly be expected to change overnight into the co-operative environment that would be essential. And few governments will be ready, one may think, to adopt positions, especially on verification, which may then tie their hands in the CW negotiations. Given the nature of the political pressures under which some of the Review Conference delegations will be operating, there is some danger that the review will impede progress towards CW disarmament.

Notes and references

A closer identification than is given below of the published source material on which this review relies is contained in the fuller version published as SIPRI Chemical & Biological Warfare Studies Number 6. The literature citations there are organized into a systematic bibliography which also records other noteworthy publications on CBW that have appeared or been received since the time of the review published in *SIPRI Yearbook 1985*.

[1] SIPRI, *World Armaments and Disarmament: SIPRI Yearbooks 1982–5* (Taylor & Francis: London, 1982–5)—*1982*: pp. 317–426; *1983*: pp. 391–426; *1984*: pp. 319–49; *1985*: pp. 159–205.

[2] The monographs so far published in this SIPRI series, which is under the editorship of the present author, are as follows: Thomas, A., *Effects of Chemical Warfare: A Selective Review and Bibliography of British State Papers*, SIPRI Chemical & Biological Weapon Studies no. 1; Robinson, J. P. P., *Chemical Warfare Arms Control: A Framework for Considering Policy Alternatives*, SIPRI CBW Studies no. 2; and Trapp, R., *The Detoxification and Natural Degradation of Chemical Warfare Agents*, SIPRI CBW Studies no. 3 (Taylor & Francis: London, 1985); and SIPRI, *The Chemical Industry and the Projected Chemical Weapons Convention: Proceedings of a SIPRI/Pugwash Conference*, vols 1 and 2, SIPRI CBW Studies nos 4 and 5; and Robinson, J. P. P., *Chemical and Biological Warfare Developments: 1985*, SIPRI CBW Studies no. 6 (Oxford University Press: Oxford, 1986).

[3] Statement by the Iranian Foreign Minister at the Conference on Disarmament in plenary session, 16 Apr. 1985, see Conference on Disarmament document CD/PV. 308, pp. 9–12.

[4] Statement of the President of the UN Security Council on behalf of the members of the Security Council, 25 Apr. 1985, see verbatim record of the 2576th meeting of the Security Council, UN Security Council document S/PV. 2576.

[5] 'The President's unclassified report to the Congress on Soviet non-compliance with arms control agreements', 1 Feb. 1985. Text in Conference on Disarmament document CD/561 of 13 Feb. 1985.

[6] Prepared statement by the Deputy Director of the US Arms Control and Disarmament Agency before the Senate Armed Services Committee, 28 Feb. 1985.

[7] US Department of State, *Soviet Noncompliance with Arms Control Agreements*, Special Report no. 136 (Bureau of Public Affairs: Washington, DC, Dec. 1985).

[8] *Report of the President's Chemical Warfare Review Commission* (the Stoessel Report) (US Government Printing Office: Washington, DC, June 1985).

[9] 'Rogers: chemical deterrence is imperative', *National Guard*, May 1985, pp. 27–8.

[10] Bundesminister der Verteidigung, Informations- und Pressestab. Material für die Presse, no. XXII/8, Mar. 1985, 'Chemische Kampfstoffe'.

[11] 'Chemische Waffen als Kampfinstrument: NATO steht zum Verbot aller C-Waffen', *Informationsdienst Sicherheitspolitik* (Bonn), vol. 3, no. 1 (Mar. 1985).

[12] 'Unklarheiten über die Absichten Washingtons', *Frankfurter Allgemeine Zeitung*, 9 Aug. 1985.

[13] Campbell, D., 'Thatcher goes for nerve gas', *New Statesman*, 11 Jan. 1985, pp. 8–10.

[14] Pikalov, V. ['Inculcate more actively the foremost experience'], *Voyennyy Vestnik*, Mar. 1985 (in Russian).

[15] Conference on Disarmament document CD/PV. 309, 18 Apr. 1985, p. 39.

[16] Gontar, F. ['Washington looks for pretext for chemical weapons buildup'], *Izvestia*, 3 Nov. 1985 (in Russian).

[17] Kuntsevich, A., Statement at a press conference in Moscow, 19 Sep. 1985.

[18] Jacchia, E. (ed.), *Chemical Warfare in Soviet Military Doctrine* (LUISS: Rome, 1985), p. 8.

[19] Donnelly, C. N., *Heirs of Clausewitz: Change and Continuity in the Soviet War Machine*, Institute for European Defence and Strategic Studies (London), Occasional Paper no. 16, 1985, pp. 30–1.

[20] See note 18.

[21] Robinson, J. P. P., 'Views of Soviet chemical-warfare armament', in Jacchia (note 18), pp. 51–68.

[22] See, for example, Lord, C., 'Rethinking on-site inspection in U.S. arms control policy', *Strategic Review*, Spring 1985, pp. 45–51.

[23] SIPRI Press Release, 'The Geneva Protocol of 1925', SIPRI: Stockholm, 14 June 1985.

9. Strategic computing

ALLAN M. DIN

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

During the past decade the computer revolution has brought about profound changes in the structure and functioning of society in most industrialized countries; even more profound changes are likely in the future. The miniaturization of electronics has meant that computer hardware which was once the size of a small house can now be accommodated on an office desk. However, the hardware is only half the story. The computer has to be given precise instructions, written in a special machine language. For this purpose, various 'intermediate' computer languages have been developed, so-called high-level languages, each suited for a particular purpose: the ultimate goal is to be able to communicate with a computer using natural language, that is, English, Russian, and so on. So on the horizon are 'intelligent' machines which can understand natural languages; which can ask questions and give answers; and which can, eventually, act autonomously in certain situations.

The military establishment has been a very heavy user of computers for a wide spectrum of applications. It has not been backward in realizing the great potential of advanced computing for a tactical and strategic environment where there is a large amount of data and at the same time a need for very quick decisions. Indeed there are many potential military situations where this combination of factors—the need for quick decisions using large amounts of data—means that the decision-making process would have to be handed over, partly or wholly, to the 'intelligent' machine, with human beings relegated to observer status. For this and other reasons, it is important to monitor what is going on in the field of military computing.

As one of the most significant examples of military interest, the US DoD Defense Advanced Research Projects Agency (DARPA) in 1983 launched its Strategic Computing Plan programme to develop a new generation of computing technology for applications to critical problems in defence.[1] The programme defines the notion of 'strategic computing' (which *per se* has nothing to do with strategy), and summarizes the challenge to the defence community in the following way: 'We are now challenged to produce adaptive, intelligent systems having capabilities far greater than current computers, for use in diverse applications including autonomous systems, personalized associates and battle management systems. The new requirements severely challenge the technology and the technical community'.

This language is somewhat reminiscent of that used by President Reagan in launching the Strategic Defense Initiative (SDI): the DARPA programme has consequently been nicknamed the Strategic Computing Initiative (SCI). In

fact, one of the major potential applications of the programme is now thought to be for SDI battle management, command and control. This aspect of the programme, with the possible transfer of decisions from humans to machines, is perhaps the most important reason for current concern.

So far, the programme is developing according to a five-year planning schedule with three specific military goals: an autonomous land vehicle; an intelligent, personalized pilot's associate; and a battle management system for a navy carrier force.[2] The cost for the initial five years is estimated at about $600 million, and the total cost may well run beyond $1000 million if the programme, as projected, is to run for a decade.

The military applications of advanced developments in computer hardware and software are likely to materialize on two general levels. First, new tactical weapons could appear relatively soon; this might be seen as a logical extrapolation of the evolution of 'smart' weapons during the past 10 years. Second, in a medium- to long-term perspective, applications to strategic weapons, eventually in the context of SDI, might emerge. In addition there is likely to be a continual upgrading of command and control structures whenever new advances in computing emerge.

Strategic computing could, however, also have a number of more peaceful uses. Significant computer applications may emerge for a wide area of arms control problems. What may be called computer-aided arms control (CAAC) is today emerging in several ways, for example, in certain satellite-monitoring projects. Eventually, CAAC may turn out to be useful, not only in treaty verification but also in the modelling of arms control negotiations.

II. Computer hardware

The evolution of computer hardware has so far produced four technology generations. The first one used vacuum tubes and was characterized initially by bulkiness and unreliability; the second was initiated with the invention of the transistor; and the third introduced integrated circuits of transistors. We are still in the middle of the fourth generation of large-scale integrated circuits, but significant progress has already been made in the technology which will constitute the fifth generation of computers, namely the very large scale integration circuit (VLSIC) and the very high speed integrated circuit (VHSIC).

In 1980, the US Department of Defense began an ambitious VHSIC programme with a scheduled budget of about $700 million for a 10-year development period.[3] The goal of the first phase of this programme was to give semiconductor developers an incentive to produce microchips with features as small as 1.25 microns (one micron = one millionth of a metre), that is, smaller than previous standards by a factor of four. The smaller the features, the more transistor devices per square centimetre can be placed on a chip; currently it is possible to pack a couple of hundred thousand devices on to a single square centimetre, and this number may soon increase to about half a million.

The goal of phase 2 of the VHSIC programme, which started in 1984/5, is to reduce the minimum size features even further, to 0.5 micron. The computing

capacity of microprocessors, however, depends on two factors: the number of devices and the number of operating cycles, that is, the switching speed measured in Hertz (Hz). Currently most microcomputer chips operate at 4–8 million Hz, but a goal of 100 million Hz seems feasible. The product of the two factors is a decisive quantity which traditionally is measured in gates-Hz/cm^2; its value was half a trillion gates-Hz/cm^2 for the phase 1 part of the programme, and the objective for phase 2 is set at 10 trillion gates-Hz/cm^2.

A variety of different semiconductor technologies are being considered for building the logic circuits of the next generation of microchips. For some years the complementary metal-oxide semiconductor (CMOS) technology has held a particularly strong position because of its very low operating power requirements; its main drawback, a relatively slow speed, is now being offset by improved designs, and, moreover, it holds a significant promise of allowing for development of submicron features. Other technologies like n-type metal-oxide semiconductors (NMOS) and bipolar transistors are, however, also under development and may be used for special applications.

New materials, other than the traditional silicon wafers, are being actively considered for the chips of the future. Gallium arsenide (GaAs) integrated circuits appear to be very interesting for a number of reasons: they have a low power dissipation, run at high speed, operate over a wide temperature range and are resistant to radiation. This last property of GaAs devices is particularly important for computer operation in a rugged military environment—for example, in satellites. In general, the robustness of the military hardware (e.g., its resistance to protection against the nuclear electromagnetic pulse) is a major concern for many development efforts.

Completely new approaches such as optical computing are also under development. The storage of large amounts of data, an area where many different advances have appeared recently, may now be performed with optical methods using laser discs; a number of more advanced ideas, such as holographic configuring of processors, seem to be only in an early development phase.

While the advances and future prospects in chip technology appear impressive, it is likely that hardware will develop even more rapidly in computer architecture, that is, in the way microprocessors are put together in one operating unit. This emphasis on architecture may be particularly crucial in artificial intelligence applications.[4] With the emerging requirements for massive real-time data-handling, it is probable that the new semiconductor technology would be insufficient; one possible solution could be the use of parallel processing. The problem of how to make large numbers of processors work simultaneously in an effective manner is, however, still the object of lively research.

III. Artificial intelligence techniques

Since the 1950s artificial intelligence (AI) has been the focus of much academic research,[5] and there have been significant changes in the methodology and in the definition of its basic purpose. The initial ambition was to develop a general

theoretical framework for intelligent problem solving, with the ultimate goal of making computers capable of replacing, and even surpassing, the natural human intelligence. After some time it became clear that the performance of even the most trivial human task was an extremely complex process, and it also appeared unlikely that a single unified theoretical approach to AI could ever be found. (In fact, it may make as little sense to develop a general theory for AI as it would be for civil engineering.)

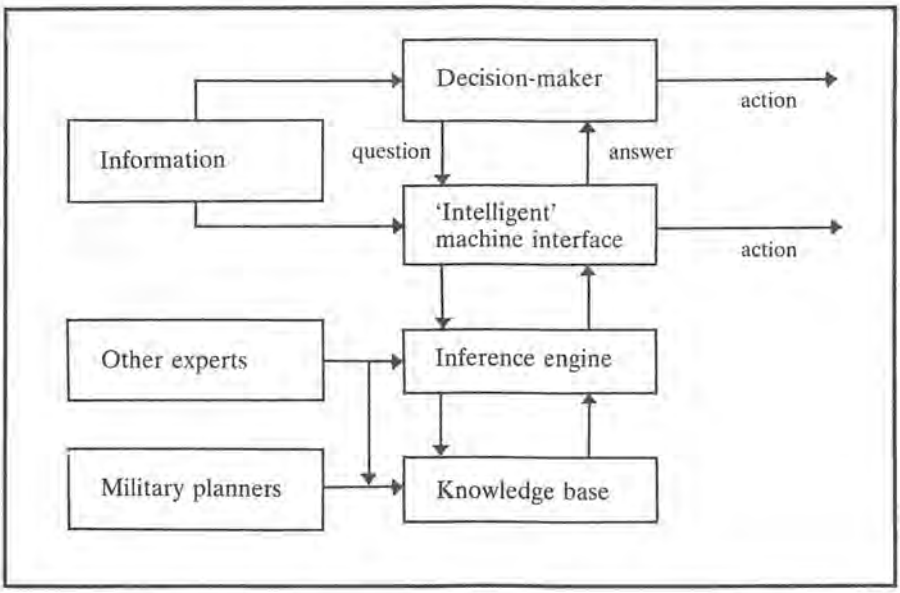
Past AI research has, however, produced a number of techniques which are relevant for addressing a variety of problems in, for example, natural language understanding, pattern recognition and theorem proving. One very useful technique is that of heuristic search within a set of possible solutions: the endeavour here is to systematize the well-known trial-and-error method by using heuristically guided selection rules to reduce the huge number of possibilities. The various AI techniques are eventually to be applied in writing computer programs (that is, software) which can run on more or less dedicated hardware. To do this a high-level language is needed which the computer is able to understand; many such languages have been developed, in particular for calculations. For example, FORTRAN, BASIC, PASCAL, MODULA, C and ADA are high-level languages which have acquired large user-bases, commercial as well as military. In principle they are all equivalent in the sense that a program written in one language could simply be translated into another one. The only difference is that certain procedures in calculation (that is, algorithms) are more elegantly written and executed faster if they use a computer language tailored to a particular class of problem.

For AI applications it has also been found useful to develop dedicated high-level languages; the two best known are LISP (from list processing) and PROLOG (from programming in logic). One reason for using special AI programming languages is the fact that AI is not specifically oriented towards applying algorithms for calculations but rather towards the logical manipulation of symbols. The distinction between algorithmic and logical programming approaches has given rise to the popular fallacy that machines performing logical manipulations might somehow be fundamentally different from the ones just doing calculations; this fallacy is part of the mystic aura which still surrounds some AI research. The fact is, however, that all successful AI applications to concrete problems have so far been composed of algorithmic elements, and it is unlikely that any metaphysically 'intelligent' computer will ever see the light of day.

Expert systems implement AI techniques, and many fields of application are opening up for them—from medical diagnosis problems to natural resource exploration.[6] Expert systems are also likely to acquire an important role in military applications in the coming years.[7] A computer running an expert system can act as an autonomous problem solver; perhaps more importantly, it is capable of engaging in a constructive dialogue with a decision-maker, so relieving him of a number of time-consuming and sometimes trivial tasks. Schematically, an expert system can be shown as in figure 9.1.

The key ingredients of an expert system are a knowledge base and an inference engine. The knowledge base is composed of data and rules which, in

Figure 9.1. Expert system outline



the case of a weapon application, are provided by the military planners who know about certain physical characteristics of the weapon and who can also define its mission. In an expert system for medical diagnosis, the data could consist of a listing of various illnesses; the rules would consist of a set of empirical interpretations of symptoms.

In constituting the knowledge base, the experts in a particular domain of application are assisted by other experts, including the so-called knowledge engineers, who are capable of reformulating human knowledge in terms of data and rules which the computer can handle. This knowledge-engineering may be the single most difficult step in making a successful expert system.

The second key element is the inference engine, put together by the knowledge-engineers and other computer experts, which is simply a collection of procedures written in one or other AI language. It makes the computer capable of using the knowledge base in conjunction with further information coming from the outside to infer certain conclusions from the available premises. The inference engine presents its conclusions to the human decision-maker in the form of natural language (albeit somewhat standardized) phrases in written, or possibly spoken, form. The communication with the decision-maker is two-way: questions can be asked and answered. In the end, the human decision-maker may choose to act himself on the basis of the assessment provided; alternatively, he can let the machine take action when certain predetermined criteria are satisfied.

IV. Tactical weapons

The modern tactical battlefield is an area which could see some very important short-term applications of AI techniques and in particular of expert systems.[8] The current panoply of weapons, and the multitude of available sensor information on targets as well as threats, together create a military environment where the human being has a great deal of information available and is faced with the need for acting very quickly, with little or no possibility of a second chance. Military planners are thus presented with the problem of deciding which elements of the human decision process could be taken over by some form of machine intelligence.

The use of advanced electronics in weapon systems is of course nothing new, and the degree of sophistication has been growing continuously. A significant example is the guidance system for cruise missiles which relies on the matching of terrain contour information with prerecorded topographical data. Advances in systems of pattern recognition are likely to improve the reliability and the precision of these weapons.

The DARPA programme's objective of an intelligent, personalized pilot's associate is a typical example of possible tactical weapon applications of expert systems. It is intended to mechanize the practical knowledge and the reasoning methods of humans in functions concerned with system status, situation assessment, mission planning and tactics. The purpose is to enhance flight safety and survivability, increase mission effectiveness and reduce the pilot's workload.

The knowledge base of the pilot's associate expert system could encompass a collection of doctrines, orders, targets and threats. The basic problem is to process, in the most effective way, a variety of sensor information including radar, signals intelligence, communications, engine data and flight control. The inference engine would involve an automatic processing of situation assessment, system status, mission planning and tactics. The pilot can decide to act on the basis of the processed information; he can request further analysis; or, in a situation which appears to be particularly time-urgent, he can let the expert system take the decisions about the flight and about fire control.

The autonomous vehicle project under DARPA's strategic computing programme requires a more ambitious use of AI techniques. It is supposed to be a demonstration platform for vision and image-understanding technology with the general (and somewhat vague) purpose of producing a military vehicle capable of adapting to its environment and mission. The sensor information on the environment will initially come from a single TV camera mounted on top of the vehicle; later this may be complemented by a five-colour laser scanner/radar.

Using a monocular sensor, a large number of computations must be performed to determine the outline of even a reasonably straight paved road. This is particularly true when the vision system is turned on for the first time and it has to determine the three-dimensional location of the road ahead, based on projective geometry and various pattern and line-matching procedures. When the vehicle starts to move forward, this is initially only expected to be

done in stops and starts; in fact, it has to stop every 6 metres to recalculate a new outline of the environmental features before it can proceed. If the vehicle is to move forward steadily, at a speed of 20 km an hour, the computer hardware will have to operate about 100 times faster than at present.

While some military AI applications obviously require much further development work, other applications are emerging relatively quickly. Several expert systems which perform system diagnosis and self-maintenance functions have already been tested commercially, and there is no reason why similar systems could not be used in a weapon such as a tank. Such a system would automatically recognize internal subsystem malfunctions and diagnose the specific problem area. Subsequently, it could either recommend corrective action to the system operator or, eventually, take the corrective action itself and provide a report of what it had done.

V. Command and control

Computers have a dominant role in today's military command and control structure, on both a tactical and strategic level.[9] It has often been argued that the present battle management, command, control and communications (BM/C^3) systems suffer from severe deficiencies;[10] very large sums of money are currently being spent on upgrading them. Advances in computer technology and software are certain to be part of these programmes.

As one example of a problem area, there are the many false alarms coming from NATO's computerized early-warning systems. Once, the rising moon was interpreted by the control computers as signalling a massive missile attack, and there are many other cases involving natural phenomena, like flocks of wild geese. So far, however, human controllers have had enough time to intervene and cancel the alert. In this and similar areas, it is likely that more 'intelligent' computers with expert system software will be introduced so as to perform threat assessments which automatically eliminate some of the more obvious false alarms.

Nuclear strategies could be affected in a number of important ways by the introduction of advanced computing. At present, since command systems are vulnerable, there is a bias towards quick execution of predetermined nuclear employment plans—in the United States of the Single Integrated Operational Plan (SIOP). Expert systems could provide more flexible options for retaliation, by using a predetermined set of rules and doctrines rather than a predetermined set of specific actions. However, it is of course open to question whether there is any system which would really give decision-makers control of a nuclear war-fighting situation.

On the tactical battlefield there are new operational concepts which emphasize deep strikes into enemy territory. These would require commanders to take very rapid decisions on the basis of very large amounts of information coming from airborne and ground-based sensors which report electronics, signals and imagery intelligence. Here again, more and more important elements of command and control functions are likely to be taken over by automated procedures of expert systems.

VI. Strategic defence implications

The military applications of AI techniques and expert systems raise an important general issue: 'intelligent' machines seem likely to take over an increasing range of significant military decisions, leaving humans in the role of spectators. This is most clearly the case with the plans for strategic defence. The DARPA strategic computing programme[11] states succinctly that 'an extreme example of such a case is the projected defense against strategic nuclear missiles, where systems must react so rapidly that it is likely that almost complete reliance will have to be placed on automated systems'.

The debate over SDI has so far tended to be about the physical requirements for specific missile defence-oriented weapon technologies, either conventional ones like missiles or advanced ones like lasers and particle accelerators. While this debate will certainly go on, it is becoming increasingly clear that the technical feasibility of SDI will depend very heavily on solutions to a variety of BM/C^3 problems.[12] This gives the strategic computing programme a quite decisive role.

A future strategic defence system is supposed to have a layered structure (four to eight layers have been discussed) so as to ensure a significant degree of efficiency. A variety of sensors based in space, in the air and on the ground would provide information to weapon platforms on a possible attack and, subsequently, on target location, kill assessment, and so on. Defensive action would have to be taken on very short notice to make sure that the system is not overrun by decoys and other countermeasures. The nature of the complex battle management required, coupled with the speed-of-light action of some of the advanced weapons, would imply extremely short decision times for all command and control functions.

There would always be the possibility, therefore, of an automatic response to, say, a false warning signal which reported that a satellite vital to the SDI system was being attacked. This could set in motion an action-reaction sequence, with no effective mechanism for stopping the process of escalation.

The question of whether one should reasonably rely on computer-based, automated decisions in BM/C^3 is more related to problems of software reliability than to doubt about projected progress in computer hardware.[13] The SDI software may be roughly estimated to require tens of millions of lines of computer code and, apart from the huge theoretical challenge of devising such a complex program, the fundamental problem is how to avoid 'bugs', that is, unanticipated features which would make the program run astray under certain circumstances. No single programmer could be expected to have a complete overview of a 10 million-line program, and the multitude of possible interconnections between the modules of even a well-structured code makes bugs inevitable.

As many people will have experienced, bugs exist, for example, in commercially available word processing programs for personal computers which characteristically may only contain a few thousand lines of code. Software producers subject programs of this kind to extensive tests, and the product is released only when the discovery of bugs has reached an acceptably

low level. Nobody seems to believe that bugs in programs of some complexity could be eliminated altogether. A special problem for SDI software would of course be that it could only be tested once under realistic conditions.

A number of ways out of the software reliability problem have been suggested. One way would be to subject the software to elaborate simulation tests, which eventually would lead to an elimination of the bugs, one by one. While this is certainly possible, it is also likely that the number of required simulations for an extremely large-scale program would be so high that the testing could not be brought to an end within a realistic time span. Another proposal is to apply automated programming techniques for writing the SDI software. This approach appears, however, to be somewhat illusory since automatic programming would amount to nothing more than implementing yet another high-level language. The human programmer would therefore again be presented with many possibilities for introducing bugs.

At this stage, the proponents of SDI, who argue that a strategic defence need not be completely effective in order to serve a useful purpose, may come up with the similar argument that the SDI software does not have to be absolutely reliable in order to make the effort worthwhile. There is, nevertheless, one very important difference in the implications of these two arguments: if it is asserted that a moderately effective strategic defence would diminish the incentive for the intentional use of strategic nuclear weapons, then it ought also to be acknowledged that unreliable software could significantly increase the risk of an outbreak of unintentional nuclear war.

VII. Computer-aided arms control

There exists a big potential for more peaceful applications of AI techniques, where the reliance on 'intelligent' software for analysis and decision-making purposes would appear to be acceptable and indeed desirable. There have already been remarkable industrial applications of computers in the form of CAD/CAM (computer-aided design and computer-aided manufacturing) techniques, and the introduction of expert systems in many complex social functions is gaining momentum.

In the arms control field there are two areas in which computer-aided arms control (CAAC) could acquire an interesting role in the coming years. First, there is the area of monitoring and verification; and second, the modelling and analysis of problems associated with strategies and negotiations.

In military intelligence gathering and analysis, the computer already plays a central role in assessing the tactical and strategic posture of the adversary; it is therefore an indispensable tool for reinforcing confidence and maintaining crisis stability. Similarly, all major arms control treaties require effective monitoring and verification of the relevant military activities. The emphasis so far has been on national technical means of verification, which to a large extent are satellite based. The monitoring technologies involve electronic, infra-red and photographic sensors as well as radars, which together produce a vast amount of data requiring elaborate assessment and analysis.

Many of these activities could be performed by 'intelligent' computers with

important gains in speed and data-handling capacity. Thus the US Defense Mapping Agency is currently putting great emphasis on AI techniques for interpreting data from remote sensing satellites like the LANDSAT satellites.[14] AI and expert systems are particularly suited to photo-interpretation problems, where pattern recognition is particularly important. The new technical possibilities for the use of powerful processors on-board satellites could further these developments.

More recent approaches to arms control verification, such as international or regional satellite-monitoring agencies[15] or automated on-site inspection, may become economically and technically more attractive as new advanced computing methods emerge. Thus, for example, platforms for satellite monitoring could become more cost effective if expert systems enable them to maintain themselves and so have a longer operating life. Automated procedures could also reduce the manpower requirements for analysis.

The second general arms control area where AI techniques could turn out to be useful is for the modelling and analysis of international relations, in particular superpower strategy and negotiations. An interesting conceptual framework for these problems may be found in game theory[16] where, for example, certain features of nuclear deterrence postures and verification approaches can be formulated in a simple language which a computer can understand.

So far, the theory and the models relevant to this area have been rather crude. Some of the game theory models nevertheless manage to quantify many real world features—for example, that perfectly 'rational' decisions about weapon acquisition may lead to results which damage the security of the players. As computer modelling techniques develop, it may be possible to take into consideration more and more important elements of superpower relationships, including even psychological ones.

The arms buildup, both nuclear and conventional, is a very complex process; in addition, tactical and strategic doctrines differ between countries and are constantly changing. As a consequence, arms control experts on both sides have an extremely difficult task in trying to reconcile and reassess their various national security imperatives. Nevertheless, it may perhaps not be too far-fetched to speculate that an expert system, based on data (i.e., quantity and quality of weapon systems) and rules (i.e., doctrines and employment plans), could somehow turn out to be of value in the arms control negotiation process.

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10. Emerging technology

GUNILLA HEROLF

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

Emerging technology (ET) is a concept known since the early 1980s: it is the NATO effort to take advantage of a higher level of technology in order to improve conventional weapon capabilities *vis-à-vis* the Warsaw Pact.

'Emerging technology' is used for a range of technological developments. Some are *exploratory* technologies which may be incorporated in weapon systems some 15–20 years hence. Others are *emerging*—that is, they are systems which may be fielded in the 1990s. Still others have already *emerged*; that is, some of them are already incorporated into weapon systems.[1]

Weapon systems incorporating emerging technology are now being developed in the USA and Europe. As yet, however, there is no complete NATO conceptual framework for their use to serve as a guide for selecting the weapon systems. There is disagreement as to the technical and operational feasibility of some of these weapon systems and European apprehension for a worsened arms trade balance. There is also discussion on the effects of some concepts which incorporate emerging technology, such as NATO's FOFA (follow-on forces attack) and the US Army's AirLand Battle doctrine. Critics of these concepts hold that they might negatively affect crisis stability and lower the nuclear threshold. Different views are expressed on the relevance of the US doctrine for Europe. These discussions reflect different perceptions of threat and security, of a fundamental nature for NATO.

II. ET priorities

The concept of emerging technology was first outlined by US Secretary of Defense Caspar W. Weinberger at a NATO Defence Planning Committee Ministerial meeting in May 1982. It was endorsed at the Bonn Summit meeting a month later[2] and once again advocated by Weinberger at the NATO Defence Planning Committee meeting in December 1982. A paragraph of the final communiqué from the latter meeting reads:

> Consistent with the Bonn Summit mandate, Ministers received a United States paper on taking advantage of emerging technologies to improve conventional capabilities and thereby enhance deterrence and defence. They agreed that NATO should actively seek ways to exploit these technologies within the co-operative defence planning process and endorsed the pursuit of NATO efforts to look for the economical and efficient application of emerging technologies.[3]

Since this meeting, various NATO bodies have repeatedly stated their general

support for efforts to exploit emerging technologies. Furthermore, in 1982 NATO's Supreme Allied Commander, Europe (SACEUR) General Bernard Rogers launched the concept of FOFA which had then been in preparation for several years. FOFA would use emerging technology for deep strikes on the second and third echelons of enemy forces: attacks on fixed and moving targets would subject advancing forces to delay, disruption and destruction. In order to attack moving targets, advanced weapon systems, surveillance systems and information processing systems would be used. The proclaimed purpose is to raise the nuclear threshold by increasing the conventional weapon capability within the doctrine of flexible response. This plan was formally approved by the NATO Defence Planning Committee in November and December 1984.[4]

There has, however, also been evidence of hesitation and criticism regarding the ET proposals. For European NATO countries, the Independent European Programme Group (IEPG) has been concerned about the effects of ET developments on their technological base and arms industry. One aim of the Group is to redress the ratio in military sales, which is much in the US favour. In order to acquire European participation in ET development, the IEPG is promoting co-ordination between the European countries already at the R&D level and harmonization of their national requirements.[5] A number of joint projects have been proposed by the IEPG through the NATO Conference of National Armaments Directors (CNAD).[6]

The European view that priority should be given to the development of emerging technologies which support combat against the first echelon of enemy forces was argued by the IEPG in a report constituting the answer to the Weinberger initiative on ET.[7] Similarly, the NATO Military Committee has treated ET priorities in 'animated discussion'. When FOFA was approved by this committee for discussion at the national level, it also stressed the importance of countering the first (rather than the second or third) echelon.[8]

At the December 1983 meeting of the Defence Planning Committee, NATO ministers agreed to create a conceptual framework before dealing with the details of emerging technologies: the framework would form a military guide for long-term planning. It would be a basis for establishing priorities for the selection and application of emerging technologies in meeting military requirements. The main initiators were Defence Minister Wörner of FR Germany and then Defence Minister Heseltine of the UK.[9]

The Conceptual Military Framework study, which is still in progress, was endorsed at the NATO Defence Planning Committee meeting held in December 1985. The document, while still secret, is known to identify seven wartime 'key mission components' listed in the following order: to defeat the leading echelon of enemy forces, to implement FOFA, to attain and maintain a favourable air situation, to control sea lanes, to project maritime power, to control and protect allied shipping, and to safeguard NATO rear areas. The study will continue in order to allow new technologies to be introduced according to the plan which will be provided in this document. The study is expected to be completed by the end of 1986.[10]

III. Long-range weapon systems

While these discussions of priorities are being held, different categories of weapons are already being developed in many NATO countries. They are described below.

Dispensers

Dispensers are among the ET systems that are already operational. They are large containers carried underneath an aircraft. Weighing several tonnes, they are of the so-called captive type (i.e., the aircraft has to fly over the target before releasing submunitions, consisting of bomblets and mines, from the dispenser).

The Mehrzweckwaffe-1 (MW-1) dispenser was developed in FR Germany and has been operational there since November 1984. It has 112 submunition tubes, the number in each tube depending on the type of submunition. The targets envisaged are armoured formations and airfields. At present, however, only unguided submunitions for use against the former type of target are operational: the KB-44 bomblet, the MIFF anti-tank mine and the MUSA multi-fragmentation mine. The group of airfield denial submunitions, which is scheduled for operation from 1987, consists of the STABO anti-runway bomb, the MUSPA mine and the ASW weapon, designed to penetrate hardened aircraft shelters.

The British JP233 is a similar type of dispenser. It is intended for use against airfields and is equipped with the SG357 runway-cratering bomb and the HB876 area denial mine.[11]

Ballistic missiles for attack on fixed targets

In a military confrontation in Europe today or in the future, aircraft would be very vulnerable owing to the much increased capability of air defences. Long-range missiles are therefore being developed as a complement to manned aircraft.

In their Counter-Air 90 report, the US Department of Defense suggested long-range ballistic missiles carrying large amounts of submunitions for use against such targets as airfields. Airfields would be attacked before Warsaw Pact aircraft had returned from an attack on Western Europe. These aircraft would then have to be reallocated to dispersal air bases where they would be more vulnerable to attack. Other targets, such as command and control centres and choke points such as bridges and railway marshalling yards, also belong to this group of high-value targets, which are considered important to attack at a very early stage of a conflict. Calculations made by proponents of these weapons have shown the increased efficiency compared to attacks by aircraft.

A number of conventional missiles were previously in development in the USA or were proposed for this mission. Some were proposed to use booster components from existing space launchers: for example, the TABAS missile (also known as the TABASCO or the Incredible Hulk) which would be built on the Saturn launcher. Others were to be developed from existing nuclear

missiles, such as the Pershing II, Polaris, Trident and Minuteman. At present only one of these missiles is still in development: the CAM-40, a conventional version of the Pershing II missile. It will be a single-stage version only, with a range of 350 km, but it will be able to attack about 70 per cent of the Warsaw Pact air bases. The system could, if so decided, be deployed in 1989 according to the producers, so it is among the ET systems that are comparatively close to introduction.[12]

Cruise missiles for attack on fixed targets

Within NATO a different type of missile is being considered for deep strikes on high-value fixed targets: the Long Range Stand Off Missile (LRSOM), a cruise missile containing a large number of submunitions. The missile would be launched from aircraft. The range is still under discussion but might be about 200 km.

A Memorandum of Understanding (MoU) was signed in July 1984 for this weapon by FR Germany, the USA and the UK, in which they agreed to share the work equally. Two US–British–West German industrial consortia have now been selected for feasibility studies. The missile is envisaged to enter service in the early to mid-1990s. In spite of these agreements there is concern in Europe about the US commitment. Not long before signing the MoU, the US Defense Department stated its preference for a ground-launched ballistic missile for this type of mission since it would be less costly to develop, produce and operate than a cruise missile. Furthermore, the US Air Force is developing another long-range cruise missile and has no formal requirement for the LRSOM. It has been suggested that the LRSOM should instead be used for other types of target: an attack on airfields in particular would be time-urgent and therefore more suitable for the faster ballistic missiles.[13]

Surveillance and C³I for attack on mobile targets

In order to attack a target, its position must be established. The positions of fixed targets are known beforehand from satellite data and other means of reconnaissance. Locating mobile targets is considerably more demanding; furthermore, information on their positions must be forwarded in real (or almost real) time to command centres, where it is evaluated and decisions are taken on which targets to attack. Orders are then forwarded to the weapon operators.

The US Joint Stars or JSTARS aircraft-based radar is intended to locate and track targets for ground- and air-launched missiles. It will also have the capability to guide missiles to these targets. To do this, aircraft would fly along the border at a distance of some 50 km while scanning the area on the other side of the border, allowing vision into enemy territory of 100–150 km.[14]

The selection of aircraft platform for the JSTARS radar has created a controversy. The US Army and Air Force agreed in May 1984 to use the C-18, the Air Force's preference. However, this has caused much criticism since the C-18 is so large that it is considered to be extremely vulnerable. In a compromise reached in September 1985 it was agreed to buy only a small number of C-18s.

The follow-on platform, according to a Pentagon official, is likely to be 'a more survivable TR-1 aircraft or even a drone'.[15]

Information from the JSTARS would be co-ordinated with information from the Precision Location Strike System (PLSS). The PLSS is designed to detect emissions from enemy radar and locate their positions. PLSS can also direct the attacking aircraft to computed points for release of their weapons. The system is now being flight-tested.[16] Useful information for attacking ground targets can also be gathered from electro-optical cameras carried by stand-off aircraft and from the Airborne Warning and Control System (AWACS). A number of systems are being developed for processing these data and forwarding them through jam-resistant channels. The task is, however, very difficult: data would be generated by a large number of different sources. There would be a need for extensive co-operation between the various NATO forces and the armed services. The decision process for selecting targets to attack must allow for the fact that priorities and the value of a target would be constantly changing and also that attacks would have to be synchronized. Finally, the available time would be very short.

Missiles for attack on mobile and fixed targets

The USA has since the mid-1970s been developing missile systems for attack on fixed and mobile targets at long ranges. Developments have been carried out in the Assault Breaker test programme, using the T-16 and T-22 missiles, which were developed from the Lance and the Patriot missiles, respectively. The aim was to develop a common ground-launched Army and air-launched Air Force missile. The programme also included testing with guided submunitions. The JSTARS radar, part of the system for attack on mobile targets, was simultaneously tested by the Air Force.[17]

In May 1984 the two services, which had never quite endorsed the idea of a joint missile, decided to develop their own versions: in June 1985 an Army request for bids for what is now called the Army Tactical Missile System (ATACMS) was finally released. The requirement is for a missile with a range of 200–300 km, four of which should fit a modified Multiple Launch Rocket System launcher (which otherwise contains 12 rockets).

The Air Force is developing a cruise missile with stealth capabilities. The development of this missile was carried out secretly after the decision was made to develop a separate Air Force missile. A contract was awarded in 1985.[18]

Drones

Drones (pre-programmed pilotless aircraft) are now being developed as long-range weapons. The anti-radar type of attack drone is intended for use against enemy air defence radars, surface-to-air missile sites and communications transmitters. The West German Air Force has requested bids from three companies for an anti-radar drone, the Kleindrohne Anti-Radar (KDAR). The main target is the radar of the Soviet ZSU-23-4 anti-aircraft gun. The UK is seeking industry teams for full-scale development of this type of drone.

The Federal Republic of Germany is also developing an anti-tank

drone, the Panzer-Abwehr-Drohne. Compared to using missiles for the same tasks, the advantage of drones is that they can independently search for and acquire targets in a given area. The drones would find their targets by searching according to a pre-programmed search pattern or while loitering in the area. Different combinations of acoustic, millimetre-wave and infra-red sensors are being tested for homing in on targets.[19]

Guided submunitions

Guided submunitions are essential for ET long-range weapons, to allow them to attack individual targets. These submunitions are planned to be ejected from dispensers, missiles and drones. They would consist of warheads and sensors: infra-red (IR) and millimetre-wave radar sensors are being developed to be used either separately or together.

A large number of types of guided submunition are being developed. The Skeet is a candidate munition for the ATACMS missile. Four Skeets would be housed in a cylindrical Sensor Fuzed Weapon (SFW). The SFWs, after descent by parachute and release, would eject Skeet warheads with infra-red sensors to search in the area below for targets. The warheads would then fire explosively forged penetrator (EFP) projectiles into the targets.

The SADARM (sense and destroy armour), a similar type of submunition, would search for targets using both IR and millimetre-wave sensors.[20]

IV. Short-range weapons

Most of the long-range weapons and systems suggested or developed under the heading 'emerging technology' are US initiatives and would be developed by the USA. A number of other projects have been suggested by European NATO members in the CNAD list. These projects are to a large extent concerned with shorter-range weapons and would be joint US–European efforts.

After the ET concept was launched, the CNAD was given the task of investigating 'near term opportunities' in the field of emerging technology: projects should have at least one European member willing to develop them in co-operation with the USA. The CNAD produced its first list in April 1984. The current list comprises the following nine projects: Low-Cost Powered Submunitions Dispensers (LOCPOD) for fixed targets, Short-Range Anti-Radiation Missiles (SRARM), Electronic Support Mission (ESM) for passive detection of enemy aircraft and vehicles, Remotely Piloted Vehicles (RPV), terminally guided submunitions for the Multiple Launch Rocket System (MLRS), automated 155-mm precision-guided munitions, the NATO 90 helicopter (NH-90), the NATO 90 frigate (NFR-90) and the NATO Identification System (NIS).[21]

Some of these projects are similar to those for long-range weapons: an attempt to achieve precision attack beyond the field of vision, without having to use penetrating aircraft. The MLRS and the 155-mm artillery will thus receive real-time surveillance information from RPVs. The

terminally guided submunition will further increase the accuracy of these weapons.

The MLRS started as a joint NATO project with a 1979 MoU signed by the USA, the UK, France and FR Germany, and Italy to join later. The MLRS is now in service with the US Army; it carries 12 unguided rockets with a range of 30 km. It will be deployed in Europe in a few years. It will then also carry unguided anti-tank warheads. A contract for development of terminally guided anti-tank submunitions was given in November 1984 to a US–French–West German–British consortium. Each warhead will carry six submunitions which can each search for targets within a small area using millimetre-wave sensors. Discussion of these submunitions has been intense: European countries insisted on being involved in the advanced technological development, rather than being relegated to being sub-contractors or licencees.[22]

The countries that are scheduled to receive the MLRS rocket system are all planning to use it with RPVs for real-time surveillance, for attack on moving targets. RPVs in development include the US Aquila, the British Phoenix, the French–West German Brevel, the West German KZO (KleinZielOrtung) and the Italian Mirach 20. These RPVs would survey an area up to some 50 km on the other side of the FEBA (forward edge of the battle area) by flying over it in a pre-programmed or manually operated pattern. They would identify targets and continuously transmit data on their position, thereby enabling the MLRS to attack moving targets beyond the field of vision. The guided submunition would furthermore enable point (as opposed to area) targets to be attacked.[23]

Regarding the 155-mm type of artillery, a study is now being made by the NATO Industrial Advisory Group (NIAG) to explore the possibilities for adding terminal guidance.[24]

The LOCPOD programme aims at producing a dispenser by taking advantage of off-the-shelf technology, and at a cost not to exceed $100 000 a piece. The dispenser, which is intended for fixed targets such as airfields and radar emplacements, would have a range of some 35 km after release from an aircraft and would enter service around 1990. An MoU was signed by Canada, Italy, Spain and the USA in 1984, after which a consortium was formed by firms in these countries. The consortium will develop a derivative of the US Brunswick Low Altitude Dispenser (LAD). This programme has been criticized in Europe for not being a true co-operation programme but rather a US attempt to sell Europe a technology already developed by the USA (with West German participation). A number of Italian companies have organized a team to develop a powered short-range dispenser, apparently as a back-up programme. This team is believed to be planning for co-operation with FR Germany and France, where two consortia are developing competing short-range dispensers—the Mobidic and the CWS/Apache. These dispensers can carry submunitions for moving as well as fixed targets.[25]

The short-range anti-radar missile (SRARM) is intended for immediate self-defence for aircraft and helicopters. Two versions are probably envisaged: one for ground attack and one for air-to-air attack. This was the first item on the CNAD list on which an MoU was agreed, but since then development has proceeded slowly. One reason seems to be the fact that no fewer than seven

countries are involved: Belgium, Canada, FR Germany, Italy, the Netherlands, the UK and the USA. There have also been doubts as to the commitment of some of the participating countries: the UK and the USA have recently developed anti-radar missiles (the Alarm and the Harm, respectively), and the USA is furthermore involved in the similar Sidearm project.[26]

Another project on the CNAD list is an electronic support mission (ESM) for passive detection of enemy aircraft and vehicles: it would be a ground-based system to process data collected by various sensors.[27]

The NATO Identification System, including friend-or-foe identification, will also be developed. A West German–US dispute ended in December 1985 with the decision to combine characteristics of their respective systems.[28]

Two other projects were added to the CNAD list: one is the NATO 90 helicopter, for which both a naval and a tactical transport version are envisaged. The Armament Directors of France, Italy, FR Germany, the Netherlands and the UK signed an MoU in 1985 for a feasibility study on this helicopter.[29] The other is the NATO 90 frigate, for which an agreement has been reached; FR Germany is responsible for programme management. A feasibility study was completed in the autumn of 1985 by Canada, France, FR Germany, Italy, the Netherlands, Spain, the UK and the USA.[30]

These nine projects suggested by CNAD have varying time perspectives. A number of technologies, such as those for surveillance RPVs and dispensers carrying unguided submunitions, have already emerged. For some of these projects, there is not yet enough information on the extent of 'emerged' as opposed to 'emerging' technologies. Clearly, the precision-guided submunitions—which still require a number of years of development before they can be fitted to the weapons—are emerging technologies.

The CNAD list should not be regarded as final. It has already been amended since its presentation in 1984. It is more a reflection of present industrial interests than the result of a comprehensive evaluation of future needs. It does, however, give an indication of the priorities as now seen by the European NATO members.

V. Exploratory technologies

Whereas much effort has been given by NATO to already emerged or nearly emerged technology, steps have also been taken for co-operation to develop weapon systems which will be operational in the more distant future. Five fields of technology have been selected for jointly funded research: microelectronics, high-strength lightweight materials, compound materials, image processing and conventional warhead design. The National Armaments Directors have been given the task of bridging the gap between these co-operative technology projects and the actual weapon systems in which they would be used. The decision to carry out this research was taken by the European NATO Ministers of Defence at an IEPG meeting in London in June 1985. The ministers further stated at this meeting that account should be taken of parallel developments in Europe, that is, the French Eureka programme.[31] Eureka is claimed to be a

civilian programme and would therefore officially not be an alternative to these co-operative technology projects. Nor would European contributions to the US Strategic Defense Initiative. These programmes, however, all deal with basic technologies and would therefore compete for the same limited European financial and scientific resources.

VI. Areas of concern

The arms industry

European apprehensions that the introduction of ET weapons might worsen an already unfavourable arms trade balance are, as described above, being handled by the IEPG and the CNAD. The present forms of co-operation are largely considered too weak. At the CNAD meeting in April 1985 a proposal was discussed for an 'umbrella' MoU to be signed by the USA and European countries, legally committing the two parties to co-operation.[32] These apprehensions have also been visible in specific US-European arms co-operation negotiations. The fears concern emerging technologies as seen both in the short run and in the long run and have been increased by US statements of the dangers of technological leaks to the East when sharing technology with alliance members.

A number of heavy investments in such projects as the Tornado, MLRS, MW1 and JP233 have recently been made by European countries. These weapons are among those envisaged for FOFA according to General Rogers, thereby countering allegations that the FOFA concept was initiated as a means to further US arms sales to Europe.[33]

To ensure involvement in emerging technologies in the long run, Europe acted by initiating R&D co-operation in basic technologies. It has been claimed that, in spite of US assertions to the contrary, there is no technology gap: there is only a gap in systems engineering and implementation owing to national, fragmentary efforts. There would therefore be no reason for the USA to exploit these technologies while Europe is restricted to licence production.[34]

The cost estimates for implementing ET systems for deep-strike missions vary greatly. While two deep-strike proponents, Cotter and Wikner, have estimated the costs over the next 10 years at $9.4 billion (1983) and $13 billion (1984), respectively, other estimates have been considerably higher.[35] In an interview in 1984, General Rogers calculated the costs of implementing FOFA at $30 billion over a 10-year period. He has therefore urged European NATO countries to make greater contributions, setting the goal at a 4 per cent real increase per year.[36] Critics claim that the same systems used at shorter ranges would be far more efficient and (partly therefore) cheaper.

The issue of arms trade balance has come to be connected to that of financial burden-sharing within the alliance. The USA considers that it carries a disproportionate burden of the NATO defence expenditure. An amendment was suggested to the US Senate in 1984 by Senator Nunn, arguing for US withdrawal of troops from Europe if European contributions were not increased. It was rejected by a small margin. Increased European commit-

ments led in 1985 to a new amendment by Senator Nunn which devoted $200 million to US–European arms co-operation in emerging technology R&D, aiming at improving the European share, and $50 million for testing of allied weapon systems against US requirements.[37] Three areas have been suggested by the USA for co-operation. They are: (*a*) the Army Tactical Missile System, (*b*) a battlefield intelligence collection and exploitation system, and (*c*) the NATO Identification System.

The European reaction to this initiative has been positive but cautious. Jan van Houwelingen, the IEPG's outgoing chairman, said that Europeans want to obtain a guarantee from the USA that this $200 million will not be used to subsidize US projects, but will indeed be utilized for genuine joint projects. He stated, however, that Europeans believe that the United States has good intentions in this connection. The IEPG members further agreed to suggest six projects for this type of co-operation, one of which—the NATO Identification System—was included in the US list. The others were among those suggested earlier by CNAD, with one addition: a surveillance and target acquisition system.[38]

Technical and operational feasibility

The use of ET systems for deep strikes has been subject to criticism in both the USA and Europe for leading to far lower returns than those claimed by the proponents. The systems rely on advanced technology and constitute a chain where each link must work in order for the system to work. They are therefore prone to malfunction. The different parts of the system (the aircraft-mounted JSTARS radar flown close to the border, the complex information system and the guided submunitions) are further vulnerable to countermeasures. The submunitions are not only considered easy to counteract through camouflage, decoys and other means, but would also, because of their small size, have a limited effect on targets.[39]

A prerequisite for a NATO attack on follow-on forces is that the WTO actually commits its forces in successive waves or echelons. NATO believes that it can keep the enemy troops engaged in battle at a manageable level by striking at massed rear echelons. However, a number of analysts claim that a more probable scenario for the WTO is a sudden attack in one echelon. There would thereby be fewer targets for NATO in the rear areas and less massing at choke points, since this type of attack would be made on a broad front.[40]

Furthermore, the increased Soviet emphasis on mobility, operational flexibility and forward penetration options is believed to make deep NATO strikes less viable. Mobile Soviet combined arms groupings would rapidly exploit breakthroughs made by penetrating forces. They would attack NATO C^{3}I and other assets essential for carrying out deep strikes. They would further increase interspersion of NATO and Warsaw Pact forces, thereby making targeting more difficult for NATO.[41]

Crisis stability and the nuclear threshold

Conventional deep-strike weapons using ET would, according to their proponents, contribute to raising the nuclear threshold. Through the increased conventional capability of these weapons NATO would, if attacked by the WTO, no longer have to face the alternatives of defeat or recourse to nuclear weapons after only a few days of fighting. The intention is not to renounce the option of first use of nuclear weapons but to avoid an early first use. The doctrine of flexible response is thereby claimed to become more credible. These changes in conventional balance would, it is hoped, act as a deterrent against a WTO attack on Western Europe.

Others claim that the effect of these proposals might be neither to raise the nuclear threshold nor to discourage an attack. One application of emerging technologies which was met with strong criticism was the suggestion to use long-range ballistic missiles for counter-air missions. Some missiles which were envisaged for these missions would have fixed basing. The US suggestion for deployment of these weapons in Europe was immediately rejected even by West German Defence Minister Wörner, considered to be a proponent of deep strike, but who for these missions preferred smaller and mobile weapons: 'Can you believe the *political* problems? Silos for Minuteman in Europe? Nobody would believe that these are conventional weapons—not just the Soviet Union, but my own people'.[42]

The opposition, apart from citing the problems of verifying that the missiles are not nuclear, has referred to the increased danger of pre-emptive attacks caused by these weapons. The missiles would be highly vulnerable to attack if they had fixed bases. It would furthermore be an advantage for the other side to attack the missiles before they are themselves attacked by them. This leads to the temptation for both sides in a tense situation to try to launch their weapons first. In view of these objections, the only missile remaining in development, the CAM-40, is mobile, and is claimed by the developing firm to be, in its present version, easily distinguished from a Pershing II.[43]

The concerns about the destabilizing effects of weapons when there is an advantage in pre-emptive attacks apply as well to weapons associated with the FOFA concept. These weapons would also be high-ranking targets. When mobile, however, they would be less vulnerable. Ballistic missiles are considered more destabilizing than cruise missiles and drones owing to their shorter flight-times. FOFA weapons, like the counter-air weapons mentioned above, would also need to be unambiguously non-nuclear in order not to lower the nuclear threshold by causing a nuclear response to a conventional attack which is not perceived as conventional. In addition, apprehensions have been voiced about the loss of political control over deep-strike weapon systems such as counter-air and FOFA systems, since decisions would have to be made quickly. This would leave little time for political consultation.

Further apprehensions have emerged in Europe concerning the so-called AirLand Battle doctrine adopted in 1982 by the US Army. Although other NATO countries also have national doctrines, it is considered that none would affect fundamental principles within NATO to the same extent as the AirLand

Battle doctrine. The doctrine is valid for the corps level, which makes it relevant for an area of about 150 km in depth. The document outlining the doctrine is the 1982 edition of Field Manual 100-5. According to the manual, enemy forces would be attacked 'with fire and manoeuvre' to exploit vulnerabilities anywhere, thereby taking advantage of emerging technologies. Conventional, nuclear, chemical and electronic means would be integrated.[44]

The AirLand Battle doctrine has in Europe largely been considered too offensive for a defensive alliance. Also, the integrated use of nuclear and conventional means has been claimed to create a deliberate lowering of the nuclear threshold not compatible with flexible response. Senior European army officials have expressed 'extreme scepticism' of counter-attacks by ground forces extending more than 40–50 km into enemy territory. For FR Germany, it is important not to be provocative *vis-à-vis* the German Democratic Republic, since this would undermine the policy of rapprochement between the two countries. Furthermore, the manoeuvre type of warfare of AirLand Battle is considered by some to be incompatible with the principle of forward defence, to the extent that manoeuvre warfare in the rear areas of FR Germany is envisaged. This principle, equal in importance to that of flexible response and a condition for West German participation in NATO, implies that the bulk of the troops would be deployed at positions within 40 km of the border.[45]

In order to alleviate European apprehensions, General Rogers has on a number of occasions stressed that the AirLand Battle doctrine is not applicable to Europe:

> – We do not plan for the integrated use of conventional, nuclear and chemical weapons in ACE [Allied Command Force]. We make a clear distinction between conventional and mass destruction weapons. Any use by the Alliance of either chemical or nuclear weapons would always be in accordance with release procedures approved by Alliance political authorities.
>
> – We will not engage in pre-emptive strikes. NATO is a defensive Alliance and as such will never fire the first shot.
>
> – Contrary to popular perception, we will not attack across our borders with ground forces heading deep into the enemy's rear area. We will, however, use the counter-attack—the essence of a viable defence—to restore our borders.
>
> These indicate some of the aspects of AirLand Battle . . . not appropriate for ACE. Although some of NATO's national forces operate under tactical and operational doctrines and procedures which exhibit varying approaches to land combat, all forces which would come under SACEUR's command in the event of war would operate under an ACE Chain of Command and ACE policies, doctrine and concepts—not those of any single Alliance nation.[46]

In the USA, however, AirLand Battle seems generally to be considered for Europe. One US analyst states the importance of defining the conditions in which AirLand Battle applies and justifies 'high-intensity conflict in Europe'.[47] Contrary to Rogers' statement, Brigadier General Anthony Smith, Principal Director for European and NATO Policy on the staff of Defense Secretary Weinberger, stated:

I would say now that I think 'AirLand Battle' is going to be fairly well accepted. Of course, what you have to remember is that each nation has its own peculiar force structure and weapons systems, so it's not surprising that nations might approach the same business of trying to defend Western Europe in a different manner. One should not necessarily insist on any identity of doctrine throughout.[48]

In congressional hearings for Department of Defense Appropriations for 1986, the US Army states that: 'The Army's operational doctrine is AirLand Battle. It is intended to be supportive of NATO's approved doctrine of Follow-on Forces Attack'. It is further stated that in NATO operations US Army doctrine would be adapted to correspond to NATO strategy and alliance doctrine. It does not, however, say which parts of the AirLand Battle doctrine are not considered applicable in a NATO setting.[49]

On the US side it is further stressed that the offensive elements do not contradict the defensive purpose of NATO: 'The alliance is a defensive alliance but it has never foresworn offensive tactics in order to pursue a defensive strategy'.[50]

Different threat perceptions seem to underlie these different views: to some, critical of the proposed systems, security is reduced when concepts are implemented that can be considered by the Soviet Union to be offensive. The proponents, referring to the offensive postures of the Soviet Union, believe that security is enhanced through increasing weapon capabilities, even if these weapons could be interpreted as offensive by the other side. The threat is thus treated as a constant factor by the proponents, while for the opponents it varies according to one's own actions.

VII. Complements and alternatives to ET

Other efforts have also been made for improving NATO's conventional capability: they do not compete with the suggested ET systems other than as regards costs. In December 1984 the NATO defence ministers decided to implement great improvements in sustainability, notably increases in munition stocks and in infrastructure such as hardened shelters for aircraft. These areas are also endorsed by proponents of emerging technology such as General Rogers and Senator Nunn and are stressed in the Conceptual Military Framework.

In order to use existing resources more efficiently a number of suggestions have come from groups such as the so-called 'military reformers' in the USA. One of the suggestions is for light infantry forces, to give flexibility and mobility to warfare; another is to increase specialization of the forces in Europe.[51] Members of this group have stated that they favour advanced technology only when applied in militarily appropriate ways and in such a way as to simplify soldiers' tasks.

Another suggestion is for a conventional retaliation strategy envisaging conventional attacks deep into enemy territory also including targets in the Soviet Union. Prescribing *retaliatory* offensives into East European territory—not only tactical *counter*-offensives—it is a considerably more far-reaching concept than AirLand Battle.[52]

Very different approaches to this, centring around defence in the rear, have also been proposed. Short-range, defensive weapons would constitute part of a 'non-provocative' defence system. These weapons are sometimes suggested to be based on emerging technology. Technology is neutral, it is claimed, and advances in areas such as guidance and miniaturization could just as well be included in other types of weapon than those hitherto proposed.

VIII. The future

Emerging technology proposals reflect NATO's emphasis on technology, but ET has also become the focal concept for disagreement within NATO in other fields and has revealed the lack of common understanding. This disagreement is to a large extent between the USA on the one side and European countries on the other, even though a great variety of opinions exist on both sides of the Atlantic. Perceptions of weapons and tactics in NATO and their effect on crisis stability and the nuclear threshold are fundamental issues. Agreement on these issues is essential for the future of NATO. Sharing of technology and costs between alliance members as well as the arms trade balance are also important issues.

The order of development has so far been illogical: weapon systems incorporating emerging technology have been under development for a number of years, whereas the conceptual framework for their use has still not been settled. This order should be reversed.

Regardless of the outcome of discussions on a conceptual framework some emerging technologies will certainly be developed—technology is versatile and can have a great many uses. The future importance of these technologies should, however, not be exaggerated: new technologies have constantly turned out to require prolonged development and bring about less than the expected revolution in warfare. The development of new technologies is also bound to lead to development of technologies to counter them.

The implications for arms control efforts would have to be considered in discussions of the Conceptual Military Framework and in the various arms development decisions concerning emerging technologies. Effects on crisis stability and the nuclear threshold are too serious to be given second priority to the efficiency of the weapons.

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Technology and Western Security Policy, Part I, Adelphi Paper no. 199 (International Institute for Strategic Studies: London, 1985), p. 42.

[36] Interview with General Bernard W. Rogers, 'FOFA: myth or reality?', *Military Technology*, vol. 9, no. 3 (1985), p. 29.

[37] Roth, W. V., 'After the Nunn-Roth amendment', *NATO's Sixteen Nations*, vol. 30, no. 3 (July 1985), pp. 15–23; see also chapter 14.

[38] The other suggestions are for co-operation in development of a remotely piloted vehicle, a short-range anti-radiation missile, the NATO 90 frigate and the 155-mm autonomous precision-guided munition. *Atlantic News*, vol. 19, no. 1767 (16 Nov. 1985), p. 1; *Atlantic News*, vol. 19, no. 1768 (20 Nov. 1985), pp. 1–2.

[39] Canby, S. L., 'The conventional defense of Europe: The operational limits of emerging technology', *International Security Studies Program, The Wilson Center, Working Papers no. 55* (Washington, DC, Apr. 1984), pp. 1–34.

[40] Greenwood, D., 'Strengthening conventional deterrence: Doctrine, new technology and resources', *NATO Review*, vol. 32, no. 4 (Aug. 1984), pp. 8–12.

[41] Sometimes identified as OMGs in Western literature. The identification appears somewhat uncertain since this particular term is not used in Soviet sources.

[42] Schemmer, B., 'No "Incredible Hulks" to be deployed in West Germany or Great Britain', *Armed Forces Journal International*, vol. 122, no. 2 (Sep. 1984), p. 26.

[43] Voigt, K. (Rapporteur), 'Draft Interim Report of the Sub-committee on conventional defence in Europe', North Atlantic Assembly, Military Committee (Nov. 1984), pp. 23–5. See Wanstall (note 12).

[44] *Field Manual* 100-5 (Headquarters, Department of the Army, Washington, DC, 20 Aug. 1982).

[45] See for example Gessert, R. A., 'The AirLand Battle and NATO's new doctrinal debate', *RUSI-Journal*, vol. 129, no. 2 (June 1984); Davis, J. K., 'Europe's edgy approach to strategy', *Air Force Magazine*, vol. 68, no. 12 (Dec. 1985), pp. 82–5; Karber, P. A., 'The strategy: in defense of forward defense', *Armed Forces Journal International*, vol. 121, no. 10 (May 1984), pp. 34; Voigt (note 43).

[46] See Rogers (note 33).

[47] London, H. J., 'Military doctrine and the American character: Reflections on AirLand Battle', National Strategy Information Center, Inc. (Transaction Books: New Brunswick, 1984), pp. 59–60.

[48] 'Defence talks to Pentagon's NATO mentor', *Defence*, vol. 15, no. 11 (Nov. 1984), p. 651.

[49] Department of Defense Appropriations for 1986, Hearings before a sub-committee of the Committee on Appropriations, House of Representatives, 99th Congress (US Government Printing Office: Washington, DC, 1985), Part 2, pp. 186, 192.

[50] Burt R., in statement 'Developments in Europe, February 1984', Hearing, Committee on Foreign Affairs, Subcommittee on Europe and the Middle East, US Congress, House of Representatives, 98th Congress, 2nd session (7 Feb. 1984), p. 27. The quotation is from Sloan S. R., *NATO's Future: Toward a New Trans-Atlantic Bargain* (National Defense University Press: Washington, DC, 1985), p. 147.

[51] Canby, S. L., 'Light infantry perspectives', *Infantry*, (July–Aug. 1984), pp. 28–31.

[52] Huntington, S. P., 'Conventional deterrence and conventional retaliation in Europe', *International Security*, vol. 8, no. 3 (Winter 1983–84), pp. 32–56.

Part IV. Military expenditure and the arms trade

Chapter 11. World military expenditure

Introduction / NATO / The WTO / China / The Middle East / South Asia / The Far East / Africa / Oceania / Latin America

Chapter 12. The US defence budget

The FY 1987 defence budget request / Breakdown of consensus / The FY 1986 defence budget request / Congressional action / Fiscal issues in the debate on military spending / Procurement reform / The deficit reduction reform / Arms control issues and reports / Broader national security policy debates

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The flow of arms: general trends / The suppliers / Some recipient perspectives / Conventional arms control in the Third World

11. World military expenditure

RITA TULLBERG

US military expenditure is dealt with more fully in chapter 12, and Soviet military expenditure in chapter 13.

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

Since the beginning of the 1980s, military spending has been growing, on average, by over 3 per cent above inflation each year. In the second half of the 1970s, the average yearly real growth rate was 2 per cent. Higher rates of spending between 1980 and 1985 compared to the preceding five years have been recorded by NATO, the Warsaw Treaty Organization (WTO), the Middle East, South Asia and Oceania.

The same pattern can be observed when looking at countries classified according to economic group (appendix 11A, table 11A.1). Military spending in industrial market economies has grown considerably faster between 1980 and 1985 than it did over the last five years of the 1970s—5 per cent as opposed to 1.5 per cent. Military spending in the United States explains virtually all this acceleration. The most disturbing feature of military expenditure trends in countries aggregated by economic group is the high real growth rate of military outlays sustained by those countries whose per capita annual incomes are less than $440. Military spending in real terms has grown at an annual rate of almost 4 per cent since 1976 for this group.[1]

So far then, the past five-year period has seen a faster military buildup than the previous five years, and one which has been in excess of growth in the total world output of goods and services (table 11.1). This means that a growing share of world resources has been transferred each year to military use. However, some marked changes can be expected in the coming five years.

Military spending grew particularly fast in 1982. This was due to the big jump in US spending that year and high growth rates in the rest of the world.[2] Since then, total military expenditure has grown more slowly, and there are signs that this deceleration will continue. World spending is dominated by expenditures in NATO and the WTO countries; together they account for almost 75 per cent of the total. Budget deficits and other economic difficulties are leading the countries of both alliances to cut public spending growth, including military outlays, or to reallocate resources from the military to other sectors. Unless the world economy recovers faster than is currently anticipated, or international tension increases, it seems likely that the rate of world military spending growth will fall for the rest of the decade.

Constant dollar figures of military expenditure for 1985 are difficult to establish. This is because of two main factors. The first is overestimation by NATO in its preliminary estimates of alliance spending in the most recent

Table 11.1. Growth of world output and military expenditure, by economic groups, 1980–5

Figures are percentages.

	1980–5 annual	1981	1982	1983[a]	1984[b]	1985[b]
World						
Gross domestic product	2.4	1.7	0.8	2.2	4.0	3.5
Military expenditure	3.2	2.2	6.1	2.7	1.7	3.2
Industrial market economies[c]						
Gross domestic product	2.1	1.5	−0.2	2.0	4.0	3.0
Military expenditure	4.9	3.8	6.2	5.4	3.1	6.1
Non-market economies[d]						
Net material product	3.7	2.4	3.7	4.3	4.0	4.0
Military expenditure	0.3	−3.0	2.2	0.1	2.0	0.5
Developing countries[e]						
Gross domestic product	1.8	1.6	0.5	0.0	3.5	3.5
Military expenditure	3.1	7.4	12.6	−0.3	−2.6	−0.8

[a] Preliminary estimates of world output figures.
[b] Forecasts of world output figures and preliminary estimates of military expenditure figures.
[c] As defined in note *c* at the end of appendix 11A, *plus* Portugal and South Africa.
[d] WTO and China only.
[e] *Oil-exporting countries* and *Rest of the world*, as defined in note *c* of appendix 11A, *less* Portugal and South Africa.

Sources: *World Economic Survey 1984* (UN: New York, 1984), p. 1, table I-1, using data from the Department of International Economic and Social Affairs of the UN Secretariat; SIPRI sources.

year.[3] Since NATO spending forms half of the world total, overestimation of spending and thus of the NATO annual growth rate contributes greatly to pushing up the growth rate of the whole world. The second factor is inflation, which affects estimates of constant dollar expenditure in two ways: first, large and volatile changes in inflation rates are extremely difficult to estimate; firm figures for price rises can result in major revisions in constant dollar series. Second, in countries where inflation proves more severe than anticipated when budget plans are drawn up, supplementary financing is often granted during the year to maintain purchasing power at the level originally planned for the armed forces.[4]

The estimation of a current dollar figure for world military spending involves added difficulties. In addition to the SIPRI estimate, two other widely known estimates of world military expenditure exist: those given in Ruth Leger Sivard's *World Military and Social Expenditures* (WMSE), and *World Military Expenditures and Arms Transfers* published by the US Arms Control and Disarmament Agency (ACDA). Looking at the figures for 1982, the last year for which a comparison can be made, world military spending is estimated by WMSE at $674 billion, by ACDA at $762 billion and by SIPRI at $720 billion. These differences are due in part to the different methods used to estimate Soviet military spending and in part to the different exchange-rates used to convert world currencies into dollars, making some adjustment for the fact that

current dollar exchange-rates reflect very imperfectly the relative purchasing powers of currencies compared to the dollar.[5] To arrive at a figure for world military expenditure expressed in current dollars, SIPRI takes the 1985 dollar figure, at 1980 prices and exchange-rates, and adjusts it for the increases in prices in the USA between 1980 and 1985. This gives a figure for world military spending in current dollars in 1985 of $850–70 billion.

SIPRI maintains a data base of military expenditure in 127 countries. In the world military expenditure tables (appendix 11A), data for the years 1976–85 are given for each country: in constant dollars, in local currency at current prices and as a share of national income. The tables can be used to study trends in military spending and the share of national resources each country devotes to its military sector. Military spending by the two power blocs dominates the world total and threatens world stability. Trends in the military spending of the USA and the USSR, together with their allies, must be observed and analysed. A burst of spending growth can signal a warning and add urgency to efforts to negotiate confidence-building measures and disarmament agreements. Military spending in the smaller and poorer countries usually has less global significance. Yet it is of vital importance for the inhabitants of the country concerned; it might determine whether they will survive another day or whether they will succumb to hunger or violence.

Military expenditure figures are misleading in a war situation, when the major part of a country's resources are mobilized in an internal or external conflict. The SIPRI military expenditure tables say little or nothing of the true costs involved in such conflicts as those in Afghanistan, Kampuchea, Iran, Iraq and some of the countries of Central America.

In the sections below, trends in military spending in alliance and regional groupings are examined, with special emphasis on the economic burden of such spending, particularly in some of the poorer countries, and on any significant attempts to expand or reduce it.

II. NATO

On the basis of preliminary figures provided by NATO for spending by the alliance members in 1985, total NATO military expenditure grew by 6.3 per cent in 1985 while military spending by the European allies alone grew by 2 per cent (table 11.2). These data, published in December 1985,[6] are based on estimates and projections and are subject to heavy revision in subsequent months. Thus the estimates for military spending in 1984 which were published in December 1984 showed an increase for all NATO countries of 7.9 per cent and for European NATO countries of 2 per cent. The revised figures put these increases at 3.1 and 0.4 per cent, respectively. Estimates of US spending were heavily revised, as were those of Belgium, Greece, Italy, Norway and the UK. Estimates made at the end of 1983, of 1983 spending, were also too high; 11.3 per cent growth for the USA and an overall 8.2 per cent growth rate for NATO were subsequently revised to 7.1 and 5.3 per cent, respectively.

It is perhaps wise therefore to treat 1985 figures with some caution. The longer-term trends are clear. For NATO as a whole, military spending in recent

Table 11.2. NATO countries: estimated real growth in military expenditure, 1976–85[a]

Figures are percentages.

Country	Annual, or average annual percentage growth							
	Long-term trend: 1976–8 average to 1982–4 average	1980	1981	1982	1983	1984	1985[b]	Relative size of military spending (USA=100)[c] 1985
USA	4.7	3.7	6.9	9.0	7.1	1.1	9.0	100
Canada	2.0	3.4	1.8	9.8	−0.2	10.5	5.8	3
UK	3.2	8.1	−5.7	5.0	10.1	1.1	3.6	15
France	2.5	1.8	2.4	2.1	1.7	−0.3	0.1	14
FR Germany	0.9	1.4	1.2	−1.3	0.8	−0.1	2.1	13
Italy	4.6	4.6	2.1	7.0	2.2	3.0	0.7	5
Netherlands	0.8	−2.7	1.1	−0.4	−0.9	1.7	−1.3	3
Belgium	0.5	2.0	0.9	−3.3	−3.8	−2.6	5.0	2
Turkey	0.2	−5.3	23.5	9.3	−3.7	−4.5	6.2	2
Greece	0.7	−13.5	18.3	2.0	−8.8	18.8	−1.5	1
Norway	2.5	1.1	1.0	3.9	4.3	−3.7	14.9	1
Denmark	1.3	0.9	1.1	2.9	0.8	−2.4	1.4	1
Portugal	0.4	8.4	−0.5	0.1	−3.8	−7.0	4.5	—
Luxembourg	5.0	16.4	3.4	0.9	2.2	0.5	0.5	—
Total NATO Europe	**2.2**	**2.7**	**0.7**	**2.3**	**2.8**	**0.4**	**2.0**	**57**
Total NATO	**3.6**	**3.3**	**4.2**	**6.3**	**5.3**	**3.1**	**6.3**	

[a] Information in this table is based on NATO-defined military expenditure for calendar years and differs from the material taken from domestic sources discussed in the text.

[b] Data for 1985 are uncertain. NATO normally revises latest year data extensively after one year.

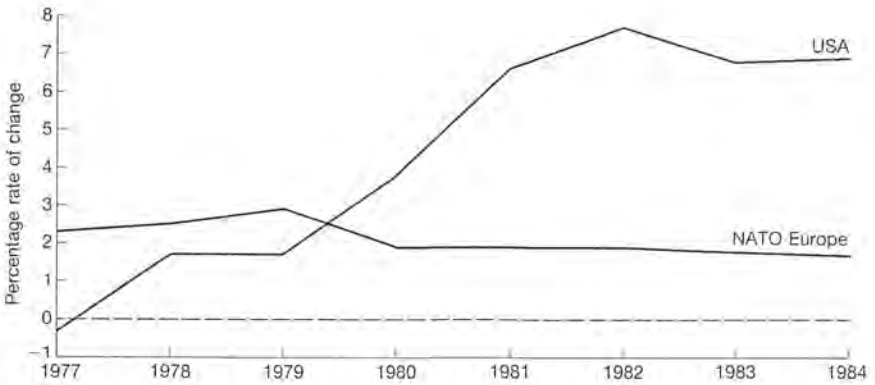
[c] Based on 1985 military spending figures, at 1980 prices and exchange-rates.

Source: Appendix 11A, table 11A.3.

years has been rising at about 5 per cent a year, in real terms—well above the long-term average. It is the United States which accounts for this acceleration. Trends in NATO Europe as a whole are more difficult to identify. Looking at the three-year moving averages it can be concluded that the rise in military spending has, if anything, slowed down (figure 11.1). This is true for three of the four big spenders in Europe (France, FR Germany and Italy), while spending by the UK grew more rapidly in the Falkland and post-Falkland years. Nonetheless, military expenditure growth has outstripped that of gross domestic product (GDP) in two of these four countries and in the USA between 1981 and 1984, as well as in NATO Europe and NATO in aggregate (table 11.3).

At the ministerial session of the NATO Defence Planning Committee in May 1985, the goal of achieving real increases in military spending in the region of 3 per cent was reconfirmed as a general guide for the period up to 1992. This was based on estimated real growth rates in national product for the period, averaging approximately 3 per cent in North America and 2.5 per cent in

Figure 11.1. Trends in NATO military expenditure: three-year moving averages for 1976–85[a]



[a] Three-year moving averages of military expenditure, in US dollars at 1980 prices and exchange-rates. For example, points plotted at 1984 refer to the years 1983–5.

Europe. It was therefore concluded, somewhat optimistically, that economic growth could sustain the force goals and national plans.

This 3 per cent target for military spending seems increasingly unrealistic. The real growth rates posited for national products are probably too high. The December 1985 projections by the Organization for Economic Co-operation and Development (OECD) suggest annual growth rates at or below 2.5 per cent (up to mid-1987) for the four European countries mentioned and about 2.5 per cent for the United States.

Table 11.3. Real growth of GDP and military expenditure in NATO countries, 1981–4

Figures are percentages.

Country	GDP	Military expenditure
France	4.6	3.4
FR Germany	1.5	−1.5
Italy	3.0	12.5
UK	5.2	16.9
USA	9.0	22.2
Total NATO Europe	**3.4**	**5.5**
Total NATO	**5.8**	**15.4**

Sources: *International Financial Statistics*, Nov. 1985 (IMF: Washington, DC, 1985); SIPRI sources.

However, countries do not primarily relate their military spending decisions to the expected amounts of national product. They relate them rather to the problem of constraining total public expenditure and to the reduction of the budget deficit. In most countries, policies limiting public spending, including military spending, have been adopted. Intensive efforts are being made to improve efficiency in the military sector in general, and in particular in procurement practices. Nonetheless, the gains to be made from the more efficient use of military resources are limited, in particular since NATO governments are not prepared to open their military sectors to national and international market forces. The latest NATO Ministerial Resource Guidance states: 'notwithstanding . . . efforts to improve the output from existing expenditures, it will be necessary to increase the allocation of resources to defence in real terms with most nations achieving rates of real increase higher than those in the past'.[7]

Yet as a result of directives or legislation, the five big spenders in NATO, with the exception of France, all made plans during 1985 to reduce their military expenditure, at least in the short term. British public expenditure plans for fiscal years (FYs) 1986 to 1988 published on 15 January 1986 show a real fall in planned military spending by almost 3 per cent for 1986 and 2 per cent for the following two years. This is a reversal of the NATO 3 per cent annual buildup policy which the UK almost alone among the European NATO partners had maintained since it was agreed in 1978. Military spending grew by 30 per cent in real terms between FY 1978 and FY 1985; in the same period spending on education and science fell by 1 per cent, on housing by 43 per cent, and on trade and industry by 56 per cent.[8]

FR Germany amended its 1985 budget several times during the year, making small cuts in a number of production, procurement and research programmes. There is no real growth planned for West German military expenditure in 1986. Italy announced that it would not meet the 3 per cent goal in 1986 and that cuts of up to 17 000 would be made in manpower in a drive to rationalize and to accommodate budget reductions. Only France has plans to increase spending during 1986, by about 2 per cent in real terms. It was pointed out in the Sénat defence budget debate that if the law of 1984 which mandated a 2 per cent real growth rate in military expenditure for the period 1984–8 was to be followed, real spending would need to increase by 4.4 per cent in both 1987 and 1988.[9]

In the United States, the period of rapid growth in military outlays seems to be coming to an end. This is not so much because military expenditure as a share of GDP is historically high. It has been rising in recent years, but is still well below the share of national product taken in the 1950s and 1960s. The economic pressure comes from the need to reduce the size of the federal budget deficit: the Administration is committed to attempt to do this without increases in taxation.

Up to FY 1985, Congress had in effect given the Administration virtually all that it asked for in budget authority for military spending. When the budget request for FY 1986 was presented, that ceased to be the case. For FY 1986, the Administration asked for $322.2 billion in national defence budget authority, a

rise of almost 6 per cent. In a long process of congressional debate, that figure was eventually cut back, by Congress, to $297.6 billion.

However, there were more cuts to come. In December 1985 Congress passed the Balanced Budget and Emergency Deficit Control Act—usually referred to as the Gramm-Rudman-Hollings bill. This specifies a series of binding limits on the budget deficit taking effect from FY 1986 until FY 1991, by which time the deficit is to be eliminated. If cuts are not made through the normal legislative process, automatic, line-by-line sequestrations will be made in all non-exempted budget items at a stipulated percentage rate. Exempted programmes include social security benefits, net interest payments and various welfare schemes.

The projected federal budget deficit for FY 1986 exceeded the Gramm-Rudman-Hollings figure by a wide margin. Thus further cuts had to be made in the military budget (described in detail in chapter 12, section VII), and, as a result, FY 1986 defence budget authority was reduced to $286.1 billion.

In the budget request for FY 1987, the Administration has tried to recoup some of this reduction in budget authority. The request is for an increase (on the reduced figure for FY 1986) of 8.2 per cent in real terms. The proposed budget combines this suggested increase in military budget authority with big reductions in budget authority for civil purposes so that, on the Administration's figures, the Gramm-Rudman-Hollings target for the FY 1987 deficit is met. However, it seems virtually certain that Congress will not approve this combination of a big increase in the military budget, coupled with reductions in civilian spending.

Budget authority is not the same as actual outlays: cuts in outlays lag behind cuts in budget authority. In 1983, when the question of federal budget deficits was becoming a matter of growing concern in Congress, it was recognized that the military budget was so 'front-loaded' with funds obligated to weapon programmes that the ability of Congress to change budget priorities was restricted.[10]

However, in the face of current congressional determination to reduce the budget deficit and President Reagan's reluctance to raise taxes, real growth in US military spending cannot continue at rates in excess of 7 per cent, as it has done since the beginning of the decade.

III. The WTO

Military spending by the East European members of the WTO (excluding Poland) grew, in aggregate, by an estimated 2.5 per cent in 1985. The trend for the periods 1975–80 and 1980–5 gives annual average real growth rates of 3.1 and 3 per cent, considerably below the average growth rate of 5.1 for 1970–5. The same pattern holds for the growth of net material product. This is in part a reflection of the economic difficulties experienced by these countries in the late 1970s and early 1980s, when it became necessary to cut back on real economic growth in order to meet serious external payments difficulties (table 11.4). Adjustment policies have been more successful than expected; the revised estimate of the International Monetary Fund (IMF) for growth of net material

Table 11.4. Eastern Europe (excl. Poland): average annual or annual percentage real growth in economic activity and military expenditure, 1970–85

Figures are percentage changes.

	1970–5	1975–80	1980–5	1981	1982	1983	1984	1985
Net material product	6.5	4.0	3.0[b]	2.5	2.0	3.0	4.0[b]	3.5[c]
Military expenditure	5.1	3.1	3.0[b]	4.0	2.3	2.5	3.9	2.7

[a] Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary and Romania.
[b] Estimate.
[c] Projection.

Sources: *World Economic Outlook 1985* (IMF: Washington, DC, 1985), table 5-1; and SIPRI sources.

product in 1984 is 4 per cent, both including and excluding Poland. Meanwhile, military spending has grown less rapidly than previously estimated, at least in 1983 and 1984, and probably has not begun to outpace overall economic growth as was suggested in the *SIPRI Yearbook 1985*.[11]

The German Democratic Republic has the largest military budget among the East European allies; its military spending increased very rapidly—by an annual average of 6.6 per cent—between 1980 and 1984. Estimates for 1985, however, suggest a slowing in the rate of expansion. Poland, on the other hand, appears to have increased its military appropriations in real terms quite significantly in 1985, even allowing for major uncertainties regarding the rate of inflation. The real increase has compensated, in part, for the fall in military spending in 1983 and 1984. The same phenomenon was observable in 1982 when Poland made up for spending cuts in 1980 and 1981.

Problems relating to the assessment of military expenditure in the USSR and its ability to devote a large share of its resources to military output are dealt with in detail in chapter 13. Largely as the result of its natural endowments of gold, oil and gas, the Soviet Union has not been subject to external payment constraints to the same extent as have its East European allies. However, Soviet leaders have expressed disappointment over the country's recent economic performance.

In discussing the results of the previous five-year plan, General Secretary Gorbachev admitted that there had been a decline in the rate of development of the national economy. This was due to the slow pace at which reforms in the structure of production and in the methods of administration and economic management had taken place. New techniques and technologies had not been introduced sufficiently quickly, and the quality and technical sophistication of many items, including consumer goods, did not meet modern requirements. In addition, 'owing to an aggravation of the international situation, the USSR was compelled to take additional measures in order to maintain its defence capacity at a level capable of guaranteeing the Soviet people a peaceful life'.[12]

In November 1985, the Kremlin released details of an ambitious economic programme which was to be presented to the 27th Party Conference in February 1986. The principal goal of economic strategy for the rest of the century would be 'the promotion of the steady rise in the material and cultural standards of the people'. Under the terms of the draft plan, per capita income is to grow by 13–15 per cent by 1990 and by 60–80 per cent in total by the end of the century. Major efforts will be made to increase the availability of food and other consumer goods and to provide each family with its own home.

Measures would be taken during 1986, the first year of the five-year plan, 'to keep up the country's defence potential at the required level'. The figure for military expenditure made public for 1986 was 19.063 million roubles, the same amount as for 1985.[13]

In 1983 US Central Intelligence Agency (CIA) analysts concluded that Soviet military growth rates since 1976 had not exceeded 2 per cent per annum, revising previous estimates of a 3–5 per cent annual real growth rate. This was due to a downward revision of CIA estimates for Soviet procurement since 1976.[14] Nor does production appear to have grown in recent years, despite the estimate by the US Defense Intelligence Agency (DIA) of a 5–10 per cent rise in procurement in 1984,[15] except for tanks, field artillery, bombers, and some missile types (table 11.5). The numbers alone give no clue as to differences in size and performance of the weapons in each category, but as the period covered is only four years, it is unlikely that many examples of new weapon systems are included.

IV. China

In presenting the 1985 draft budget, the Chinese Minister of Finance emphasized the need to maintain economic stability by controlling state expenditures and reducing the deficit. To this end, total government expenditure was to increase by only 3 per cent. While expenditure on most programmes was cut, military expenditure was allowed to rise in line with the overall increase, and its share of the state budget therefore remained unchanged (table 11.6).

Three reasons were given for the curtailment of government expenditure: (*a*) the need to contain inflation,[16] (*b*) the reduction in government revenue owing to reforms in the wage and price systems, and (*c*) wage reforms for government employees which were expected to increase the salaries bill by about 3 billion yuan. All three reasons are closely connected with China's new economic policies which have allowed a measure of free enterprise in first the agricultural and then the industrial sectors.

Budgeted expenditure by no means covers all the expenditure of the central government and it has long been assumed that, in the case of the military, the budgeted amount meets only operating costs.[17] Military procurement, investment in military industries and R&D costs are to be found in the budgets of the Ministries of Machine Building.[18]

The transformation of the People's Liberation Army (PLA) into a modern professional force progressed in 1985, although the reforms are still said to be

Table 11.5. US estimates of Soviet weapon production of selected items, 1980–4[a]

Figures are numbers of these weapons.

Item	1980	1981	1982	1983	1984
Tanks	3 100	2 000	2 500	2 700	3 200
Other armoured fighting vehicles	6 500	5 200	4 500	4 500	3 800
Towed field artillery	1 400	1 600	1 800	1 700	1 600
SP field artillery	900	950	850	750	1 000
Multiple rocket launchers	700	700	700	700	600
SP AA artillery	300	300	200	100	50
Bombers	30	30	35	35	50
Fighters/fighter bombers	1 300	1 350	1 100	950	900
Transports	350	350	300	300	300
Utility/trainers	85	50	50	10	10
ASW aircraft	10	10	10	5	5
Helicopters	700	800	800	800	800
ICBMs	250	200	175	150	100
LRINF	100	100	100	125	150
SRBMs	300	300	300	350	350
SLCMs	750	750	800	800	850
SLBMs	200	175	175	200	200
Submarines	13	11	9	10	9
Major combatants	11	9	8	10	9
Minor combatants	65	45	55	45	45
Naval support ships	9	6	5	6	5

AA Anti-aircraft
LRINF Longer-range intermediate-range nuclear force
SRBM Short-range ballistic missile
SLCM Submarine-launched cruise missile
SLBM Submarine-launched ballistic missile
SP Self-propelled

[a] Armoured vehicles and ships may include some imports; transports and helicopters may include some civil production.

Source: *Soviet Military Power 1985* (US Government Printing Office: Washington, DC, 1985), pp. 38, 75, 87, 105.

meeting pockets of resistance. It remains unclear to what extent the plan, announced in June 1985, to cut manpower by almost 25 per cent has taken effect: news reports tend to relate to housing and retraining programmes for men when they have been demobilized rather than to actual dismissals, although demobilization is planned to be completed by mid-1987. Steps have been taken to rejuvenate the top echelons, and half of the 1 million men to be demobilized will be officers.[19] The government plans to spend 1 billion yuan on resettlement and re-employment, and efforts are being made to accommodate the needs of families for jobs and schooling. Cuts are to be made in the Frontier Guard Forces, including those in Fujan Province opposite Taiwan.[20]

Chairman Deng Xiaoping has indicated that the PLA must be reduced in numbers so that resources devoted to the military sector can be used more effectively. 'If the economic system were not reformed it would be impossible to liberate and develop the productive forces. Without reform of the military, it

Table 11.6. China's state budget and expenditures, 1977–85

Figures are in billion yuan, at current prices.

	1977	1978	1979	1980	1981	1982	1983	1984	1985
State budget	84.4	111.1	127.4	121.3	109.0	115.3	129.3	151.5	156.5
Official military expenditure	14.9	16.8	22.3	19.4	16.8	17.9	17.7	18.1	18.7
Share of budget (per cent)	*17.7*	*15.1*	*17.5*	*16.0*	*15.4*	*15.5*	*13.7*	*11.9*	*11.9*
Culture, education, science and public health expenditure				15.6	17.2	19.7	22.4	26.3	29.3
Share of budget (per cent)				*12.9*	*15.8*	*17.1*	*17.3*	*17.4*	*18.7*

Sources: State budget: *International Financial Statistics*, Nov. 1984 (International Monetary Fund: Washington, DC, 1984).

Military expenditure 1977–85: SIPRI military expenditure tables.

Culture, etc. 1980: Zhao Ziyang, *China's Economy and Development Principles* (Foreign Language Press: Beijing, 1982).

Culture, etc. 1981: *Far Eastern Economic Review*, 10 Dec. 1982.

Remaining information is from the Report of the Final State Accounts for 1983 and the Draft Budget for 1984, delivered at the Second Session of the Sixth National People's Congress on 16 May 1984, *Xinhua News*, Special Issue, 7 June 1984; Report on the Execution of the State Budget for 1984 and on the Draft State Budget for 1985, delivered at the Third Session of the Sixth National People's Congress on 28 Mar. 1985.

would be impossible to raise our troops' fighting capacity. Reforms and the reductions are very closely linked.'[21] In themselves the reforms do not necessarily entail cuts in military expenditure; on the contrary, if all the costs of resettling and retraining demobilized PLA personnel and their families as well as retraining, re-equipping and improving pay and conditions for those remaining fall on the 'open' military budget, military expenditure in the short run could be expected to increase.

In the minds of some of the newly affluent peasants and workers in China, the four modernizations—agriculture, industry, science and technology, and the military—have been replaced by the four new 'big things'—a colour television, a washing machine, a stereo recorder and a refrigerator.[22] The government is committed to meeting such rising expectations but without an increase in consumer imports which drain limited foreign currency reserves. Consumer demand is to be satisfied by increased domestic production, and the Chinese leadership is determined that the PLA will contribute to development in the domestic sector. As Chairman Deng told a symposium held by the Military Commission of the Central Committee in November 1984, the excellent equipment and technical forces in the defence industry should be put to the service of the national economy while continuing to maintain the supply of military equipment.[23] Military factories in recent years have built 2.3 million bicycles, 1.4 million sewing machines, 2 million electric fans and 70 per cent of all the cassette tapes and motorcycles sold in the country. Over 100 key military production lines had been modified for civilian use.[24]

V. The Middle East

Figures for military expenditure in the Middle East have fallen by an estimated annual average of 3.5 per cent in 1984 and 1985 after the explosive growth of the first three years of the decade. Hard data for spending in this region are difficult to obtain, but, with the exception of perhaps Bahrain and Jordan and the warring countries of Iran and Iraq, the remaining countries have found it necessary to reduce military spending in line with deficit-cutting policies and the general recession in government revenues.

Military spending in Israel has fallen for the second year running in the face of such continuing serious economic difficulties as hyper-inflation and shrinking foreign currency reserves. However, on provisional figures, it appears to be beginning to rise again as a share of the national product.

Israel blames its economic woes on the Arab–Israeli wars of 1967 and 1973 and the Israeli–Egyptian Camp David Peace Treaty of 1979, under the terms of which it returned the oil-producing Sinai Peninsula to Egypt. By the end of 1984, Israeli external debt was $23 billion, one of the highest per capita debts in the world. One-third of this debt is owed to the United States on loans for weapons purchased after the 1973 war. Service payments to the USA amount to $1 billion annually and will rise to $1.4 billion in the early 1990s, before declining. Since 1984, it has been accepted that US economic support funds to Israel would be large enough to cover these annual repayments. From US FY 1985, all US aid to Israel is given as grants; but the need to repay old loans, plus the practice of 'cash-flow' financing which permits Israel to pay for its US weapon purchases in instalments instead of pre-paying in full as is the normal practice, ensures Israeli dependence on US aid for many years to come.

US aid to Israel of $4.1 billion, including a supplemental $1.5 billion, during the period October 1984–September 1985 has only previously been exceeded by the $4.8 billion in aid given in 1979 as part of the Camp David accord. At least $3 billion in aid will be given to Israel in both of the US FYs 1986 and 1987. Despite massive support for Israel in the US Congress, it is becoming increasingly difficult for congressmen to agree to increases in the US aid programme. They are being asked to accept major cuts in the US budget while at the same time the Israeli Government seems unable or unwilling to put its own economic house in order. Israel is therefore coming under increasing pressure from both the US Administration and Congress to curb still further its government spending. However, with 40 per cent of its budget tied up in debt repayment and another 30–40 per cent going to military expenditure, Israel has little room for manoeuvre. So far, cuts have fallen on the social services, in particular education.[25]

VI. South Asia

Following revisions of the 1984 budget in Sri Lanka and the 1983 and 1984 budgets in India, the apparent slowing of military expenditure growth in South Asia for 1984 proved instead to be another rise. A further increase, of over 5

per cent, is estimated for 1985. Military spending in the region, one of the poorest in the world, has grown at the astonishing average real rate of 6 per cent annually since 1975. The momentum of military expenditure growth is carried by the two largest protagonists, India and Pakistan, but in this region even domestic disturbances tend to spill over into neighbouring countries and cause military spending to increase. Currently the most rapid growth of military spending is taking place in Sri Lanka.

It proved impossible in 1985 for the Sri Lankan Government to conceal the seriously disruptive effect which ethnic violence between the majority Sinhalese community and the minority Tamils has had on the economy of the whole island. Although it is not possible to give exact details of the growth rate of Sri Lankan military spending, it has been officially admitted that military expenditure has risen tenfold since 1978, giving a real increase of 388 per cent, most of which took place in the past two years. Total military spending is now put at 5 per cent of GDP as against 0.7 per cent in 1983.[26]

Sri Lanka has spent a great deal of money on military equipment for immediate delivery—fast patrol boats, transport aircraft, small arms and ammunition—often purchased through commercial channels either for cash or at market interest rates.[27] In May 1985, the President of Sri Lanka announced that an armed national auxiliary force would be established to augment the country's military and police. No details were given of the costs involved.[28]

In the Sri Lankan budget for 1985, announced in November 1984, the military were allocated a relatively modest share of central government outlays.[29] In May 1985 a supplementary budget was announced which increased military spending by 85 per cent, and further increases were announced in September. These unexpectedly high military expenditures, plus a sharp fall in tea prices, turned a projected budget surplus of $62 million into a major deficit of $149 million.[30] The budget for 1986 involves a further growth in military spending and a deficit reaching 14 per cent of GDP. Forty per cent of the budget will not be covered by revenue.

The Minister of Finance spelt out the cost of meeting the growing civil unrest in his budget speech: either a cut-back in development programmes to meet escalating military expenditure, or massive budget deficits which would become 'unmanageable and unsustainable' and a threat to the country's internal and external financial stability. 'A poor country like Sri Lanka can ill afford a military build-up of this nature without making great sacrifices in terms of development and growth, employment and living standards.'[31]

VII. The Far East

Estimated military spending for the Far East in 1985 is only slightly below the 6 per cent trend for 1975–85 and reverses a tendency towards lower military spending growth rates which was apparent in 1983 and 1984. The degree of caution observable in the South Korean and Taiwanese budgets of 1984 was abandoned in 1985, while Malaysia continued to keep a tight rein on spending. Singapore, whose military spending expanded by over 10 per cent on average each year between 1980 and 1984, cut back to a 6 per cent growth rate in 1985.

Throughout its over 30 years in power, the Japanese Liberal Democratic Party (LDP) has, generally speaking, followed a policy of making small defence appropriations (relative to GNP), concentrating instead on the promotion of rapid economic growth. Since Prime Minister Nakasone took office in 1982, steps have been taken to increase military spending. Military expenditure has grown at an annual real rate of 4.4 per cent since 1982, compared to 2.9 per cent in the previous three years; and the increase budgeted for FY 1986 is 5.4 per cent, after allowing for inflation. There are two main reasons for this change in direction.

First, there has been a growing realization by domestic arms producers of the number of orders which an expanding military sector entails. Domestic arms producers warmly welcomed the 1986–90 military spending programme announced in September 1985, under which $20 billion were allocated for the purchase of military equipment. Second, US pressure has for some time been exerted on Japan to bear more of its 'share' of the cost of maintaining the US–Japanese Security Treaty. Complaints from the United States on this score were generally muted in 1985. The Pentagon is reportedly pleased by the way in which Japan is accommodating itself to the US strategic plan for the area and contributing to the costs of the US defence 'umbrella'. It is still felt, however, that the pace of the military buildup towards the goal of Japanese capability in defending its air and sea approaches is too slow.

Currently, the main area of discord between the USA and Japan relates to the $35 billion US trade deficit with Japan and lack of genuine progress in the opening of Japanese markets to US goods. It may therefore be expected that the question of Japan's share of the common defence 'burden' will be raised again, even though it has been admitted that more than half the trade deficit is the result of the overvalued US dollar.[32]

In May 1985, the purchase by Thailand of eight F-16A and four F-16B fighter aircraft from the United States for a reported cost of 8.5 billion baht ($315 million) was finally announced after over a year of debate in both countries. The deal had been strongly opposed by the Thai Ministers of Finance and Economics on the grounds of the country's serious external debt (including military debt) situation. A National Debt-Policy Committee has now been formed with wide powers to control both foreign and domestic borrowing, but it is feared that this civilian body will be unable to control military borrowing. Under an austerity budget introduced for FY 1985, debt servicing, military expenditure and internal security accounted for 47 per cent of total outlays, while shares going to health and economic development fell for the third year running. In August 1985, it was officially announced that Singapore had ordered four F-16A and four F-16B aircraft. Indonesia also pressed its earlier request to become a member of the exclusive and expensive club of Third World owners of advanced, supersonic aircraft.[33]

The Philippines present a classic case of a country seeking to solve by military means problems which are basically economic in origin. Since 1982, the country has lived with a serious external debt problem; foreign debts equal 81 per cent of GNP and the debt service ratio is currently 30 per cent. As an exporter of mainly agricultural products, the Philippines have been badly hit by

the fall in world commodity prices, in particular those for sugar, coconut oil and copper. Seventy per cent of the people in the rural areas are said to be living below the poverty line. In 1985 country-wide unemployment was 20 per cent and underemployment 45 per cent. In addition, the Philippines have the highest rate of population growth in the region, and real per capita GDP has fallen by 10 per cent since the beginning of the decade. A $10 billion rescue package put together by commercial bank creditors in August 1985, including a $2.9 billion trade facility, is not expected to lead to heightened economic activity. Businessmen pointed to the absence of domestic demand and their lack of confidence in the government of President Marcos.

Radical opposition has grown rapidly during the country's three years of economic crisis, fuelled by military abuse against civilians and ineffectual local and central government. The main focus of resistance to the Marcos regime was the New People's Army (NPA) and its civilian arm, the National Democratic Front. Although largely confined to rural areas, the NPA began to move into the towns.

The switching of $60 million of a proposed $85 million from military to economic aid signalled the opinion of the US Congress that the solution to the guerrilla problem lay in economic reform rather than enhanced military performance. The view has been expressed on a number of occasions that a restoration of democracy and a revival of the Philippine economy would contribute more to the defeat of the guerrillas than would an increase in military spending.[34] Fearing that the fate of its Philippine bases—the Subic Bay naval base and Clark Air Base—would be bound up with the political turmoil in the country, the USA has begun to look for other possible sites in the Pacific.

Increasing guerrilla activity and US disillusionment with the stability of his regime led President Marcos to assert that the country must take steps to build up its own military capability. The military themselves wish to speed up the process of professionalization, including training and acquisition of new equipment. In particular it is felt that reforms are called for in the Civilian Home Defence Force (CHDF) which is responsible for keeping order in rural areas. This paramilitary organization is the largest branch of the armed forces, with 73 000 men of whom all but 10 000 are full time. Recruitment standards have been too low, and abuses by the CHDF against civilians have further weakened the credibility of the military and the Marcos regime.

Military spending as originally budgeted for 1984 and 1985 made no allowance for rapid inflation in those years; details of supplementary budgets have not yet become available. While a real fall in total government spending for 1986 is planned, military expenditure on the regular and paramilitary forces is expected to increase. Again it may be difficult to determine the exact size of military spending, since 20 per cent of total government outlays for 1986 have been appropriated for unspecified 'inter-sectoral spending'.[35] In his manifesto for the February 1986 elections, President Marcos promised increases in the military budget; his main opponent, Corazon Aquino, promised to reduce military spending, passing savings to education.[36]

VIII. Africa

Military spending in Africa is estimated to have fallen in 1985 for the second year running. This reflects the economic difficulties which have faced the region—declining terms of trade for producers of primary products, falling oil revenues for the oil-exporting countries and debt repayment difficulties requiring major readjustments in government spending plans—as well as natural disasters which have brought famine to many of the countries of Central Africa. These difficulties have been compounded by political instability in a number of countries. Firm trends are difficult to establish for the region; information on actual military expenditure and inflation rates for recent years are not always available. However, it seems clear that real military spending has been declining by perhaps 3 per cent annually between 1980 and 1985, while in the previous five years it grew by 4.6 per cent in real terms. Only Chad and Tunisia are known to have planned for real growth in their military budgets for 1985. The white minority South African Government, which cut public spending in 1985 in an attempt to re-establish its financial credibility, may have found it necessary to pass a supplementary military budget as resistance to the apartheid regime gathered force during the year.

Chad is an example of a country whose military expenditure is negligible in the world total. Yet the fact that it allocates so much of its budget to the military is certainly one of the explanations of its formidable economic, social and political problems. Chad is one of the poorest countries in Africa and in the world. In 1982, the most recent year for which statistics are available, per capita income was $80; GNP had declined by 2.8 per cent annually since 1960. Poorly endowed and with an unfavourable climate, Chad has suffered from civil strife and external interference since shortly after independence in 1960.

The economic situation deteriorated from 1984 onwards. This was due to the war against the rebels in the north of the country supported by Libyan forces and against armed commando groups in the south, in combination with a severe drought throughout the whole country. The production of the country's main export crop, cotton, was badly affected, cutting one of the main sources of government revenue. For its planned spending in 1985 of 39.8 billion CFA ($82 million), the government had revenues of only 15 billion CFA ($31 million); other sources of revenue received during the year were international and multinational loans and aid and budget support from France. Government officials stressed that actual spending would be kept in line with actual income but that priority would be given to 'defence and security'. A reported 40–50 per cent of the budget was appropriated for military activities.

Over the years, numerous attempts have been made to reconcile by negotiation the differences in religious, tribal and political interests within the country, but opposing factions have frequently resorted to military confrontation. The military involvement of such foreign powers as France and Libya has complicated the picture; Libya is said to be occupying large areas in the north of the country which is believed to be rich in uranium. In July 1985, United Nations experts named Chad as one of the six African countries worst affected

by famine. It was estimated that food was reaching only one-third of the 1.5 million people in need. The Chad Government was optimistic that it could deal with the country's economic problems if, at the same time, political stability and 'the reconquest of the north' could be achieved.[37]

IX. Oceania

On available figures, the estimated increase in military spending for Oceania was small in 1985. However, supplementary budgets in both Australia and New Zealand will probably cause this estimate to be revised upwards before the end of the fiscal year. Australia faced the usual spectrum of economic problems in 1985—heavy external debt and debt repayments, high interest rates, rapid inflation, poor export performance, a weak currency which fell 25 per cent against the US dollar in 1985 and a persistent government deficit. The main remedy was the familiar one, too—to reduce government spending. Cuts of A$1.5 billion (US$1 billion) were announced in May 1985 in the social services programmes and in military expenditure. In the latter case, planned real growth for FY 1985 was cut from 4.5 to 3.1 per cent, although this was still double the proposed growth rate for the central government budget as a whole. Details of cuts were not specified, except that provision would not be made for forthcoming salary increases.

In FY 1974, purchases of capital equipment took 6 per cent of the Australian military budget; by FY 1984 this share had grown to 28 per cent, much of it bought from the USA. Military expenditure is therefore very sensitive to price increases as the result of inflation and any weakness in the Australian dollar. Such extra costs are expected to lead to a supplementary budget in 1986 as was the case in April 1985 when military expenditure for FY 1984 was increased by 3.6 per cent to meet rising domestic and foreign exchange costs.[38]

In New Zealand, the anti-nuclear stance of the Labour government, which took office in July 1984, prompted a sharp reaction by one of the country's two main allies. US naval officials claim that 75 per cent of US ships are nuclear-powered or -capable but will neither confirm nor deny the status of any particular ship. In February 1985, New Zealand, having banned all nuclear-powered or nuclear-armed ships from calling at its ports, rejected a US request for its destroyer *USS Buchanan* to make a port call. This move was condemned by the USA as a threat to the ANZUS defence pact between Australia, New Zealand and the USA. US reaction included the cancelling of joint exercises and a ban on the sharing of US intelligence.

The New Zealand Government referred to this breakdown in military relations with the United States when seeking support for a substantial increase in the military budget for FY 1985. It was programmed to rise by 18 per cent, four percentage points above the budget in general. The extra money would be spent in increasing stocks of spares and ammunition, raising the numbers of personnel and upgrading equipment. Funds were also made available for the refurbishing of 22 A-4 Skyhawk aircraft. The latest major re-equipment of the New Zealand forces took place in the 1960s, and recent Defence White Papers have pointed out the need for phased modernization if 'insurmountable peaks

of requirements' are to be avoided.[39] Military spending was already rising in 1984, and the FY 1985 budget continued this trend. Unless cuts are made elsewhere, the devaluation of the New Zealand dollar by 18 per cent in July 1985, the month following the budget, will make a supplementary budget inevitable during 1986.[40]

X. Latin America

Little real growth occurred in total military spending in Central America and the Caribbean in 1985, largely because of an estimated real fall in the military outlays of Mexico which form almost one-third of the region's total spending. However, military spending in the five Central American Isthmus countries (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua) continued to grow, despite the emergence of economic problems similar in character, if not in size, to those of South America. Military budgets give only a partial picture of the amounts devoted to military ends in these countries. In Guatemala and El Salvador, the military, having permeated the economic and social frameworks of both countries, command resources far in excess of the budgeted amounts.[41] The Nicaraguan economy is on a war footing; few if any domestic resources can be devoted to projects for growth and development. Furthermore, a rapidly growing volume of foreign aid is being given to the five countries which to some extent perpetuates their willingness to seek military solutions to their problems. (See chapter 22 for a general discussion of the military situation in the Isthmus countries, and chapter 16 for details of security assistance to the area.)

Military outlay estimates for South America fell in 1985 as in the previous two years. These falls reflect in part the 'return to normal' after the Falklands/Malvinas conflict, though at a higher level of real spending than before 1982. In part they reflect the serious problems faced by the South American economies—external debt repayments, central government budget deficits, protectionist trade policies, inflation and the lack of investment capital. In part they reflect a willingness in some countries to make the military sector bear its share of public expenditure cuts.

As in no other region of the world in 1985, the countries of Latin America formally recognized the economic burden of military expenditure on their economies and pledged to use more of their limited resources for the elimination of economic and social ills. In July 1985, representatives of 19 Latin American nations met in Lima at the inauguration of Peruvian President Alan García where they signed a declaration supporting the balanced reduction of military expenditures and the allocation of greater resources to the social and economic development of their countries. They also agreed to adopt further confidence-building measures in the region, especially between neighbouring countries.[42] However, for a number of reasons, it has not proved easy to change spending patterns and reallocate funds to socially productive ends.

First, in those countries where civilian governments have recently been elected, the military cannot readily accept a supporting role after spending so

many years centre-stage. Civilian governments have understood, or been made to understand, that austerity measures taken to meet the problems of debt repayment and other economic ills are not to apply to the funding of the armed forces. Military expenditure reductions can therefore be cosmetic rather than real. For example, the armed forces can be lent money to bypass a strict, national wage-freeze. Pensions which are major fixed costs in the military budget can be transferred to the social services budget. Heavy amortization costs on arms loans can be transferred to the central treasury. All these practices have been reported in the case of Argentina.[43] Brazil is about to embark on a major modernization programme for its army, emphasizing its role as the guardian against foreign aggression rather than its more familiar one as the watchdog of internal security. Money is being set aside for the purchase of missile launchers, helicopters, cannons, radar, new uniforms, barrack renovations and new training courses for officers in order to meet the 'threat of guerrilla wars spilling over into Brazil from neighbouring countries'. Funds for the programme are said to have been taken from the Ministries of the Interior, Health and Communications.[44]

Second, during their years in power, the military have been able to draw on sources of wealth beyond those allocated in military budgets. There is evidence that this habit has not changed. During the military regime in Argentina, loans taken in the name of the state oil company, Yacimientos Petrolíferos Fiscales (YPF), were used to finance arms purchases.[45] Under the civilian government of Raúl Alfonsín, the naval budget has been cut; the Navy, however, is seeking to supplement its allocation by selling off a package of naval equipment said to be worth $700 million. The Air Force is hoping to raise funds from the sale of 80 IA-58 Pucará aircraft to Iraq which would help them finance the production of the IA-63 Pampa light jet trainer from its own production division. No allocations for production had been made in the budget.[46] In Brazil, the civilian government has given the Army permission for the first time to raise a foreign loan for the purchase of equipment. In Ecuador, the armed forces receive a royalty—said to be 15 per cent—on all oil revenues, and in Chile the armed forces receive a royalty on the sale of copper.[47] Armed forces which have independent incomes through sales or loans are able to act independently of the democratic process and make nonsense of fiscal constraints. They also take on financial obligations which will eventually have to be met out of public funds.

Third, military rule created a framework of social and economic control which cannot easily be dismantled or replaced. Furthermore the military were able to improve their living standards through social benefits and perquisites which they are reluctant to relinquish. The Uruguayan civilian government, which came to office in March 1985, was faced with a bloated salaries bill for government officials. This was the result of the public control apparatus built up under the military regime[48] and an unusual number of new appointments and promotions made by the military in the interregnum, after the election in November 1984. About 1 in every 30 members of the economically active population was employed by the Ministry of Defence, and ministry employees were the only ones in the public sector to enjoy a system of salary increments

ranging from 25 to 50 per cent above basic salary. Although some cuts could be made, mass redundancies would have been socially disruptive and present a threat of military reprisals against the new government. Furthermore, cuts in the numbers of military and ancillary employees would not produce much in the way of immediate savings, since generously indexed pensions are the norm among the military. The replacement of undesirable officers entails an added cost. Meanwhile, the thousands of public employees who during the 11 years of military rule had lost their jobs for political reasons expected to be reinstated under the democratic government.[49]

Even President García of Peru, who has been most outspoken in his campaign to reduce military spending both in Peru and throughout the continent, has found it difficult to resist 'special' military pleading. Peru announced in July that its debt-service payments would not exceed 10 per cent of its export receipts, and, at a meeting of the non-aligned countries in Angola, García argued that it was unethical to refuse to repay debts yet at the same time to buy arms. However, rather than face a penalty clause, the order for the Mirage 2000 aircraft will go ahead;[50] and, when the USA threatened to cut off economic and military aid to Peru for failure to meet payments on a military loan, Peru quickly agreed to pay $123 000 in overdue interest. Disappointingly, the Peruvian military budget for 1986 will take 33 per cent of total outlays, with only 11 per cent going to education and 7 per cent to health.[51]

Notes and references

[1] Membership of this group of poorest nations is not static; in recent years its numbers have been growing. Countries are classified for the whole 10-year period according to their GNP in 1983.

[2] Exceptions were Oceania, Africa and Central America, whose share in total world spending is together about 3 per cent.

[3] In these preliminary estimates, the calendar year current dollar spending of the USA was overestimated by approximately 5 per cent in 1984. As a result of this and other overestimations, the SIPRI 1984 constant dollar NATO aggregate was overestimated by 4 per cent.

[4] In addition, the military sector is often compensated for unfavourable shifts in the dollar exchange-rate.

[5] ACDA reflates the constant dollar series using the US implicit GNP deflator, as supplied by the World Bank. See Sivard, R. L., *World Military and Social Expenditures 1985* (World Priorities Inc: Washington, DC, 1985), table 'Military and social trends', p. 34 and 'Notes on data', p. 45; *World Military Expenditures and Arms Transfers 1985* (US Arms Control and Disarmament Agency: Washington, DC, 1985), table 1, p. 47, and p. 143.

[6] *Financial and Economic Data Relating to NATO Defence*, Press Release M-DPC-2(85) 25, 3 Dec. 1985.

[7] Quoted in Field, B., 'Economics and defence resources: the prospect', *NATO Review*, Oct. 1985.

[8] *Financial Times*,16 Jan. 1986, p. 10, quoting the UK Government Expenditure Plans, 1986–87 to 1988–89.

[9] *Jane's Defence Weekly*, vol. 4, no. 24 (14 Dec. 1985) and vol. 5, no. 1 (11 Jan. 1986); *Das Parlament*, vol. 38, no. 50 (14 Dec. 1985); *Frankfurter Rundschau*, 30 Oct. 1984; Sénat, France, *Rapport Général*, No. 096, Tome III, Annexe no. 45, Défense (21 Nov. 1985).

[10] SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1984* (Taylor & Francis: London, 1984), chapter 3, p. 76; see also SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1983* (Taylor & Francis: London, 1983), chapter 7, pp. 135–8.

[11] SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1985* (Taylor & Francis: London, 1985), table 7.1, p. 226.

[12] 'Guidelines for the economic and social development of the USSR for 1986–90 and for the period ending in 2000' (draft), supplements to *Moscow News*, nos. 46 (3190) and 47 (3191) (Nov. 1985).

[13] Report by the First Vice-Chairman of the Council of Ministers of the USSR and the Chairman of the State Planning Committee of the USSR, N. V. Talyzin, 'On the State Plan for the economic and social development of the USSR for 1986 and on the fulfillment of the plan for 1985' and Report by Soviet First Deputy Minister of Finance, V. V. Dementsev, 'On the State Budget of the USSR for 1986 and on the execution of the State Budget of the USSR for 1984', in *Daily Review* (APN), part II, vol. 31, no. 233 (7879) (27 Nov. 1985), pp. 2 (doc. 1) and 9 (doc. 2).

[14] *SIPRI Yearbook 1984* (note 10), p. 89.

[15] *SIPRI Yearbook 1985* (note 11), p. 252 and reference 74, p. 268.

[16] Inflation may have been as much as 16–18 per cent in 1985.

[17] This practice is borne out by the specific description of the amount budgeted for culture, education, science and public health services as 'operating costs'.

[18] The Ministries of Nuclear Industry, Aviation, Electronics, Ordnance and Space Industry and the China State Shipbuilding Corporation.

[19] *China Daily*, Beijing, 12 June 1985.

[20] *China Daily*, Beijing, 7 July 1985.

[21] Note 20.

[22] From an interview reported in *Xinhua News*, 19 Feb. 1985.

[23] *Summary of World Broadcasts*, London, Part 3, 2 Mar. 1985.

[24] *Financial Times*, 20 Apr. 1985; *Asiaweek*, 6 Dec. 1985.

[25] *Congressional Quarterly*, 29 Dec. 1984; *Wall Street Journal*, 25 Jan. 1985; *International Herald Tribune*, 9 Oct. 1985; *Financial Times*, 23 May 1985; *Jerusalem Post*, 9 Aug. 1985; *Le Monde*, 8 Dec. 1985.

[26] *Patriot*, Karachi, 25 May 1985 and 9 Aug. 1985. On SIPRI figures, this should be 1.5 per cent for 1983.

[27] *Defense & Armaments*, no. 42, June 1985.

[28] *Patriot*, Karachi, 28 May 1985.

[29] *Sun*, Colombo, 2 Nov. 1984.

[30] *Far Eastern Economic Review*, 13 June 1985; *Patriot*, Karachi, 25 May 1985; *Sun*, Colombo, 20 Sep. 1985.

[31] *Far Eastern Economic Review*, 28 Nov. 1985.

[32] *Far Eastern Economic Review*, 17 Jan. 1985; *PSAJ-Newsletter*, Peace Studies Association of Japan, May 1985; *Mainichi Daily News*, Tokyo, 20 Sep. 1985; *Atlantic News*, 4 Oct. 1985.

[33] *Far Eastern Economic Review*, 14 Feb. 1985, 7 Mar. 1985, 30 May 1985, 1 Aug. 1985, 15 Aug. 1985; *Bangkok Post*, 3 Apr. 1985; *Patriot*, Karachi, 5 May 1985; *SIPRI Yearbook 1985* (note 11), chapter 12, p. 454.

[34] See, for example, 'Marcos turns a deaf ear to reform pleas', *Far Eastern Economic Review*, 27 June 1985, citing the US House Foreign Affairs Committee, Asia and Pacific Affairs Subcommittee; Lee Hamilton, chairman of the House Select Committee on Intelligence, has said that 'the NPA can be stopped and democracy restored in the Philippines only if major political, economic and military reforms take place . . .', *Far Eastern Economic Review*, 31 Oct. 1985; the Archbishop of Manila, Jaime Cardinal Sin: '. . . we witness the Armed Forces striving mightily to project the dangers arising from growing Communist power in order to acquire more sophisticated weaponry', quoted in *Pacific Defence Reporter*, Sep. 1985.

[35] *Far Eastern Economic Review*, 8 Aug. 1985, 29 Aug. 1985, 31 Oct. 1985; *Asia Research Bulletin*, 31 Jan. 1985; *International Herald Tribune*, 15 Mar. 1985; *Milavnews*, no. 289 (11 Nov. 1985); *Jane's Defence Weekly*, 10 Aug. 1985, 23 Nov. 1985; *Pacific Defence Reporter* (note 34).

[36] *Asiaweek*, 9 Feb. 1986.

[37] *Africa Defence*, no. 54 (Feb. 1985) and no. 59 (July 1985); *Africa Research Bulletin*, vol. 22, no. 12 (31 Jan. 1985) and vol. 22, no. 6 (31 July 1985); *Europa Yearbook 1985* (Europa Publications Ltd: London, 1985), quoting the World Bank.

[38] *Milavnews*, vol. 24, no. 287 (June 1985) and vol. 24, no. 288 (Oct. 1985); *Far Eastern Economic Review*, 23 May 1985; *Defence Report 1984–85* (Australian Government Publishing Services: Canberra, 1985).

[39] *Far Eastern Economic Review*, 29 Dec. 1983, quoting the New Zealand Defence White Paper for 1984.

[40] *Business Asia*, 21 June 1985; *Jane's Defence Weekly*, 29 June 1985; *Defence and Foreign Affairs Daily*, 21 June 1985; *Estimates of the Expenditure of the Government of New Zealand* for the year ending 31 Mar. 1986 (Government Printer: Wellington, New Zealand, 1985); *Financial Times, Survey: New Zealand*, 17 June 1985.

[41] Instituto de Investigaciones Económicas, 'Hacia una economía de guerra: El Salvador 1982–1983', *Estudios Centroamericanos* (ECA), vol. 38, no. 415–6, May–June 1983, numero extraordinario, pp. 439–58.

[42] UN document A/39/544, 13 Aug. 1985. The meeting was attended by all the countries of Latin America given in table 11A.3 except Guyana, Jamaica, and Trinidad and Tobago.

[43] *Jane's Defence Weekly*, vol. 4, no. 14 (5 Oct. 1985); *Latin America Weekly Report*, WR-84-31, 10 Aug. 1984; *Latin America Regional Report*, RS-85-06, 3 Aug. 1985.

[44] *Latin America Regional Reports: Brazil*, RB-86-01, 3 Jan. 1986.

[45] *New York Times*, 12 May 1984. Out of loans amounting to $4.2 billion, YPF claims it benefited from only $300 million. The rest was used by the military regimes 'to subsidize extremely low gasoline prices, to buy arms and finance Argentine tourists travelling abroad'.

[46] *Milavnews*, vol. 24, no. 287 (Sep. 1985); and vol. 24, no. 288 (Oct. 1985).

[47] Ball, N., 'The security sector, the budget and development', *IDS Bulletin*, Institute of Development Studies, Sussex, UK, vol. 16, no. 4 (Oct. 1985); Cordero, F., 'Antecedentes para una evaluación del gasto militar y del gasto fiscal social en Chile 1973–84', *Ibero-Americana, Nordic Journal of Latin American Studies*, vol. 15, no. 1–2 (1985), pp. 133–53.

[48] The Presidential press office, which in 1973 had 6 employees, had 120 at the beginning of 1985 charged with the control of the press and government information. *Latin America Weekly Report*, WR-85-02, 11 Jan. 1985.

[49] *Latin America Weekly Report*, WR-85-42, 25 Oct. 1985.

[50] Peru will purchase 12 of these aircraft for its own use but must find buyers for the remaining 14.

[51] *Comercio Exterior*, Mexico, vol. 35, no. 9 (Sep. 1985).

Appendix 11A. Tables of world military expenditure, 1976–85

GERD HAGMEYER-GAVERUS assisted by RITA TULLBERG

Notes, definitions, sources and conventions for the military expenditure tables can be found on pages 247–8.

Table 11A.1. World military expenditure summary, in constant price figures

Figures are in US $m., at 1980 prices and exchange-rates. Totals may not add up due to rounding.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Share of 1985 total (%)
USA	131 712	137 126	137 938	138 796	143 981	153 884	167 711	179 651	187 987	204 896	*30.9*
Other NATO[a]	101 592	103 282	107 039	109 361	112 320	113 153	116 080	119 171	120 137	122 784	*18.5*
Total NATO	233 304	240 408	244 977	248 157	256 301	267 037	283 792	298 822	308 124	327 680	*49.4*
USSR	[124 200]	[126 100]	[128 000]	[129 900]	[131 800]	[133 800]	[135 800]	[137 900]	[142 000]	[146 200]	*22.0*
Other WTO	11 548	11 863	12 208	(12 366)	(12 479)	(12 678)	(13 174)	(13 145)	(13 303)	(13 932)	*2.1*
Total WTO	[135 748]	[137 963]	[140 208]	[142 266]	[144 279]	[146 478]	[148 974]	[151 045]	[155 303]	[160 132]	*24.1*
Other Europe	14 084	14 061	14 262	15 026	15 427	15 327	15 756	16 059	16 271	(16 639)	*2.5*
Middle East	39 116	37 683	37 522	39 485	41 190	(46 177)	(52 346)	[53 317]	[51 434]	[49 634]	*7.5*
South Asia	5 718	5 521	5 773	6 269	6 599	7 055	7 794	8 137	8 605	9 087	*1.4*
Far East (excl. China)	21 270	22 780	25 080	26 000	27 360	29 060	30 920	31 940	32 930	34 800	*5.2*
China[b]	[44 700]	[43 100]	[48 400]	[52 600]	[42 700]	[34 900]	[36 400]	[34 500]	[33 900]	[30 000]	*4.5*
Oceania	3 832	3 849	3 917	4 036	4 273	4 587	4 768	4 904	5 274	5 350	*0.8*
Africa (excl. Egypt)	12 950	13 498	13 824	14 670	(14 758)	(13 850)	(13 931)	[14 222]	[12 869]	[12 699]	*1.9*
Central America	1 891	2 429	2 598	2 620	2 853	3 275	[3 359]	[3 616]	[3 751]	[3 797]	*0.6*
South America	9 907	10 637	10 525	10 720	11 305	11 818	[17 012]	[15 027]	[14 116]	[13 300]	*2.0*
World total	**522 520**	**531 930**	**547 090**	**561 850**	**567 050**	**579 560**	**615 050**	**631 590**	**642 580**	**663 120**	***100.0***
Industrial market economies[c]	249 924	257 241	262 841	267 683	276 957	287 383	305 116	321 625	331 619	351 870	*53.1*
Non-market economies[c]	[183 646]	[184 858]	[192 760]	[199 248]	[191 449]	[186 265]	[190 684]	[191 057]	[195 201]	[196 451]	*29.6*
Oil-exporting countries[c]	40 892	39 833	41 851	44 125	47 005	[51 910]	[58 195]	[57 832]	[55 768]	[54 624]	*8.2*
Rest of the world[c]	48 057	49 999	49 634	50 793	51 635	54 007	[61 059]	[61 075]	[59 991]	[60 174]	*9.0*
with 1983 per capita GNP:											
<US $440	8 201	7 805	8 411	9 006	9 297	9 562	10 387	10 761	11 077	11 552	*1.7*
US $440–1639	12 982	13 760	12 168	11 934	11 651	12 666	13 495	14 086	13 772	14 008	*2.1*
≥US $1640	26 873	28 435	29 054	29 853	30 687	31 780	37 177	36 228	35 143	34 615	*5.2*

Table 11A.2. World military expenditure, annual real rates of change

Figures are percentages, based on constant price figures (see table 11A.1).

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Total NATO[a]	−2.4	3.0	1.9	1.3	3.3	4.2	6.3	5.3	3.1	6.3
Total WTO	[1.7]	[1.6]	[1.6]	[1.5]	[1.4]	[1.5]	[1.7]	[1.4]	[2.8]	[3.1]
Other Europe	4.7	−0.2	1.4	5.4	2.7	−0.6	2.8	1.9	1.3	(2.3)
Middle East	9.7	−3.7	−0.4	5.2	4.3	(12.1)	(13.4)	[1.9]	[−3.5]	[−3.5]
South Asia	13.4	−3.4	4.5	8.6	5.3	6.9	10.5	4.4	5.8	5.6
Far East (excl. China)	9.1	7.1	10.1	3.7	5.2	6.2	6.4	3.3	3.1	5.7
China	[10.0]	[−3.6]	[12.3]	[8.7]	[−18.8]	[−18.3]	[4.3]	[−5.2]	[−1.7]	[−11.5]
Oceania	−0.4	0.5	1.8	3.0	5.9	7.3	3.9	2.9	7.6	1.4
Africa (excl. Egypt)	5.4	4.2	2.4	6.1	(0.6)	(−6.2)	(0.6)	[2.1]	[−9.5]	[−1.3]
Central America	8.2	28.5	6.9	0.9	8.9	14.8	[2.6]	[7.7]	[3.7]	[1.2]
South America	10.1	7.4	−1.1	1.9	5.5	4.5	[44.0]	[−11.7]	[−6.1]	[−5.8]
World total	**1.7**	**1.8**	**2.8**	**2.7**	**0.9**	**2.2**	**6.1**	**2.7**	**1.7**	**3.2**
Industrial market economies[c]	−2.2	2.9	2.2	1.8	3.5	3.8	6.2	5.4	3.1	6.1
Non-market economies[c]	[3.8]	0.7	[4.3]	[3.4]	[−3.9]	[−2.7]	[2.4]	[0.2]	[2.2]	[0.6]
Oil-exporting countries[c]	10.1	−2.6	5.1	5.4	6.5	[10.4]	[12.1]	[−0.6]	[−3.6]	[−2.1]
Rest of the world[c]	1.0	1.6	3.2	2.7	0.9	2.0	[5.4]	[3.0]	[2.1]	[3.5]
with 1983 per capita GNP:										
<US $440	6.5	−4.8	7.8	7.1	3.2	2.9	8.6	3.6	2.9	4.3
US $440–1639	7.0	6.0	−11.6	−1.9	−2.4	8.7	6.5	4.4	−2.2	1.7
≥US $1640	11.3	5.8	2.2	2.7	2.8	3.6	17.0	−2.6	−3.0	−1.5

Table 11A.3. World military expenditure, in constant price figures

Figures are in US $m., at 1980 prices and exchange-rates. Totals may not add up due to rounding.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
NATO[a]										
North America										
Canada	4 342	4 623	4 793	4 550	4 703	4 786	5 255	5 247	5 797	6 132
USA	131 712	137 126	137 938	138 796	143 981	153 884	167 711	179 651	187 987	204 896
Europe										
Belgium	3 473	3 562	3 798	3 882	3 959	3 995	3 862	3 714	3 616	3 798
Denmark	1 527	1 534	1 594	1 604	1 618	1 636	1 683	1 697	1 656	1 680
France	22 706	23 984	25 387	25 964	26 428	27 069	27 626	28 097	27 999	28 035
FR Germany	25 015	24 923	25 979	26 328	26 692	27 012	26 664	26 887	26 612	27 159
Greece	2 508	2 658	2 715	2 630	2 276	2 693	2 746	2 505	2 975	2 930
Italy	7 688	8 257	8 609	9 154	9 578	9 781	10 463	10 689	11 008	11 088
Luxembourg	41.1	40.3	43.8	45.1	52.5	54.3	54.8	56.0	56.3	56.6
Netherlands	4 746	5 287	5 106	5 414	5 269	5 325	5 306	5 529	5 351	5 280
Norway	1 479	1 507	1 612	1 651	1 669	1 686	1 752	1 828	1 761	2 024
Portugal	846	781	789	801	868	864	865	832	774	809
Turkey	3 295	3 173	2 906	2 578	2 442	3 015	3 296	3 173	3 031	3 219
UK	23 927	22 953	23 710	24 761	26 767	25 239	26 508	29 188	29 502	30 573
Total NATO (excl. USA)	101 592	103 282	107 039	109 361	112 320	113 153	116 080	119 171	120 137	122 784
Total NATO	233 304	240 408	244 977	248 157	256 301	267 037	283 792	298 822	308 124	327 680
WTO[d]										
Bulgaria	(910)	(902)	[946]	[971]	[1 000]	[1 056]	[1 090]	[1 112]	[1 145]	[1 170]
Czechoslovakia	2 346	2 292	2 381	(2 338)	(2 432)	(2 415)	(2 460)	(2 506)	(2 583)	. .
German DR	3 390	3 507	3 686	(3 860)	(4 167)	(4 508)	(4 765)	(5 030)	(5 376)	(5 464)
Hungary	644	668	760	754	755	778	765	708	(674)	(726)
Poland	2 897	3 089	2 964	(2 984)	(2 863)	(2 673)	(2 938)	(2 656)	(2 408)	(2 762)
Romania	1 363	1 405	1 472	1 460	1 263	1 249	1 157	(1 133)	(1 119)	(1 148)
USSR	[124 200]	[126 100]	[128 000]	[129 900]	[131 800]	[133 800]	[135 800]	[137 900]	[142 000]	[146 200]
Total WTO (excl. USSR)	11 548	11 863	12 208	(12 336)	(12 479)	(12 678)	(13 174)	(13 145)	(13 303)	(13 932)
Total WTO	[135 748]	[137 963]	[140 208]	[142 266]	[144 279]	[146 478]	[148 974]	[151 045]	[155 303]	[160 132]

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Other Europe										
Albania[e]	112	115	117	126	131	134	134	130	144	243
Austria	813	840	918	973	952	942	975	1 100	996	1 093
Finland	662	613	642	717	771	787	910	(933)	(894)	(773)
Ireland	283	290	319	344	362	347	351	329	. .	. .
Spain	3 529	3 538	3 526	3 699	4 007	4 101	4 650	5 078	5 267	5 318
Sweden	3 788	3 829	3 943	4 079	4 008	4 012	3 960	3 921	3 932	3 951
Switzerland	2 133	2 022	2 026	2 120	2 108	2 105	2 193	2 139	2 230	2 480
Yugoslavia	2 764	2 815	2 773	2 969	3 089	2 899	(2 583)	(2 428)	[2 492]	[2 471]
Total Other Europe	14 084	14 061	14 263	15 026	15 427	15 327	15 756	16 059	16 271	(16 639)
Middle East										
Bahrain	35.7	46.6	114	149	157	192	[232]	[238]	[259]	[263]
Cyprus	30.4	39.3	31.3	40.5	30.9	44.8	[48.1]	[68.7]	. .	. .
Egypt	[3 711]	[3 882]	[2 179]	[2 068]	(1 464)	(1 488)	(1 679)	(1 883)	[1 948]	[1 868]
Iran	14 658	11 898	11 036	6 577	5 123	[5 564]	[6 161]	[5 275]	. .	. .
Iraq	2 584	2 700	2 556	(3 235)	[3 353]	[3 815]	[5 981]	[7 791]	. .	. .
Israel	(4 425)	(4 437)	(3 939)	(4 154)	(4 256)	(4 565)	[4 382]	[4 959]	[4 377]	[4 000]
Jordan	537	440	436	496	457	499	519	(536)	[545]	[551]
Kuwait	1 250	1 344	1 168	1 159	1 265	(1 481)	(1 672)	. .	. .	. .
Lebanon	199	121	195	266	332	265	275	[301]	. .	. .
Oman[e]	785	686	767	779	1 178	1 511	1 682	1 943	[2 131]	[2 070]
Saudi Arabia	(9 159)	[9 901]	(12 279)	(16 336)	(19 261)	(22 164)	(25 396)	[24 183]	[22 557]	[21 429]
Syria	1 409	1 388	1 505	2 511	(2 144)	(2 018)	[1 841]	[1 906]	[2 042]	[2 036]
United Arab Emirates	97.4	541	860	1 230	1 707	(1 990)	(1 899)	[1 798]	[1 783]	. .
Yemen Arab Republic	168	188	344	371	339	423	(440)	(604)	. .	. .
Yemen, People's Democratic Rep. of	67.1	74.6	112	115	123	156	140	(129)	(144)	. .
Total Middle East	39 116	37 683	37 522	39 485	41 190	(46 177)	(52 346)	[53 317]	[51 434]	[49 634]
South Asia										
Afghanistan	78.9	81.5	83.9	125	[174]	. .	. .	. .	. .	. .
Bangladesh	163	179	168	177	187	(209)	234	233	(236)	(245)

India	4 256	4 042	4 233	4 585	4 755	5 015	5 445	5 677	5 992	(6 182)
Nepal	17.3	17.5	17.8	19.5	19.6	20.3	23.1	25.1	28.2	[31.5]
Pakistan	1 161	1 156	1 231	1 302	1 404	1 572	1 817	1 915	2 032	2 199
Sri Lanka	41.4	45.3	38.9	61.3	58.7	53.9	[69.4]	73.1	90.5	190
Total South Asia	5 718	5 521	5 773	6 269	6 599	7 055	7 795	8 137	8 605	9 087
Far East										
Brunei	95.2	96.1	107	189	[192]	180	[200]	(217)	(279)	. .
Burma	156	181	213	227	(246)	[257]	(263)	(261)	(262)	(274)
Hong Kong	63.5	97.6	142	156	279	(271)	(234)	(222)	[221]	. .
Indonesia	(2 469)	(2 384)	(2 576)	(2 458)	(2 723)	(3 059)	[3 391]	[3 318]	[3 600]	[3 937]
Japan	8 233	8 467	8 987	9 573	9 766	10 041	10 429	10 913	11 369	11 879
Korea, North[e]	1 147	1 168	1 307	1 429	1 533	1 677	1 807	1 968	2 129	(2 213)
Korea, South	2 433	2 891	3 603	3 384	3 707	3 844	4 003	4 168	4 131	4 477
Malaysia	923	1 059	1 108	1 249	1 557	1 856	1 970	2 090	(1 840)	(1 769)
Mongolia[e]	140	139	145	(165)	(146)	(217)	(246)	(249)	(263)	. .
Philippines	991	980	899	825	776	836	887	757	. .	. .
Singapore	500	556	520	533	605	677	748	816	905	960
Taiwan	1 890	2 245	2 538	2 662	2 681	2 795	3 142	3 169	3 146	3 481
Thailand	913	1 101	1 382	1 559	1 476	1 574	1 699	1 823	1 968	2 041
Total Far East	19 954	21 366	23 525	24 407	25 687	27 282	29 018	29 972	30 893	32 663
Total Far East (incl. Kampuchea, Laos and Viet Nam)	21 270	22 780	25 080	26 000	27 360	29 060	30 920	31 940	32 930	34 800
Oceania										
Australia	3 480	3 493	3 540	3 650	3 857	4 112	4 300	4 447	4 801	(4 866)
Fiji	3.4	3.7	4.1	4.3	5.9	4.4	4.7	4.5	4.1	3.9
New Zealand	348	353	373	382	410	471	463	452	469	480
Total Oceania	3 832	3 849	3 917	4 036	4 273	4 587	4 768	4 904	5 274	5 350
Africa										
Algeria	836	729	792	783	890	792	830	912	885	(856)
Benin[f]	8.3	10.1	16.0	17.7	23.1	27.6	29.5	[33.1]	. .	. .
Burkina Faso	40.1	37.2	44.6	36.2	35.4	40.5	(42.4)	[40.5]	[39.1]	. .
Burundi	18.9	25.8	25.5	21.9	[27.8]	[26.8]	[31.0]	[27.7]	[28.8]	. .

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Cameroon	82.6	79.3	75.8	77.1	89.1	97.7	101	104	[117]	[120]
Central African Republic	14.3	12.5	13.9	17.0	13.3	16.9	. .	. .	. .	. .
Chad[e]	28.3	24.9	24.5	27.9	. .	. .	. .	[66.3]	. .	[71.0]
Congo	56.8	54.4	54.9	48.0	47.6	. .	. .	. .	[63.8]	[65.7]
Ethiopia	207	187	304	365	359	[359]	[349]	[353]	[365]	. .
Gabon	34.8	45.2	[69.8]	(64.0)	(74.8)	[47.9]	. .	[85.0]	[83.0]	. .
Ghana	398	229	170	(95.5)	[175]	[97.4]	[61.8]	[40.1]	[66.2]	. .
Ivory Coast	114	90.4	124	119	119	[109]	115	[111]	[117]	[111]
Kenya	97.1	176	279	344	319	229	285	268	(199)	(197)
Liberia	10.5	12.2	12.0	14.7	26.4	40.3	[33.8]	[23.9]	. .	. .
Libya	[2 011]	[2 312]	[2 924]	[3 799]	[3 276]	[3 439]	[3 518]	. .	. .	. .
Madagascar	55.4	73.4	75.1	97.5	(91.4)	(85.2)	. .	. .	(66.6)	(66.4)
Malawi	15.5	21.7	35.1	51.6	(53.2)	(39.7)	(29.1)	[23.9]	[21.9]	. .
Mali	96.6	94.2	78.1	88.7	77.1	72.6	79.6	76.3	. .	. .
Mauritania	109	123	94.9	104	80.6	. .	. .	. .	. .	. .
Mauritius	2.2	2.2	2.3	2.9	5.5	5.4	3.1	[3.5]	[3.2]	. .
Morocco	948	1 088	966	971	1 118	1 140	1 187	[1 329]	[953]	[969]
Mozambique[e]	36.0	38.8	74.6	76.3	97.2	114	127	(200)	(209)	(211)
Niger	12.7	13.2	16.0	18.3	(19.4)	(16.5)	(14.6)	(15.3)	. .	. .
Nigeria	3 249	3 333	2 744	2 298	2 613	2 077	1 636	1 326	[810]	[608]
Rwanda	17.5	17.1	18.9	19.7	21.5	25.3	23.6	22.7	19.1	. .
Senegal	82.3	96.9	106	104	92.5	95.0	87.6	83.9	(82.5)	[74.7]
Sierra Leone	9.7	10.5	10.7	10.8	[12.1]	[10.9]	[9.5]	[7.2]	. .	. .
Somalia	62.9	69.0	161	139	95.5	92.7	80.9	(87.2)	[62.7]	. .
South Africa[g]	2 590	(2 819)	(2 733)	(2 948)	(3 106)	(2 915)	[2 884]	[3 127]	[3 222]	[3 248]
Sudan	239	270	233	212	217	211	207	[193]	[189]	[180]
Tanzania	184	228	(420)	(449)	(242)	[164]	. .	. .	. .	. .
Togo	19.7	24.5	26.4	24.8	24.4	23.9	(21.3)	[20.0]	. .	. .
Tunisia	119	161	181	178	194	256	539	(549)	(573)	[680]
Uganda	539	373	295	(278)	(399)	(447)	[505]	. .	. .	. .
Zaire	212	151	85.7	96.9	102	102	116	[78.2]	[90.1]	. .
Zambia	[117]	[97.7]	[96.3]	[181]	[134]	. .	. .	. .	. .	. .
Zimbabwe	276	369	440	492	(459)	361	395	384	[328]	[321]
Total Africa	12 950	13 498	13 824	14 670	(14 758)	(13 850)	[13 931]	[14 222]	[12 869]	[12 699]

Central America										
Costa Rica	24.1	33.7	31.2	33.3	32.1	35.3	32.8	34.7	(36.8)	[37.1]
Cuba[h]	. .	957	1 029	1 068	986	1 080	1 221	1 196	1 425	(1 447)
Dominican Republic	100	100	111	127	99.4	[117]	[111]	106	[104]	[96.2]
El Salvador	66.1	87.1	85.5	(82.0)	102	112	123	122	142	(149)
Guatemala	98.2	111	127	131	143	145	[186]	(191)	(207)	[222]
Haiti	15.4	15.8	19.6	22.2	20.1	20.2	22.8	22.8	. .	. .
Honduras	35.5	43.9	56.0	57.3	(87.5)	(109)	[116]	[126]	(137)	(177)
Jamaica	110	95.2	99.2	89.7	76.7	(83.2)	[81.8]	[83.8]	[85.2]	. .
Mexico	791	803	794	800	1 046	1 291	1 119	[1 360]	[1 194]	[1 111]
Nicaragua	60.5	75.7	91.5	[61.5]	95.7	[104]	(113)	(168)	[201]	[270]
Panama	44.2	[41.0]	[44.2]	[46.6]	[42.2]	[43.3]	[49.2]	[52.5]	75.9	(78.3)
Trinidad and Tobago	63.1	66.6	110	102	123	135	184	(153)	(121)	[98.9]
Total Central America	1 891	2 429	2 598	2 620	2 853	3 275	[3 359]	[3 616]	[3 751]	[3 797]
South America										
Argentina	3 851	3 952	4 020	3 975	3 936	4 178	[8 784]	(6 537)	[5 633]	4 506
Bolivia	182	166	187	191	(192)	(242)	(257)	[209]	[210]	[230]
Brazil	2 209	2 020	1 868	1 665	1 304	1 354	1 535	(1 902)	[1 866]	[2 056]
Chile	971	1 285	1 443	1 651	2 038	1 761	[2 098]	[2 256]	[2 274]	[2 297]
Colombia	(328)	. .	(501)	(562)	668	597	613	735	709	. .
Ecuador	183	285	204	210	222	(235)	(209)	(196)	[217]	. .
Guyana	65.7	40.7	(35.3)	(30.0)	[38.4]	30.2	28.7	[32.8]	[31.4]	[33.5]
Paraguay	54.0	57.9	60.9	56.3	60.7	73.7	(76.2)	(67.9)	. .	. .
Peru	771	1 120	850	667	(980)	(1 211)	(1 217)	(1 293)	[1 290]	[1 202]
Uruguay	188	201	243	(301)	260	338	[382]	. .	. .	[384]
Venezuela	1 102	1 158	1 114	1 413	1 607	1 798	1 813	(1 462)	(1 504)	[1 618]
Total South America	9 907	10 637	10 525	10 720	11 305	11 818	[17 012]	[15 027]	[14 116]	[13 300]

Table 11A.4. World military expenditure, in current price figures

Figures are in local currency, current prices.

		1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
NATO[a]											
North America											
Canada	*m. dollars*	3 589	4 124	4 662	4 825	5 499	6 289	7 655	8 086	9 320	10 263
USA	*m. dollars*	91 013	100 925	109 247	122 279	143 981	169 888	196 390	217 198	237 052	266 642
Europe											
Belgium	*m. francs*	81 444	89 480	99 726	106 472	115 754	125 689	132 127	136 853	141 676	155 668
Denmark	*m. kroner*	5 714	6 382	7 294	8 045	9 117	10 301	11 669	12 574	13 045	13 750
France	*m. francs*	63 899	73 779	85 175	96 439	111 672	129 708	148 021	165 029	176 638	186 242
FR Germany	*m. marks*	38 922	40 184	43 019	45 415	48 518	52 193	54 234	56 496	57 274	59 737
Greece	*m. drachmas*	56 963	67 738	77 861	89 791	96 975	142 865	176 270	193 340	271 922	321 722
Italy	*b. lire*	3 608	4 533	5 301	6 468	8 203	9 868	12 294	14 400	16 433	18 059
Luxembourg	*m. francs*	983	1 029	1 154	1 242	1 534	1 715	1 893	2 104	2 234	2 317
Netherlands	*m. guilders*	7 662	9 092	9 146	10 106	10 476	11 296	11 921	12 149	12 765	12 885
Norway	*m. kroner*	5 333	5 934	6 854	7 362	8 242	9 468	10 956	12 395	12 688	15 431
Portugal	*m. escudos*	18 845	22 082	27 354	34 343	43 440	51 917	63 817	76 765	92 009	111 522
Turkey	*m. lira*	40 691	49 790	66 239	93 268	185 656	313 067	447 790	556 738	803 044	1 198 125
UK	*m. pounds*	6 132	6 810	7 616	9 029	11 510	12 144	13 849	15 952	16 923	18 572
WTO											
Bulgaria	*m. leva*	(613)	(614)	[650]	[700]	[820]	[870]	[901]	[932]	[969]	[1 010]
Czechoslovakia	*m. korunas*	18 821	18 646	19 666	(20 050)	(21 470)	(21 500)	(23 020)	(23 650)	(24 602)	. .
German DR	*m. marks*	7 994	8 261	8 674	(9 110)	(9 875)	(10 705)	(11 315)	(11 970)	(12 830)	(13 041)
Hungary	*m. forints*	11 671	12 607	14 983	16 200	17 700	19 060	20 050	19 900	(20 500)	(23 300)
Poland	*m. zlotys*	56 605	63 315	65 653	(70 780)	(74 285)	(84 450)	(191 100)	(210 900)	(218 723)	(288 745)
Romania	*m. lei*	10 575	10 963	11 713	11 835	10 394	10 503	11 379	(11 725)	(11 700)	(12 278)
Other Europe											
Albania	*m. leks*	783	805	818	885	915	940	935	910	1 010	1 700
Austria	*m. schillings*	8 728	9 515	10 767	11 828	12 317	13 021	14 202	16 546	15 843	17 875
Finland	*m markkaa*	1 695	1 767	1 996	2 396	2 876	3 287	4 154	(4 616)	(4 737)	(4 303)

Ireland	*m. punt*	84.0	98.0	116	142	176	203	241	250	. .	. .
Spain	*m. pesetas*	127 028	158 568	189 104	229 401	287 276	336 974	437 102	535 226	620 865	679 811
Sweden	*m. kronor*	10 719	12 082	13 674	15 163	16 951	19 023	20 386	21 993	23 816	25 532
Switzerland	*m. francs*	3 242	3 110	3 151	3 414	3 533	3 756	4 134	4 155	4 457	5 127
Yugoslavia	*m. dinars*	33 234	38 766	43 379	56 330	76 100	99 800	(118 200)	(154 600)	[246 600]	[391 300]
Middle East											
Bahrain	*m. dinars*	9.3	14.3	40.5	53.9	59.2	80.7	[106]	[112]	[122]	[128]
Cyprus	*m. pounds*	7.5	10.4	8.9	12.6	10.9	17.5	[20.0]	[30.0]	. .	. .
Egypt	*m. pounds*	[1 564]	[1 845]	[1 150]	[1 200]	(1 025)	(1 150)	(1 490)	(1 940)	[2 350]	[2 550]
Iran	*m. rials*	546 500	563 750	584 500	385 000	361 750	[488 000]	[641 250]	[657 500]	. .	. .
Iraq	*m. dinars*	520	593	587	(788)	[990]	[1 350]	[2 400]	[3 200]	[4 300]	. .
Israel	*b. shekels*	(2.7)	(3.7)	(4.9)	(9.2)	(21.8)	(50.7)	[107.2]	[298.2]	[1 247]	[3 830]
Jordan	*m. dinars*	103	96.5	102	133	136	160	179	(194)	[205]	[215]
Kuwait	*m. dinars*	247	292	276	293	342	(430)	(523)	. .	. .	. .
Lebanon	*m. pounds*	327	255	491	738	1 141	1 058	1 246	[1 465]	[2 030]	. .
Oman	*m. rials Omani*	271	237	265	269	407	522	581	671	[736]	[715]
Saudi Arabia	*m. riyals*	(26 325)	[31 685]	(38 684)	(52 388)	(64 076)	(75 723)	(87 695)	[84 311]	[77 817]	[72 000]
Syria	*m. pounds*	3 778	4 160	4 740	8 287	(8 415)	(9 378)	[9 778]	[10 729]	[12 602]	[13 000]
United Arab Emirates	*m. dirhams*	312	1 928	3 019	4 394	6 330	(7 575)	(7 309)	[6 985]	[6 855]	. .
Yemen Arab Republic	*m. rials*	411	572	1 180	1 606	1 545	2 025	(2 165)	(3 060)	. .	. .
Yemen, People's Democratic Rep. of	*m. dinars*	17.1	20.0	30.8	36.1	42.6	56.0	55.1	(56.0)	(66.1)	. .
South Asia											
Afghanistan	*m. afghanis*	2 353	2 617	2 919	5 472	[7 667]	. .	. .	. .	. .	. .
Bangladesh	*m. taka*	1 581	1 917	2 038	2 409	2 891	(3 661)	4 482	4 805	(5 765)	(6 950)
India	*m. rupees*	25 400	26 159	28 091	32 336	37 390	44 556	52 192	60 840	69 586	(75 583)
Nepal	*m. rupees*	148	165	180	204	236	271	345	421	485	[575]
Pakistan	*m. rupees*	8 112	8 895	10 054	11 513	13 903	17 407	21 316	24 129	27 432	31 354
Sri Lanka	*m. rupees*	432	478	460	804	971	1 051	[1 500]	1 800	2 600	5 600
Far East											
Brunei	*m. dollars*	167	175	203	372	[410]	416	[480]	(530)	(700)	. .
Burma	*m. kyats*	1 041	1 197	1 320	1 491	(1 622)	[1 703]	(1 833)	(1 923)	(2 023)	(2 245)
Hong Kong	*m. dollars*	219	354	545	666	1 388	(1 530)	(1 463)	(1 525)	[1 648]	. .

		1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Indonesia	*b. new rupiahs*	(903)	(968)	(1 130)	(1 300)	(1 708)	(2 153)	[2 613]	[2 858]	[3 425]	[3 923]
Japan	*b. yen*	488	653	822	2 010	2 214	2 388	2 547	2 712	2 890	3 087
Korea, North	*m. won*	2 058	2 096	2 344	2 563	2 750	3 009	3 242	3 530	3 819	(3 970)
Korea, South	*m. won*	770	1 008	1 438	1 597	2 252	2 831	3 163	3 406	3 452	3 826
Malaysia	*m. ringgits*	5 654	1 987	2 183	2 547	3 389	4 432	4 978	5 479	(5 010)	(4 830)
Mongolia	*m. tughriks*	(407)	(405)	(421)	(480)	(426)	(630)	(716)	(726)	(764)	. .
Philippines	*m. pesos*	4 614	4 924	4 863	5 240	5 829	7 100	8 300	7 800	. .	. .
Singapore	*m. dollars*	878	1 007	987	1 051	1 296	1 569	1 800	1 988	2 263	2 411
Taiwan	*m. dollars*	46 000	58 500	70 000	80 500	96 500	(117 000)	135 500	138 500	137 500	151 650
Thailand	*m. baht*	(12 250)	(15 875)	(21 500)	26 650	30 255	36 325	41 250	45 900	50 000	52 900
Oceania											
Australia	*m. dollars*	2 100	2 365	2 590	2 911	3 388	3 962	4 603	5 241	5 886	(6 383)
Fiji	*m. dollars*	2.0	2.3	2.7	3.1	4.8	4.0	4.6	4.7	4.5	4.5
New Zealand	*m. dollars*	209	243	288	334	421	557	638	668	735	865
Africa											
Algeria	*m. dinars*	2 001	1 956	2 490	2 742	3 417	3 481	3 893	4 477	4 631	(4 793)
Benin	*m. francs*	1 750	2 133	3 384	3 736	4 888	6 502	7 821	[9 500]	. .	. .
Burkina Faso	*m. francs*	4 667	5 627	7 305	6 814	7 470	9 216	(10 800)	[11 172]	[11 312]	. .
Burundi	*m. francs*	860	1 256	1 533	1 800	[2 500]	[2 700]	[3 300]	[3 200]	[3 800]	. .
Cameroon	*m. francs*	11 582	12 769	13 700	14 876	18 816	22 860	26 645	32 216	[40 373]	[47 449]
Central African Rep.	*m. francs*	1 915	1 880	2 289	3 061	2 816	4 029	. .	. .	. .	. .
Chad	*m. francs*	5 977	5 255	5 186	5 890	. .	. .	. .	[14 000]	. .	[15 000]
Congo	*m. francs*	8 205	9 000	10 000	9 450	10 050	. .	. .	. .	[21 596]	[25 000]
Ethiopia	*m. birr*	265	280	519	722	744	[789]	[811]	[816]	[915]	. .
Gabon	*m. francs*	4 807	7 107	[12 160]	(12 036)	(15 806)	[11 000]	. .	[25 150]	[26 500]	. .
Ghana	*m. cedis*	126	157	202	(175)	[480]	[580]	[450]	[650]	[1 500]	. .
Ivory Coast	*m. francs*	12 536	12 640	19 579	21 854	25 031	[25 000]	28 400	[29 057]	[31 807]	[32 203]
Kenya	*m. pounds*	20.6	42.9	79.4	106	112	89.7	135	141	(115)	[115]
Liberia	*m. dollars*	7.2	8.9	9.4	12.8	26.4	43.4	[38.5]	[28.0]	. .	. .
Libya	*m. dinars*	[405]	[495]	[810]	[995]	[970]	[1 130]	[1 270]	1 010	. .	. .
Madagascar	*m. francs*	7 895	10 800	11 775	17 420	(19 315)	(23 500)	. .	. .	[31 730]	(33 520)

Malawi	*m. kwachas*	8.4	12.3	21.6	35.2	(43.2)	(36.0)	(29.0)	[27.0]	[27.9]	. .
Mali	*m. francs*	10 456	12 751	14 080	15 331	16 295	17 217	19 302	20 486	. .	. .
Mauritania	*m. ouguiyas*	3 497	4 350	3 605	4 301	3 700	. .	. .	. .	. .	. .
Mauritius	*m. rupees*	8.8	9.4	10.8	15.7	42.6	47.7	30.8	[36.0]	[36.0]	[37.0]
Morocco	*m. dirhams*	2 548	3 294	3 209	3 495	4 400	5 047	5 814	[6 910]	[5 573]	[6 105]
Mozambique	*m. meticais*	(1 760)	1 900	3 650	3 733	4 754	5 595	6 188	(9 800)	(10 200)	(10 300)
Niger	*m. francs*	1 667	2 143	2 862	3 509	(4 103)	(4 286)	(4 232)	(4 321)	. .	. .
Nigeria	*m. nairas*	1 070	1 219	1 222	1 142	1 429	1 372	1 164	1 162	[991]	[964]
Rwanda	*m. francs*	1 020	1 131	1 414	1 704	1 993	2 500	2 622	2 693	2 386	. .
Senegal	*m. francs*	12 661	16 600	18 800	20 150	19 550	21 250	23 000	24 600	(27 046)	[28 235]
Sierra Leone	*m. leones*	6.3	7.4	8.3	10.3	[12.8]	[14.2]	[16.2]	[20.8]	. .	. .
Somalia	*m. shillings*	165	200	513	552	601	843	902	(1 325)	[1 831]	. .
South Africa[g]	*m. rands*	1 281	(1 548)	(1 654)	(2 018)	(2 419)	(2 615)	[2 967]	[3 615]	[4 158]	[4 611]
Sudan	*m. pounds*	52.0	68.9	70.9	84.7	108	131	162	[198]	[248]	[306]
Tanzania	*m. shillings*	818	1 130	(2 324)	(2 828)	(1 985)	[1 690]	. .	. .	. .	. .
Togo	*m. francs*	2 799	4 268	4 615	4 661	5 155	6 040	(5 998)	[6 140]	. .	. .
Tunisia	*m. dinars*	36.0	52.2	61.8	65.4	78.6	113	270	(300)	(339)	[435]
Uganda	*m. shillings*	835	1 089	1 174	(1 548)	(2 958)	(5 413)	[8 253]	. .	. .	. .
Zaire	*m. zaires*	79.7	96.0	81.0	191	286	385	596	[713]	[1 250]	. .
Zambia	*m. kwachas*	[54.0]	[54.0]	[62.0]	[128]	[106]	. .	. .	. .	. .	. .
Zimbabwe	*m. dollars*	122	180	227	300	(295)	262	318	380	[390]	[412]
Central America											
Costa Rica	*m. colones*	145	211	207	242	275	415	733	1 027	(1 220)	[1 425]
Cuba	*m. pesos*	. .	700	784	814	759	931	1 109	1 133	1 404	1 471
Dominican Republic	*m. pesos*	67.4	75.8	87.1	109	99.4	[126]	[128]	129	[160]	[200]
El Salvador	*m. colones*	97.0	143	159	(175)	254	322	395	442	574	(700)
Guatemala	*m. guetzales*	65.5	83.2	103	118	143	161	[208]	(231)	(270)	[400]
Haiti	*m. gourdes*	55.8	60.9	73.7	94.1	101	112	136	150	. .	. .
Honduras	*m. lempiras*	47.4	63.6	86.2	99.1	(175)	(240)	[280]	[335]	(380)	(505)
Jamaica	*m. dollars*	79.3	76.5	108	126	137	167	[175]	[200]	[260]	. .
Mexico	*m. pesos*	8 026	10 500	12 214	14 519	24 000	37 890	52 212	[128 000]	[186 000]	[269 700]
Nicaragua	*m. cordobas*	260	363	459	[456]	961	[1 300]	(1 760)	(3 420)	[5 550]	[17 760]
Panama	*m. balboas*	33.0	[32.0]	[36.0]	[41.0]	[42.2]	[46.5]	[55.0]	[60.0]	88.0	(92.0)
Trinidad and Tobago	*m. dollars*	91.2	108	195	208	296	371	563	(545)	(490)	[465]

		1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
South America											
Argentina	*t. australes*	18	50.9	142	364	724	1 572	[8 750]	(28 900)	[181 000]	[815 000]
Bolivia	*b. pesos*	2.2	2.1	2.7	3.2	(4.8)	(8.0)	(19.0)	[58.0]	[805]	[100 500]
Brazil	*b. cruzeiros*	20.9	27.5	35.2	48.0	68.7	147	329	(988)	[2 874]	[10 071]
Chile	*m. pesos*	7 815	19 850	31 223	47 640	79 488	82 184	[107 700]	[147 300]	[178 000]	[238 000]
Colombia	*m. pesos*	(6 270)	. .	(15 000)	(21 000)	31 600	36 000	46 000	66 105	74 000	. .
Ecuador	*m. sucres*	2 914	5 116	4 097	4 638	5 539	(6 639)	(6 870)	(9 540)	[13 900]	. .
Guyana	*m. dollars*	100	67.0	(67.0)	(67.0)	[98.0]	96.0	108	[142]	[156]	[192]
Paraguay	*m. guaranies*	3 588	4 204	4 892	5 793	7 644	10 581	(11 687)	(11 800)	. .	. .
Peru	*b. soles*	38.5	77.2	92.5	121	(283)	(613)	(1 014)	(2 274)	[4 770]	[12 000]
Uruguay	*m. new pesos*	274	464	811	(1 676)	2 362	4 126	[5 540]	. .	. .	[22 000]
Venezuela	*m. bolivares*	3 000	3 400	3 500	4 991	6 899	8 952	9 905	8 488	(9 800)	[12 200]

Table 11A.5. World military expenditure as a percentage of gross domestic product

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
NATO[a]										
North America										
Canada	1.8	1.9	2.0	1.8	1.8	1.8	2.1	2.0	2.1	2.2
USA	5.4	5.3	5.1	5.1	5.6	5.8	6.5	6.7	6.5	6.6
Europe										
Belgium	3.1	3.2	3.3	3.3	3.3	3.5	3.4	3.1	3.1	3.3
Denmark	2.3	2.3	2.3	2.3	2.4	2.5	2.5	2.4	2.3	2.3
France	3.8	3.9	4.0	3.9	4.0	4.2	4.1	4.2	4.1	4.1
FR Germany	3.5	3.4	3.3	3.3	3.3	3.4	3.4	3.4	3.3	3.3
Greece	6.9	7.0	6.7	6.3	5.7	7.0	6.9	6.3	7.2	7.1
Italy	2.3	2.4	2.4	2.4	2.4	2.5	2.6	2.7	2.7	2.7
Luxembourg	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.9	0.9	0.9
Netherlands	3.2	3.3	3.1	3.2	3.1	3.2	3.2	3.2	3.2	3.1
Norway	3.1	3.1	3.2	3.1	2.9	2.9	3.0	3.1	2.8	3.2
Portugal	4.0	3.5	3.5	3.5	3.5	3.5	3.4	3.4	3.3	3.2
Turkey	6.2	5.8	5.2	4.3	4.3	4.9	5.2	4.9	4.4	4.4
UK	4.8	4.7	4.5	4.6	5.0	4.8	5.0	5.3	5.3	5.4
WTO										
Bulgaria[f]	(3.1)	(3.0)	[3.1]	[3.1]	[3.1]	[3.1]	[3.0]	[3.1]	[3.1]	. .
Czechoslovakia[f]	3.1	3.1	3.1	(3.0)	(3.1)	(3.2)	(3.2)	(3.2)	(3.3)	. .
German DR[f]	4.1	4.0	4.1	(4.1)	(4.2)	(4.4)	(4.5)	(4.5)	(4.7)	(4.6)
Hungary	2.2	2.2	2.4	2.4	2.5	2.4	2.4	2.2	(2.1)	. .
Poland[f]	2.6	2.7	2.6	(2.7)	(2.8)	(2.9)	(3.0)	(2.6)	. .	. .
Romania[f]	2.2	2.1	2.1	2.0	1.7	1.6	1.5	(1.5)	(1.4)	. .
Other Europe										
Austria	1.2	1.2	1.3	1.3	1.2	1.2	1.2	1.4	1.2	1.4
Finland	1.4	1.4	1.4	1.4	1.5	1.5	1.7	(1.7)	(1.6)	(1.3)
Ireland	1.8	1.7	1.7	1.8	1.9	1.8	1.8	1.7	. .	. .
Spain	1.8	1.7	1.7	1.7	1.9	1.9	2.2	2.3	2.4	2.4
Sweden	3.2	3.3	3.3	3.3	3.2	3.3	3.2	3.1	3.0	2.9
Switzerland	2.3	2.1	2.1	2.2	2.1	2.0	2.1	2.0	2.1	2.2
Yugoslavia[f]	5.6	5.3	4.8	4.8	4.9	4.5	(4.0)	(3.8)	[5.2]	[5.2]

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Middle East										
Bahrain	1.7	2.2	. .	. .	. .	5.0	[6.1]	[6.1]	[6.4]	. .
Cyprus	2.3	2.5	1.7	2.0	1.5	2.0	[2.0]	[2.7]	. .	. .
Egypt	[21.0]	[20.5]	[10.3]	[8.5]	(6.2)	(6.1)	(6.6)	(7.4)	[8.2]	. .
Iran	12.4	10.5	10.5	6.3	5.3	[6.1]	[6.3]	. .	. .	. .
Iraq	10.7	10.4	. .	. .	. .	. .	[23.2]	[33.7]	. .	. .
Israel	(26.4)	(24.4)	(20.4)	(20.1)	(20.3)	(20.3)	[19.2]	[20.8]	[17.9]	. .
Jordan	24.4	18.8	16.2	17.7	13.9	13.7	13.5	(13.5)	[13.5]	. .
Kuwait	6.6	7.3	6.6	4.8	4.7	(6.2)	(8.5)	. .	. .	. .
Lebanon	. .	3.1	5.6	6.6	. .	. .	. .	[7.5]	[11.8]	. .
Oman	32.8	26.9	28.0	20.9	19.7	20.8	22.3	24.5	[24.2]	. .
Saudi Arabia	(16.0)	(15.5)	(17.3)	(21.1)	(16.6)	(14.5)	(16.7)	[20.3]	[20.4]	. .
Syria	15.2	15.3	14.5	21.1	(16.2)	(14.1)	[13.6]	[13.8]	. .	. .
United Arab Emirates	0.6	3.0	5.0	5.5	5.8	(6.4)	(6.7)	[6.9]	. .	. .
Yemen Arab Republic	5.6	6.2	10.7	12.8	11.1	13.3	. .	. .	. .	. .
Yemen, People's Democratic Rep. of	13.4	12.5	17.5	17.5	18.3	15.4	17.3	(17.1)	. .	. .
South Asia										
Afghanistan	1.7	1.8	1.9	3.5	. .	. .	. .	. .	. .	. .
Bangladesh	1.5	1.5	1.3	1.3	1.3	(1.3)	1.5	1.6	(1.6)	
India	3.2	3.0	2.9	3.1	3.1	3.1	3.3	3.2	. .	. .
Nepal	0.8	0.8	0.8	0.8	0.8	0.8	1.0	. .	. .	. .
Pakistan	5.8	5.4	5.4	5.3	5.3	5.7	6.2	6.2	. .	. .
Sri Lanka	1.4	1.3	1.1	1.5	1.5	1.2	1.5	1.5	1.7	. .
Far East										
Brunei	4.8	4.1	4.6	6.1	[3.9]	4.5	[5.4]	(5.6)	(7.0)	. .
Burma	3.9	4.1	4.2	4.3	(4.3)	[4.1]	(4.0)	. .	. .	. .
Hong Kong	0.4	0.5	0.7	0.6	1.0	(0.9)	(0.8)	(0.7)	[0.7]	. .
Indonesia	(5.8)	(5.1)	(5.0)	(4.1)	(3.8)	(4.0)	[4.4]	[4.0]	[4.5]	. .
Japan	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	. .	. .
Korea, North[i]	10.1	9.6	10.1	10.4	10.7	11.5	11.8	12.3	. .	. .
Korea, South	5.5	5.6	6.0	5.1	6.0	6.0	6.0	5.7	5.1	

Malaysia	5.9	6.1	5.8	5.6	6.5	7.9	8.1	8.1	(6.5)	. .
Philippines	3.4	3.2	2.7	2.4	2.2	2.3	2.4	2.0	. .	. .
Singapore	6.0	6.3	5.6	5.1	5.3	5.5	5.6	5.7	5.8	. .
Taiwan	7.6	7.9	7.8	6.8	6.6	6.7	7.3	6.8	6.1	. .
Thailand	(3.6)	(4.0)	(4.6)	4.8	4.4	4.6	4.9	5.0	5.0	. .
Oceania										
Australia	2.7	2.7	2.7	2.7	2.7	2.8	2.9	3.0	3.0	3.1
Fiji	0.3	0.3	0.4	0.4	0.5	0.4	0.4	0.4	. .	. .
New Zealand	1.6	1.6	1.7	1.7	1.8	2.0	2.0	2.0	2.1	2.4
Africa										
Algeria	2.9	2.4	2.4	2.1	2.1	1.8	1.9	1.9	. .	. .
Benin	1.3	1.4	2.0	1.9	2.1	2.3	2.3	[2.5]	. .	. .
Burkina Faso	2.9	2.9	3.4	2.7	2.7	2.9	(3.0)	[2.8]	[2.7]	. .
Burundi	2.6	2.5	2.8	2.6	[2.9]	[3.0]	[3.6]	[3.2]	[3.4]	. .
Cameroon	1.6	1.5	1.3	1.2	1.2	1.2	1.1	1.1	[1.2]	. .
Central African Republic	. .	1.5	1.7	2.0	1.7	2.1	. .	. .	. .	. .
Chad	3.8	3.2	. .	. .	. .	. .	. .	. .	. .	. .
Congo	4.6	. .	5.0	. .	2.8	. .	. .	. .	[4.0]	. .
Ethiopia	4.1	4.0	6.8	8.8	8.5	[8.7]	[8.4]	[8.1]	. .	. .
Gabon	0.7	1.0	[2.3]	(1.9)	(1.7)	[1.1]	. .	[2.0]	[1.7]	. .
Ghana	1.9	1.4	1.0	(0.6)	[1.2]	[0.8]	[0.5]	[0.4]	. .	. .
Ivory Coast	1.1	0.8	1.1	1.1	1.1	[1.1]	1.1	[1.2]	[1.1]	[1.1]
Kenya	1.4	2.3	3.9	4.6	4.2	3.0	4.0	3.6	(2.7)	. .
Liberia	1.1	1.3	1.2	1.5	2.9	5.0	[4.6]	[3.2]	. .	. .
Libya	[8.3]	[8.6]	[14.2]	[12.7]	[9.2]	[12.1]	[14.4]	[11.8]	. .	. .
Madagascar	1.9	2.4	2.5	3.0	(2.9)	(3.1)	. .	. .	. .	. .
Malawi	1.4	1.7	2.7	4.2	(4.6)	(3.4)	(2.5)	[2.0]	[1.6]	. .
Mali	. .	. .	. .	. .	5.9	5.2	5.4	5.2	. .	. .
Mauritania	15.3	17.9	14.5	15.5	11.7	. .	. .	. .	. .	. .
Mauritius	0.2	0.2	0.2	0.2	0.5	0.5	0.3	[0.3]	[0.3]	[0.2]
Morocco	6.2	6.6	5.8	5.6	6.3	6.6	6.5	[7.3]	[5.3]	. .
Mozambique	. .	. .	. .	. .	6.0	6.9	7.2	(12.6)	(11.9)	(11.7)
Niger	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.6	. .	. .
Nigeria	4.4	4.5	3.8	3.0	3.4	3.2	2.6	2.1	. .	. .
Rwanda	1.6	1.6	1.7	1.8	1.8	2.1	2.0	1.8	1.5	. .

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Senegal	2.8	3.4	3.8	3.5	3.1	3.2	2.7	2.6	2.7	. .
Sierra Leone	0.9	0.9	0.9	0.9	[1.0]	[1.0]	[1.0]	. .	. .	. .
South Africa	4.2	(4.5)	(4.2)	(4.3)	(3.9)	(3.7)	[3.7]	[4.0]	[4.0]	. .
Sudan	3.1	3.3	2.7	2.8	3.0	3.0	2.9	[2.8]	[2.8]	. .
Tanzania	3.5	3.8	(7.0)	(7.7)	(4.9)	[3.7]	. .	. .	. .	. .
Togo	2.1	2.5	2.4	2.2	2.2	2.3	(2.2)	[2.2]	. .	. .
Tunisia	1.9	2.4	2.5	2.2	2.2	2.7	5.6	(5.4)	(5.4)	[6.2]
Uganda	3.2	2.2	1.8	. .	(2.1)	(1.8)	[1.7]	. .	. .	.
Zaire	2.8	2.4	1.5	1.7	1.7	1.6	1.9	[1.2]	. .	. .
Zambia	[2.9]	[2.8]	[2.8]	[4.8]	[3.5]	. .	. .	. .	. .	. .
Zimbabwe	5.6	8.2	10.0	11.0	(8.6)	6.0	6.2	6.4	[5.6]	. .
Central America										
Costa Rica	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	(0.8)	. .
Cuba/	. .	8.3	8.3	8.5	7.8	8.0	9.2	8.6	9.8	. .
Dominican Republic	1.7	1.7	1.8	2.0	1.5	[1.7]	[1.6]	1.5	[1.5]	. .
El Salvador	1.7	2.0	2.1	(2.0)	2.8	3.7	4.4	4.4	4.9	. .
Guatemala	1.5	1.5	1.7	1.7	1.8	1.9	[2.4]	(2.6)	(2.9)	(4.0)
Haiti	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7	. .	. .
Honduras	1.8	1.9	2.3	2.3	(3.5)	(4.5)	[5.0]	[5.7]	(6.0)	. .
Jamaica	2.9	2.6	2.9	2.9	2.9	(3.2)	[3.0]	[3.0]	[2.8]	. .
Mexico	0.6	0.6	0.5	0.5	0.6	0.6	0.6	[0.7]	[0.6]	. .
Nicaragua	2.1	2.5	3.2	[3.1]	4.4	[5.0]	(5.9)	(9.6)	[11.7]	. .
Panama	1.7	[1.5]	[1.5]	[1.5]	[1.2]	[1.2]	[1.3]	[1.4]	. .	. .
Trinidad and Tobago	1.5	1.4	2.3	1.9	1.9	2.2	3.2	. .	. .	. .
South America										
Argentina	2.4	2.4	2.7	2.5	2.6	2.9	[5.9]	(3.9)	[3.3]	. .
Bolivia	3.8	3.3	3.5	3.5	(3.7)	(4.9)	(4.8)	[3.8]	[4.0]	. .
Brazil	1.3	1.1	0.9	0.8	0.5	0.6	0.6	(0.8)	[0.7]	[0.8]
Chile	6.1	6.9	6.4	6.2	7.4	6.5	[8.7]	[9.5]	[8.8]	. .
Colombia	(1.2)	. .	(1.6)	(1.8)	2.0	1.8	1.8	2.2	2.0	. .
Ecuador	2.2	3.1	2.1	2.0	1.9	(1.9)	(1.6)	(1.7)	[1.8]	. .
Guyana	8.8	6.0	(5.3)	(5.1)	[6.5]	6.0	7.5	[9.8]	[9.2]	. .
Paraguay	1.7	1.6	1.5	1.3	1.4	1.5	(1.6)	(1.5)	. .	. .

Peru	5.0	7.3	5.5	3.9	(5.7)	(7.2)	(7.2)	(8.6)	[8.2]	. .
Uruguay	2.2	2.3	2.6	(2.9)	2.6	3.4	[4.3]	. .	. .	. .
Venezuela	2.2	2.2	2.1	2.4	2.7	3.1	3.4	2.9	(3.1)	. .

Conventions

. . Information not available or not applicable
( ) Uncertain data
[ ] Estimates with a high degree of uncertainty
— Negligible or nil.

Notes, definitions and sources for the tables of world military expenditure

[a] Spain is not included in NATO but in Other Europe, since Spanish military expenditure data according to the NATO definition are not yet available.

[b] The exchange-rate used is $1/0.5 yuan. See further *SIPRI Yearbook 1984*, p. 136.

[c] The economic groupings used here are as follows:

Industrial market economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, FR Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, UK and USA.

Non-market economies: Albania, Bulgaria, China, Cuba, Czechoslovakia, German DR, Hungary, North Korea, Mongolia, Poland, Romania and USSR.

Oil-exporting countries: Algeria, Bahrain, Congo, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Mexico, Nigeria, Oman, Saudi Arabia, Syria, Tunisia, Trinidad and Tobago, United Arab Emirates and Venezuela.

Rest of the world: Excluding Kampuchea, Laos and Viet Nam. Countries are grouped in accordance with the classification of per capita GDP used by the World Bank in *World Development Report 1985* (Oxford University Press: New York, 1985), p. 174 and table 1, p. 232.

[d] The SIPRI practice of using official consumer price indices, which tend to understate actual price changes in WTO countries, especially for recent years, results in overstated volume expenditure increases for the WTO countries, excluding the USSR.

[e] At current prices and 1980 exchange-rates.

[f] At current prices and 1980 exchange-rates. Figures for 1980–3 are in constant prices.

[g] The SIPRI estimate in square brackets is based on planned military expenditure in real terms.

[h] The current price series is deflated from 1977 using Cuban figures for inflation. Between 1976 and 1977 it is assumed that there was little or no inflation.

[i] Per cent of gross national product.

[j] Per cent of gross material product.

Table 11A.1: Military expenditure figures are given in 1980 prices and 1980 US dollar exchange-rates by (*a*) alliances and regions and (*b*) economic groups. World totals are rounded to the nearest 10 million.

Table 11A.3: This series is based on the data given in the local currency series, deflated to 1980 price levels and converted into dollars at 1980 period-average exchange-rates. Local consumer-price indices (CPI) are taken as far as possible from *International Financial Statistics* (IFS) (International Monetary Fund: Washington, DC). For the most recent year, the CPI is an estimate based on the first 6–10 months of the year. Period-average exchange-rates are taken as far as possible from the IFS. Regional totals include estimates of military expenditure in countries for which data were not available.

Table 11A.4: Figures for recent years are budget estimates.

Table 11A.5: The share of gross domestic product (GDP) is calculated in local currency. GDP data are taken as far as possible from IFS. For WTO countries (except Hungary), military expenditure is given as a percentage of gross national product (GNP) up to and including 1978, and after 1978 as a percentage of net material product (NMP).

Definitions and sources

For more detailed information, readers are referred to previous editions of the *SIPRI Yearbook*.

The NATO definition of military expenditure is used as a guideline throughout. Where possible, the following items are *included*: all current and capital expenditure on the armed forces and on the running of defence departments and other government agencies engaged in defence projects; the cost of paramilitary forces and police when judged to be trained and equipped for military operations; military R&D, tests and evaluation costs; costs of retirement pensions of service personnel, including pensions of civilian employees. Military aid is included in the budget of the donor country.
Excluded: civil defence, interest on war debts and some types of veterans' payments.

Problems encountered when applying this definition include: the absence of disaggregated expenditure series; the non-disclosure of certain expenditure categories, especially procurement and R&D; uncertainty as to the amount of military aid included in recipients' budgets; and the degree to which police forces, border and coastguards and the like play a military role.

The data cover 127 countries for the calendar years 1976–85. *Calendar year* figures are calculated from fiscal year data where necessary, on the assumption that expenditure takes place evenly throughout the year. All series are *revised* annually.

General remarks on the data and data presentation

Changes in data published in successive Yearbooks may be due to the revision of any component of the data base, i.e. military expenditure, consumer price indices, exchange-rates and GDP/GNP/NMP data.

Primary sources are official publications. Secondary sources are press information, specialist literature and other background information.

Uncertain data (with round brackets in the tables) are figures from secondary sources or figures from primary sources, adjusted for known inconsistencies with the time-series in use.

Estimates with a high degree of uncertainty (with square brackets in the tables) are data with components of primary and secondary sources and SIPRI estimates based on other country background material.

Regional totals include SIPRI estimates for those countries where no data are available for the respective year. These estimates are based on the regional development of military expenditure and the known developments in military spending, and on the general economic profile of the country concerned.

Main sources of military expenditure data

NATO
Official NATO data published in *Financial and Economic Data Relating to NATO Defence*, annual press release (NATO: Brussels).

USSR
SIPRI estimate. For further details see *SIPRI Yearbooks 1974*, p. 172; and *1979*, p. 28.

Other WTO
1975–79: Alton, T. P., Lazaricik, G., Bass, E. M. and Znayenko, W., 'East European defense expenditures, 1965–1978', in *East European Assessment*, Part 2, a compendium of papers submitted to the Joint Economic Committee, US Congress (US Government Printing Office: Washington, DC, 1981); Alton, T. P., Lazaricik, G., Bass, E. M. and Znayenko, W., *Military Expenditure in Eastern Europe, Post World War II to 1979* (L.W. International Financial Research, Inc: New York, 1980). After 1979: domestic sources.

Others
Domestic budgets, defence appropriations and final accounts. Official publications such as *Government Finance Statistics* (International Monetary Fund: Washington, DC); *Statistical Yearbook* (United Nations: New York); *Statistical Yearbook for Asia and the Pacific* (United Nations: Bangkok); *Statistik des Auslandes* (Federal Statistical Office: Wiesbaden); *Europa Yearbook* (Europa Publications: London). Journals and newspapers are consulted for the most recent figures.

12. The US defence budget

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Superscript numbers refer to the list of notes and references at the end of the chapter.

I. The FY 1987 defence budget request

The Reagan Administration requested $320.3 billion in budget authority for national defence in fiscal year (FY) 1987. The Administration's budget proposal, submitted to Congress in February 1986, included $311.6 billion for the Department of Defense and $8.2 billion for military-related atomic energy activities in the Department of Energy. National defence outlays are programmed to increase by more than 16 per cent in real terms by 1991 (table 12.1), that is, at levels considerably lower than the president requested in the FY 1986 defence budget programme.[1] In order to comply with the deficit limit of $144 billion imposed by new legislation, the president's FY 1987 federal budget request included heavy cuts in domestic spending programmes.

Table 12.1. US Administration budget estimates for fiscal years 1986–91 (as of February 1986)

Figures are in US $b.

	1986	1987	1988	1989	1990	1991
Total budget authority						
Total national defence,[a] current prices	286.1	320.3	341.6	363.2	384.8	405.9
Total Department of Defense, current prices	278.4	311.6	332.4	353.5	374.7	395.5
Total Department of Defense, constant (1987) prices[b]	288.0	311.6	321.1	330.4	340.0	349.2
Percentage change	*−5.9*	*8.2*	*3.0*	*2.9*	*2.9*	*2.7*
Outlays[c]						
Total national defence, current prices	265.8	282.2	299.1	322.3	344.8	366.3
Total Department of Defense, current prices	258.4	274.3	290.7	313.3	335.5	356.6
Total Department of Defense, constant (1987 prices)	267.8	274.3	279.8	290.8	301.3	311.5
Percentage change	*2.4*	*2.4*	*2.0*	*3.9*	*3.6*	*3.4*

[a] *National defence*: A broader concept than Department of Defense activities, including military activities financed outside the DoD budget, mainly the design, testing and production of nuclear weapons (budgeted for under Department of Energy) and military construction.

[b] The inflation factors used to calculate constant dollars come from the Department of Defense deflator table, 3 Feb. 1986 (to be published).

[c] *Outlays*: The actual spending of money in cash or cheques during a given year. Includes net lending. Outlays are seldom identical to *budget authority* in any fiscal year because outlays spent during a year may be drawn partly from the budget authority conferred in previous years and budget authority includes funds which will be spent in future years.

Sources: Office of Management and Budget, *Historical Tables, Budget of the United States Government, FY 1987* (US Government Printing Office: Washington, DC, 1986).

The Administration's FY 1987 defence budget request constituted an 8.2 per cent increase above inflation on the final budget authority level for FY 1986. The Administration, however, described its FY 1987 proposal as no more than a 3 per cent real rise on FY 1986. It reached this result by comparing its $320.3 billion request with the $302.5 billion budget authority level passed by Congress in August 1985 in the FY 1986 budget resolution. This defence budget authority level was lowered by Congress in December 1985 to $297.6 billion and reduced further in March 1986 to $286.1 billion by automatic cuts under the terms of the deficit reduction legislation—the Gramm-Rudman-Hollings bill (see below, section VII).

The Administration estimates that national defence outlays in FY 1987 will rise to $282.2 billion, an increase of $16.4 billion on FY 1986 or 2.4 per cent growth after inflation. The Congressional Budget Office, however, projects that defence outlays will be as high as $297 billion in FY 1987. The fastest growing major category in the FY 1987 defence budget is research and development (R&D). The Administration's proposal includes $41.9 billion for R&D, an increase of 19.7 per cent after inflation compared with FY 1986. The rapid growth in military R&D is spurred, in part, by a request for $4.8 billion in funding for the Strategic Defense Initiative (SDI), an increase of 75 per cent on the FY 1986 funding level. In contrast to previous years, the Administration's FY 1987 defence budget request holds procurement spending at a steady level, providing no real growth after inflation.

This FY 1987 budget request, coupling as it does a further substantial increase in military spending with severe cuts in civil spending, is likely to be strongly contested in Congress.

II. Breakdown of consensus

Since 1980, the United States has undergone its largest peacetime military buildup in history. National defence outlays increased from $134 billion in FY 1980 to an estimated $252.7 billion in FY 1985, an increase of 38 per cent in real terms. During this same period, defence budget authority increased by 56 per cent in real terms from $143.9 billion to $294.7 billion.[2] In real terms, US military spending in 1985 was at its highest level since World War II except for the peak spending years of the Korean and Viet Nam wars.[3]

Upon entering office in 1981, President Reagan made large increases in military expenditure a top priority of his Administration. Congress, for the most part, supported the president's military buildup, authorizing $1.1 trillion for national defence for FYs 1982–5. According to the Congressional Research Service, the Administration received 96.8 per cent of the funds it requested (after adjustment for actual inflation) from FY 1981 to FY 1985.[4]

In 1985, congressional support for the Reagan Administration's military buildup eroded. Democrats and Republicans in both Houses rejected the president's proposed funding increases for FY 1986. For the previous five years, Congress had voted for average annual increases (in real terms) of 9 per cent in budget authority for the Department of Defense (DoD). In reviewing the president's military budget request for FY 1986, Congress

debated whether to freeze spending at the FY 1985 level or to allow growth just to cover inflation.

There were three major reasons for the breakdown of consensus in Congress on the Reagan Administration's military spending plans: high budget deficits, waste and abuse, and public opinion.

High budget deficits

The Republican-controlled Senate Budget Committee expressed the mood of Congress in 1985 in its annual budget report: 'the need to reduce the Federal deficit is currently the highest priority of the Congress . . . it is clear that major deficit reduction is impossible if the defense function is allowed to grow as rapidly as the president recommends'.[5]

During the four years of the first Reagan Administration, federal budget deficits averaged $183 billion per year. The annual deficit had increased from 2.7 per cent of the gross national product in 1980 to 5.7 per cent in 1985. For FY 1986, the Administration estimated a deficit of $180 billion while the Congressional Budget Office projected a deficit of $220 billion.[6] Led by Senate Republicans, Congress attempted to reduce the deficit in FY 1986 by $60 billion. Since President Reagan had refused to consider a tax increase to enhance revenues, Congress saw no alternative but to cut back on spending, including military expenditure, in order to reach this goal.

Waste and abuse

Investigations by Congress and the Administration revealed evidence of widespread wasteful and illegal activities by military contractors. The Pentagon's Inspector General disclosed that 45 of the 100 top defence contractors were under investigation for abuses including kickbacks, false claims and questionable billing. General Electric was convicted of wrongly billing nearly $800 000 in labour payments. Facing prosecution by the Justice Department, Rockwell International pleaded guilty to criminal charges of padding labour bills for military electronics work in 1982. Rockwell was fined $1.5 million and was temporarily barred from government contracts.[7]

Government investigations revealed numerous cases of alleged wrongdoing by General Dynamics ranging from fraudulent claims for cost overruns on attack submarines to illegal gratuities to Navy officials. In May 1985, the Department of Defense temporarily suspended two divisions of General Dynamics from new contracts and cancelled existing contracts after finding that the company had wrongfully billed $244 million in overhead costs to the DoD since 1973. General Dynamics was again temporarily suspended from government contracts in December 1985 because of illegal billings of cost overruns on a prototype for the division air defense gun (DIVAD). A federal grand jury indicted General Dynamics, three company officials and a former company officer who was serving as head of the National Aeronautics and Space Administration (NASA), on charges of defrauding the government.[8]

Public opinion

Public attitudes towards military spending have changed dramatically since 1981. An NBC/Associated Press poll in January 1981 showed that two-thirds of those sampled supported increased military spending. By November 1981, the same pollsters found that support had dropped to 34 per cent. This downward trend continued throughout 1985, according to other polling data. The Harris poll, which found 71 per cent supporting increased military expenditure in February 1980 (the year President Reagan was elected) showed that support declined to 28 per cent in November 1983 and 9 per cent in January 1985 (see chapter 2). In June 1985, 61 per cent of those surveyed by Harris supported the position of Congress in freezing military spending at FY 1985 levels compared to 34 per cent who favoured the president's request for an increase.[9]

III. The FY 1986 defence budget request

The Reagan Administration requested $322.2 billion for national defence budget authority in FY 1986, a real increase of 5.9 per cent above the $292.6 billion granted in FY 1985.[10] The budget request included $313.7 billion for the DoD, with most of the balance going to the nuclear warhead programmes of the Department of Energy. Total national defence outlays in FY 1986 were expected to rise to $285.7 billion in real terms, an 8.2 per cent increase on the $253.8 billion in FY 1985. In FY 1986, the defence share of the federal budget was planned to be 29.3 per cent compared to 23.2 per cent in FY 1981. As a share of gross national product, military spending would be 6.8 per cent compared to 5.5 per cent in FY 1981.

The Administration's budget request included $161.2 billion for military investment: weapon procurement, research and development, military construction and the nuclear warhead programmes of the Department of Energy. Research and development, the fastest growing account, was to rise from $31.5 billion in FY 1985 to $39.3 billion in FY 1986, an increase of 20 per cent in current dollars. Large-scale research and development projects in the FY 1986 budget request included: the Strategic Defense Initiative ($3.7 billion), the Air Force's Midgetman missile ($625 million), the Joint Services' Vertical Lift Aircraft ($609 million), and the C-17 military transport aircraft ($454 million). Funding requests for classified research programmes totalled nearly $8 billion, almost 20 per cent of the Defense Department research and development budget.[11]

Funding for major strategic and conventional weapons constituted 22.7 per cent ($71.1 billion) of the Administration's FY 1986 request for the Pentagon. Strategic systems were to claim $38.1 billion and conventional/ tactical systems $33 billion. Major strategic programmes in the Administration's FY 1986 budget included: the B1-B bomber ($6.2 billion), the MX missile ($4 billion), the Trident II missile ($2.9 billion), the Trident submarine ($1.8 billion), sea-launched cruise missiles ($848 million) and ground-launched cruise missiles ($620 million).

For FY 1986, the Administration requested $82.5 billion in budget authority

for operations and maintenance and $73.4 billion for military personnel. As a share of the entire military budget, funding for the operations and maintenance and military personnel accounts was to decline from 60.8 per cent in FY 1980 to an estimated 48.4 per cent in FY 1986. Budget authority for each of the services was to rise in FY 1986 under President Reagan's request. The Air Force was to get $110.1 billion, an increase of $10.2 billion on FY 1985. The request for the Navy was $104.8 billion, an increase of $8.4 billion on FY 1985. The Army was to receive $81.7 billion, an increase of $7.4 billion on the previous year.

IV. Congressional action

It was a forgone conclusion that Congress would not give the Reagan Administration the requested 5.9 per cent real increase in FY 1986 defence budget authority. As early as December 1984, congressional leaders were publicly planning significant reductions in the president's military budget proposal.[12]

The budget process in the United States is an extremely prolonged affair, and an agreement was not reached until the end of 1985. Throughout the process, the Senate position was that defence budget authority should not increase more rapidly than inflation (zero real growth). The House of Representatives was in favour of a lower figure—to keep the FY 1986 defence budget at the same level as that for FY 1985 (implying a 3 per cent cut in real terms).

The final agreement on military appropriations appeared to be a compromise between the House and Senate positions: $297.6 billion. However, this agreement included a transfer of $6.3 billion in unobligated funds from previous years which could be used in FY 1986 for specified programmes.[13] With this supplemental $6.3 billion, the total available defence budget authority in FY 1986 would be $303.9 billion.

Although Congress appropriated approximately $25 billion less than the president requested,[14] including $8.4 billion less for procurement, it did not cancel a single major weapon system to account for this reduction. Defense Secretary Weinberger's cancellation of the DIVAD air defence gun did not result in budget savings since funds were reallocated to other programmes. In essence, Congress adopted President Reagan's procurement programme at a lower level.

The decade-long MX missile controversy appeared to end in 1985. The compromise legislation included $1.75 billion for 12 missiles in FY 1986 and a permanent statutory maximum of 50 deployed missiles. Congress also agreed to consider additional funding for test missiles and spares and additional deployed missiles should the president propose a more survivable basing mode than the Minuteman silos (see chapter 3).

The FY 1986 request for $3.7 billion for the Strategic Defense Initiative represented an increase of 165 per cent on FY 1985. A compromise was reached half-way between the Senate and House positions authorizing $2.75 billion for FY 1986, an increase of almost 100 per cent on FY 1985. This agreement affirmed congressional support for the 1972 US–Soviet Anti-

Ballistic Missile (ABM) Treaty and required that SDI funds should not be spent 'in a manner inconsistent' with the ABM Treaty and other arms control agreements.[15] Members in both houses attempted unsuccessfully to impose specific restrictions on demonstration projects believed to be in violation of the treaty's testing prohibitions. These projects and their planned initial testing dates include: the Airborne Optical System (1988), the Space-Based Laser (early/mid-1990s), the Space-Based Kinetic Kill Vehicle (early 1990s) and the Space Rail Gun (1991).[16]

In authorizing funds for SDI, Congress imposed several requirements on the Administration:

1. No future decisions on deploying a strategic defence system can be made until the president certifies that the system would be survivable and cost-effective relative to offensive countermeasures.

2. The president must keep NATO nations informed 'to the maximum extent feasible and within national security guidelines . . . of the progress, plans and potential proposals' of the US strategic defence programme.

3. The Administration must submit a report with the FY 1987 budget request on the probable responses of potential adversaries to a deployed defence system including the deployment of offensive weapons not endangered by the SDI, such as cruise missiles and low-trajectory submarine missiles. This report will also analyse the potential impact of an adversary's anti-satellite (ASAT) capability on SDI, and the research and development cost estimates for SDI. An additional report, due with the FY 1989 request, should estimate costs for procurement and deployment of a strategic defence programme.

4. The Secretary of Defense should report by 15 February 1986 on the feasibility and value of early applications of SDI in defending 'high value' US and allied capabilities abroad, meaning airfields and prepositioned military equipment. This report should also evaluate the potential contributions of such defences to deterrence stability and examine the adequacy of the Army's anti-tactical missile programme for allied defence.[17]

Congress debated whether to extend the five-month testing moratorium for ASAT weapons that expired on 1 March 1985. The Senate voted down an amendment prohibiting ASAT testing against a target in space so long as the Soviet Union continues to observe a testing moratorium and negotiating an agreement to limit ASAT weapons. The House, however, passed an amendment proscribing ASAT target tests so long as the Soviet Union refrained from ASAT tests. The House-Senate agreement on the defence authorization bill adopted the Senate's position, permitting three tests in FY 1986. The defence appropriations bill later in the year reversed this agreement by prohibiting the use of funds for ASAT testing.

The DIVAD air defense gun was the first weapon in production to be cancelled by the Department of Defense in 15 years. Originally intended to protect US tanks from Soviet helicopters in the European theatre, DIVAD (also known as the Sergeant York) was plagued by cost overruns and repeated test failures. A bipartisan group had been trying unsuccessfully to kill DIVAD in Congress.[18] Nevertheless, Congress voted to authorize the procurement of 72 air defence guns in FY 1986 but ordered that all funds be withheld until the

DoD completed a rigorous testing and evaluation study. Citing DIVAD's inability to fulfil its mission of shooting down distant Soviet helicopters, Defense Secretary Weinberger cancelled the programme in August 1985 after expenditures of $1.8 billion.

A number of other decisions on weapon procurement were made in 1985:

1. Congress appropriated $624.5 million for the development of the Midgetman, a mobile single-warhead intercontinental ballistic missile (SICBM).

2. Congress required the Air Force to institute competitive procurement for future purchases of tactical fighter aircraft. The F-16, currently used by the Air Force, is purchased from General Dynamics as sole contractor. The competitor is Northrop's F-20.[19]

3. Congress voted to terminate automatically the advanced medium-range air-to-air missile (AMRAAM) system if the Secretary of Defense could not certify by 1 March 1986 that the programme met specified performance standards and that total production costs for 17 000 missiles would not exceed $5.2 billion.

4. Congress appropriated $5.16 billion for the procurement of 48 B-1B bombers, set a ceiling of 100 B1-B bombers for the whole programme, and prohibited any diversion of funds from the 'Stealth' bomber or Advanced Cruise Missile programmes to the B-1B programme.

5. Congress appropriated $931 million for the procurement of 716 Bradley fighting vehicles contingent upon the successful completion of a live-fire survivability testing programme. The Secretary of Defense is required to submit reports to Congress by 1 December 1985 and 1 June 1986 on the results of the testing programme, on proposed design modifications to enhance survivability and on estimated costs of modifications.

6. Congress appropriated procurement funding for 840 M-1 tanks ($1.6 billion) and the thirteenth Trident submarine ($1.2 billion). For the Trident II D-5 missile, Congress appropriated $2.1 billion for research and development and $313 million for production.

V. Fiscal issues in the debate on military spending

One of the more controversial aspects of the budget debate in 1985 was the disclosure by Defense Secretary Weinberger that overestimation of inflation by the DoD had led to a windfall of $4 billion. Weinberger's announcement in May came after several months of arguing that any reductions in the proposed FY 1986 defence budget would harm national security. The announcement upset members of Congress, who suspected that the Defense Department had previously withheld knowledge of this 'inflation dividend' in order to secure higher military appropriations.[20]

The chairman of the House Armed Services Committee, Representative Les Aspin, estimated in May 1985 that, because of overestimated inflation, Congress had appropriated $18–$50 billion more than the DoD had needed over the previous four years. In August 1985, the General Accounting Office (GAO), the investigative arm of Congress, found that overestimated inflation

had resulted in a $35 billion windfall for the DoD from FY 1982 to FY 1985. The GAO study questioned the Defense Department's budgeting assumption that weapon costs would rise 30 per cent more rapidly than the overall national inflation rate. The GAO also concluded that the cushion for inflation was a disincentive for Pentagon managers to keep down the costs of their programmes. For FY 1986, the Secretary of Defense was required to submit a report to Congress on current DoD policies concerning savings resulting from overestimated inflation and alternative proposals for budgeting without planning inflation allowances in advance.[21]

The growing problem of controlling future military spending became acute with the FY 1986 defence budget. Because the basic feature of the Reagan buildup has been a concentration on weapon procurement and R&D (the 'investment' share of the military budget), spending for these purposes has risen from 37.7 per cent of budget authority in FY 1980 to 50 per cent in FY 1986. Appropriated funds for weapons are normally spent over the number of years needed for their manufacture.[22]

As a result, the Defense Department's backlog of appropriated, but unspent, funds has risen sharply, from $92 billion in FY 1980 to an estimated $244.3 billion in FY 1985. These funds are, in large part, obligated to weapon contracts already signed.[23] Thus, the funds must be spent and are, according to the Office of Management and Budget, 'uncontrollable'. The uncontrollable share of defence outlays has risen from 27 per cent in FY 1980 to an estimated 39 per cent in FY 1986.[24]

In sum, this means that US military spending will be increasingly difficult to control by 1990. Actual defence outlays will continue to rise well past the rate of inflation, according to the Office of Management and Budget, even if defence budget authority is frozen for FY 1986 and allowed to grow at only 3 per cent a year later in the decade.[25] Since the Pentagon intends to maintain planned spending levels for personnel, which could only be lowered significantly if soldiers were discharged, the personnel and uncontrollable shares of military spending, together, will be approximately 85 per cent of total Pentagon outlays in 1989. At the start of a new administration only 15 per cent of military outlays will be truly discretionary without major changes in the structure of the armed forces.

VI. Procurement reform

Some of the key congressional battles on FY 1986 military spending concerned procurement reform legislation. The Senate passed the Defense Procurement Improvement Act, establishing restrictions on and reporting requirements for DoD employees who discuss future employment with military contractors; directed the DoD to set up competitive bidding procedures and tougher regulations defining what costs could be charged to the government by military contractors; and required contractors to supply the Pentagon with more extensive cost data on major contracts.

The House passed and strengthened a series of procurement reforms that were reported by the Armed Services Committee. The House legislation

included more stringent restrictions and requirements than the Senate bill: (*a*) a strict ban on former procurement officials accepting employment with certain military firms for two years after leaving the government if they exercised significant procurement responsibility with those firms—this has become known as the 'revolving door' problem; (*b*) a statutory list of costs that contractors could not charge to the government; and (*c*) specific requirements for competitive bidding on military contracts that would promote multiple sources for the development and production of weapon systems.

The final procurement reform package, as negotiated by a Joint House-Senate Conference Committee, included provisions in four major areas of procurement:

1. Revolving door: only presidential appointees in the Pentagon who served as primary government representatives in dealings with a contractor would be subject to the two-year employment restriction.
2. Competition: the DoD is required to set annual goals for competitively awarded contracts and to seek multiple sources for major weapon systems.
3. Allowable costs: under penalty of law, military contractors are forbidden to seek reimbursement from the government for certain costs, such as entertainment, lobbying, advertising and country club memberships.
4. Should costs: defence contractors are required to provide the Pentagon with a new type of data giving specific costs for most weapon systems.

VII. The deficit reduction reform

The FY 1986 budget process was disrupted by unexpected legislation in the final weeks of 1985. The Senate passed the Balanced Budget and Emergency Deficit Control Act, authored by Senators Gramm, Rudman and Hollings, that would mandate a balanced federal budget by 1991. Better known as the Gramm–Rudman–Hollings bill, this legislation required incremental annual decreases of $36 billion in the deficit beginning with FY 1987. If deficit targets were not met by Congress in its budget, automatic across-the-board spending reductions would be triggered except for a few exempted programmes such as social security. With presidential support, the balanced budget legislation became one of the most controversial political issues of the year as Senate and House negotiators worked for two months to draft a compromise agreement.

In its final form, the legislation required a balanced budget by FY 1991, with the first deficit reduction target set for FY 1986. According to the formula of the bill, automatic spending reductions (sequestrations) would be shared equally between non-exempted military and domestic programmes. Since FY 1986 began prior to the passage of the legislation, special provisions have been made which limit total cuts to $11.7 billion for the remainder of the fiscal year. Other provisions which apply only to FY 1986 allow the president extra flexibility in allocating cuts among various items within the military budget.

Under the legislation, cuts in military spending are to be made from the total budgetary resources, that is, from new budget authority and unobligated balances from previously appropriated budget authority.[26] The president is also permitted to make cuts in obligated funds by modifying existing contracts so long

as there is no net loss to the government nor violation of its legal obligations. The president has chosen not to make use of this authority in FY 1986.

For FY 1986 only, the bill gave the president the authority to exempt all or part of the military personnel accounts from the cuts.[27] The president decided to make use of this authority and exempted $63.1 billion or 93 per cent of these accounts from sequestration. Certain other military programmes have been exempted from cuts in FY 1986 because fixed-price contracts would have to be broken, costing the government more than it would save. Additionally, the president decided to exempt high-priority programmes such as SDI from the FY 1986 cuts. The total obligated value in FY 1986 of exempted programmes is $68.3 billion. Outlays valued at $109 billion or 40 per cent of total military spending remain subject to sequestration in FY 1986. Some savings were made by eliminating certain automatic cost-of-living allowances (COLA).[28] The rest, totalling $5.4 billion, was to be obtained by uniform percentage sequestration from non-exempted budget items which in the case of defence gives a uniform rate of 4.9 per cent (table 12.2).

Table 12.2. Estimated sequestration of defence outlays for 1986

Figures are in US $m.

Size of cut (0.5 × $11.7 b.)	5 850
Savings from cuts in automatic spending increases (COLA)	497
Amount remaining to be obtained from uniform percentage reductions from non-exempted budget items (A)	5 353
Value of outlays from which cuts can be made (B)	109 335
Uniform reduction percentage (A as a percentage of B)	*4.9*

Source: *Wireless File* (US Information Service, Press Section, 16 Jan. 1986), p. 17.

In order to achieve cuts of $5.4 billion in outlays from non-exempted programmes, defence budget authority must be reduced by $13.3 billion. Half of the budget authority cuts—$6.6 billion—will come from the procurement programme, producing an outlay reduction of only $0.9 billion. Of the required defence budget authority cuts, $11 billion will come from FY 1986 new budget authority and $2.3 billion will be taken from unobligated balances.[29]

VIII. Arms control issues and reports

Congress passed a resolution calling for continued observance of the SALT II Treaty. The congressional resolution left room for the president to carry out proportionate responses to Soviet treaty violations. In the FY 1986 Defense Authorization Act, Congress also required several reports on arms control matters from the Administration: (*a*) a report due 1 February 1986 comparing the inventories of US and Soviet strategic forces over the next five years with and without continued compliance with arms control agreements; (*b*) an annual report on Soviet compliance with its arms control treaty commitments, due in 1985 on 1 December; (*c*) a study of possible co-operation between the USA and the Soviet Union in developing arms control verification capabilities (this study, due 1 May 1986, will explore the possibilities of exchanging data and

scientific personnel and establishing a joint programme in the area of seismic monitoring); and (*d*) a study on the consequences of nuclear war associated with nuclear winter, due 1 March 1986 (this study will analyse the findings in the scientific literature on the atmospheric, environmental, climatic and biological consequences of nuclear war and their implications for nuclear strategy, arms control policy and civil defence policy).[30]

IX. Broader national security policy debates

A new dimension was brought to the military spending debate in 1985 with the release of several studies examining the results of the unprecedented peacetime buildup between 1981 and 1985 and persistent problems in Defense Department management and operations. In February 1985, the Center for Strategic and International Studies of Georgetown University published a study endorsed by six former Secretaries of Defense which made major recommendations for the reorganization of the Defense Department and the Congress, including: (*a*) designating the Chairman of the Joint Chiefs of Staff as the 'principal military adviser' to the president, the Secretary of Defense and the National Security Council; (*b*) expanding the role of the Undersecretary of Defense for Policy to include policy considerations in budgetary decisions; (*c*) shifting the defence budget from a one-year to a two-year cycle; (*d*) reinforcing the institutional role of unified commanders *vis-à-vis* the military services; and (*e*) emphasizing market incentives over regulation in the acquisition process in the Pentagon.[31]

In October 1985, a major Senate Armed Services Committee staff study on defence organization was released at hearings jointly sponsored by Senators Goldwater and Nunn. This extensive review contained major criticisms of the internal structure of the DoD and its relationship with the executive branch and the Congress: (*a*) the DoD focuses too much on defence inputs (weapons, research, personnel, logistics) and not enough on the outputs in terms of major missions (nuclear deterrence, maritime superiority, power projection, defence of Europe, East Asia and South-West Asia); (*b*) the military services are too powerful *vis-à-vis* the Secretary of Defense, the Joint Chiefs of Staff or the unified commands; and (*c*) Congress spends too much time on DoD conflicts, does not maintain stable budgets, and superintends inconsistently. Among other changes, the staff study recommended replacing the Joint Chiefs of Staff with a Joint Military Advisory Council, strengthening the unified commanders, appointing three mission-oriented undersecretaries (for nuclear deterrence, NATO defence, and regional defence and force projection), and creating a two-year military budget cycle in the Congress.[32]

The House Armed Services Committee chairman released a report and held hearings in October 1985 on the link between the funds spent on the military since 1981 and the results obtained by the Pentagon. The report noted that while the period 1980–4 had seen substantial improvement in the personnel area, the US lead over the USSR in military technology had not improved, readiness measures had increased only marginally, and neither weapon unit costs nor inventories had grown as quickly as the funds being spent on them.

With respect to readiness, for example, despite real growth in funding, flying hours for two of the services had actually declined. Major equipment inventories had actually shrunk for one-third of the categories, including sea-lift ships and airlift aircraft, despite major increases in procurement funding.[33]

Notes and references

[1] SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1985* (Taylor & Francis: London, 1985), table 7.4, p. 241.

[2] In calculating real changes in outlays and budget authority, the Department of Defense uses two different deflators.

[3] Office of Management and Budget (OMB), *Historical Tables, Budget of the U.S. Government, FY 1987* (OMB: Washington, DC, Feb. 1986, pp. 3.1(5) and (6), 5.1(1) and (2); Office of Management and Budget, *Mid-Session Review of the 1986 Budget* (OMB: Washington, DC, 30 Aug. 1985), p. 26; Defense Budget Project, Center on Budget and Policy Priorities, *The FY 1986 Defense Budget: The Weapons Buildup Continues* (Defense Budget Project: Washington, DC, Apr. 1985), pp. 5, 43, 44, 48, 49.

[4] Maroni, A., *Defense Spending: An Introduction to Key Questions*, Congressional Research Service report no. IB83169 (US Library of Congress: Washington, DC, 7 Aug. 1985), p. 6.

[5] *First Concurrent Resolution on the Budget, Fiscal Year 1986*, Report of the Committee on the Budget, US Senate, 99th Congress (US Government Printing Office: Washington, DC, 1985), p. 85.

[6] OMB, *Mid-Session Review of the 1986 Budget* (note 3), p. 3; Congressional Budget Office, *An Analysis of the President's Budgetary Proposals for Fiscal Year 1986* (Congressional Budget Office: Washington, DC, Feb. 1985), p. xvi.

[7] Statement of Department of Defense Inspector General J. H. Sherick, before the Subcommittee on Oversight and Investigations, Energy and Commerce Committee, US House of Representatives (Washington, DC, 4 Apr. 1985), typed statement; Statement of V. Toensig, Deputy Assistant Attorney General for the Criminal Division, before the Subcommittee on Administrative Practice and Procedure, Committee on the Judiciary, US Senate (Washington, DC, 1 Oct. 1985), typed statement; Tofani, L., 'GE pleads guilty in fraud case', *Washington Post*, 14 May 1985; Weisskopf, M., 'Rockwell said to admit padding contracts', *Washington Post*, 30 Oct. 1985; Weisskopf, M., 'Air Force moves to bar Rockwell from U.S. business', *Washington Post*, 1 Nov. 1985.

[8] O'Rourke, R., *Alleged Fraud, Waste and Abuse: General Dynamics Corporation*, Congressional Research Service report no. IB85067 (US Library of Congress: Washington, DC, 12 July 1985); Shenon, P., 'Top NASA official indicted in fraud on weapons costs', *New York Times*, 3 Dec. 1985, p. 1; Shenon, P., 'General Dynamics suspended by U.S. on new contracts', *New York Times*, 4 Dec. 1985, p. 1.

[9] Schneider, W., 'Military spending: the public seems to say "we've gone far enough"', *National Journal*, 23 Apr. 1983, pp. 866–7; 'National security: views on war and peace', *National Journal*, 2 Feb. 1985, p. 284; 'On the hill', *National Journal*, 31 Aug. 1985, p. 1962.

[10] Data in this section on the Administration's FY 1986 defence budget request are taken from Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year 1983* (OMB: Washington, DC, Feb. 1984); Office of Management and Budget, *Budget of the U.S. Government, Fiscal Year 1984* (OMB: Washington, DC, Feb. 1985); Weinberger, C. (Secretary of Defense), *Annual Report to Congress, Fiscal Year 1986* (DoD: Washington DC, Feb. 1985); *Program Acquisition Costs by Weapons System* (DoD: Washington DC, Feb. 1985); *Department of Defense Budget for Fiscal Year 1986* (DoD: Washington DC, Feb. 1985); Defense Budget Project, Center on Budget and Policy Priorities, *FY 1986: The Weapons Buildup Continues* (Defense Budget Project: Washington, DC, Apr. 1985).

[11] Morrison, D. C., *DOD's Secret Budget, FY 1984–1987* (Center for Defense Information: Washington DC, 13 Feb. 1985); Keller, B., 'Defense Department seeks more money for secret weapons, analyst says', *New York Times*, 12 Feb. 1985.

[12] Department of Defense officials, alarmed by congressional reductions of their funding requests, have claimed that defence has contributed more than its fair share to reducing the deficit. In introducing the FY 1986 military budget request, Defense Secretary Weinberger claimed that the DoD had already reduced budget authority by $148.7 billion and outlays by $156.5 billion from FY 1982 to FY 1986. See Weinberger, C. (Secretary of Defense), *Your Defense Budget: Fiscal Year 1986* (DoD: Washington, DC, Feb. 1985). The Congressional Research Service (CRS) noted that

these reductions were determined from March 1981 spending projections in current dollar terms and not the current services baseline in real dollar terms used to measure cuts in domestic programmes. CRS found that from FY 1982 to FY 1986, reductions from planned defence spending were $46.7 billion (constant FY 1986 dollars) for budget authority and $85.1 billion for outlays. See Maroni, A., *Reducing the Deficit: Measuring DOD's Proposed Contribution*, Congressional Research Service report no. 85–590F (US Library of Congress: Washington, DC, 25 Feb. 1985).

[13] Unobligated funds are funds appropriated in previous years but not yet obligated by contract.

[14] That is, $297.6 billion instead of the requested $322.2 billion.

[15] Conference Report no. S.1160, *Department of Defense Authorization Act, 1986*, Report 99–235, House of Representatives, in *Congressional Record*, 29 July 1985, section 225, p. H6500.

[16] Pike, J., *The Strategic Defense Initiative: Areas of Concern* (Federation of American Scientists: Washington, DC, 10 June 1985); Longstreth, T. K., Pike, J. and Rhinelander, J. B., *The Impact of U.S. and Soviet Ballistic Missile Defense Programs on the ABM Treaty* (National Campaign to Save the ABM Treaty: Washington, DC, Mar. 1985); US Department of Defense, *Report to the Congress on the Strategic Defense Initiative* (DoD: Washington, DC, 1985).

[17] These reports are described in Conference Report no. S1160 (note 15), sections 226–6.

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13. Soviet military expenditure and the Soviet defence burden

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Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

The defence burden of the Soviet Union should not be underestimated. Fifteen years ago Abel Aganbegyan, who now serves as General Secretary Gorbachev's foremost economic adviser, arrived at a very high estimate of the military's share of the economy. He did not then have access to the full range of official data, but Gosplan official N. Baryshnikov, who presumably did, was two years earlier said to have declared: 'Our national income is only 65 per cent of the United States. Yet it is obvious that we cannot spend less than the United States does on national defence . . . This means that the defence burden of our country is much greater than that of the United States.'[1] The statement is indicative, not definitive. But it is difficult to be more precise.

A tradition of secrecy precludes exact calculation of Soviet military expenditures and of the burden that they represent. The rulers of Muscovy have always employed secrecy and deception (*maskirovka*) to obscure both weaknesses and strengths. Paradoxically, the result today, as in the past, is that Western observers magnify both.

There is no consensus on what is covered by the official Soviet military budget, on the range of items paid through other accounts or on the percentage of other budget categories that go to meet defence needs. Soviet budgetary statistics are neither comprehensive nor specific enough to allow confident, independent calculations of military costs.

II. Western estimates: problems and politics

In examining the methodological and conceptual problems affecting Western estimates of Soviet military spending, and attendant political ramifications, it is necessary to refer to data and analyses presented by the US Central Intelligence Agency (CIA). The CIA uses a building-block approach, based on satellite monitoring and other intelligence. The scope for concealment, and the resultant margin of uncertainty, are thought to be too small to affect the larger picture. Actual numbers, especially aggregates, can therefore be viewed with a fair degree of certainty, but their meaning is sometimes open to debate and their translation into fiscal values must be treated with care—as stressed by the CIA's own, often scrupulous caveats.

Unfortunately, numbers have political effect, and inconvenient caveats are often forgotten or ignored. When the CIA doubled its estimate of the rouble

value of the Soviet military budget, in 1976, it did not add one soldier, ship or aircraft. The revision reflected new intelligence, that Soviet military-industrial efficiency was not twice the civilian norm, but was in accordance with that norm. Particular sectors of the military economy do receive special privilege, but so do priority civilian concerns. Models of the military economy as distinct, uniquely privileged and insulated from the vicissitudes of the economy at large need to be revised.[2] Reality appears instead to reflect a central tenet of Russian (Bolshevik and tsarist) political culture, that the military is not a functionally separate interest group, but an integral member of a far broader establishment.

The immediate impact of the CIA revision, however, was to focus attention on the much higher figure now attributed to Soviet efforts. The impact was further dramatized through the established practice of 'dollar-costing' (not affected by the revision), which is intended to show what it would cost the United States to replicate Soviet military systems. Soviet conscript soldiers receiving $6 a month are dollar-costed at the US average of over $20 000 per annum. The same procedure applied to Chinese forces suggests that China's military forces cost as much as those of the United States.

The 1976 'doubling' of the rouble cost of Soviet defence efforts, dollar-costing and postulated high Soviet military growth rates during subsequent years drew attention to Soviet military expenditure figures that appeared to be a third to a half as high again as those of the United States. In 1981 and beyond, the figures were seen to legitimize and compel the Reagan Administration's historically unprecedented defence budget increases.

In 1983 CIA analysts again found occasion to change course.[3] New data showed that Soviet military growth rates since 1976 had in fact not exceeded 2 per cent per annum, a rate lower than that achieved by the Soviet GNP as a whole. Military procurement had not grown. That defence growth was shown at all was due to extremely high assumptions of research, development, testing and evaluation (RDT&E) expenses, assumptions that the CIA describes as the 'least reliable' of all its figures (they are contradicted by other evidence of Soviet investment priorities).[4] If Soviet research, development and testing cost estimates are reduced to a US-equivalent percentage, then Soviet military expenditures show no growth since 1976, absolute expenditures appear well below those of the USA, and the gross national product (GNP) percentage and assumed defence burden shrink to historically modest levels in Soviet and Russian terms. The latest CIA revision also had political impact. In 1984 and, especially, 1985, Congress was increasingly reluctant to ratify rapid military expenditure growth.

Ironically, the slow-down in US military growth came after Moscow announced a near 12 per cent increase in its official defence budget in November 1984, purportedly in response to the threat of the Strategic Defense Initiative (SDI).[5] The announcement expressed political will and probably reflected an increase in the operational budget. But the increase found no echo in budget accounts thought to cover other categories of military spending, and 1985 brought no follow-on addition to the official ledger. It was, however, a reminder that space defence efforts will increase number uncertainties and the

scope for manipulation, if only because of the difficulty of clearly distinguishing between military and civilian applications of component technologies.

But it is not just financial figures that have become tainted through political manipulation. Hardware figures are equally suspect. US presentations of Soviet military aid usually only give tonnage figures, though a vintage tank from World War II can scarcely be compared with an Exocet missile. Some US and NATO sources present fleet vessel comparisons that lump Soviet patrol craft with US aircraft-carriers. Others tabulate tank disparities without mentioning that the average firing rate of Western tanks is double that of Soviet tanks, and tally aircraft without reference to manoeuvrability and range differentials or widely disparate target tracking, discrimination and kill capabilities.

Quality and sophistication of equipment do not guarantee success in war. France's pioneer machine-gun failed to turn the tide during the Franco-Prussian war of 1870; its users mastered neither the technology nor the potential. Early tanks and aircraft were not used to optimum effect in World War I. Some of today's Western equipment may, similarly, suffer from too great an emphasis on advanced technology at the expense of durability and user familiarity.

The Soviet military has a formidable record of innovation in weapon design and in the area of operational patterns and concepts. Its strength lies in innovative use of existing technology. The approach to new technology is conservative and cautious: the byword is evolution, not revolution.[6]

But while advanced technology is no panacea, neither is reliability, even when combined with design and operational innovation (witness the ignominious fate of China's assault on Viet Nam in 1979). And although Soviet forces are incorporating impressive technological advances in their latest weapon systems, it is important to note that the West has not stood still. In his official 1983 Report to Congress the US Undersecretary of Defense for Research and Engineering pointed out that, in the 20 'most important basic technology areas', the USA was superior in 15, equal in 4 and behind in only 1. The equivalent 1984 Report showed the USA superior in 15, equal in 5 and behind in none. In a less exclusive survey of 32 technologies built into weapons already deployed, the 1983 Report declared that the USA was superior in 14, equal in 13 and behind in 5. By 1984 the US lead had widened: it was ahead in 17, equal in 10 while still behind in 5.[7]

Technology estimates affect cost assumptions. As noted, dollar-costing grossly inflates the price of items such as manpower, certain materials (like titanium) and standardized production runs, that reflect the strengths and resources of the Soviet economic system. The alternative—rouble-costing more sophisticated US forces—is equally distorting. The cost of a new-generation computer, for example, to a country not yet able to replicate it is, in effect, infinite.

The most extreme estimate of Soviet military expenditures, that of Steven Rosefielde, rests on assumptions of the very rapid Soviet introduction of sophisticated technologies in the military sphere, technologies that are disproportionately expensive to a less advanced infrastructure.[8] But the

assumption is contradicted by the CIA, by the testimony of the Undersecretary of Defense, and by the historical pattern of the sometimes rapid Soviet introduction of evolutionary and derivative technologies but cautious and only gradual adoption of more novel concepts. The pattern of caution gives greater credence to Franklin Holzman's calculator analogy: initial models were dear and customers willing to wait found lower prices and better quality.

There are other difficulties with rouble-costing. Its translation into dollars, and the currencies of other systemically different nations, will always be open to dispute. But the inclusive rouble cost of Soviet defence efforts should at least be an accurate indicator of the burden on the economy that sustains it, as the inclusive dollar cost (including defence-related items funded by other agencies and accounts) mirrors the burden on the USA. One problem is that the CIA, at least until 1985, employed a 1970 rouble base. Abraham Becker comments: 'even accurate CIA *ruble* figures at constant prices are becoming increasingly remote from actual values at current ruble prices. It is current-price values that bear most directly on the assessment of the burden of Soviet defense'.[9] 1970 base prices may understate pre-1970 costs, while overstating costs to the more sophisticated technological base of later years—although this may, again, be offset by the rate of evolution of military technological demands. Only an updated price base can address this uncertainty.

Another problem is that few rouble prices are available. Until 1977 the CIA had just 10. And although more are now known, precise values can still only be attached to a small fraction of military products and services. This means that CIA rouble costs rely to a very great extent on extrapolations from costs to US industry. The CIA's rouble-costing is thus a hybrid that incorporates much of the inflationary impact of dollar-costing.[10]

This makes it more difficult to follow the standard economic prescription to compute the mean of the currency calculations in question. The CIA in fact does this for GNP and other comparisons, though not for military expenditures. It arrives at an index-number spread (dividing the comparative dollar price ratio with the rouble price ratio) of 1.49 for Soviet–US GNP calculations, 1.54 for consumption, 1.3 for investment, and 1.63 for machinery and equipment; the same methodology applied to CIA defence totals, however, indicates a spread of only 1.15.[11] There can be little doubt that Soviet military expenditure calculations are, indeed, disproportionately inflated by dollar-cost estimates.

Quite apart from questions of cost, attempts to calculate the inclusive rouble value of Soviet military activities also come up against the question of what to include. One much-quoted high rouble calculation, by former CIA official (1951–64) and government consultant William T. Lee, assumed that all unspecified or unaccounted-for production of the machine-building industries went to the military.[12] The calculation appears to have been wrong. Using the same data, but with updated input/output tables, the CIA arrived at a residual figure that was only half that claimed by Lee. The residual also appears to cover space programme hardware, arms exports and perhaps other categories excluded from US definitions of military expenditure. A somewhat different model was suggested by Peter Wiles, of the London School of Economics, the

effect of which was to exclude all depreciation cost from the *pro forma* defence budget. But civilian depreciation statistics are fully accounted for.[13]

III. International variables

International considerations affect the balance sheet; context is an important factor. If defence budgets are compared for the purpose of gauging the threat that one nation might pose to another, then budget percentages committed to extraneous tasks must first be discounted. During the Viet Nam War, for example, the US Government excised all Viet Nam-related expenditures from East–West balance sheets. Similar allowance must obviously be made for Soviet forces committed to a possible confrontation with China. In 1979 the US Department of Defense noted that Moscow 'felt obliged to allocate up to 20 per cent of their total defence effort to the Far East and the PRC'.[14] Perhaps another 5 per cent is allocated to Afghanistan and the threat of Muslim fundamentalism (from Iran). But this may be balanced by US forces targeted on Central America and peripheral trouble spots. Even assuming further easing of Sino-Soviet relations, China and the Far East will continue to constitute a net drain on Soviet force potentials of at least 15 per cent until the end of this century, and probably well beyond.

Context also compels acknowledgement of the fact that the USA and the USSR do not stand alone. France, Britain and FR Germany each spend nearly as much on defence as all of the Soviet Union's East European allies together, even when their budgets too are inflated through dollar-costing that assigns US values to personnel costs and presumed combat effectiveness (dollar-costing more than doubles their figures).[15]

Before its 1983 downward revision of Soviet military growth rates, CIA dollar-costing indicated that the USSR spent $420 billion more on defence than the USA during the period 1971–80. But these same pre-discounted dollar-cost calculations still showed that NATO as a whole outspent the Warsaw Pact, including the USSR, by $250 billion during these years. As Professor Franklyn Holzman has pointed out: 'If one adjusts this $250 billion gap in our favor for the index number effect, for the impact of China, and for the CIA's recent error (the acknowledged overstatement of Soviet growth rates) . . . the NATO–Warsaw Pact gap rises to over $600 billion.'[16] In other words, consideration of the overall context makes a difference, in NATO's favour, of more than $1 trillion, suggesting an enormous NATO advantage.

IV. Complications

Other variables exaggerate and ameliorate the defence burden. The above discussion concerns only military costs as these are defined, rather narrowly, by the USA and NATO. The balance sheet excludes items such as civil defence, space activities, foreign military aid and defence-related economic subsidies (to Cuba, Viet Nam and others), intelligence, the strategic rationale and impact of transportation links like BAM (the second, more northerly trans-Siberian rail link), the additional cost of building subways deep enough to

use as shelters, the cost of maintaining reserve facilities for wartime expansion of military production, and the cost to the economy of whatever preference is accorded the military in the allocation of human and raw material resources. Analogous categories should be added to Western numbers, but the comprehensive nature of Moscow's civil defence effort alone suggests a greater increment to Soviet totals.

On the other hand, there are also considerations that work the other way. At the 24th CPSU Congress in 1971, then General Secretary Brezhnev acknowledged that '42 per cent of its [the defence industry] output is used for civilian purposes'.[17] Defence industries produce refrigerators, videos and a whole range of higher-technology civilian goods and appliances. Military construction troops build roads, bridges and buildings—for example, the Moscow State University. Soldiers help gather the harvest. The military furthermore contributes to the nation's socio-economic fabric by providing technical and specialist training for recruits and language tuition for minorities; conscription serves as perhaps the single most important functional vehicle for national consciousness and integration.

Low levels of readiness and less intense operating schedules lower costs. Normally, only 14 per cent of Soviet missile-carrying submarines are at sea, versus about 65 per cent of the US sea-based deterrent. It appears that only one of the air defence forces' three ground-based radars in the Far East was operating at the time of the downing of Korean Airlines flight 007, a factor possibly contributing to delayed interception and hasty decision (officers involved have been reassigned and demoted).[18] Soviet pilots are allowed only one-third the flying time of US pilots. Army recruits receive less training with frontline equipment. The percentage of Soviet intercontinental ballistic missile forces on alert is well below US norms.

There is also the question of deception, *maskirovka*, and the tradition of 'Potemkin villages' (false village fronts, like film sets). This works two ways. There is reason to presume the existence of at least some concealed Soviet force components, including some missile reloading capabilities.[19] On the other hand, US personnel visiting Soviet-built surface-to-air missile sites in Egypt, after that country switched allegiance, found that half the missiles were dummies—so 'lifelike' that air and satellite reconnaissance could not distinguish the real from the false.[20] This norm, of 50 per cent dummies, may or may not be applicable to other Soviet force elements.

The overstating of Soviet military expenditures that is inherent in dollar-costing and the projection of US norms and price relationships is further aggravated by the wastefulness that accrues from US defence budget politics. Single supplier bidding, truly extraordinary profit margins, 'goldplating' (such as power steering and air conditioning in vehicles that need neither), duplication and incompatibilities resulting from inter-service (and sometimes inter-alliance) rivalries, and non-optimal base structures and contract spread mandated by congressional, state and local political considerations, all constitute categories of waste not replicated in the Soviet system, or at least not to the same degree. Some may have their Soviet analogue; the contentious Krasnoyarsk radar, for example, is located in former General Secretary

Chernenko's home district. But there is no evidence that these problems are as pervasive in the Soviet Union as they admittedly are in the United States.

Yet, the Soviet defence burden is obviously a strain on the economy. The military does not have *carte blanche*. Its requirements are not allowed to cut into social programmes.[21] Its traditions, long, exposed borders, and a multitude of past and potential enemies predispose the Soviet military to quantity, in troops and *matériel*, and proven reliability and sturdiness of equipment. But a strong emphasis on quantity exacts a price. The price is lower investment in individual soldiers and individual items, a less than optimum training regimen, and lower readiness. Staying power is bought at the expense of instant response. Quick reaction is sacrificed to endurance.

The fact that the military is forced to sacrifice and resign itself to shortfalls in areas of lesser priority, does not, however, mean that the burden is crippling. Even the starkest estimates of today's Soviet military burden pale when placed in the historical context. During the 1660s, 1670s and 1680s about 50 per cent of Russian Government funding went to defence; the figure rose to 80 per cent between 1710 and 1715. From the 1730s to the 1860s the norm was 40 to 46 per cent, and a similar figure was reached in 1911. In fact, even the lowest defence budget years of the late 19th century, as well as many during the first decades of Soviet rule, saw percentages well above the CIA high of the early 1980s.[22]

V. Soviet strategy: the political variable

The strategic posture of the Soviet Union, and Soviet perceptions of sufficiency, threat and challenge, must also be considered. The restrained growth of the Soviet military from the mid-1970s to 1985 clearly was not due solely, or even primarily, to poor growth in the overall economy. The CIA testifies that total outlays for the Strategic Rocket Troops and Air Defence actually 'declined in absolute terms after 1977'.[23] Considering lead times, the length of time needed to research, test and develop new weapons, it is evident that the decision to decelerate strategic investment dates back to the late 1960s or early 1970s—that is, the time leading up to the signing of SALT I.[24] This suggests basic Soviet satisfaction with the balance struck by SALT, and Soviet acceptance of the thesis that Mutual Assured Destruction, its central tenet, was likely to endure.

In 1977 the thesis was reinforced. The analogous Soviet stress in the early and mid-1960s on the suicide implication of nuclear war initiation had been replaced by a search for war-fighting and war-winning potential and strategy.[25] General Secretary Brezhnev's 1977 Tula speech and the appointment of Marshal Ogarkov as Chief of the General Staff, that same year, signalled a return to the earlier posture.[26]

Ogarkov's tenure saw ever-increased emphasis on the mutuality of the cataclysm that would inevitably attend the unleashing of strategic nuclear war. He heaped scorn on the illusions of those who thought such wars could be either contained or controlled. Strategic nuclear weapons could have no other purpose than to deter their use by others. They promised doomsday, and had no military utility. Ogarkov instead emphasized new and 'smart' technologies

which, with novel operational concepts, might circumvent the nuclear impasse. He emphasized that new non-nuclear technologies promised to achieve the military tasks once assigned to nuclear weapons, without the latter's attendant import of collateral self-destruction. There is some evidence that Ogarkov pressed for increased funding for his advanced technology ambitions. But Ogarkov's focus was long-term. He vigorously supported General Secretary Andropov's call for economic reforms and the truism that bespeaks a relatively sanguine attitude towards current threat spectres, the truism that long-term security depends on a healthy socio-economic base.

Ogarkov re-emphasized both themes after President Reagan's 1983 announcement of the SDI goal of securing US immunity from nuclear annihilation.[27] Seeing this goal as one that could not be achieved, the Marshal was not diverted from his path.

Yet SDI and the concomitant nuclear war-fighting creed that permeated at least the public façade of the Reagan Administration's strategic bent, obviously reinvigorated the equivalent Soviet constituency. Ogarkov's departure from his post towards the end of the Chernenko interregum, and the later announcement of increased defence spending, appeared to some observers to confirm a decision to both counter and emulate the US effort.

But Ogarkov's successor was his own deputy, Marshal Akhromeev, and Ogarkov re-emerged, in 1985, as author of a major new strategic text[28] in which he repeats and extends his earlier arguments. His concerns are echoed in other military writings.[29] At the December 1985 meeting of COMECON (Council for Mutual Economic Assistance) premiers, Ryzhkov, newly appointed by Andropov's designated heir and now General Secretary Gorbachev, delivered a clarion call for a new-technology effort that sounded more like French President Mitterrand's civilian-targeted Eureka programme than SDI. As concerns the military threat of SDI, 'a Soviet military specialist' declared that countermeasures costing only '1 or 2 per cent' as much would suffice to turn US space defence installations into 'useless junk'.[30]

On the other hand, Akhromeev himself had earlier warned that the continued US pursuit of SDI would lead to 'an uncontrollable race in strategic offensive weapons', and compel 'retaliatory measures in the field of both offensive and defensive weapons'.[31] Official statements serve propaganda and obfuscatory as well as declaratory purposes. Contradictory postures may reflect audience discrimination rather than policy differences. Suffice to say that Soviet reaction to SDI is not yet hewn in stone. Significant elements within the political-military hierarchy apparently remain convinced that effective defence against either superpower's multiple penetration options remains illusory, and that Moscow may therefore rest content with its traditional, more limited goal of perpetuating a measure of defence against less capable opponents—for the same penetration assurance that has been conceded to Washington has not been conceded to Beijing or Paris.

Western assumptions of Soviet inability to compete in SDI- or Eureka-type ventures should be tempered.[32] Moscow's first nuclear explosion, in 1949, defied US political certitude (scientists disagreed) that the day was far off. Subsequent history is replete with other examples. Civilian sectors of the

Soviet economy may suffer complacency from lack of competition, but military sectors face the most demanding competition of all, that of a dynamic and sophisticated adversary. Whereas in the USA military industries may be the least challenged, in the Soviet Union they are the most. There are also those who feel that SDI is precisely the goad needed to overcome political and bureaucratic dogma, and propel Soviet embrace of the technological revolution that threatened to pass the Soviet Union by. It may be just the spur that Gorbachev needs to ram through his ambitions for high technology.

VI. Political-military culture: the final variable

The most uncertain and vexing variable affecting balance calculations is not that of differing socio-economic infrastructures, with their attendant exchange and burden-evaluation problems, nor is it the purely military dimensions of geography, strategy or doctrine; it is the question of political-military culture. The concept is amorphous but crucial. Soviet-Russian political-military culture is quite different from the Anglo-Saxon heritage of the USA. The latter viewed the military as a perhaps necessary but not necessarily desirable complement to the state—as a service-adjunct to the state, but definitely not of the state. The tradition of Muscovy, on the other hand, was of the military as an integral and vital component of the state. The tradition was reinforced by Lenin's Clausewitzian predilections, and by the *realpolitik* implications of the early Bolshevik struggle against what appeared to be an immensely more powerful coalition of domestic and external enemies: Bolsheviks were, *ipso facto*, soldiers; Red Army men were, *ipso facto*, Bolsheviks.[33]

There is thus no 'military-industrial complex', as such, in the USSR. President Eisenhower's warning, in 1961, of 'a permanent armaments industry of vast proportions' whose 'total influence—economic, political, even spiritual—is felt in every city, every State house, every office of the Federal government . . . the potential for the disastrous rise of misplaced power exists and will persist', was directed at a new phenomenon outside the state, a phenomenon that threatened the state.[34] What so alarmed Eisenhower was but a Lilliput compared to today's Gulliver. But the beast remained essentially outside—not of—the state, at least for some years.

Today's US reality may be different. A new, more incestuous pattern of interaction and cross-employment between military industries and defence officialdom was established during the Nixon presidency. Critical observers talk of the emergence of a symbiotic military-industrial-administrative-government-research complex. Yet there is an uneasy dichotomy between the reality of an increasingly composite whole and a more centrifugal tradition, philosophy and culture.

In the Soviet Union there is no internal contradiction. Political leaders have always served on local defence councils. Military officers, as a matter of course, serve on legislative and executive bodies.[35] Political leaders perform military roles and military leaders have civilian responsibilities. There is no symbiotic relationship. Rather, there is a composite that is deeply ingrained and fundamental. The Soviet military is not outside the state. It is of the state.

Western postulates of Party-military friction have always proved mistaken and/or facile, reflecting ethnocentric extrapolations from an alien cultural environment. There are of course factions and different interpretations of interest in Moscow too, but they do not take the forms that they do in Anglo-Saxon, or indeed Western political-military cultures.

Such observations are not much help to those who seek exact estimates of the military expenditures and defence burden. On the contrary, they suggest that the question is unanswerable and misguided. The contexts are vastly different. The important point may rather be to emphasize, on the one hand, that the US Joint Chiefs of Staff have asserted, and in no uncertain terms, that they would not wish to exchange their forces and problems for Moscow's, while, on the other, Soviet military leaders may also, on the basis of different premises and calculations, draw comfort from their *Weltanschauung*.

With each possessing more than 25 000 nuclear warheads, when the explosion of just 1000 may suffice to ensure nuclear winter, both powers have ample reason indeed for confidence—too ample. Existing arsenals mock notions of strategic rationality. It is time to re-evaluate and reconsider: what are the requirements of defence and strategy? Fixation on contrived balance sheets serve neither.

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[11] See note 10.

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[13] Wiles, P., 'Soviet military finance', paper presented to World Soviet Studies Conference, Washington, DC, Oct. 1985, based on Efrat, M. and Wiles, P., *The Economics of Soviet Arms* (CT/CERD, London School of Economics: London, 1985); critique by Professor Alec Nove, of Glasgow, keynote speaker to the same conference. The ongoing debate should improve our knowledge of the difficulties involved and help resolve or circumvent some of these.

[14] Then Secretary of Defense Harold Brown; see Holzman, F. D. 'Are we falling behind the Soviets', *Atlantic*, July 1983, p. 10. For fuller discussion and analysis, see Holzman, F. D. 'Are the Soviets really outspending the U.S. on defense?', *International Security* (Harvard University), vol. 4, no. 4 (Spring 1980), and 'Soviet military spending: assessing the numbers game', *International Security*, vol. 6, no. 4 (Spring 1982).

[15] Compare International Institute of Strategic Studies, *The Military Balance 1985–86* (IISS: London, 1985), pp. 31–60; and Sivard, R. L., *World Military and Social Expenditures* (World Priorities: Leesburg, VA, 1985), especially pp. 46–7.

[16] Holzman, F. D., 'Can military expenditure comparisons provide any useful information?', *Russia*, no. 11 (1985), p. 32.

[17] Jacobsen, C. G., *Soviet Strategy—Soviet Foreign Policy* (Robert MacLehose, The University Press: Glasgow, 1972), chapter 6 ('Military-civilian integration in the USSR'), p. 181.

[18] D. R. Jones (ed.), *Soviet Armed Forces Review Annual (SAFRA) 8* (Academic International Press: Gulf Breeze, FL, 1985), pp. 8, 11, and 246.

[19] See *International Herald Tribune*, 23 Dec. 1985, for unclassified digest of a Presidential report to Congress on alleged Soviet treaty violations.

[20] *Aviation Week & Space Technology*, 11 Jan 1982, p. 63. See also 'Air Defense Forces', in Jones (note 18), pp. 132–95.

[21] See text; also, e.g., then General Secretary Chernenko's Kuibyshev speech, in *Pravda*, 3 March 1984: international pressures have 'forced us to divert sizeable resources to meet needs related to strengthening our country's security. But even in these circumstances we have never even contemplated any cutting back of social programmes'.

[22] Jacobsen, C. G., *The Nuclear Era: its History; its Implications* (Spokesman Books and Oelgeschlager, Gunn & Hain: Cambridge, MA, 1982), Introduction. (D. R. Jones, Director of the Russian Research Centre of Nova Scotia, notes that many of these figures are in fact understatements. Typically, tsarist figures exclude the very considerable cost of the gentry militia, a cost borne by the serf-peasantry rather than the state; nearly 50% of the agricultural production and employment should be counted as hidden defence expenditure.) For post-World War II trends, see Becker, A. J., *Sitting on Bayonets? The Soviet Defense Burden and Moscow's Economic Dilemma*, RAND-P-6908, Sep. 1983, p. 15.

[23] Gates (note 3) p. 13.

[24] Kaufman (note 2), p. 191.

[25] McConnell, J., 'Shifts in Soviet views on the proper focus of military development', *World Politics*, Apr. 1985, esp. pp. 320–4; K. Bochkarev's article in *Voennaya Mysl'*, no. 9 (1968), exemplifies the nuclear war-fighting school. *Note*: The author is indebted to Mary C. Fitzgerald, of the US Centre for Naval Analysis, for her pioneering work on Ogarkov. Some will appear in a forthcoming issue of *International Security*. See also Fitzgerald, M. C., *The Soviet Union and Nuclear War* (Academic International Press: Gulf Breeze, FL, forthcoming).

[26] 'Comrade L. I. Brezhnev's speech', *Pravda*, 19 Jan. 1977, p. 2; Ogarkov, N. V., in *Sovietskaya Rossiya*, 23 Feb. 1977, p. 2; Ogarkov, N. V., 'Military Strategy', *Sovietskaya Voennaya Entsiklopedia*, vol. 7 (Voenizdat: Moscow, 1979), p. 564; and Ogarkov, N. V., 'Military science and the defence of the socialist fatherland', *Kommunist*, no. 7 (1978), p. 117.

[27] Ogarkov, N. V., 'The defence of socialism: the experience of history and the present day', *Krasnaya Zvezda*, 9 May 1984, p. 3.

[28] Ogarkov, N. V., *History Teaches Vigilance* (Voenizdat: Moscow, 1985), p. 88; see also Ogarkov's post-transfer article, 'The unfading glory of Soviet weapons', *Kommunist Vooruzhiennikh Sil*, no. 21 (1984), p. 25.

[29] Gareyev, Col. Gen. M. A., *M. V. Frunze—Voyennyy Teoretik* (Voenizdat: Moscow, 1985) p. 240.
[30] *International Herald Tribune*, 20 Dec. 1985, p. 1.
[31] See note 30.
[32] See note 6; and Kiser, J. W., 'How the arms race really helps Moscow', *Foreign Policy*, no. 60 (Fall 1985).
[33] Jacobsen (note 22), chapter 6, especially pp. 114–15.
[34] Eisenhower, D. D. in *Public Papers of the Presidents* (US Government Printing Office: Washington, DC, 1961), p. 1038.
[35] Jacobsen (note 22), chapter 6.

14. The SDI programme and international research co-operation

ELISABETH SKÖNS

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

The main importance of the US Strategic Defense Initiative (SDI) lies in its implications for military strategy, for the arms race and for arms control. These issues are treated in chapter 4.

The SDI programme has also been presented as a vehicle for technological innovation. While governments of the USA's NATO allies have questioned the strategic and political impact of SDI, they regard SDI as a threat to the competitiveness of their industries and as a potential lure of their human and capital resources to the United States. The US invitation to participate in SDI research and development (R&D) opened up the possibility of a spread of the presumed technological benefits. It could also serve to enlist political support: countries benefiting economically would hardly be vociferous in criticizing the programme. Such a linkage of issues is unfortunate: if the political support for SDI is weak, ways other than co-operation in the programme could be sought to counteract its economic repercussions.

The SDI programme

One year after President Reagan's 1983 SDI speech, the SDI Organization (SDIO) was established within the Pentagon to administer the programme and to assimilate the existing R&D projects for ballistic missile defence (BMD) into it.[1] SDI is a long-term R&D programme whose components are described in chapter 7. The technological sophistication required is in many fields beyond the current state-of-the-art.

The planned level of investment is high. US Department of Defense (DoD) plans included $26 billion for the first five-year period (fiscal years (FYs) 1984–9), and for FYs 1985–90 the planned total was originally set at $32 billion.

The SDIO budget does not include all R&D items relevant for strategic defence purposes; alternative funding estimates have been made. One such estimate amounts to $90 billion for the entire pre-full-scale development phase, lasting through FY 1994. Taking into consideration previous experience and cost and time over-runs in other high-technology weapon projects, however, 'it could become a twenty year, $225 billion development effort'.[2]

Estimates of the total investment necessary for the deployment of a strategic defence system can naturally be no more than informed guesses. Such estimates are highly dependent on hypothetical systems architecture, especially on the number of space battle stations included.[3] This, in turn, depends on

the assumptions made about the level of effectiveness of the system and about Soviet countermeasures. Estimates by experts range between $500 billion and $1 trillion,[4] and even higher estimates have been mentioned. A major non-government study predicts a total cost of $400–800 billion.[5]

Much lower estimates have also been made. Supporters of strategic defence have claimed that 'we can now construct and deploy a two-layer . . . defense, which can be in place by the early 1990s at a cost . . . in the neighborhood of $60 billion . . . The combined effectiveness of the two systems would be over 90 per cent'.[6] The costs of projects in the frontier of technology are likely to be even more underestimated than those of less innovative weapon programmes. The initial cost estimate made for the Manhattan project which developed the first atomic bomb was $100 million (at 1942 prices); the actual cost was $2 billion.[7]

The US invitation

A US invitation to co-operate in SDI R&D projects was formally extended to the NATO allies, Australia, Israel and Japan on 26 March 1985. It stated that the USA was prepared to undertake co-operative programmes on data and technology, up to the anti-ballistic missile (ABM) component level, and asked these countries to indicate both their interest in participation and the areas of their research excellence. No mention was made of the terms of such participation.[8] It is not clear whether there was a genuine desire to use the expertise and knowledge of these countries, or whether the proposal was made purely for political reasons.

While NATO countries have lent their support to US research on SDI technologies on the grounds that the Soviet Union has pursued research in BMD technologies, their support has been limited and qualified.[9] It is also clear that, for some of these countries, political support is tied to economic benefits. Thus the West German Defence Minister has claimed that without technological and industrial co-operation in SDI, it would be impossible to maintain West German and NATO support for the initiative in Europe.[10] Fear, therefore, of a serious rift within NATO was no doubt one of the reasons for the US invitation to participate.

Neither the US Government nor the SDIO has given any indication of the magnitude of RDT&E contracts that participating countries could count on. One of the actively involved US scientists has mentioned a sum of $1 billion,[11] but this has never been confirmed by any US Government official. On the contrary, the US Government has consistently emphasized that country quotas cannot be established, that the USA cannot make any commitments in this respect, and that the scale of participation will depend on the competitiveness of what is offered.

This chapter outlines a number of the main economic issues involved in international co-operation in the SDI programme. First, the increased international competition in high-technology sectors is described, since it is in these sectors that the SDI programme is said to have its most pervasive spin-off potential. The next three sections discuss past experience of military- and space-related R&D, and finally the response in 1985 to the US invitation for

co-operation—including the Eureka proposal—is summarized. The commercial benefits for participating countries depend greatly on the scale of participation that the USA agrees to and the transfers of technology that the United States permits. Previous experience in both these areas is rather negative: the US Congress has been very restrictive in giving away employment opportunities and US technologies to other countries. On the other hand, there is some recent evidence of a change in attitude.

A broad range of technologies are considered militarily sensitive in the United States and are therefore protected from diversion to adversary states. The USA also has been able to exert some influence over the export of such technologies from other countries—including those invited to participate. Many high-technology research fields could be claimed to be relevant for the SDI programme. There is, therefore, a risk that the SDI programme will result in increased international friction over technology transfer issues, or even in increased dependence of other countries on US policy for high-technology exports. Countries co-operating in SDI projects may also find their freedom of research becoming inhibited for national security reasons.

II. Technological competition

High-technology products are the fastest growing sector in both manufacturing output and international trade in manufactured goods. They contribute significantly to product development in other areas and to productivity growth. There is further a belief that a period of radical technological and industrial change is just beginning, for which high-technology industries are decisive, and that these industries will therefore dominate economic development in the next century. Micro-electronics is particularly important:

> Microelectronics is at the heart of thousands of products ranging from highly sophisticated systems such as telecommunications and observation satellites or professional and personal computers to watches and toys. Today, the world turnover in this industrial sector is about US $30 thousand million, but the estimated turnover in other sectors in future years which make use of microelectronics amounts to more than US $660 thousand million.[12]

The United States

The share of high-technology products (as defined in table 14.1) in total exports of manufactured goods is greater for the USA than for any other major economy—40 per cent in 1980, against 25–30 per cent for FR Germany, France and Japan—because the USA has long enjoyed a comparative advantage[13] in the production of such goods. Two product groups are particularly important: aircraft and computer-related goods, which together accounted for over 50 per cent of the US surplus in high-technology trade in 1980.[14]

In the field of civil aircraft, the USA has dominated the world market. However, by 1981 the European Airbus consortium had gained roughly one-quarter of the jet aircraft market.[15] Europe is also challenging the US monopoly in the launching of satellites. The US lead in exports of computer

Table 14.1. Classification of US high-technology products, 1980[a]

Figures are percentages.

Product group	Research intensity[b]
Aircraft and parts	12.41
Computers and office equipment	11.61
Electronic equipment and components, electrical industrial components and communications equipment	11.01
Optical and medical instruments, photos and watches	9.44
Drugs and medicines	6.94
Plastic and synthetic materials	5.62
Engines and turbines	4.76
Agricultural chemicals	3.64
Professional and scientific instruments	3.17
Industrial chemicals	2.78
Radio and TV receiving equipment	2.57
Average for all manufactured products	2.36

[a] High-technology products are defined here as those with a research intensity above the average of all manufactured products. Definitions of high-technology products and industries vary somewhat, but are all based on the concept of research intensity. Regardless of definition used, those products listed in the table above, or their industries, are included, although the rank order may differ. When the product category of guided missiles and spacecraft is singled out, these products have an extremely high R&D intensity: 64 per cent. For the three different high-technology definitions developed in the USA, see the source for this table. For the conceptual problems involved, see OECD, *Problems of Establishing and Comparing 'R&D Intensities' of Industries*, DSTI/SPR/78.44, 1978.

[b] Research intensity refers to the ratio of applied R&D funds to output by product group.

Sources: *An Assessment of U.S. Competitiveness in High Technology Industries*, US Department of Commerce, International Trade Administration (US Government Printing Office: Washington, DC, Feb. 1983), appendix B, table 7. The source for that table is Kelly, R. K., *The Impact of Technological Innovation on International Trade Patterns* (Office of International Economic Research, US Department of Commerce: Washington, DC, Dec. 1977).

hardware and software, and in the field of semiconductors, is being challenged by Japan, which has overtaken the USA in some of these product areas. In fiber optics and robotics, Japan's capabilities exceed those of the USA.

Various explanations have been sought for the erosion of the United States' dominant position in high-technology trade. They include the overvaluation of the US dollar; mismanagement of US enterprises; incoherent and non-competitive US policies and institutions; the priority given to military R&D in total US R&D efforts; and the successful industrial strategies of competitors such as Japan, France and the newly industrialized countries (NICs).[16] As to the third of these explanations, it has been argued that US military and space programmes serve as a substitute for an industrial policy. While most other major industrialized countries have developed new industrial policies with considerable state intervention in support of high-technology sectors, in the United States it is the DoD which gives this support. These allocations are considerably higher, but also more inefficient, than the funds devoted to such companies in other countries within the framework of civilian industrial policies.[17] Aside from the SDI projects, the most important current DoD research programmes in this context are the VHSIC programme for development of very-high-speed integrated circuits, the software technology programme (STARS), and the strategic computing programme.[18] The

activities of the National Aeronautics and Space Administration (NASA) also fall in the high-technology category. Its largest current R&D project is for the design of a permanent, manned space station to be put into orbit by the mid-1990s at a planned total cost of $20 billion by the year 2000.

Japan

As early as in the 1960s the Japanese Government was promoting R&D, most notably with a law to waive anti-trust legislation for companies engaged in co-operative research.[19] The most successful of the resulting research projects was that for very large-scale integrated circuits (VLSICs), which was government-subsidized. By 1981 Japan had captured 70 per cent of the world market in 64K (kilobyte) RAMs (Random Access Memories),[20] the essential building-block of today's computer memories. Research has since been aimed at the next generation of VLSICs: the 256K RAM (for which Japan controlled 90 per cent of the world market by 1985)[21] and the one-megabyte RAM. Other recent high-technology R&D projects include: the fourth-generation computer project (1979–84), based on VLSICs; the opto-electronics project[22] (1981–6); the high-speed computer project (1982–90), aimed at increasing the speed to more than 1000 times that of today's computers; and the fifth-generation computer project (1982–91), based on artificial intelligence.[23]

The EC countries

Western Europe also feels threatened by the increasingly competitive environment in high-technology areas:

> Europe launched the first two industrial revolutions: is it now missing out on the third? Can Europe be satisfied with its continuing domination in medium-technology products when the newly industrializing countries of Asia and Latin America are ready to take over? Must Europe accept the brain drain to the United States and let Japan take over its market shares?[24]

It is the following trends that give rise to anxiety. Since 1972 the annual growth rate in real terms of the production of high-technology goods in Europe has not exceeded 5 per cent, while the rate in the USA has been 7.6 per cent and in Japan 14 per cent. Over the period 1973–83 the EC (European Communities) surplus in high-technology trade was eroded, the ratio of exports to imports having declined from 190 to 110 per cent.[25] It is in such future-oriented fields as information technology and laser technology that Europe is falling behind.

Both the Commission of the EC and the Organization for Economic Co-operation and Development (OECD) blame the difficulties experienced by EC countries on the fragmentation of the European market. The combined R&D expenditure in high-technology industries in the EC area is only slightly less than that of the USA and considerably greater than that of Japan.[26]

A range of collaborative West European research and industrial programmes has been initiated in order to reduce the waste resulting from duplication but also in the hope that they will contribute to the reduction of trade and other barriers between European countries. The activities of the European Space

Agency (ESA)[27] are one example. In January 1985 the ESA adopted two major programmes—the development of an advanced satellite launcher system, Ariane-5, and the Columbus part of the US space station programme—and recommended a 70 per cent real increase in the annual budget by 1990. The civil aircraft programmes of Airbus and Transall are other examples. Within the EC, the most notable research programme is the 10-year European Strategic Research Programme in Information Technology (ESPRIT) launched in 1984, which concentrates on five key areas: advanced microelectronics, software technology, advanced information processing, office automation and computer-integrated manufacturing. In 1985 the Council of the EC adopted seven large-scale long-term research programmes, the largest of which were for research and training on controlled thermonuclear fusion, for R&D in the field of non-nuclear energy, and for R&D on basic technological research and the application of new technologies. The latter, so-called BRITE programme is intended to encourage co-operation between European industries in lasers, catalysis and particle technology, new materials, and new computer-aided design and manufacturing methods.[28] A number of other R&D projects are still under consideration.[29]

III. Commercial benefits

Spokesmen for the SDI Organization are optimistic about the potential benefits of the SDI R&D programme, for direct stimulation of the economy and for enhanced productivity. The computer, communications, propulsion and laser technologies are seen as having attractive spin-off possibilities.[30] In October 1985 it was decided that an office be set up within the SDIO with the specific task of 'developing and encouraging the widest possible use of SDI-related technologies, consistent with security considerations, for civil use'.[31]

It is unarguable that direct investment in civil R&D is a more cost-effective method of supporting the development of commercially viable products than relying on spin-offs from military- and space-related R&D. Whether this route is taken or not is a matter of political choice. This simple argument is often forgotten. It is equally true that military and space programmes have generated development of commercially useful technologies for civil purposes.

Arguments about the commercial impact of military and space-related R&D centre around the United States' experience. Several studies have been made of the impact on the growth of productivity in the United States. Econometric studies to assess the effect of NASA R&D have been contradictory.[32] Other econometric studies have investigated the relationship between productivity and total US Government-funded R&D, over two-thirds of which is currently spent on military and space programmes. These studies found that no significant relationship existed, while industry-funded R&D is positively related to productivity growth, and that industries which are major recipients of government R&D funds have the lowest productivity return on R&D from both sources.[33] The latter result could be explained by another finding: increases in government-funded R&D were associated with reductions in

company-funded R&D.[34] A comparison often made is that between the USA and Japan, relating the low level of military R&D in Japan to the increasing competitiveness of Japanese industry. The US high-technology industries which have experienced a long-term decline in competitiveness are exactly those in which US military R&D is concentrated.[35]

Studies such as these are general and difficult to interpret. They do, however, at least indicate that the US economy has not benefited greatly from their huge investments in military and space programmes.

Basic research, which has few immediate commercial applications but is an important source of innovation, has received only 4 per cent of US military R&D during the past decade, while the largest portion—84 per cent—has been devoted to development of already existing technologies; the remaining 12 per cent was for applied research.[36]

The supportive role that the DoD has played for a number of innovations, especially in the electronics field, has been not as a sponsor of R&D, but as a big customer providing a sufficiently large market to give the production experience and economies of scale required to make products marketable. This is true for transistors, integrated circuits, semiconductors, microprocessors and fibre optics.[37]

Technologies and products developed for military purposes are often very sophisticated and therefore too expensive to be commercially viable. The large US military research programme for the development of very-high-speed integrated circuits was initiated precisely to drive technology in this field away from the commercially proven low-risk and low-cost products now dominating the market to military-adapted products of 'increased speed, throughput and reliability'.[38]

From a strictly technological viewpoint, many technologies developed for military purposes have a potential civil use. Economically, successful exploitation of military-developed technologies depends on the ease and speed with which they can be used for commercial products. A report based on interviews made in the British electronics industry found that there were few companies in which civil and military work was done side by side; that firms working on military contracts were both unsuitable for and uninterested in applying their skills to civil uses because of the different approaches, standards and customer relationships; that companies doing predominantly civil work had little access to technology developed for military purposes; and that a considerable amount of additional technical work has to be done before such technologies can be brought to the market place.[39]

The technologies explored under the SDI programme have been divided into three categories: mature, advanced and innovative. The major thrust is on advanced technologies, which still have to be developed considerably before they can be implemented.[40] Innovative science, that is, basic research, is concentrated in the Innovative Science and Technology Office (ISTO) of the SDIO. Whenever spin-offs are mentioned, reference is made to the activities of ISTO. Although the ISTO budget is only a small part of the total SDI budget—$100 million, or 2.7 per cent of the SDI total requested for FY 1986—it has been estimated that over the next few years it will equal about

one-fifth of the flow of capital into US high-technology ventures.[41] An important question is whether this 20 per cent will be in addition to sustained civilian funding, or whether SDI outlays will substitute for civil investment.

It would be surprising if large-scale SDI investments of money, science and engineering talents did not give some impetus to the development of civilian products. The greatest gap in relation to state-of-the-art technologies is in computer technology. SDI requires computers with a processing speed 1000 times greater than speeds currently achieved. Computer software is the most pervasive and most likely commercial use of SDI research, according to ISTO. Other examples include multi-purpose satellites and transmission of energy by laser beams.[42]

The director of ISTO claims that, since the research results of SDI will be protected, the mechanism through which SDI projects will generate commercial spin-offs is training: 'What this process does is to create an infrastructure and an ability to think and create. Once that is there, . . . people . . . can apply it anywhere they like. That is the critical issue in spinning-off technology: the people'.[43]

On the other hand, there is the countereffect of fewer scientists and engineers in civilian R&D. The demand for scientists and engineers was rapidly increasing in the USA even before the SDI programme started, and potential supply constraints have been identified for computer engineers and scientists, and for electrical/electronic engineers.[44]

Since little is known about the exact nature of the SDI projects, and because they are continuously changing,[45] judgements about commercial benefits are difficult to make. It is striking how different the assessments are. Experts of the EC Commission believe that about 80 per cent of SDI R&D will benefit both the military and the civilian sector, and therefore refer to SDI as an 'American industrial policy of vast proportions'.[46] IBM, the world's largest computer company, has concluded, in a study assessing the first 350 SDI contracts awarded during 1983 and 1984, that these contracts are not of any value to the civilian industry.[47] A study made by the think tank of the French Foreign Ministry concludes that, apart from computer software and propulsion, the SDI programme is not of key importance to industry.[48] In a study sponsored by the West German Ministry for Research and Technology, it is claimed that no immediate military-to-civil technology transfers can be expected from the SDI programme since, in contrast to previous military programmes for which there were several civilian counterparts, there are no such counterparts to space-based weapon systems.[49] Finally, a US study argues as follows:

> A detailed look at SDI shows a strong bias toward specific applications, including an emphasis on developing prototypes . . . [P]rivate application of high-energy lasers, particle beams, large optics, and infrared sensors are not immediately obvious. While the techniques developed for producing these systems may have broader applications, commercial benefits from the bulk of SDI research are at best speculative.[50]

While it is very likely that US technological progress will gain from the sizeable R&D outlays of the SDI programme, this is much less certain for other countries deciding to take part. For other countries to benefit, it would require

either that they receive a substantial share of the contracts, since the scale of investment is one decisive factor for such benefits, or that they participate in crucial technology projects in which a free exchange of technological know-how was allowed. Anything less would probably only drain expertise from participating countries or, at most, allow for minor benefits in individual company employment and sales revenues. In many of the countries invited to participate, the more cost-effective alternative of increased civil R&D programmes is politically possible. It is true that funding from the USA represents an addition to domestic financial resources. This is, however, not true for human R&D resources: these resources are scarce, especially in innovative science, and their costs include not only the funding of a specific research project but also educational costs.

IV. The scale of participation: lessons from the past

There is a good deal of experience with international co-operation in the armaments field, and there may be lessons to learn from this experience. In Europe, there have been several truly collaborative projects such as those for the Alpha Jet, Jaguar and Tornado aircraft, and the Euromissile projects for the Hot, Milan and Roland missiles. However, co-operation between the United States and other NATO countries has been modest for a variety of reasons, foremost among them the reluctance of the US armed forces to accept foreign designs, economic protectionism and, more recently, US restrictions on the transfer of militarily sensitive technologies to other countries.

Research and development

The US disinclination to award military research contracts abroad can be inferred from table 14.2: the foreign share is less than 2 of every 1000 dollars worth of contracts. If Canada—by far the largest foreign contractor—is excluded, then the figure in most years is less than 1 in 1000 dollars.

Trade

Similarly, for foreign procurement contracts the imbalance in the transatlantic arms trade has been a persistent source of European discontent. According to the US statistics in table 14.3 US exports to NATO Europe were in 1984 three times higher than its imports. Other sources claim a much greater imbalance.[51]

The figures in table 14.3 conceal an important fact: a large share of US purchases consist of mere sub-contracts to European and Canadian companies. While these contracts do result in employment benefits, they do not promote technology development,[52] and France has been the most vocal critic of this relationship. European governments fear that this will be their fate also in any forthcoming SDI contracts.

A major reason for the failure to create a genuine two-way arms trade street is US congressional concern for employment in home-district arms industries. Memoranda of understanding (MoUs) that have been signed to ensure equal trade in both directions are agreements between governments and indicate

Table 14.2. Foreign contractors' share of US military RDT&E contracts, FYs 1965–84

Figures are rounded.

Fiscal years[a]	DoD prime contract awards for RDT&E to top 500 contractors[b]			
	Total (US $ m.)	To foreign countries[c] (US $ m.)	Foreign contracts as a share of total (per thousand)	Canadian contract as a share of foreign (per cent)
1965	4 658	6	1.4	*95*
1966	5 210	10	1.9	*77*
1967	5 949	13	2.1	*82*
1968	6 404	. .	. .	. .
1969	5 910	9	1.5	*67*
1970	5 368	12	2.2	*77*
1971	5 449	9	1.6	*70*
1972	5 742	6	1.1	*90*
1973	6 185	9	1.4	*75*
1974	5 708	10	1.6	*40*
1975	6 191	5	0.9	*75*
1976	6 768	14	2.0	*46*
1977	7 758	7	0.9	*58*
1978	8 520	5	0.6	*89*
1979	8 378	13	1.6	*64*
1980	. .	. .	. .	. .
1981	10 225	49	4.7	*34*
1982	14 611	20	1.4	*36*
1983	16 014	18	1.1	*48*
1984	17 958	22	1.2	*95*

[a] US FYs 1965–76 begin on 1 July of the previous year; FYs 1977–84 begin on 1 Oct. of the previous year.

[b] Department of Defense prime contract awards (excl. sub-contracts) greater than $10 000 ($25 000 starting with FY 1982) for RDT&E to top 500 contractors. The total value of these contracts represented 97.9–98.3 per cents of total DoD prime contract awards for RDT&E during the period FYs 1974–9.

[c] Contracts to US contractors abroad are not included.

Sources: 500 Contractors Receiving the Largest Dollar Volume of Prime Contract Awards for RDT&E, US Department of Defense, Directorate for Information Operations and Reports, Washington, DC, annual volumes for FYs 1965–79 and 1981–4.

only intent, since congressional approval is required for actual US purchases.[53] Congress has not only been able to use the Buy America Act of 1933 but has also in most years since 1973 introduced a Specialty Metals Amendment to the Defense Appropriations Act. This is a measure to ban the import of any component containing specific foreign metals, which in fact most foreign military items do contain. So far, the DoD has, however, obtained exceptions for imports of weapons produced in other NATO countries.[54]

Licensed production

There are many examples of foreign licensed production of US-developed weapon systems. Examples of licensed production in the other direction are few. The US armed services demand tailor-made systems. US production of the European-designed Roland SAM (surface-to-air missile) system was the major exception until it was abruptly cancelled in 1982.[55] A joint US/British

Table 14.3. Arms trade balance between the USA and other NATO countries, FYs 1982–4

Figures are rounded.

Country	Trade balance US sales: purchases			US sales ($ m.)	US purchases ($ m.)
	FY 1982	FY 1983	FY 1984	FY 1984	
Belgium	0.3:1	8.9:1	0.1:1	14	114
Canada	1.4:1	1.2:1	1.7:1	5 333	2 062
Denmark	0.6:1	1.1:1	1.4:1	71	49
France	6.3:1	6.0:1	3.8:1	180	48
FR Germany	2.8:1	1.7:1	1.0:1	313	308
Italy	7.7:1	3.7:1	1.5:1	98	65
Luxembourg	11.5:1	5.8:1	1.2:1	2	2
Netherlands	9.0:1	11.3:1	37.3:1	1 455	39
Norway	1.1:1	2.9:1	0.8:1	36	44
Portugal	4 071.1:1	3 127.7:1	15.0:1	19	1
Spain	25.3:1	67.9:1	3.1:1	78	25
UK	2.3:1	4.9:1	3.1:1	1 544	493
Total NATO Europe	2.4:1	6.7:1	3.2:1	3 810	1 187
Total NATO (excl. USA)	1.9:1	4.0:1	2.6:1	8 178	5 333

Sources: *Armed Forces Journal International*, Aug. 1984, p. 36; and May 1985, p. 28.

design effort was also started in 1973 for an improved version of the British Harrier VSTOL fighter aircraft. Two years later the British Government opted out of the venture because there was not enough common ground between US and British requirements. Subsequently, a US company designed an enhanced version on its own, the Harrier AV-8B, production of which began in 1983.[56] A third, and so far the only successful example is the British Hawk jet trainer aircraft which won a US Navy contract in 1981 (although it has not yet entered production). Over 300 aircraft are to be built, with about three-quarters of the work to be carried out in the USA. Thus, licensed production of complete weapon systems has been virtually a one-way street.

The family-of-weapons approach[57]

From the outset the USA decided to exclude several categories of weapon from consideration under the family-of-weapons concept. This was the case with air defence weapons, aircraft, tanks and ships, leaving only air-to-air and anti-tank missiles and possibly, for later consideration, air-to-surface and anti-ship missiles, mines and torpedoes. The reason for excluding 'the weapons with the greatest potential for savings' was that 'these are also the weapons which would involve the most conflict on the economic, technological, military and political issues'.[58] Co-operation with this approach has been very limited.

New initiatives

US congressional opposition to NATO co-operation reached a peak around 1980, as a result of the divisive NATO burden-sharing issue. With NATO

acceptance of the 1982 US initiative to enhance NATO conventional capabilities, this opposition weakened and measures were introduced to promote co-operation in the procurement of emerging technology (ET) systems. In the meantime a new type of transatlantic arms co-operation had evolved: US and European companies had started to team together in the bidding for contracts, without any government involvement. Several recently launched NATO weapon programmes are carried out in such multinational ventures (see also chapter 10).[59] The Reagan Administration and sections of the US Congress support this trend: thus in 1985 two measures were introduced to facilitate arms co-operation in the field of emerging technology.

A draft DoD proposal called for DoD authority to sign agreements with NATO governments on joint research, development, testing and evaluation (RDT&E) or production of military items, or on military purchases from NATO countries. The authority would include the right to waive any provision of law regulating procedures for formation, terms and conditions of contracts, clauses prescribing preferences for US products, and requirements for making competitive contracts.[60] In the Senate a similar amendment to the FY 1986 Defense Authorization Bill was passed.[61] According to another amendment in the same vein, Congress decided to provide $200 million exclusively for NATO co-operative R&D projects, under the condition that they would enhance efforts to improve NATO's conventional defence capabilities through the application of emerging technologies.[62]

Industry-to-industry co-operation is viewed with scepticism in Europe since it is believed to favour US companies which are larger than European companies and thus will tend to dominate any partnership.

V. Restrictions on technology transfer

If participation in the SDI programme is to benefit technological progress in Europe, technology transfers must be permitted, both between the USA and participating countries and from SDI programmes to commercial product development. However, the Reagan Administration has strongly reinforced US policy on technology controls,[63] a process started in the mid-1970s. These efforts have been motivated by national security concerns.[64]

Multilateral trade controls

The United States will be concerned to see whether countries wishing to participate in SDI projects share the US attitude towards technology transfers to third countries. Currently this is the case to only a limited extent: for political and economic reasons, European countries favour a more liberal East–West trade policy than does the United States.[65]

After a long period of low-level activity in the Coordinating Committee on Export Controls (COCOM)[66] during the years of détente, COCOM was reactivated following an appeal by President Reagan at the 1981 Ottawa Summit meeting. Three lists of products and technologies to be controlled have been established by COCOM: one for those for direct military use, one for

atomic energy, and one for technologies of dual military and civil use. Agreements on the first two have been straightforward. Negotiations on the updating of the third list were, however, drawn out over several years because the extensions sought by the United States were resisted by other members. The agreement finally reached in July 1984 on new rules for three major areas of dual-use items—computer hardware and software and telecommunications—was the result of considerable compromises made by European members. The agreement did not, however, put an end to their differences since it is subject to different interpretations. Furthermore, the United States is also trying to persuade other COCOM governments to introduce extraterritorial export controls, which is strongly resisted by European countries and Japan.

Unilateral US trade controls

The transfer of US dual-use technologies is regulated by the Export Administration Act (EAA), under which foreign sales of civilian articles and technologies with military applications may be denied for national security or foreign policy reasons. The US Department of Commerce has traditionally had overall licensing responsibility for such items, defined by their inclusion in the Commodity Control List (CCL), but approval by the Departments of Defense and State is also required in some cases. As a result of revisions of the EAA in 1979, the CCL was complemented by the Militarily Critical Technologies List (MCTL), a 700-page document drawn up by the DoD. The MCTL is more comprehensive than the CCL, defining militarily critical technologies, in a broad manner, as:

> technologies that consist of arrays of design and manufacturing know-how (including technical data); keystone manufacturing, inspection, and test equipment; keystone materials; and goods accompanied by sophisticated operation, application, or maintenance know-how, that would make a significant contribution to the military potential of any country or combination of countries and thus [be] detrimental to the security of the United States.[67]

The EAA has been strongly criticized by other NATO countries. Although US export licences to other COCOM countries are seldom denied, licensing procedures impose considerable delays in fulfilling orders. The major criticism is, however, of the extraterritorial controls. These controls mean that foreign companies must have the approval of the US Department of Commerce to export goods which contain any US component or which are manufactured on the basis of US technical data. Since this is true for a large proportion of goods produced in other NATO countries, the impact of these rules is significant. A survey made among companies in NATO countries showed that 'virtually every company visited had experienced some form of difficulty either in obtaining or in exporting high technology items, as a result of export regulations. Furthermore, those companies have almost invariably been able to make a convincing case explaining the injustice or futility of the specific restrictions imposed upon them.'[68] There are also accusations that restrictions are imposed more vigorously on European companies than on US-owned companies.[69]

The US Government can also apply punitive measures to enforce their re-export restrictions: they include export bans and penalties on companies which violate US rules. One case in point is the use of the EAA by the President in 1982 to impose an embargo on the supply of US equipment to European companies involved in the Soviet–West European gas pipeline. Europe sees such measures as an attempt by the United States to define other countries' sales territories and foreign policies, and as an infringement on national sovereignty.[70] In September 1983 the 1979 EAA expired, and Congress was unable until June 1985 to agree on new provisions. Extraterritorial controls on COCOM countries were not eased, in spite of compromises made by the other countries in the COCOM negotiations. On the contrary, authority was given also to ban imports from 'disobedient' foreign companies.

Freedom of research

US export laws apply also to the flow of scientific and technical information. According to the EAA and the Arms Export Control Act,[71] the 'export of data' is defined to include 'any oral or visual presentation of restricted data at meetings attended by foreign nationals'.[72] In several instances the US Government has thus been able to restrict the participation of foreign scientists at US scientific conferences and to demand the withdrawal of scientific papers.[73] US scientists are in general very critical of these restrictions, arguing that 'the current system of national security controls, if implemented more widely, will undermine the foundations of scientific and technological achievement by retarding the acquisition of knowledge'.[74]

In September 1983 the US Congress gave the DoD further authority to restrict the dissemination of data. Under a provision in the FY 1984 Defense Authorization Act, the DoD can now withhold from public disclosure any data with military or space application that would be subject to export control. Thereby it gained the right to withhold also unclassified data, which previously had not been possible, especially not for requests under the Freedom of Information Act.[75] Similarly, NASA has tightened its restrictions on the transfer of data in the fields of aeronautics and space technology.[76]

SDI and technology transfer

US export laws apply to commercial contracts. Thus, all contracts made directly with a US company, whether in a joint venture or in the role of sub-contractor, are subject to these laws. Governments of countries invited to participate in SDI therefore want guarantees for a free flow of research results and access to commercial spin-offs from SDI research and development. Such guarantees can be made in government-to-government Memoranda of Understanding. The US Government and the SDIO have, however, been publicly silent about the terms they are willing to accept for participating countries. The SDIO has made general statements to the effect that other nations will be able to participate in both classified and unclassified research, and that potential future co-operative efforts in classified portions of SDI research should proceed under arrangements similar to those with which they

are already familiar, which implies that there would be no exceptions to the existing practice. The agreement signed in July 1985 for the first stage of ESA's participation in the US space station illustrates this point. The articles included concerning transfer of information and technology were only reluctantly accepted by ESA after long negotiations. These articles referred to 'applicable national laws and regulations'—a reference to US export control restrictions. ESA has stated that similar wording will not be accepted in the agreement to be made in 1987 for subsequent phases of co-operation, and this was also noted in a letter accompanying the agreement.[77]

On the US side, the DoD would certainly have some role in drafting an MoU, and it is the DoD which has pushed for the tighter security controls enforced both in the USA and in COCOM. MoUs can, moreover, be brushed aside by new legislation. Congress has been divided on the issue of technology transfer. While the House of Representatives has sided with the business lobby, which wants to liberalize trade in order to promote exports, the Senate has given priority to national security goals, and it was the House that made the most compromises in the EAA as amended in 1985. A Senator who has made a fairly comprehensive review of required technology security in relation to non-US participation in the SDI programme said that, 'the SDI Program Office is developing an improved, detailed security framework and identifying additional controls, improved methods of protection and the mechanisms for orderly transfer to both US and allied organizations. Full development of this security system is a prerequisite to implementation of the detailed security arrangements that must be part of any bilateral agreements with the allies'.[78]

In view of these efforts and of the sentiments currently dominant in both the US Government and Congress, it is doubtful whether any participating country will be able to negotiate conditions involving substantial sharing of US research results which are militarily sensitive. Considering the broad definition of 'military sensitivity', a large proportion of SDI research would fall under this category. Furthermore, any such agreements will surely include restrictions on further dissemination of such data, which would hinder their commercial application.

VI. The Eureka proposal

Ever since President Mitterrand announced the French Eureka proposal on 18 April 1985, journalists, politicians and analysts have been discussing the nature of the proposal. The most general way to describe it is as a call to West European governments[79] and companies to promote advanced technology programmes in collaboration between countries. The idea is to encourage high-technology companies to join together in R&D projects for products with mass-market application, and to provide financial contributions to projects that achieve Eureka status. Funds should come from government, industrial and banking sources, possibly including EC funds.

The areas of technology included in the Eureka proposal overlap considerably with those of the SDI programme. According to the French proposal, they are the development of computers and their components and

software, telecommunications, robotics and automated factories, lasers, ceramic-materials and bio-technologies.[80] Although both European and US governments have pointed out that the Eureka proposal is not a technological alternative to SDI, it does appear to be precisely that. A basic difference between the two is, however, that Eureka concentrates on marketable products. According to one of the French engineers of the proposal, the main problem for Western Europe is not one of research: 'We feel we are competent in this area. The main challenge today is the interpenetration of an active research policy with a policy for industrial development responding to a market demand.'[81]

This does not mean that the projects under consideration for Eureka are entirely irrelevant for military purposes. On the contrary, there seems to be some interest in military applications among the countries taking part in the discussions. However, these applications would be in the form of spin-offs. Whether realistic or not, the underlying logic of the Eureka proposal is that 'it is easier and less costly to reinvest civilian technology in a problem of defence, than to bet on eventual civilian spin-offs from a purely military program'.[82] The director of a French high-technology company has even gone so far as to suggest that Eureka could serve as a platform for future co-operation in the SDI programme: such co-operation was perceived as not beneficial to West European industry 'unless we in Europe have sufficient technological expertise and succeed through Eureka, at the same time as SDI, in creating solid projects in a few well-chosen areas. Only at that time can we have veritable cooperation'.[83]

Although the question of finance for Eureka projects has not been resolved,[84] it is likely that the proposal will gather momentum. In the two meetings held by end-1985, it received general government endorsement. Companies have also responded favourably. Some 300 project proposals were presented to the second Eureka conference in Hannover, FR Germany, in November 1985, 10 of which have been agreed to (table 14.4). Further, and most important, the Eureka proposal does not represent a completely new direction but is in line with the evidence of increasing West European co-operation: for example, the joint programmes of the ESA and the EC, and such industrial co-operative projects as Airbus, Transall and several arms production projects.

Table 14.4. Projects approved under Eureka auspices

Production of a standard microcomputer for educational and domestic use
Production of a new type of computer chip
Development of a high-speed computer
Development of a cloth-cutting laser
Development of membranes for water filtration and desalinization
Development of high-power laser systems
Development of a system to trace air pollutants
Development of a European research computer network
Development of a diagnosis kit for sexually transmitted diseases
Development of advanced optical electronics

Source: *International Herald Tribune*, 7 Nov. 1985.

VII. Developments in 1985

By late 1985 nine countries had responded to the US invitation and were engaged in consultations with the SDIO, and a few contracts had been signed.

Government decisions

The day after the US invitation, the Australian Defence Minister announced that his government intended to decline it. The Danish Parliament shortly afterwards adopted two resolutions prohibiting its government's participation. In April the Norwegian Government made an announcement opposing SDI research, which was interpreted as declining to participate on a government level. The Greek Government has stated that it is 'categorically opposed' to SDI, and the Canadian Government decided in September, after several months of parliamentary hearings and debates, against government participation. The positions taken have in most of these cases been motivated by strategic and arms control concerns. At the same time the governments of these countries have said that individual companies and research organizations are free to undertake work in SDI research, Denmark being a possible exception.

The French Government has rejected participation, first indirectly when in April it made the Eureka proposal. At the Bonn Summit meeting in May, President Mitterrand was more explicit, saying that the French Government could not participate in SDI 'in its present form'. The main rationale behind the French decision is strategic—that SDI will jeopardize the concept of nuclear deterrence. But there is also scepticism that the USA would share the research findings with participating countries, and that the latter would only be sub-contractors.

Both the Israeli and Japanese governments appear interested in participation. The attraction for Israel is mainly the spin-off potential for conventional defence requirements. Although no decision has been formally announced, Israel may already have made a tentative agreement with the USA. There has been very little public debate about the issue in Israel. Objections that have been raised concern the effect of SDI on arms control as well as the effect of participation on political relations.[85]

In Japan the issue of participation is politically sensitive. A 1976 decision bans Japanese exports of arms and arms production technology. An agreement signed with the USA in 1983 provides an exception for the USA, but there is still opposition to extensive transfers of military-related technology to other countries. In addition, a Diet resolution of 1969 limits Japan's role in space to peaceful purposes.

The other governments tried during the summer and autumn of 1985 to develop a concerted stand on the issue of participation. Many of these efforts were made within the framework of the Western European Union (WEU), of which France is also a member. Divergences were great, and the discussions were not very successful.

The British Government signed a memorandum of understanding with the US Government on 6 December 1985. Although the content of this MoU is

confidential—even to the parliamentary bodies of the two countries—some aspects are known. The British request for guaranteed R&D contracts at a value of $1.5 billion had been previously rejected by the USA. According to the US Defense Secretary, the number of contracts to be awarded will depend on the US Congress, and all contracts will be awarded competitively. No British funding will be required. A list of 18 fields of research has reportedly been agreed to, the foremost of which are precision radars, rockets and optical computing technology. In parliamentary debate, there was strong criticism from the opposition, on the grounds that the agreement implied endorsement of the SDI programme; that there would in effect be a transfer of advanced technology to the United States; and that not many contracts would result. The reply was that firms would engage in such work anyway, and the agreement would simply ensure fair terms for them; that there would be substantial civil spin-offs; and that safeguards were adequate.[86]

Two weeks after the British announcement, the West German Government decided to 'open negotiations' in January 1986 with the United States on conditions of participation for West German companies. The government spokesman pointed out that the government would not play any role nor provide any funds. The economic aspects were emphasized by selecting the economics minister as chief negotiator.

The decision reflects the division between the coalition partners of the government. The conservative parties (CDU/CSU) have argued for stronger NATO support for the SDI programme. The liberal party (FDP) has been more cautious, partly because of the risks they see for the *Ostpolitik*. Chancellor Kohl's foreign policy adviser, who led the delegation sent to the USA in November 1985 to discuss participation, produced a report with a very positive view of its economic and political consequences. The response by the Foreign Office, led by Hans-Dietrich Genscher (FDP), was sceptical, noting that the delegation did not have any expertise in the issues of 'technology transfer, protection of secrets, and the ingenuity of US legislation',[87] and arguing that none of the West German prerequisites for participation[88] was fulfilled. The Ministry of Research and Technology shares this scepticism.

By the end of 1985 the Italian Government was in the process of defining a timetable and conditions for a commitment to participate in SDI research: an announcement was expected to be made in early 1986. Belgium, the Netherlands and Portugal had not adopted official government positions, but they appeared to lean towards declining participation on the government level.

Contracts

Few firm contracts were announced in 1985. The mirror for focusing laser beams which a French company delivered in 1985 was the result of an order in 1982 from the US Navy and was not directly related to SDI. However, the company is hoping for follow-on orders since such mirrors will probably be required for SDI.

A team at the British Heriot-Watt University accepted a $150 000 grant for building optical switches, in co-operation with a British and US company.

Optical switches will become for tomorrow's optical computers what microchips are for conventional computers today, but with a potential speed about 100 000 times higher. The research team at Heriot-Watt is very advanced. The Computing Department of Imperial College, London, has been awarded a contract for software engineering for the SDI programme.[89]

The West German company Dornier joined with the US company Sperry in bidding for a missile-tracking system. Dornier has developed relevant capabilities through its work on a tracking device in a project for ESA.

Two contracts awarded by the US DoD to two Canadian companies are also SDI-related, although they have not been awarded under this programme and do not concern BMD: they are for study of the feasibility of space-based radar surveillance systems to detect cruise missiles and bombers.

It is possible that additional contracts have been made, although not publicly announced. It is, however, difficult to conceal orders, so additional contracts awarded by the end of 1985, if any, are probably very few.[90] In the United Kingdom companies were asked to refrain from signing up for SDI work until there was a government agreement, and companies in other countries may have preferred to wait for such an agreement.

Notes and references

[1] These projects and their funding levels for the period 1961/2–1986/7 are listed in *Congressional Record*, 4 Apr. 1985, pp. E1444–5, and have been reproduced in, for example, *Defense Week*, 15 Apr. 1985.

[2] Pike, J., *The Strategic Defense Initiative—Areas of Concern*, a staff study by the Federation of American Scientists, Washington, DC, 10 June 1985, p. 4.

[3] Estimates of the number of satellites required vary considerably, as can be seen from the list of estimates below (Guertner, G. L., 'What is "proof"?' in *Foreign Policy*, Summer 1985):

Lawrence Livermore National Laboratory	90
Brzezinski, Jastrow and Kampelman	114
Office of Technology Assessment	160
Union of Concerned Scientists	300
Drell, Fairley and Holloway	320
High Frontier	434

(The last figure refers to kinetic-energy weapons; the other estimates to lasers.)

[4] *Strategic Defense and Anti-Satellite Weapons*, Hearings before the Committee on Foreign Relations, United States Senate, 25 Apr. 1984: see introductory statement, p. 1; the table from a 1982 DoD study, p. 67; a quotation from *New York Times* of an estimate based on Pentagon testimony, p. 217; statement of the Union of Concerned Scientists, pp. 345–6; and statement of the Center for Defense Information, p. 360.

[5] *The Strategic Defense Initiative: Costs, Contractors & Consequences* (Council on Economic Priorities: New York, 1985), p. 45. This estimate is based on the general historical relationship between pre-full-scale development expenditures and total production cost, and is made under the assumption that the first five-year R&D programme will immediately lead to full-scale development.

[6] Brzezinski, Z., Jastrow, R. and Kampelman, M., *New York Times Magazine*, 27 Jan. 1985. See also Jastrow's testimony before the Senate Defense Appropriations Subcommittee on 22 Apr. 1985.

[7] Guertner (note 3).

[8] For the full text of the letter of invitation, see *Survival*, vol. 27, no. 3 (May/June 1985), pp. 128–9.

[9] Neither the final communiqué nor the political declaration from the Bonn summit meeting in May 1985 mentioned SDI. The Reagan Administration also failed to gain the support it wanted from the North Atlantic Council at its June ministerial session, because of objections from Denmark, France, Greece and Norway. The final communiqué only stated support for the US stance in the Geneva negotiations 'concerning strategic and intermediate range nuclear weapons,

and defence and space systems'. ('North Atlantic Council Communique', *NATO Review*, vol. 33, no. 3 (June 1985), p. 29.) The subsequent meeting in Dec. adopted the same formulation.

[10] 'U.S. launches program to bring NATO into SDI research role', *Aviation Week & Space Technology*, 11 Mar. 1985, p. 56.

[11] Edward Teller, quoted in, for example, 'US may spend $1 billion abroad on SDI research', *Financial Times*, 7 June 1985.

[12] *Towards a European Technological Community*, memorandum of the Commission of the European Communities, COM(85)350 final, Brussels, 25 June 1985, pp. 1/1–2.

[13] Comparative advantage refers to the special ability of a country to provide one product or service cheaply relative to other products or services.

[14] US Department of Commerce, International Trade Administration, *An Assessment of U.S. Competitiveness in High Technology Industries* (US Government Printing Office: Washington, DC, Feb. 1983), p. 10.

[15] Department of Commerce (note 14), p. 14.

[16] Scott, B. R., 'U.S. competitiveness: concepts, performance, and implications', in B. R. Scott and G. C. Lodge (eds), *U.S. Competitiveness in the World Economy* (Harvard Business School Press: Boston, MA, 1985), pp. 41–70.

[17] Junne, G., 'Das amerikanische Rüstungsprogramm: ein Substitut für Industriepolitik', *Leviathan, Zeitschrift für Sozialwissenschaften*, vol. 13, no. 1 (1985).

[18] See chapter 9.

[19] The Mining and Manufacturing Industries Technological Research Co-operatives law of 1961. The USA is about to enact similar legislation.

[20] Anderson, A. M., *Science and Technology in Japan* (Longman Group Limited: Essex, 1984), p. 29.

[21] 'US trade action urged against Japan, Taiwan', *International Herald Tribune*, 15 Nov. 1985.

[22] Opto-electronics fulfil the same functions as conventional electronics, but with a transmission capacity thousands of times greater.

[23] For a complete list of research projects, see Anderson (note 20).

[24] EC (note 12), p. 1.

[25] EC (note 12), p. 1.

[26] 'The aims of Eureka', *Financial Times*, 17 July 1985, quoting an OECD official.

[27] ESA was established in 1962 and has operated under its current name since 1975. The member countries are Belgium, Denmark, France, FR Germany, Ireland, Italy, the Netherlands, Spain, Sweden, Switzerland and the United Kingdom. Austria, Norway and Canada are observers and they participate in some of the projects.

[28] *Eusja Newsletter*, Commission of the European Communities, Apr. 1985.

[29] For a list of them, see EC (note 12), p. 15.

[30] See, for example, Abrahamson, J. A., 'SDI and the new space renaissance', *Space Policy*, May 1985.

[31] Abrahamson, before the US House of Representatives Science and Technology Subcommittee on Energy Research and Production, quoted in *Military Space*, 14 Oct. 1985.

[32] The results of these studies are summarized in CEP (note 5), pp. 106–7.

[33] See Thomas, E., *Recent Research on R&D and Productivity Growth: A Changing Relationship Between Input and Impact Indicators?*, paper prepared for the Third Conference on Science and Technology Indicators, OECD Headquarters, 15–19 Sep. 1980; and Griliches, Z. and Lichtenberg, F., 'R&D and productivity growth at the industry level: is there still a relationship?' in Z. Griliches (ed.), *R&D Patents, and Productivity* (University of Chicago Press: Chicago, 1984), pp. 465–501. Both these and other studies are summarized in CEP (note 5), p. 115.

[34] Lichtenberg, F., 'The relationship between Federal contract R&D and company R&D', *American Economics Association Papers and Proceedings*, May 1984, pp. 73–8, summarized in CEP (note 5), p. 109.

[35] See, for example, Reich, R. B., 'Making industrial policy', *Foreign Affairs*, vol. 60, no. 4, spring 1982; and 'Military research and the economy: burden or benefit?', *Defense Monitor*, vol. 19, no. 1 (1985).

[36] Calculated from: National Science Foundation, *National Patterns of Science and Technology Resources, 1982* (US Government Printing Office: Washington, DC, 1982), NSF 82-319, pp. 38–41.

[37] DeGrasse, R., 'The military and semiconductors', in J. Tirman (ed.), *The Militarization of High Technology* (Ballinger Publishing Company: Cambridge, MA, 1984), pp. 77–104.

[38] McClelland, L. A., 'Military requirements push IC development', *Defense Electronics*, Feb. 1985, p. 37. See also DeGrasse (note 37) and Watson, J., 'Bridge the gap between military and commercial IC's', *Defense Electronics*, June 1984, pp. 146–52.

[39] Maddock, I., *Commercial Exploitation of Defence Technology*, report to the Electronics Economic Development Committee, London, 1982.

[40] Hecht, J., 'Star Wars—an astronomical bribe for scientists', *New Scientist*, 20 June 1985, pp. 14–18.

[41] Reich, R. B., quoted in 'High-tech stardust', *Fortune*, 30 Sep. 1985.

[42] 'SDI: technological renaissance or political manoeuvre?', *Space Markets*, supplement to *Interavia*, Nov. 1985, p. 26. For an extensive list of potential spin-offs claimed by ISTO, see 'SDI innovative science and technology: the tip of the transfer iceberg', *Congressional Record*, 12 June 1985, pp. E2709–10.

[43] *Interavia* (note 42), p. 28.

[44] *Science and Engineering Personnel: A National Overview*, NSF 85–302 (National Science Foundation: Washington, DC, 1985), p. VI. See also Kreinin, M. E., 'United States trade and possible restrictions in high-technology products', *Journal of Policy Modeling*, vol. 7, no. 1 (1985).

[45] Towards the end of 1985, SDIO announced that it was forced by budget cuts to focus on land-based lasers and killer rockets rather than on more complex weapons such as space-based lasers and high-powered electromagnetic guns. This implies a shift towards the mature end of SDI technologies.

[46] 'The technological community—slogan or reality?', *Neue Zürcher Zeitung*, 8 June 1985, as translated in 'Two-way street in space', *Current News*, special edition, 9 Sep. 1985.

[47] *Frankfurter Rundschau*, 28 Oct. 1985.

[48] 'French study says SDI will benefit civil industry little', *Financial Times*, 8 May 1985.

[49] 'Militärforschung nur mit geringem Nutzen', *Frankfurter Rundschau*, 4 Dec. 1985.

[50] CEP (note 5), p. 10.

[51] A ratio of 8:1 was, for example, reported in *International Herald Tribune*, 6 Nov. 1985.

[52] On the other hand, these statistics also exclude the employment and other benefits to Europe of the sometimes extensive offset agreements included in arms transactions. For further information, see chapter 17.

[53] Callaghan, T. A., 'The unbuilt street—defense industrial co-operation within the alliance', *NATO's Fifteen Nations*, Oct./Nov. 1982, p. 28.

[54] Feldman, J., 'Collaborative production of defense equipment within NATO', *Journal of Strategic Studies*, Sep. 1984.

[55] See SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1985* (Taylor & Francis: London, 1985), p. 239.

[56] *Jane's All the World's Aircraft 1983–84* (Jane's: London, 1984), p. 112.

[57] The family-of-weapons approach starts one step earlier than licensed production. The idea is to formulate joint requirements between countries for weapons belonging to a mission family or weapon type. The two or more different weapons would then be developed, produced and funded by different countries or country groups, thereby eliminating duplication.

[58] *Cooperation in Development and Production of NATO Weapons: An Evaluation of Tactical Missile Programs* (Institute for Defense Analysis Division: Arlington, VA, Dec. 1980), p. S–4.

[59] Examples include the Multiple Launch Rocket System (MLRS), the terminal-guidance warhead for which is being developed by a consortium of companies from four countries, and the Rolling Airframe Missile (RAM) developed by a three-nation team.

[60] 'Interagency conflicts stall bill on cooperative NATO arms efforts', *Aviation Week & Space Technology*, 6 May 1985, pp. 24–5.

[61] Sponsors were Senators Nunn, Quayle and Roth. See, for example, *Defense Daily*, 29 May 1985.

[62] Sponsored by Senator Nunn and supported by Senators Glenn, Roth and Warner. For the full text of the amendment, see *NATO's Sixteen Nations*, July 1985, p. 23. This amendment also proposed a sum of $50 million for US purchases of allied equipment for testing and evaluating purposes.

[63] The main proponent of stricter rules is Richard Perle, DoD Assistant Secretary for International Security Policy. Perle has written numerous articles on the subject, including 'Technology and the quiet war', *Strategic Review*, Winter 1983, and 'The eastward technology flow: a plan for common action', *Strategic Review*, Spring 1984.

[64] US DoD and intelligence officials have given numerous testimonies about the leakage of advanced technology to the Soviet Union and Soviet application of Western technology in several of its weapon projects, and several reports on the subject have been released in recent years: for example, *Soviet Acquisition of Western Technology* (Central Intelligence Agency: Washington, DC, Apr. 1982); *Technology Transfer: The Soviet Threat* (DoD: Washington, DC, Feb. 1984); *Assessing the Effect of Technology Transfer on US/Western Europe: A Defense Perspective*,

released in May 1985 by DoD; and *Soviet Acquisition of Militarily Significant Western Technology: An Update*, released in Sep. 1985 by DoD.

[65] See, for example, *Interim Report of the Sub-Committee on Advanced Technology and Technology Transfer*, North Atlantic Assembly, Oct. 1985; and Ritter, K., 'The critical issue of the transfer of technology', *NATO's Sixteen Nations*, July 1985.

[66] COCOM (also reported as the acronym for 'the Coordinating Committee for Exports to Communist Areas') was established in 1949 to protect strategic goods/technologies from being diverted to Eastern bloc countries. Members include all NATO countries except Iceland and Spain, as well as Japan (in Sep. 1985 Spain announced its decision to join COCOM).

[67] Fajans, A. E., Office of the Deputy Under Secretary of Defense, 'Stronger safeguards for US technology—recent legislation, new DoD directives will help control the export of militarily critical American know-how', *Defense 85*, Mar. 1985.

[68] North Atlantic Assembly (note 65), p. 1.

[69] North Atlantic Assembly (note 65), p. 11.

[70] Feldman, J., 'Trade policy and foreign policy', *Washington Quarterly*, Winter 1985.

[71] The AECA is the main piece of US legislation regulating exports and imports of arms.

[72] Ferguson, J. R., 'National security controls on technological knowledge: a constitutional perspective', *Science, Technology, & Human Values*, vol. 10, issue 2 (Spring 1985).

[73] A list of 16 scientific meetings in which the US Government intervened in the period 1980–Mar. 1985 has been compiled by the American Association for the Advancement of Science Committee on Scientific Freedom and Responsibility. The list is reproduced in *Chemical & Engineering News*, 1 July 1985.

[74] National Academy of Sciences, *Scientific Communication and National Security* (National Academy of Sciences Press: Washington, DC, 1982), quoted in Ferguson (note 72), p. 88.

[75] This authority is spelled out in DoD implementing directives 5230.25 ('Withholding of Unclassified Technical Data from Public Disclosure') and 5230.24 ('Distribution Statements on Technical Documents'), both from Nov. 1984. See Fajans (note 67).

[76] NASA, Management Instruction 2230, Dec. 1984. See 'NASA issues technology transfer procedures', *Aerospace America*, Apr. 1985.

[77] 'NASA, Europeans approve parallel station definition and design studies', *Aviation Week & Space Technology*, 10 June 1985, pp. 24–5.

[78] Lugar, R. C., 'US-allied participation in the SDI research programme', *Space Policy*, Aug. 1985, pp. 234–5.

[79] The countries to which the initial proposal was made in a letter from the French Foreign Ministry were those of the EC, including Spain and Portugal, which have been EC members since January 1986. The subsequent discussions have included also Austria, Finland, Norway, Sweden, Switzerland and Turkey.

[80] *Eureka—The Technological Renaissance of Europe—French Proposals*, République Française, June 1985, pp. II–VI.

[81] Stourdzé, Y., quoted in 'SDI-Eureka: a complementary defense', *Defence & Armament*, Dec. 1985, p. 22. For a comprehensive discussion of the background to the Eureka proposal, see Schütze, W., 'SDI oder Eureka? Die Position Frankreichs', *Aus Politik und Zeitgeschichte*, no. 44 (1985), pp. 30–9.

[82] Stourdzé (note 81), p. 20.

[83] Lesgards, R., director of Societé Européene de Propulsion, quoted in note 81, p. 22.

[84] France has committed itself to a sum of FFR 1 billion ($116 million) for 1986, and the Netherlands has promised an annual sum of about $8.5 million. The British Government has offered contributions from an existing fund—totalling about $360 million in 1985—for industrial investment, and FR Germany has pledged only a general declaration of willingness to provide financial support for selective Eureka projects from the federal budget.

[85] See, for example, 'Lack of debate over "Star Wars"', *Jerusalem Post*, 27 July 1985; and *SDI—The US Strategic Defence Initiative and The Implications of Israel's Participation*, Tel Aviv University, Jaffee Center for Strategic Studies, Memorandum no. 16, Dec. 1985.

[86] House of Commons, *Parliamentary Debates (Hansard)*, vol. 88, no. 24 (9 Dec. 1985), columns 623–35.

[87] *Der Spiegel*, vol. 39, no. 45 (4 Nov. 1985), p. 20.

[88] These are: fair partnership and free exchange of technical know-how; guarantees of a two-way street; that FR Germany as far as possible is ensured a specific research field; and that some influence is allowed over the entire SDI programme. See 'Erklärung des Bundesregierung zur Strategische Verteidigungsinitiative (SDI) des Präsidenten der Vereinigten Staaten von Amerika', *Bulletin*, no. 40, Presse und Informationsamt der Bundesregierung, Bonn, 19 Apr. 1985, p. 344.

[89] *ADIU Report*, vol. 7, no. 6 (Nov.–Dec. 1985), p. 10, quoting *Computer Talk*, 21 Oct. 1985.

[90] Data on SDI contracts and sub-contracts awarded to European countries are being compiled by the Council on Economic Priorities, New York. These will be presented in their forthcoming study on European participation in SDI, planned for publication in Spring 1986.

15. Military research and development expenditure

MARY ACLAND-HOOD

Superscript numbers refer to the list of notes and references at the end of the chapter.

Military research and development (R&D) is undertaken by countries with the intention of improving their national security by means of developing new weapons themselves or keeping up with new weapon developments in other countries. Unfortunately, much military R&D reduces security. It appears threatening to potential adversaries, and the rapid change it generates increases dangerous uncertainty. Many specific developments are highly threatening and destabilizing in themselves.

While civil R&D can be regarded as a means of solving problems (and only creates them accidentally), military R&D is—in a sense—in the business of creating a virtually infinite series of problems. If techniques are found for detecting submarines, this will present the problem of designing submarines which cannot be detected. If ways are found of attacking missiles in their boost phase (while each is still one target), this will present the problem of finding ways of shortening the boost phase, and so on.

Much of today's very large military expenditure pays for new and modernized weapons rather than for more of existing kinds of weapons. Military R&D is a necessary condition for this qualitative arms race, and, although it is not a sufficient condition for it, it does create long-lasting pressures to increase military spending far into the future, independently of the state of political relations then. Even static or declining levels of military R&D create this pressure, provided that it leads to some technological change. Moreover, the pressure is not confined to the countries which conduct military R&D themselves: it feeds through to the countries which buy military R&D incorporated into advanced weapons. Military R&D therefore has a significance greater than its relatively small share—about one-tenth—of world military expenditure would suggest.

World military R&D expenditure continued to grow rapidly in volume in 1985. It seems likely that it was about $80 billion (in current US dollars). (Current price estimates are subject to considerable variation, depending on the exchange-rates and prices used in constructing them.) It is not possible to be precise about total world military R&D expenditure because of the lack of hard information about many countries. These include the USSR, which is one of the two overwhelmingly biggest spenders and for which estimates vary wildly,[1] and China, which is one of the six largest.

World military R&D spending is highly concentrated in a few countries, much more so than total military expenditure. The USA and the USSR, which together account for about half of all military expenditure, are estimated to be

Table 15.1. Military R&D in 22 countries, current prices, fiscal years[a] 1976–85, national currencies

Country	Currency	Fiscal year[a] begins	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Australia	m. dollars	1 July	80	..	86 ⧗	94 ⧗	100	105	115	121	131*	..
Austria	m. schillings	1 Jan.	..	..	..	8	19	..	22	..	..	..
Belgium	m. francs	1 Jan.	117	68	50	77	58	64	129	101	(55*)	..
Canada	m. dollars	1 Apr.	71	79	83	86	101	116	132	159	..	..
Denmark	m. kroner	[b]	7	8	8	4	5	5	6	6	(6*)	..
Finland	m. markaa	1 Jan.	14	15	17	18	20	24	29	32	36	(40*)
France	m. francs	1 Jan.	5 600	6 100	7 500	9 350	11 350	15 700	16 700	18 100	(19 600*)	(20 800*)
FR Germany	m. marks	1 Jan.	1 491	1 596	1 732	1 848	1 730	1 572	1 647	1 835	1 937	2 509*
Greece	m. drachmas	1 Jan.	..	53	82	97	194	221	—	..	..	..
India[c]	m. rupees	1 Apr.	(873)	(864)	(1 082)	(1 386)	(1 346)	(1 600)	(1 950*)	..	..	..
Italy	b. lire	1 Jan.	26.3	31.9	36.7	32.8	41.7 ⧗	168.1[d]	142.6	216.0	(388)	..
Japan	b. yen	1 Apr.	18.9	22.0	24.2	26.7	29.1	32.3	(36.2)	(39.3)	(44.4)	(58.7*)
Netherlands	m. guilders	1 Jan.	74	74	84	91	91	107 ⧗	(124)	(107)	(120)	(116*)
New Zealand[e]	m. dollars	1 Apr.	1	2	2	4	3	4	4	(4)	(6*)	..
Norway	m. kroner	1 Jan.	..	92	96	96	102	161	220	296	..	..
Spain	m. pesetas	1 Jan.	773	285	409	432	261	1 114	..	..	..	..
Sweden	m. kronor	1 July	..	1 143	1 097	992	942	1 055	1 482	2 010	(2 335*)	..
Switzerland	m. francs	1 Jan.	91	83	93	126	84	69	..	..	..	..
Thailand	m. baht	1 Oct.	8	..	..	..	..	..	..	59	67	..
Turkey	m. lire	[f]	..	..	..	..	54	134	134[g]	154	..	..
UK[h]	m. pounds	1 Apr.	(782)	(902)	(1 063)	(1 350)	(1 683)	1 739	1 758	1 977	2 169	2 379*
USA[i]	m. dollars	1 Oct.[j]	10 430	11 864	12 583	13 594	15 075	17 841	22 102	24 500[k]	(28 767)[k]	(33 740*)[k]

[a] Fiscal years are entered under the calendar years in which they begin, with the exception of Thailand and the USA, for which they are entered under the calendar year in which they end. This ensures that the fiscal years are entered under the calendar year in which the greater part of them falls.

[b] 1976–7, 1 Apr.; 1978 onwards, 1 Jan. 1978 data grossed up to a full year basis by the national authorities.

[c] The SIPRI estimates are military R&D (which does not include space), plus 75 per cent of space R&D, since 'the Department of Space . . . [is] engaged in research primarily orientated towards the achievement of strategic/defence objectives' (*R&D Planning in the Framework of National Plans*) (Centre for the Study of Science, Technology and Development, Council of Scientific and Industrial Research: New Delhi, 1978), p. 2). If space is not included, the figures are about one-third smaller.

[d] Figures for earlier years have major omissions.

[e] Expenditures of the Ministry of Defence, which are included in R&D objectives other than defence.

[f] 1976–81, 1 Mar.; 1983 onwards, 1 Jan. for 1982, 1 Mar.–31 Dec.

[g] 1 Mar. 1982–31 Dec. 1982.

[h] 1976–80 adjusted upwards to make them consistent with later years, which have fuller coverage because of improved reporting methods.

[i] 1976–7 outlays; 1978 onwards, obligations. 1976 transitional quarter (1 July–30 Sep. 1976) omitted.

[j] Pre-1976, 1 July; from 1976, 1 Oct.

[k] Revised downwards from 1983. Previously, all space spending was classified as R&D or R&D support. From 1983 some has been reclassified as non-R&D. The provisional figure for 1986 military R&D is 41 600.

Sources: See page 305.

Table 15.2. Military R&D in 22 countries, constant prices, calendar years 1976–85, US $ m., 1980 prices and exchange-rates

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Australia	125.6[a]		..	113.1	110.2	106.1	102.3	100.1	103.1*	..
Austria	..	..	..	0.7	1.5	..	1.5	..	..	..
Belgium	5.0	2.7	1.9	2.8	2.0	2.0	3.8	2.8	(1.4*)	..
Canada	83.5	86.3	84.3	80.4	83.2	85.4	87.9	98.8	..	..
Denmark	1.8	1.8	1.8	0.8	0.8	0.8	0.8	0.9	(0.8*)	..
Finland	5.4	5.2	5.4	5.4	5.4	5.7	6.3	6.5	6.7	(7.2*)
France	1 989.7	1 982.8	2 235.2	2 517.1	2 685.8	3 276.1	3 116.5	3 081.3	(3 111*)	(3 100*)
FR Germany	959.1	991.1	1 047.0	1 072.3	951.8	813.7	809.6	873.0	899.9	1 139.7*
Greece	..	2.1	2.8	2.8	4.5	4.2	—	..	..	..
India	(143.0)	(133.8)	(154.8)	(185.7)	(172.5)	(172.9)	(194*)	..	..	..
Italy	56.1	58.1	59.5	46.4	48.7	166.6	121.4	160.3	(260*)	..
Japan	102.0	108.8	116.6	124.2	125.6	132.3	(144.2)	(154.9)	(169.6)	(212*)
Netherlands	45.8	43.0	46.9	48.7 ⧗	45.8	50.4 ⧗	55.4	46.1	(50.1)	(48*)
New Zealand	2.1	2.5	3.0	4.4	3.3	2.9	2.7	(2.9)	(3.7*)	..
Norway	..	23.4	22.6	21.5	20.6	28.7	35.2	43.6	..	..
Spain	21.5	6.4	7.6	7.0	3.6	13.6	..	..	..	..
Sweden	288.7[b]	..	323.0	281.0	228.6	210.6	246.4	311.3	(360*)	..
Switzerland	59.9	53.8	60.1	77.9	50.4	38.8	..	..	..	..
Thailand	0.6	..	..	..	..	..	..	2.4	..	..
Turkey	..	..	..	..	(0.7)	1.2	1.20	0.9	..	..
UK	(2 959.7)	(2 936.8)	(3 181.8)	(3 503.9)	(3 718.7)	(3 583.3)	3 354.0	3 514.1	3 695.2	3 814.2
USA	15 785.4	16 363.6	16 206.8	15 850.5	15 766.5	17 125.2	19 386.4	21 147.0	(23 798*)	(27 340*)

[a] Fiscal year 1976/7.
[b] Fiscal year 1975/6.

Sources: See page 305.
Conventions for tables 15.1 and 15.2:
— Nil
.. Information not available.
* Provisional figure.
( ) SIPRI estimate.
⧗ Break in series.

responsible for around four-fifths of world military R&D expenditure. If the next four largest spenders—the UK, France, China and the Federal Republic of Germany—are added in, nine-tenths or more is accounted for.

Tables 15.1 and 15.2 give an indication of the level and pattern of and trends in spending on military R&D over the past 10 years in the 22 countries engaged in it for which reasonably reliable data for a number of years are available. They account for over one-half of total military R&D expenditure and cover all the size groups into which the significant military R&D spenders fall. Table 15.1 shows fiscal year expenditures in national currencies at current prices; table 15.2 shows them adjusted to calendar years and converted to constant 1980 US dollars. The main feature of such estimates as exist for 1985 is the continued rapid rise in US spending—a volume increase of the order of 15 per cent. West German and Japanese spending rose even more sharply—by about 25 per cent in volume—but their spending is still only about 4 per cent and less than 1 per cent of US expenditure.

Table 15.3 shows the shares in national resources used for R&D since the early 1960s in six countries selected from these 22 because they are particularly significant R&D spenders. The data are three-year averages of military R&D expenditure (MIRD), estimated civil government R&D expenditure (civil GOVRD) and gross domestic expenditure (government and non-government) on R&D (GERD), all as percentages of gross domestic product (GDP). (This is a rough but useful way of relating expenditure to national resources. It does not show the absolute levels of expenditure which are crucial determinants of whether a country can effectively enter a particular field.) The countries are listed in order of the size of their GERD in the 1980s. The USA is in a class of its own, spending over $60 billion a year (at constant 1980 prices, as are the following figures for the other countries' spending).

Japan, FR Germany, France and the UK are the other large R&D spenders out of the 22; Japan spent over $20 billion a year and the other three over $10 billion. There is a distinct gap in spending between these five and the next group—Italy, Canada, the Netherlands, Sweden and Switzerland—which all spend between $2 and $5 billion. (Of the rest, only Australia and Belgium spend over $1 billion.) From this group, Sweden was selected as it spends the most on military R&D, both absolutely and as a share of GDP. (The others have spent less than 0.1 per cent of GDP on military R&D during most of the period.)

A few points can be picked out. MIRD has not been increasing its share. Over the period as a whole, its share of GDP in each of these countries has tended to stay about the same or to fall. For these countries, it does not seem that MIRD is an increasing strain on resources. The recent large increases in MIRD in the USA have so far only brought its share in GDP to two-thirds of the level of 1961–3. However, countries spending large absolute amounts on MIRD tend to be using very large shares of their total GERD and GOVRD on it, and there is some evidence to suggest that they may have undertaken this military R&D at the expense of their civil R&D.

Countries with larger shares of MIRD in GDP—the USA, the UK and France—had falling or roughly level shares of GERD in GDP over the period: in Sweden, FR Germany and Japan, which spent smaller proportions of GDP

Table 15.3. Military R&D (MIRD), civil government R&D (civil GOVRD) and gross domestic expenditure on R&D (GERD): percentages of gross domestic product, 3-year averages 1961–3 to 1982–4

	1961–3	1964–6	1967–9	1970–2	1973–5	1976–8	1979–81	1982–4
USA								
MIRD	1.32	1.09	0.97	0.79	0.67	0.62	0.62	0.79
civil GOVRD	0.62	0.97	0.89	0.70	0.60	0.63	0.62	0.45
GERD	..	3.06	3.02	2.66	2.42	2.36	2.46	2.73
Japan								
MIRD	0.01	0.01	0.01	..	0.01	0.01	0.01	0.01
civil GOVRD	0.45	0.49	0.48	..	0.58	0.58	0.61	0.62
GERD	1.31	1.31	1.52	1.93	2.03	1.99	2.23	2.40
FR Germany								
MIRD	0.12	0.16	0.19	0.15	0.14	0.13	0.12	0.11
civil GOVRD	0.49	0.65	0.75	0.93	1.07	0.98	1.03	1.05
GERD	..	1.51	1.77	2.16	2.16	2.19	2.44	2.58
France								
MIRD	0.42	0.53	0.46	0.34	0.36	0.34	0.43	0.46
civil GOVRD	0.59	0.87	1.01	0.84	0.80	0.72	0.74	0.92
GERD	1.58	1.98	2.11	1.89	1.79	1.76	1.89	2.15
UK								
MIRD	0.78	0.73	0.56	0.52	0.58	0.61	0.68	0.63
civil GOVRD	0.52	0.60	0.67	0.75	0.79	0.67	0.69	0.69
GERD	..	2.36	2.33	2.12	2.18	2.19	2.42	2.27
Sweden								
MIRD	0.36	0.40	0.37	..	..	0.27	0.19	0.19
civil GOVRD	0.44	0.54	0.58	..	0.77	0.93	0.97	1.01
GERD	..	1.23	1.27	1.46	1.65	1.84	2.20	..

Sources: See page 305.

on MIRD, shares of GERD in GDP rose. For the USA and the UK there is some indication of rises in shares of MIRD in GDP being associated with falls in shares of civil GOVRD: it might well be expected that there would be competition between MIRD and civil GOVRD in these countries, which have spent about half of their total GOVRD on MIRD over the period. For the other countries there does not seem to be much sign of any such association (except perhaps in Sweden); however, civil GOVRD rose in the three countries with the smallest MIRD shares of GDP. Countries concentrating heavily on MIRD may not be straining their general resources, but they do not seem to be stimulating their civil or total research and development—rather the reverse.

This is not surprising. Military R&D is research directed to a specific objective: national security. In this field, as in others, the possibility of chance, unplanned benefits from R&D, not necessarily accruing to those who have paid for it, exist. There are spin-offs from military to other uses: there are also spin-offs from civil to military uses. However, there is no reason to expect that R&D directed to this particular—military—objective will provide a general

stimulus. Such a stimulus could reasonably be expected from an adequate foundation of basic research directed to the general advancement of knowledge, when it is combined with a wide and healthy civil technological infrastructure which incorporates research directed to civil ends. Indeed, the dependence of military R&D on a strong general civilian R&D base is widely recognized. A former US Undersecretary of Defense for Research and Engineering said that the Soviet Union's 'military effort is the country's major area of research and development. In the United States, Europe and Japan, on the other hand, there is a vast technological infrastructure not funded by defense but exploited by it.'[2] In the 1983 report on civil exploitation of defence technology to the British Electronics Economic Development Committee (Maddock Report) it was said, 'Of the many reasons why Britain responded so well to the technological challenges of the European War (1939–45) the most important was the fact that there existed a very healthy civil industrial base.'[3]

Nor is it very likely that military R&D can substitute for R&D for economic or industrial objectives. It is true that there are common areas of interest. Many of the new technologies that industry and government want to develop most have both civil and military applications—a few examples are fifth-generation and super-speed computers, very large-scale integrated circuits (VLSICs) and fibre optics communications. However, there are considerable differences in military and civil requirements and such great obstacles to the civil exploitation of defence technology[4] that the likelihood of any civil benefit is small. The fact of overlap of technology seems to have diverted attention away from consideration of whether it is likely that the best way to achieve civil technological development is to spend money on something else. Firms may be deterred from funding from their own resources research on projects which are at the margins of existing technology, because it is often the followers rather than the leaders which reap the major benefits. Governments which wish to finance such developments may find it easier to do so as part of military rather than civil R&D programmes.

This is unfortunate. In deciding whether to undertake a military research programme, the important—indeed the only—consideration should be the consequences for security, both national and international. The risks are too great for any hopes of civil benefits (which are likely to be balanced by military benefits from civil programmes) to be allowed any influence. If the judgement is that security is not likely to be increased, the research should not be undertaken.

Sources, methods and definitions

Military R&D is the effort to extend knowledge and technical expertise wherever there are thought to be military applications, existing or potential, in order to create more effective weapons, more effective means of using them and more effective ways of making these same weapons (when used by the other side) ineffective.

It is the objective of this R&D rather than the institutional sources of funds for it that distinguishes it. Therefore the military R&D data are, as far as

possible, government funds used for the objective defence. (The great bulk of military R&D is government funded.) The preferred definitions of the R&D figures are those of the Organization for Economic Co-operation and Development (OECD) *Frascati Manual*.[5]

Table 15.1 is on the basis of the fiscal years (defined in the table) for which the data were originally reported. For table 15.2, the data were adjusted where necessary to calendar years, assuming an even spread of expenditure throughout the year. Consumer price indices were used as deflators, as they are available over the whole period covered for all the countries included, and their use results in reasonable indications of trends in resources used. This is also consistent with the calculation of the constant military expenditure table in appendix 11A.

Notes and references

[1] SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1983* (Taylor & Francis: London, 1983), pp. 228–40.

[2] Perry, W. and Roberts, C., 'Winning through sophistication: how to meet the Soviet military challenge', *Technology Review*, July 1982.

[3] *Civil Exploitation of Defence Technology*, Report to the Electronics Economic Development Committee by Sir Ieuan Maddock and Observations by the Ministry of Defence (National Economic Development Office: London, Feb. 1983), p. 15.

[4] See, for example, the Maddock Report (note 3).

[5] 'The socio-economic objectives of government R&D funding', *The Measurement of Scientific and Technical Activities: Proposed Standard Practice for Surveys of Research and Experimental Development, Frascati Manual 1980* (OECD: Paris, 1981), chapter 8.

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16. Security assistance: the case of Central America

RITA TULLBERG and VICTOR MILLÁN

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

In deciding on the size of their military sectors, developing countries are not limited to what they can afford from their own resources. Two other sources of funds are available—foreign borrowing and foreign 'security' assistance. For governments in some developing countries, foreign borrowing on commercial or 'soft' loan terms has been an important method of shifting costs for current military spending on to future generations. (This topic has been dealt with at length elsewhere).[1] Other countries have had access to substantial sums as 'security assistance', that is, military loans and grants and general economic support given to developing countries because of their strategic importance to the donor.

In any study of the military activities of developing countries, it is important to record these 'security assistance' flows. In the case of Central America, they have been rising very fast in recent years; for some countries, security assistance is now as great or greater than military spending from indigenous sources.

Statistical problems exist in defining and quantifying exactly what part of total aid is for military purposes. Military aid takes many forms—for example, the sale of second-hand equipment at give-away prices or the stretching of already generous loan conditions on military purchases. Transactions of this kind mean that the official figures of military aid are usually understated.

There are also some ambiguities about economic assistance. Some aid is given for specific projects which would not otherwise have been undertaken by the recipient country or undertaken on a smaller scale. Other aid finances programmes which a country might have felt obliged to fund out of its own resources; such assistance swells a country's fund of available resources and can be seen as an indirect contribution to the military sector.[2] This is true, at least in part, of US Economic Support Funds (ESF). They are designed specifically to promote economic or political stability in areas where the USA has special security interests. It is open to question whether assistance of this sort should be in the category of economic aid: given the objective, it should probably be classed as military.

This difficulty illustrates one of the problems involved in the various proposals for taking resources out of the military sector in the main industrialized countries and putting them into aid for development. Effectively transferring military spending from North to South would be pointless. Any

'disarmament for development' proposal would have to include some provisions for ensuring that the transferred resources did not serve, directly or indirectly, to build up the military sector in recipient countries.

This chapter presents a study of the main flows of security assistance to one region, Central America,[3] from the two major donors: the United States, and the Soviet Union in its role as dominant country within the Council for Mutual Economic Assistance (CMEA).[4] As usual, much more is known about US than about Soviet aid: estimates of the latter come from Western sources. The level of Soviet economic and military aid to Cuba is high but has grown very little in recent years: similar aid to Nicaragua is small but has grown from nothing in 1979. In 1979, US security assistance was less than 3 per cent of total US aid to Costa Rica, El Salvador, Guatemala and Honduras. Six years later, it accounted for more than two-thirds of the total (see table 16.1 and figure 16.1).

The following sections begin with a brief note on total economic aid given to Latin America by the members of the Development Assistance Committee of the Organization for Economic Co-operation and Development (OECD),[5] multilateral organizations including a large number of UN bodies, the Organization of Petroleum Exporting Countries (OPEC) and the CMEA. The United States section covers economic, military and security assistance, and there is a separate section on El Salvador. Such information as is available on CMEA assistance is then given, based on Western estimates; and there is a short sub-section on other forms of international finance. For reference purposes, some data are included for the whole of Latin America. The

Table 16.1. US security aid to four Central American countries as a percentage of total US aid[a] to these countries, 1979–86

Total aid in US $m., at current prices; years are fiscal years.

	1979	1980	1981	1982	1983	1984	1985	1986 R[b]
Costa Rica total	17.9	16.0	15.3	53.8	218.7	179.0	217.2	190.1
% security assistance	—	—	—	*41.1*	*73.9*	*77.7*	*77.9*	*80.3*
El Salvador total	11.4	64.2	149.5	264.2	326.9	412.5	454.3	483.4
% security assistance	*0.0*	*23.4*	*53.8*	*74.6*	*67.7*	*98.7*	*71.1*	*70.9*
Guatemala total	24.7	13.0	19.0	15.5	29.7	20.3	74.1	87.5
% security assistance	—	—	—	—	*33.7*	*0.0*	*17.3*	*40.3*
Honduras total	31.4	57.0	45.3	112.0	138.5	286.5	201.4	246.2
% security assistance	*7.3*	*6.8*	*19.6*	*60.8*	*75.3*	*66.3*	*68.2*	*68.4*
Total aid	85.4	150.2	229.1	445.5	713.8	898.3	947.0	1 007.2
% security assistance	*2.7*	*12.6*	*39.0*	*64.5*	*69.7*	*81.9*	*67.8*	*68.4*

[a] Total aid here includes aid, Food for Peace and Other Economic Assistance, Economic Support Funds and Military Aid.

[b] R—Request

Sources: *US Overseas Loans and Grants, Obligations and Loan Authorizations*, July 1, 1945–September 30, 1981 and July 1, 1945–September 30, 1984 (Office of Planning and Budgeting, Agency for International Development (AID): Washington, DC); Office of Planning and Budgeting, Department of Defense Appropriations for 1986: *Hearings before the Sub-Committee on Appropriations*, House of Representatives, 99th Congress, Part 2, p. 1027.

discussion, however, focuses on Central America which in recent years has received the bulk of security assistance funds to the Latin American region.

II. Official development assistance

Official development assistance (ODA) given to Latin America by members of the OECD Development Assistance Committee (DAC), other multilateral organizations and OPEC increased by 50 per cent between 1979 and 1983 (see table 16.2). Major beneficiaries in 1983 were Costa Rica, El Salvador and Peru which each received $250–300 million. Contributions from OPEC trickled to a halt from a high point in 1981 when Nicaragua received $100 million from Libya.[6] Gross disbursements of development assistance from the CMEA grew by 60 per cent in the years 1979–83.[7] This represents a slight increase in Latin America's share of total CMEA aid resources.

Table 16.2. Official development assistance to Latin America,[a] 1979–83

Figures are in US $m., at current prices; years are calendar years.

	1979	1980	1981	1982	1983
Net disbursements[b]					
DAC countries, OPEC and multilateral organizations[c]	1 581	2 450	2 049	3 067	2 353
of which to Cuba	59	32	14	17	13
Gross disbursements					
CMEA	457	663	775	807	741
of which to Cuba[d]	400	600	670	680	690

[a] The term 'Latin America' refers here to those countries listed under both Central and South America in table 11A.3.

[b] Less capital payments on earlier loans.

[c] ESF and Food for Peace are included as US development aid in OECD statistics.

[d] Other Latin American countries to which aid was given in amounts described as 'negligible' by the FCO source are Argentina, Bolivia, Brazil, Guyana, Nicaragua and Peru.

Sources: For DAC countries, multilateral organizations and OPEC, OECD, *Development Co-operation Review, 1983* and *1984* (OECD: Paris, 1983 and 1984). For CMEA countries, British Foreign and Commonwealth Office (FCO), London, no date. Data given in this source are similar to those given for 1979–82 in NATO, 1984 (see note 7).

In order to qualify as ODA, aid flows, comprising both loans and grants, must be undertaken by the official sector with promotion of economic development and welfare as the main objectives. Technical co-operation, involving the exchange of students, teachers and other experts, also forms part of ODA. Loans must be granted on 'concessional terms', that is, they must be made on terms considerably more favourable than comparable commercial loan terms. According to the OECD (the organization which maintains ODA statistics and determines which aid flows can be included in a donor country's tally of ODA), grants, loans and credits for military purposes do not qualify for inclusion.[8]

The USA alone of all the DAC countries gives significant amounts of bilateral aid to Central American countries. For example, in 1981–2 El Salvador received as much official bilateral development assistance from the

USA as did Pakistan, a country whose population was 17 times as large and whose per capita income was half that of El Salvador.

In 1982, 90 per cent of net aid from the CMEA (the major part of which is from the USSR) went to six Socialist developing countries. Among these, Cuba took about 20 per cent—half as much as Viet Nam and a little less than Mongolia.[9] Outside this group of six, Nicaragua received roughly 2 per cent of CMEA aid in 1982 and 1983.[10]

III. US assistance

The USA gives grants and loans to developing countries under a variety of programmes which it officially groups under two major headings: Economic Assistance and Military Assistance.[11] More resources are channelled to Central than to South America, due to the US perception of the threat to its own security which follows from the radicalization of the former region.

Economic assistance

Economic Assistance comprises (*a*) aid, (*b*) Food for Peace and (*c*) other economic assistance. The heading 'aid' covers development assistance and Economic Support Funds; 'Food for Peace' covers the transfer, directly or via voluntary relief agencies, of agricultural commodities to friendly countries and needy people to meet famine or other urgent requirements or to promote economic development; 'other economic assistance' includes the Peace Corps and the narcotics programme.

The most controversial of these aid forms are the Economic Support Funds. These are designed to promote economic or political stability in areas where the USA has special security interests and where it is determined that economic assistance can be useful in helping to secure peace or to avert major economic or political crises.[12] ESF funds are 'the most flexible form of US assistance' and can be used to meet 'immediate budget and balance-of-payments problems while longer term policy adjustments are made'. They are described as justifiable on political, strategic or economic grounds or any combination of these. ESF aid is viewed as providing a stabilizing force for a government's economy and as a highly versatile instrument for meeting policy objectives. To the extent that ESF aid prevents security problems arising from economic unrest, US authorities believe it contributes significantly to the security of the recipient country.[13]

Economic Support Funds to Central America have grown markedly in recent years, from $8 million in FY (fiscal year) 1979 to a requested $757 million in FY 1986. Development aid and other economic assistance to the region is to grow in the same period from $270 million to $390 million (table 16.3 gives data for the whole of Latin America).

Military assistance

Military Assistance comprises the Military Assistance Program (MAP) grants, Foreign Military Credit Financing,[14] Military Education and Training (IMET),

Table 16.3. US economic and military assistance to Latin America, 1979–85

Figures are in US $m., at current prices; years are fiscal years.

Fiscal year	1979	%	1980	%	1981	%	1982	%	1983	%	1984	%	1985 CR	%	1986 Request	%
Development aid and other economic assistance[a]	303	*63*	331	*64*	288	*43*	333	*34*	391	*30*	501	*32*	*438*	*26*	461	*24*
Food for Peace	138	*29*	152	*29*	179	*27*	178	*18*	269	*20*	251	*16*	267	*16*	257	*13*
Security Assistance	39	*8*	36	*7*	203	*30*	480	*48*	664	*50*	823	*52*	959	*58*	1 190	*62*
Economic Support Funds[b]	8	*2*	15	*3*	143	*21*	329	*33*	500	*38*	464	*29*	679	*41*	833	*44*
Military Assistance	31	*6*	21	*4*	60	*9*	151	*15*	164	*12*	359	*23*	280	*17*	357	*19*
Total	480	*100*	519	*100*	670	*100*	991	*100*	1 324	*100*	1 575	*100*	1 664	*100*	1 908	*100*

[a] Described in the AID reference below as 'Aid and predecessor' and 'Other economic assistance' which includes the narcotics programme.

[b] Described in the AID reference below as 'Security support assistance'.

Sources: Editions of *Overseas Loans and Grants, Obligations and Loan Authorizations* (Agency for International Development (AID): Washington, DC); 1985 CR (Continuing Resolution) and 1986 Request from Western Hemispheric Affairs Subcommittee, 19 Mar. 1985; Food for Peace, 1985 and 1986 from *US Department of State Bulletin*, May 1984 and May 1985.

Transfers from Excess Stocks, and Other Grants, which include grants for the transfer, without payment, of military facilities to the host government. Military assistance to Central America grew over fifty-fold between FY 1979 and FY 1986. For the countries of the Central American Isthmus,[15] the growth has been even more dramatic. In the 35 years from 1946 to 1980, US military loans and grants totalled $137 million. In the five years from 1981, the total was $764 million. El Salvador, which in the 35-year period received $23 million, received $524 million in military assistance in 1981–5.[16]

Military aid is also provided in other forms. Pursuing its policy of countering alleged Soviet expansion, the USA gives additional aid to Central American governments and to the anti-Sandinista contras of Nicaragua. The large numbers of US troops stationed in Central America or engaged in joint manoeuvres with local forces have permanently improved local military facilities and infrastructure, and in some cases they have left behind them large quantities of military equipment.[17] During the period of the covert war up to FY 1985, an estimated $80–$100 million was spent by the US Central Intelligence Agency (CIA) to arm and train some 12 000 contras. Congress cut off the flow of funds in the autumn of 1984 and rejected an Administration request in April 1985 for $14 million for military purposes as a result of a growing awareness of the extent of US involvement in regional conflicts. After a turn-around by Congress, following President Ortega's trip to Moscow in April 1985, $27 million has been made available to the contras, ostensibly for the purchase of non-military equipment. Private donations to the contras from US sources were said to have amounted to $20 million in 1984.[18]

The Reagan Administration asked Congress in November 1985 for $54 million for its Regional Counter-Terrorism Program (RCTP), half of which would be used for training and equipping police forces in Costa Rica, El Salvador, Guatemala and Honduras. Such programmes had been stopped by Congress in 1974 following allegations of human rights abuses by US-trained police.[19]

Security assistance

The US General Accounting Office (GAO), in its report on US Security and Military Assistance of 1 June 1982, classifies the four above-mentioned Military Assistance programmes *and* Economic Support Funds together as forming the 'five major security assistance programs through which the United States provides defense articles, military training, and other assistance and defense-related services to eligible foreign countries'.[20]

The same report also gives examples of ways in which client governments benefit from security transfers which are not accounted for in the normal security assistance programmes. These take the form of hidden subsidies when, for example, weapons are sold at below their full cost, military equipment is leased at a nominal rate or rent-free, used equipment is sold at scrap value, foreign bases built by the USA are made the property of the host government, and so on.

A number of Central American governments have benefited by these

practices. In 1981, for example, El Salvador was leased at a nil-rent six UH–1H helicopters.[21] Honduras has acquired equipment and facilities free of charge following combined US–Honduran manoeuvres which have been held at frequent intervals since 1983.

Excess defence articles are sold to eligible countries at between 5 and 50 per cent of their acquisition value. Between 1979 and 1981, articles valued at $3.3 million were sold to Latin America for $0.9 million. Countries benefiting specially from this scheme include Haiti, Honduras and Panama.

US aid: the case of El Salvador

The results of a close inquiry by officials of the Arms Control and Foreign Policy Caucus into US aid to El Salvador highlight very clearly the true distinction between development and security assistance and the way in which foreign aid facilitates a high level of military activity.[22]

The Caucus divides aid to El Salvador in the period 1981–4 into:

Caucus headings		*Administration headings*
(1) aid for reform and development	15%	'economic aid'
(2) commercial food aid	11%	'economic aid'
(3) indirect war-related aid	44%	'economic aid'
(4) direct war-related aid	30%	'military aid'

Headings 1–3 are classified by the Administration as 'economic aid' and 4 as 'military aid'. In this way it can claim that economic aid to El Salvador was double that of military aid in 1981–4.

Analysing actual aid programmes, the Caucus report concludes that 15 per cent has been spent on reform and development, 11 per cent on commercial food aid which was sold on the open market by the Salvadorean Government and 30 per cent in the direct prosecution of the civil war, and that the vast majority of the remainder 'is indirectly war-related, because it addresses needs created by war, rather than addressing the underlying inequities that gave rise to and now sustain the war'. The levels of official development and commercial food aid planned for FYs 1985 and 1986 are about 30 per cent of the total aid package. Thus the Caucus analysis puts the relationship between economic and military aid the other way round with 'war-related' aid over twice as great as aid for development and reform.

The bulk of the indirect war-related aid has been given as cash transfers to the Salvadorean Government. The dollars received in aid are sold to Salvadorean businessmen and the resulting local currency income can be used anywhere in the government budget. Economic aid which is project-specific can be regarded as extra-budgetary, that is, the project would not have been undertaken if foreign aid had not been forthcoming. Non-specific budget support, on the other hand, clearly permits a higher level of current government spending than would otherwise have been possible. In the case of El Salvador, cash transfers from the USA have helped to make up the deficit caused by falling tax revenues and the general contraction in economic activity, and have enabled the Salvadorean Government to double its military spending in recent years.

The Caucus concludes that indirect war-related aid, by topping up the budget, rebuilding rebel-damaged infrastructure and caring for displaced persons, removes the incentive for the government to seek a negotiated settlement with the rebels.

The same conclusion may well be true in some measure in the cases of Guatemala and Honduras. Security aid now forms 60 per cent of total aid to these countries, rising from an insignificant level in 1980 (table 16.3). Their domestic economies have faltered. Annual average GDP growth between 1980 and 1984 was 0.4 per cent in Honduras and minus 1.4 per cent in Guatemala.[23] The accumulated fall in per capita income over the same period was 11 per cent in Honduras and 15 per cent in Guatemala. Meanwhile their military budgets increased 55 and 45 per cent, respectively, in real terms in the four years.

Looking at the four countries Costa Rica, El Salvador, Guatemala and Honduras, US security assistance has risen from 3 per cent of the total US aid going to these countries in FY 1979 to a share of almost 70 per cent in both FY 1985 and FY 1986 (see figure 16.1).

IV. CMEA assistance to Latin America

The value of aid coming from the CMEA countries and in particular from the Soviet Union is difficult to estimate due to the absence of standardized information, but this has been attempted in table 16.4.[24] A large part of CMEA economic support takes the form of price subsidies to other CMEA partners, as well as favourable maritime transport tariffs and technology transfers which are not normally included under aid as defined by the OECD.[25] Typically, the CMEA countries concentrate both their project aid and economic assistance efforts on the poorer members of the organization.[26] Cuba is the main beneficiary of project aid in Latin America and receives 99 per cent of CMEA price subsidies.[27]

Figures of CMEA economic aid to Nicaragua vary. NATO sources give a total of $138 for the years 1979–82. The OECD puts the figure at $189 million for the period 1980–3.[28] Another source puts economic aid at $450 million for 1979–83.[29] In addition to aid from the CMEA, there is a possibility that—despite US disapproval—some aid will be forthcoming to Nicaragua

Table 16.4. Estimated CMEA development aid, arms deliveries and price subsidies to Latin America, 1979–83

Figures are in US $m., at current prices; years are calendar years.

	1979	%	1980	%	1981	%	1982	%	1983	%
Development aid	457	*76*	663	*79*	775	*58*	807	*57*	741	*51*
Arms deliveries	145	*24*	181	*21*	555	*42*	599	*43*	723	*49*
Total	**602**	**100**	**844**	**100**	**1 330**	**100**	**1 406**	**100**	**1 464**	**100**
Price subsidies	3 304		2 698		2 918		3 958		3 664	

Sources: Development aid: see table 16.1.
Price subsidies: Foreign and Commonwealth Office (see note 7).
Arms deliveries: NATO, February 1984 (see note 7). Figures for 1983 are arrived at by combining information in the FCO and NATO sources.

from the European Economic Community (EEC), other DAC countries and some of the countries of Latin America.[30]

In 1982–3, the grant element of Soviet aid commitments to Socialist developing countries exceeded 90 per cent while the grant element of commitments to other developing countries was on average less than 50 per cent.[31] The OECD, however, suggests that Soviet loan terms have hardened significantly in recent years compared with the 1970s. The 1981 aid agreement with Cuba covering the period 1981–5 carries loan terms of 4 per cent, repayable over 12 years following a five-year grace period. The 1972 agreement was for 2.5 per cent interest, with repayment over 25 years after a two- to three-year grace period.[32] CMEA grants and loans are normally 'double-tied', that is, they restrict the recipient to buying specified goods and services from the donor country. Thus recipients are restricted not only in what they buy but from where they buy it. Commentators also note the inferior quality of products available to developing countries as a result of this policy.[33]

Arms deliveries

Cuba claims that it receives all its weapons as gifts from its CMEA partners, and a Western source states that Nicaragua appears to have received some of its Soviet equipment free of charge.[34] The value of these arms deliveries to Cuba and Nicaragua was estimated by NATO sources at $560 million in 1982.[35] US sources claim that arms deliveries to Nicaragua in 1983 were worth over $100 million.[36] Of the 800 Cuban military advisers whom Nicaragua admits were in the country, 100 were withdrawn in May 1985.[37]

Security assistance: the cases of Cuba and Nicaragua

CMEA economic support efforts in Central America are largely confined to one country, Cuba. Overwhelmingly, this support takes the form of trade subsidies—Cuban sugar and nickel are assured a market at prices above world market prices and Soviet oil is sold to Cuba at below world prices. According to Western sources, CMEA price subsidies to Cuba increased only 11 per cent in nominal terms between 1979 and 1983 (see table 16.4).

Such economic assistance is described by NATO as necessary to support this 'bastion of socialism' in the western hemisphere against collapse and because it serves Soviet strategic, military and political interests in the region and in the Third World.[38] In other words, the Soviet Union provides Cuba with economic support for political and ideological purposes in the same way as the USA offers economic support to some of the countries of Central America.

V. Development and security aid: the total

The total of development, economic and military aid flowing into Latin America in 1983, the last year for which the estimate can be made, is roughly $4.0 billion, almost twice the amount for 1979.[39] About $1.3 billion of this aid was pouring into the five countries of the Central American Isthmus, equivalent to almost 6 per cent of their combined GDPs. Of this sum, more

Figure 16.1. Share of security assistance in total US aid to four Central American countries: Costa Rica, El Salvador, Guatemala and Honduras, 1979–86[a]

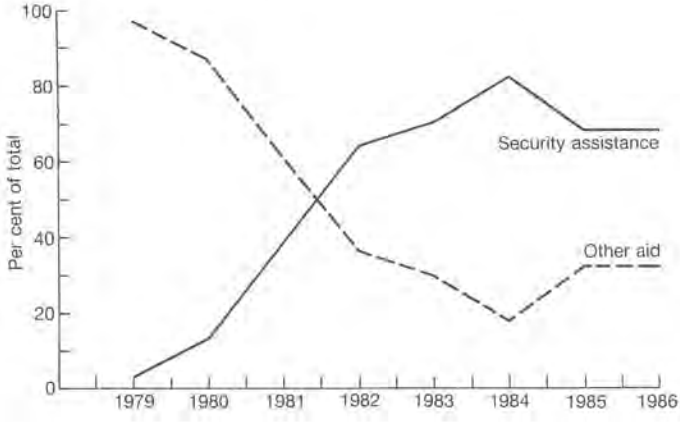
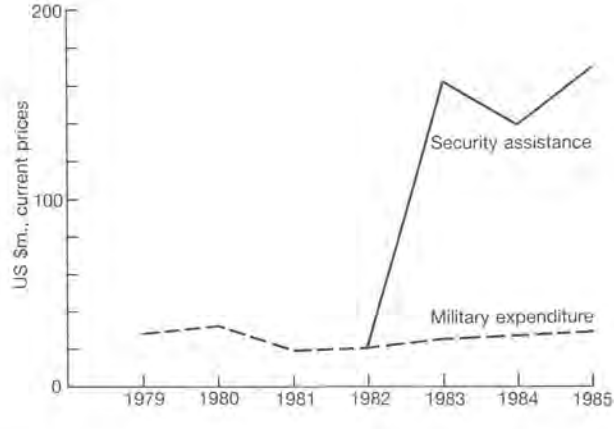


Figure 16.2(a). Military expenditure and US security assistance: Costa Rica, 1979–85[b]



Notes:

[a] The years indicated for US aid are fiscal years. Figures for FY 1986 are requests.

[b] Figures for military expenditure (figure 16.2) have been converted into US dollars for the purpose of comparison. They are affected by changes in the dollar exchange-rate: e.g., Costa Rica devalued by 150 per cent in 1981. Military expenditure in local currency has grown, in real terms, over these periods. The years indicated for US aid are fiscal years.

Figure 16.2(b). Military expenditure and US security assistance: El Salvador, 1979–85[b]

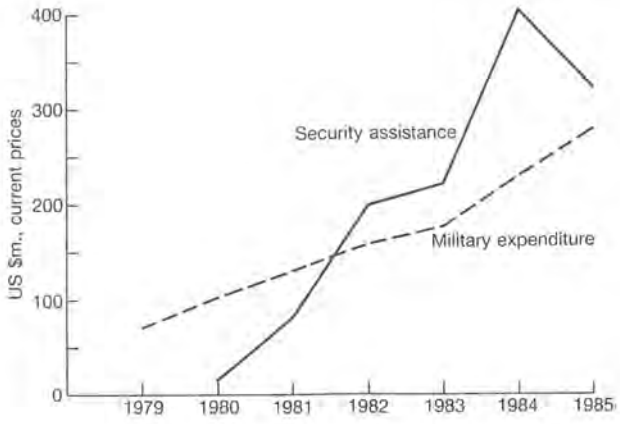
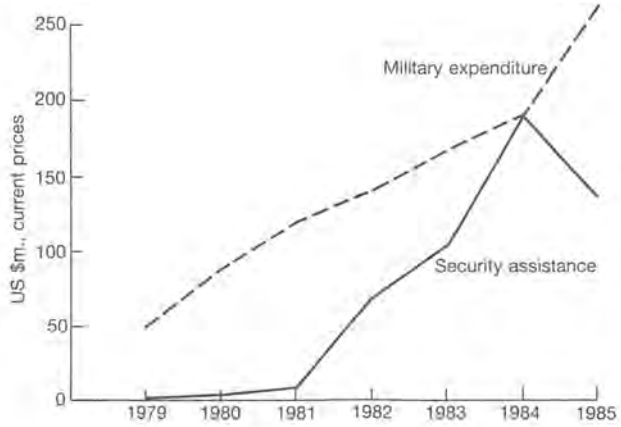


Figure 16.2(c). Military expenditure and US security assistance: Honduras, 1979–85[b]



Sources: Figure 16.1: see table 16.1.
Figure 16.2: see table 16.1 and table 11A.4.

than half can be identified as security assistance and, in the light of the Caucus study on El Salvador, the share is probably higher. Identifiable security aid doubled the combined domestic military spending of Costa Rica, El Salvador, Guatemala and Honduras in 1984. (See figure 16.2. Guatemala has hitherto received relatively small amounts of security assistance.)

Other forms of international finance

Besides giving security aid directly, the United States—because of its enormous economic might—is able to steer international funds in the direction of its allies, or away from its enemies. Borrowing from international financial institutions (IFIs) is an important source of capital in many countries. Since an IFI loan is often regarded as giving a country an economic 'seal of approval', it also gives a country access to international commercial borrowing.

Cases of positive and negative discrimination are few in relation to the total number of loans processed by the IFIs each year, but when concentrated on the countries of one region, such as Central America, they can contribute to its economic destabilization. The USA is reportedly a powerful advocate for International Monetary Fund (IMF), World Bank and Inter-American Development Bank (IDB) loans in particular to El Salvador, even in cases when that country is technically ineligible. In 1982–3, seven loans to Nicaragua worth $82.6 million were given a negative US vote on the grounds that Nicaragua's macroeconomic policies are so bad that even the best development project would be a waste of money; however, only one of these seven votes resulted in a veto. Observers note that Nicaragua's macroeconomic policies differ little from those of other developing countries, and development agency officials hold that its development programmes are usually well administered.[40] Cuba is a member of only one IFI—the International Fund for Agricultural Development. The US delegation has opposed all funds to Cuba and in all but two cases has succeeded in having them rejected.[41]

Notes and references

[1] Military-related external debt has been dealt with in Tullberg, R., 'Military-related debt in non-oil developing countries', in SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1985* (Taylor & Francis: London, 1985), pp. 445–58; Tullberg, R., 'Military-related debt in Latin America', in *Proceedings of the 7th RIAL Conference, Bogotá 1985* (forthcoming). When loans are made on sufficiently 'soft' terms, that is, with interest rates and other conditions substantially better than current market conditions, these loans are often classified as aid.

[2] This problem has been identified by US legislators who added the following Section 620(s) to the Foreign Assistance Act of 1961: 'In order to restrain arms races and proliferation of sophisticated weapons, and to ensure that resources intended for economic development are not diverted to military purposes, the President shall take into account before furnishing development loans, Alliance loans or supporting assistance [economic support fund] to any country under this Act, and before making sales under the Agricultural Trade Development and Assistance Act of 1954, as amended: (A) the percentage of the recipient or purchasing country's budget which is devoted to military purposes; and (B) the degree to which the recipient or purchasing country is using its foreign exchange or other resources to acquire military equipment.' This requirement notwithstanding, economic assistance is currently being given to such countries as Jamaica and Guatemala which are cutting their expenditures on health and education without making similar cuts in military spending.

[3] The term 'Central America' refers to the 12 countries listed under that heading in table 11A.3.

[4] The CMEA, sometimes referred to as COMECON, was founded in 1949 to assist the

economic development of its member states. Current members are: Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the USSR and Viet Nam.

Military assistance from Argentina, Israel, Taiwan and Venezuela to Costa Rica, from Israel and Taiwan to Guatemala, and from the Netherlands and France to Nicaragua are discussed in chapter 22 and have not been included here.

[5] Members of the Development Assistance Committee (DAC) are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, FR Germany, Italy, Japan, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the United Kingdom, the United States and the Commission of the EEC. The World Bank and the International Monetary Fund (IMF) are observers. Aid is distributed both bilaterally and through multilateral organizations.

[6] OPEC aid to Latin America, however, has always been trivial by comparison with the assistance it has given to Middle and Far Eastern countries.

[7] Information on CMEA aid has been compiled from the following sources: *Soviet and East European Aid and Arms Deliveries to Developing Countries*, NATO 1983 annual report as given in *Defense and Economy, World Report and Survey*, no. 918, issues 32/35 Aug. 1984; *Soviet Bloc Aid and Arms Deliveries to the Developing World*, Note by the Secretary General, NATO, 29 Feb. 1984; 'A study by NATO experts on the Warsaw Pact countries' economic relations with developing countries 1980–83', *Atlantic News*, no. 1704, 22 Mar. 1985; *Soviet Arms Exports to the Third World*, Background Brief, British Foreign and Commonwealth Office (FCO), June 1985; *Soviet, East European and Western Development Aid 1976–83* (FCO: undated). These papers are referred to here as NATO, 1983; NATO, 1984; NATO, 1985; FCO, 1985; and FCO, undated); and *Development Co-operation Review 1984* (OECD: Paris, 1984).

[8] OECD, 1984 (note 7). Less detailed statistics are kept of development aid from non-DAC countries, OPEC and the CMEA.

[9] The remaining recipients in this group are Afghanistan, Kampuchea and Laos. Among the Central American countries, Cuba is a member of the CMEA; Mexico (1975) and Nicaragua (1983) have signed co-operative agreements.

[10] NATO, 1984 (note 7); FCO, undated The bulk of CMEA aid is not classified as such by the OECD. See section IV.

[11] *US Overseas Loans and Grants and Assistance from International Organisations, Obligations and Loan Authorizations* (Agency for International Development: Washington, DC). The most recent edition examined is for 1 July 1945–30 Sept. 1984.

[12] *US Security and Military Assistance: Programs and Related Activities*, Report by the US General Accounting Office (GAO), GAO/ID-82-40 (Washington, DC, 1 June 1982), p. 20.

[13] Report of the Commission on Security and Economic Assistance, no date, p. 34, reprinted in *Hearings before a Sub-Committee of the Committee on Appropriations*, House of Representatives, Ninety-Eighth Congress, Second Session, Part 3 (US Government Printing Office: Washington, DC, 1985), p. 782.

[14] All foreign assistance is a mixture of loans and grants: military assistance is no exception. The US military credit financing programme offers loans on concessional terms—currently repayment over a maximum of 12 years, with interest between 5 per cent and the going rate on government obligations of comparable maturity. Less obvious concessional elements are fixed interest rates, immediate delivery of equipment and Presidential powers to stretch repayment periods. Loans to Central America under this programme have amounted to $178 million in the period 1979–84, less than 5 per cent of total security assistance, distributed as follows:

Dominican Republic	$18.2 million
El Salvador	$97.2 million
Haiti	$ 1.1 million
Honduras	$41.9 million
Jamaica	$ 2.6 million
Panama	$16.0 million

[15] The five Isthmus countries are Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

[16] Note 11; and Western Hemispheric Affairs Subcommittee, 19 Mar. 1985.

[17] NARMIC (National Action Research on the Military Industrial Complex), *Invasion: A Guide to US Military Presence in Latin America* (NARMIC: Philadelphia, 1985), p. 12. See further, Goldblat, J. and Millán, V., chapter 22.

[18] *International Herald Tribune*, 9 Aug. 1985. Other sources give the figure of $25 million since October 1984. See *Svenska Dagbladet* (Stockholm), 21 Aug. 1985.

[19] Two programmes are involved—the Law Enforcement Counterterrorism Assistance Program with $26 million in funds and the Regional Enhanced Counterterrorism Assistance

Program with $27 million. $22 million of the total is for El Salvador. *International Herald Tribune*, 26 July 1985; *Congressional Quarterly*, 24 Aug. 1985, p. 1691; *Latin American Weekly Report*, WR-85-44, 8 Nov. 1985. Reports in December 1985 suggest that in the face of strong Congressional disapproval, the Administration will remove the Regional programme from its proposal. *Washington Post*, 4 Dec. 1985.

[20] GAO (note 12), p. 3. The audit work for this report ended in 1981.

[21] These helicopters were later given to El Salvador under a Presidential drawdown authority which permits the President in an emergency to supply Department of Defense services and equipment from stocks to foreign governments. The President possesses a number of such authorities which allow him to respond to an emergency situation without first consulting Congress. Others include a Presidential waiver authority, which permits the President to waive provisions of foreign assistance and other legislation which would otherwise prohibit the provision of aid, due to the ineligibility of a country or circumstances; transfer authority which permits the President to transfer foreign assistance funds between programme accounts and countries; and a cloaking authority which permits the President not to disclose the nature of any expenditure he deems 'inadvisable' to specify. All these authorities are subject to a monetary ceiling, and aid given in this fashion can be 'approved' retrospectively by Congress by a vote of funds to cover it. However, of the $80 million in drawdowns authorized by the President for El Salvador in 1981 and 1982, only 25 per cent was subsequently approved by Congress. *Uses of Special Presidential Authorities for Foreign Assistance*, General Accounting Office (GAO), GAO/NSIAD-85-79, Washington, DC, 20 May 1985.

[22] Arms Control and Foreign Policy Caucus, Feb. 1985, reprinted in *Foreign Assistance Legislation for Fiscal Years 1986–87*, Review of proposed economic and security assistance requests for Latin America and the Caribbean, Committee on Foreign Affairs, House of Representatives, 5 and 19 Mar. 1985 (US Government Printing Office: Washington, DC, 1985), pp. 183–250.

[23] Preliminary data from the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), Feb. 1985.

[24] See note 7.

[25] OECD (note 7), p. 117. Similar support by the USA to its Isthmus allies is presumably also excluded.

[26] FCO (undated), para. 12, the OECD, 1984 and NATO, 1984 (note 7), all suggesting that net project aid to the non-socialist less developed countries (LDCs) was negative in 1983.

[27] FCO, undated (note 7), table 10.

[28] NATO, 1983 (note 7); *Geographical Distribution of Financial Flows to Developing Countries, 1980/1983* (OECD: Paris, 1984).

[29] Berrios (note 36), quoting Sims, H., 'Relations with the Socialist bloc', in T. Walker (ed.), *Nicaragua: The First Five Years* (Praeger: New York, forthcoming).

[30] Mexico informed Nicaragua in April 1985 that oil credits could no longer be extended since Nicaragua had fallen so far behind in payments of its $600 million oil debt. Unable to pay cash for Mexican oil, Nicaraguan President Ortega flew to Moscow to seek pledges of Soviet oil deliveries. The US reaction to this trip was to embargo all trade with Nicaragua. However, in the case of oil deliveries, the Reagan embargo boomeranged, since Mexico reacted by deciding to resume oil shipments to Nicaragua in June 1985.

[31] FCO, undated (note 7), para. 21.

[32] OECD, 1984 (note 7) p. 119.

[33] FCO, undated (note 7), para. 22.

[34] *Financial Times*, 8 Aug. 1983; FCO, 1985 (note 7), p. 4.

[35] NATO, 1984 (note 7).

[36] Given in Berrios, R. B., *Economic Relations between Nicaragua and the Socialist Countries*, Wilson Center Working Paper no. 166 (Washington, DC, 1985).

[37] UN document S/16993, 1 Mar. 1985. The USA claims there are 2000 Cuban military advisers and 4000 civilians in Nicaragua. US Department of State, *Special Report*, no. 103, Aug. 1982.

[38] NATO, 1983 (note 7), p. 4.

[39] Price subsidies to Cuba are excluded since similar subsidies from the USA and other countries to Latin America cannot be identified.

[40] *Latin America Regional Report*, RM-84-01, 13 Jan. 1984; Caleb, R., *The Financial Hit List, International Policy Report*, Feb. 1984 (Center for International Policy: Washington, DC, 1984).

[41] See note 40.

17. The trade in major conventional weapons

MICHAEL BRZOSKA and THOMAS OHLSON

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. The flow of arms: general trends

The trade in arms did not change dramatically during 1985. Provisional figures for 1985 suggest that the stagnating trend of the early 1980s is continuing. (The figures in this section are based on the SIPRI values of major weapons *actually delivered* in the given year or years; for a description of the valuation method used, see appendix 17D.) The stagnation in the arms market is accompanied by profound changes in its structure.

The most important reason why arms sales did not increase is the poor economic performance of many leading arms-importing countries. Indeed, for the group of countries which sustained the highest growth-rates in arms imports in the 1970s, the economic future does not look bright. Oil-exporting Third World countries now face reduced oil earnings. For some 12 years oil has fuelled the arms market—arms exports have also been an important means of recycling money back to the industrialized countries. Oil-rich states have built up their arsenals at a fast rate and other countries have followed suit. Arms imports by non-oil-exporting Third World countries have often been financed through credits which became available from the recycling of oil incomes. The arms trade was further propelled by the strategic interests of the USA and the USSR and by the economic interests of all major arms suppliers. Existing crises were exacerbated and new ones were created. Now that the arms market is much less buoyant, the possibilities for establishing a regime to control and limit future arms transfers may be improved.

A number of other factors may also facilitate a reduction in the proliferation of conventional weapons. One is that military arsenals in many countries are full. Another noticeable factor is the increasing production of arms in the Third World. Arms production has become a major activity in a number of Third World countries; exports of major weapons from the Third World are still limited, but the trend is upward.[1] The potentially positive side-effect of this is that arms production would become less lop-sided. The concept of conventional arms control can now more easily be extended to include arms production.

Other factors militate against such control. The reduced demand for arms and the increasing number of suppliers have created a buyer's market. The role of the superpowers is diminishing. Even for them, economic interests sometimes override political ones, although their arms export policies remain instruments of diplomacy. Still they comply with the current rules of the game by offering favourable financial conditions, by agreeing to countertrade and by giving away some of their arms production technology—thus contributing to

the commercialization of the arms market. In some other countries, where economic interests are predominant, governments tend towards a policy of oversight rather than control. The competition in the arms market calls for flexibility, shrewd marketing and clever package-dealing. Government control interferes with this and is commercially undesirable. The market situation is slowly reverting to that of the 1920s and 1930s, when private commercial interests ruled and governments remained passive.

That supplier states have less control of the market is most noticeable in the resupply of weapons, ammunition and spare parts to countries at war. Both Iraq and Iran have been able to acquire weapons from a large number of countries. Had there been a concerted effort at control, the war would have stopped long ago.

The existence of conflicting trends, working for and against control of production of and trade in conventional arms, means that a new appraisal of what is politically desirable and feasible is needed. Public discussion in countries as apart as Argentina and Sweden, Bangladesh and FR Germany, and in international forums, shows some renewed interest in the subject, but hopeful signs are few.

Table 17.1. The leading major-weapon exporting countries: the values and respective shares for 1981–5

Figures are SIPRI trend indicator values, as expressed in US $m., at constant (1975) prices; shares in percentages. Figures may not add up to totals due to rounding.

Country	1981	1982	1983	1984	1985	1981–5	Per cent of total exports to Third World, 1981–5
USA	5 325	5 726	5 425	4 995	4 187	25 659	*44.3*
	39.2	*40.4*	*40.6*	*36.1*	*36.5*	*38.7*	
USSR	3 905	4 095	3 233	3 613	3 460	18 306	*74.1*
	28.8	*28.9*	*24.2*	*26.1*	*30.2*	*27.6*	
France	1 454	1 274	1 410	1 553	1 319	7 010	*80.5*
	10.7	*9.0*	*10.6*	*11.2*	*11.5*	*10.6*	
UK	536	638	494	825	654	3 146	*66.3*
	4.0	*4.5*	*3.7*	*6.0*	*5.7*	*4.7*	
FR Germany	487	325	639	790	420	2 662	*61.6*
	3.6	*2.3*	*4.8*	*5.7*	*3.7*	*4.0*	
Italy	545	695	396	460	405	2 501	*93.9*
	4.0	*4.9*	*3.0*	*3.3*	*3.5*	*3.8*	
Third World	409	454	764	510	297	2 434	*95.5*
	3.0	*3.2*	*5.7*	*3.7*	*2.6*	*3.7*	
China	161	252	255	555	293	1 516	*95.3*
	1.2	*1.8*	*1.9*	*4.0*	*2.6*	*2.3*	
Others	737	701	729	523	423	3 111	*67.3*
	5.4	*5.0*	*5.5*	*3.8*	*3.7*	*4.7*	
Total	**13 559**	**14 160**	**13 345**	**13 824**	**11 458**	**66 345**	*64.1*

A closer examination of the structure of arms exports shows the following picture:

1. In the five-year period 1981–5 the USA was the leading arms supplier, with

about 39 per cent of total arms exports. The share of the Soviet Union was about 28 per cent.

2. The Soviet Union was the largest supplier of major weapons to the Third World during 1981–5. The Soviet share was about 32 per cent and the US share around 27 per cent. Whereas US exports go mostly to industrialized countries, Soviet exports are predominantly directed towards the Third World.[2]

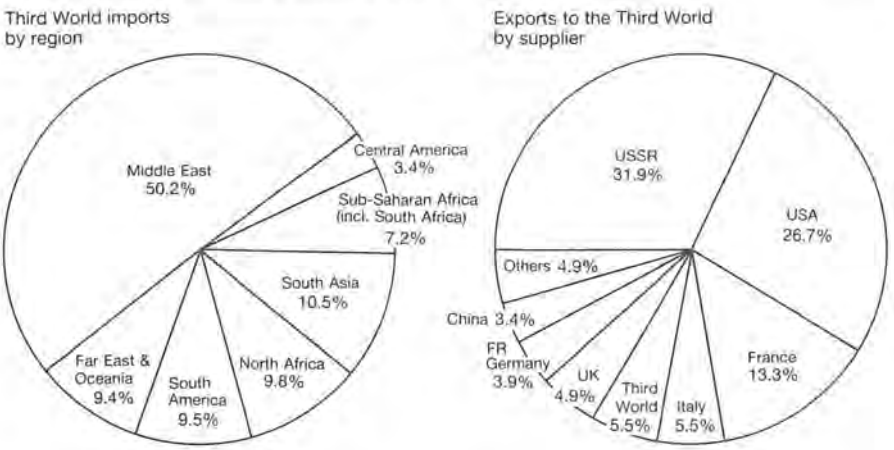
3. The USA and the USSR together continue to account for more than half of both total trade and trade with the Third World only. Both shares are decreasing, however. While their combined share was 71 per cent for 1978–82, this has now decreased to 66 per cent. Their share in arms exports to the Third World was always smaller and is declining faster: while it was 69 per cent for the five-year period 1978–82, it was 59 per cent for 1981–5.

4. France has further consolidated its position as third-ranking exporter of major weapons, followed by the UK, FR Germany and Italy. Together, the four major West European arms exporters now account for almost 28 per cent of arms exports to the Third World. In 1978–82 that share was around 18 per cent. In addition, new West European arms exporters have gained market shares, most notably Spain, which ranked eighth among arms exporters to the Third World in 1981–5 with a share of almost 2 per cent.

5. China, Israel and Brazil are ranked seventh, ninth and tenth respectively, among the exporters of major weapons to the Third World. The share of Third World arms exporters continues to rise slowly.

Figure 17.1. Percentage shares of the trade in major weapons with the Third World, 1981–5

Percentages are based on SIPRI trend indicator values, as expressed in US $m., at constant (1975) prices. The values are listed in appendix 17A.



Statistics on arms imports for the same period show that:

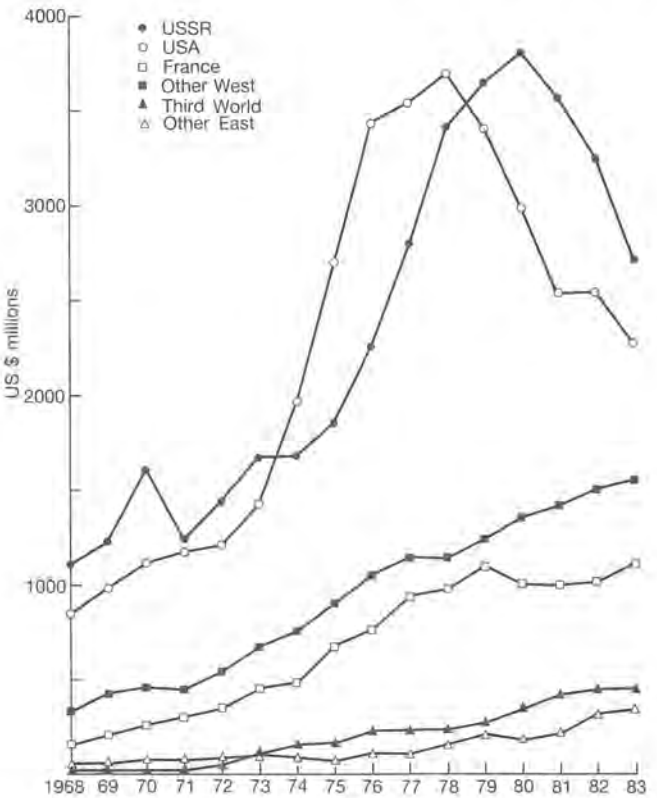
1. The Third World share of total imports of major weapons is slowly decreasing. From 66 per cent during 1978–82, the share is down to 64 per cent for the current period.

2. The volume growth of Third World arms imports has stagnated. The annual average growth rate during 1981–4 (1985 figures are largely preliminary) was below 1 per cent.

3. The largest arms-importing region is the Middle East with a share of about 50 per cent of total Third World imports during 1981–5. In recent years, the decline is most pronounced in Africa and in Latin America (after a short increase during and after the Falklands/Malvinas War).

Figure 17.2. Exports of major weapons to the Third World regions listed in appendix 17A, by supplier, 1966–85

Based on SIPRI trend indicator values at constant (1975) prices, 5-year moving averages.



Source: Table 17A.2.

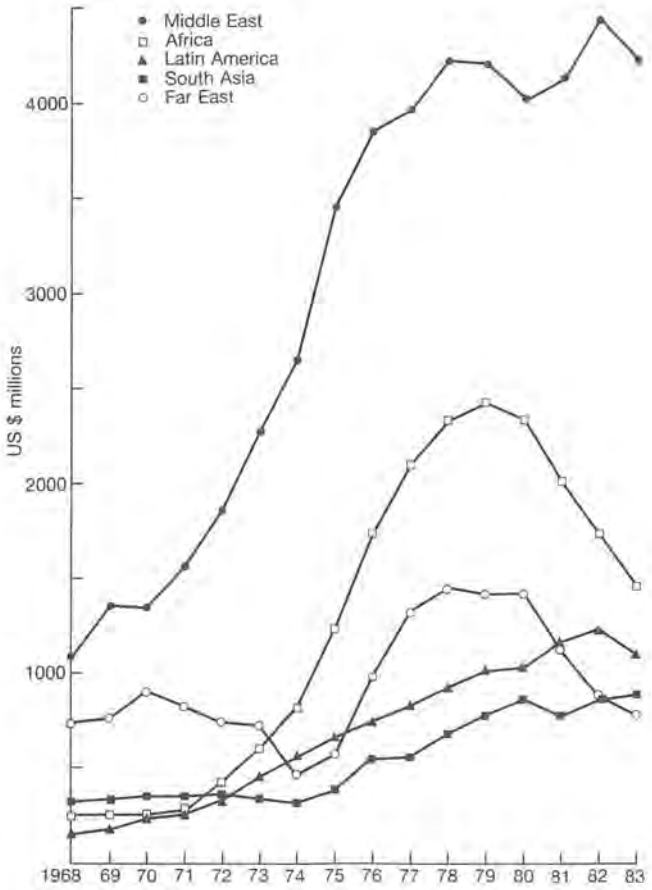
4. The three highest-ranking arms-importing countries in the Third World are in the Middle East. Iraq, Egypt and Syria alone account for almost 32 per cent of Third World arms imports.

5. Countries in conflict normally tend to increase their imports of major weapons. Iraq is not the only example; arms imports are also increasing in Angola and Sri Lanka, and they increased in Central America when military activity was stepped up. South Africa is a notable exception: its arms imports

continue to decrease because of the UN arms embargo and substantial domestic arms production.

Figure 17.3. Imports of major weapons, by region, 1966–85

Based on SIPRI trend indicator values, at constant (1975) prices, 5-year moving averages.



Source: Table 17A.1.

II. The suppliers

The United States

In 1985 the United States reaffirmed its position as the leading arms supplier in the world. The structure of its export market has changed, however. Deliveries to the Third World declined from about 55 per cent of total US arms exports in the five-year period 1976–80 to about 44 per cent in the period 1981–5. This trend may be reversed in the future: a November 1985 Pentagon report estimates the value of Foreign Military Sales (FMS) orders concluded in fiscal

year (FY) 1985 at approximately $13.5 billion—58 per cent of which involve contracts with Third World countries.[3]

The USA supplies arms to almost twice as many Third World countries as the USSR, and over 90 per cent of total US deliveries are to countries in the middle- and high-income groups (see figure 17.4). Unlike the USSR, the USA has adapted itself to the changing conditions of the arms market with relative ease. This is not surprising: the commercialization of the arms trade means that the USA can more fully co-ordinate arms sales with other instruments of expanding its influence—such as civil trade, economic aid and direct investments by multinational companies.

In the internal US arms transfer debate during 1985 four issues stand out: arms sales to the Middle East, US involvement in regional wars in the Third World, the increasing use of offsets[4] and technology transfers in arms sales.

Sales to the Middle East

The main problem for the USA with respect to arms sales to the Middle East is that while Israel and some Arab states such as Jordan and Saudi Arabia are US friends, they are also each other's enemies. This calls for US balance and restraint. It is also argued, however, that unilateral US restraint would threaten the security of these countries since the Soviet Union supplies vast quantities of arms to Iraq, Libya and Syria. In January 1985 a temporary ban was imposed on all arms sales to the Middle East while a review of the connection between such sales and peace and stability in the region was conducted. The underlying reasons for the ban were to allow time to remove disagreements within and between the Administration and Congress on arms sales to Jordan and Saudi Arabia and—in the light of the disastrous performance of the Israeli economy—to reduce the immediate pressures on Israel to match Arab arms purchases. A summary of the secret review became public in September, its main message being that the Arab countries need the requested arms for their defence and that Israel is strong enough not to be endangered by such purchases.[5]

However, the US Administration refrained from proposing to Congress a sale of additional F-15 fighters to Saudi Arabia. Tacit support for a Saudi purchase of British Tornado fighters may indicate more than the simple recognition that the F-15 sale would not be approved by Congress anyway. There are political advantages in supporting the Tornado deal: it repays the UK for its support of President Reagan's Strategic Defense Initiative (SDI) programme; it maintains good relations with Saudi Arabia without endangering the US–Israeli relationship; and it underlines the argument that 'if we don't sell, they go elsewhere'—a strong argument supporting the politically more important arms package to Jordan. In October President Reagan notified Congress of the Administration's intention to sell to Jordan 40 advanced fighter aircraft (F-16s or F-20s) with 300 Sidewinder air-to-air missiles (AAMs), 12 mobile Improved Hawk surface-to-air missile (SAM) systems with 222 missiles, a mobility package for 14 existing stationary I-Hawk systems, 72 Stinger man-portable SAMs, 32 M-3 Bradley fighting vehicles and various

associated equipment at a total value of some $1.9 billion. Congress blocked the proposed arms sale until the end of March 1986 unless 'direct and meaningful' peace talks between Israel and Jordan begin before then.[6]

The Jordan deal illustrates once more the 'arms for peace' policy established in connection with the 1979 Camp David Peace Treaty. Similar evidence emerges from the Foreign Aid Authorization Bill cleared by Congress for FYs 1986 and 1987. Fifty per cent of the total US military aid approved (including FMS forgiven, concessional or market-rate loans) is in the form of annual forgiven loans to Israel ($1.8 billion) and Egypt ($1.3 billion). Of the Israeli total, $400 million are annually earmarked for development of the Lavi fighter aircraft, most of which will be spent in Israel. The rest of the money is not linked to any specific programme. The Bill also authorized an annual Economic Support Fund (ESF) grant to Israel of $1.2 billion and to Egypt of $850 million. This amounts to 53 per cent of total ESF grants. Finally, the bill granted Israel $1.5 billion and Egypt $500 million in supplemental economic aid for FYs 1985–6. For Israel this means a cash transfer of $4.5 billion during 1986 or the equivalent of 1.5 per cent of total US military expenditures for FY 1986. Proponents of US support for Israel argue that this is more than compensated for by what the USA gets in return in Israeli contributions to the financial and strategic interests of the United States.[7]

Regional wars

The Foreign Aid Authorization Bill also sheds light on US involvement in regional wars. Many congressmen are worried that the CIA-supervised aid programme to the Afghan resistance is costing too much (about $250 million per year). The bill earmarked $15 million in humanitarian aid to the Afghan refugees in addition to continued provision of covert arms by the CIA. The Clark Amendment—restricting US support for the UNITA guerrilla force in Angola—was removed, and a proposal barring US military advisers from operating in Western Sahara during the war between Morocco and the Polisario movement was also deleted. An annual $5 million were earmarked for economic or military aid to the non-communist resistance in Kampuchea and $27 million for non-military aid through March 1986 were given, with a number of provisions, to the contras fighting the Nicaraguan Government. A proposal to bar US military aid to El Salvador and Honduras from being rechannelled to the contras was rejected in the bill. In sum—despite strong congressional criticism—US military commitments in these countries will not be reduced but rather, in some cases, increased.

Offsets

The US Government is worried about the general trend towards offsets in connection with arms sales. The current policy of not interfering with companies' offset negotiations was subjected to many reviews by federal agencies during 1985.[8] It is estimated that offsets valued at $5 billion annually were negotiated by arms exporting companies during FYs 1984–5—this would equal about one-third of total US FMS agreements in these two years.[9] US

arms manufacturers do not readily enter into offset arrangements, but they are seen as essential for winning orders.

Technology transfers

The Reagan Administration is also enforcing strict rules on the supply of sensitive military and dual-use technology to other countries.[10] This problem was highlighted by a number of military-related export deals negotiated or concluded in 1985. They are of two types: first, government-handled negotiations on arms sales to countries such as Algeria, China and India. Algeria became eligible for US arms sales in 1985—reports indicate that such sales may amount to $110 million in FY 1986. They may be complicated by the US support for Morocco—in union with Libya since 1984—in the Western Saharan conflict and the Algerian support for the Polisario movement. The development of US arms sales to China—slow and selective mainly due to US–Taiwanese relations—produced a concrete result in 1985: the sale of $6 million worth of explosives, including a US Letter of Offer for the sale of a $98 million artillery munitions factory. (There was also a commercial sale of five General Electric gas turbine engines for two new Chinese Luda Class destroyers.) During 1985 India received clearance as a recipient of advanced US military technology and weaponry, conditional on strict Indian safeguards. The main causes of earlier reluctance about such sales were India's relationship with the Soviet Union in military technology and US links with Pakistan and, more recently, China. China and India requested similar equipment from the United States, such as aircraft avionics and jet engines; they also both prefer technology transfers to off-the-shelf purchases.

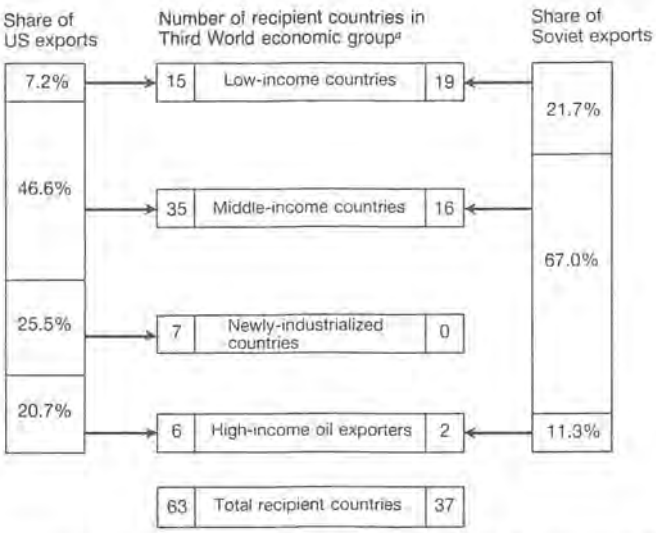
The second type of deal is exemplified by the company-to-company or company-to-government commercial sales to Iraq and South Africa. In 1985 US companies sold to Iraq 24 Hughes Model-530 and 45 Bell Model-214B helicopters. These sales illustrate the US tilt towards Iraq in its war with Iran; they also prompt the question why there was such an uproar in the United States about the illegal diversion, and thus technology transfer, of Hughes helicopters to North Korea when the same, even improved, technology is legally delivered to another ally of the Soviet Union. According to US Department of Commerce data there were also substantial sales of dual-use technology to South Africa in the 16-month period ending April 1985. Sales reportedly included $110 million worth of computers, semi-conductors and integrated circuits and $110 000 worth of weapon parts.[11]

Clearly the United States, and other leading arms-exporting countries, face a potential conflict between diverging interests. The long-term consequences of arms sales are increasingly hard to predict. In such a situation corporate interests, national economic considerations and national security concerns frequently clash.

The Soviet Union

In 1985 the Soviet Union was the largest supplier of major weapons to the Third World, continuing to supply mainly Iraq, Syria and India. The most notable

Figure 17.4. Exports of US and Soviet major weapons to Third World countries, 1981–5



[a] Economic groups are in accordance with World Bank, *World Development Report 1985* (Oxford University Press: New York, 1985). The newly-industrialized group consists of: Argentina, Brazil, Israel, Mexico, Singapore, South Korea and Taiwan.

arms sale was negotiated when Indian Defence Minister Narasimha Rao visited Moscow in early April. He was reportedly offered arms production technology, including that for building nuclear-propelled submarines, modern long-range radar systems and a coastal defence system. India continues to play a special role in the arms transfer policy of the Soviet Union. Not only is it offered the most modern equipment (sometimes, as in the case of the MiG-29 aircraft, even before it is produced), but India is also the only non-socialist country to receive arms production technology from the Soviet Union.

India is among the countries in the Third World which by late 1985 had signed treaties of friendship and co-operation (sometimes extended also to mutual assistance) with the Soviet Union. Such treaties are viewed as important elements of Soviet Third World policy. In the draft of the new programme of the Communist Party of the Soviet Union (CPSU) the 'development of relations of equality and friendship with newly-free countries' is mentioned as one of the four main goals and directions of its international policy.[12]

Table 17.2 reflects the concentration of arms deliveries by the Soviet Union to countries with which it is linked via such treaties. The reorientation towards aligned states may not be voluntary. In the 1970s the Soviet Union substantially increased the use of arms transfers to improve its balance of payments. Weapons were sold to countries that had something to offer on the world market and could therefore pay the Soviet Union in hard currency. Several factors are at work that currently limit the number and size of such deals,

Table 17.2. Soviet deliveries of major weapons to WTO countries and countries with which a treaty of friendship and co-operation has been signed[a]

Country/Country group	Date of treaty	Percentage of total Soviet deliveries of major weapons		
		1981	1985	1981–5
Afghanistan	1978	—	—	0.4
Angola	1976	2.0	3.7	3.4
Ethiopia	1978	0.4	—	0.9
India	1971	13.8	10.1	11.1
Iraq	1972	10.4	23.2	17.9
Mozambique	1977	0.2	0.1	0.9
North Korea	1961	1.5	2.4	1.4
Syria	1980	9.8	22.2	17.5
Viet Nam	1978	2.6	2.8	2.1
Yemen, South	1980	1.1	—	0.6
Third World total		**41.8**	**64.5**	**56.2**
Members of Warsaw Treaty Organization	1955	27.2	22.2	24.8
World total		**69.0**	**86.7**	81.0

[a] There is speculation that a similar treaty was signed with North Yemen in 1984.

however. First, the depressed world market has led to a decrease in the overall volume of the arms trade. Second, Soviet weaponry has gained little reputation in recent wars. In Afghanistan, Angola, Iraq, Kampuchea and Lebanon the performance of Soviet-produced weapons has been poor—with some exceptions, like the new helicopter gunships. In Jordan, where Western and Soviet air defence systems are tested side by side, there has been mounting criticism of the Soviet SAM-8 missile.[13] Third, the internal pressure to devote more arms production capacity to the needs of the Soviet armed forces is probably increasing.[14] A fourth point is the Soviet reluctance to allow customers much freedom of action via arms transfers. Deliveries of ammunition and spare parts are usually small, repair facilities are seldom part of a deal (even the Indian Navy has to send its submarines to Vladivostok for repairs[15]) and the transfer of arms production technology is heavily restricted.

The notable exception to Soviet transfers of arms production technology is India, where aircraft, tanks and other Soviet weapons are produced under licence. But there are reports that even this relation is strained by Soviet concern about technology transfer. Indian technicians training in the Soviet Union are reported to receive instruction only in rudimentary techniques, and written instructions given to them are reportedly retrieved upon completion of the course.[16]

This Soviet policy is contrary to current trends in the arms market and Soviet opinion on Third World arms production is mostly negative: 'The establishment by many developing countries (they already number more than a dozen) of their own military production under licence and with the technical assistance of Western powers allows these countries to begin exporting their own military production and promotes the spread of arms around the planet and the growth of the international arms trade.'[17]

While arms transfer relations with the Soviet Union are not very attractive for so-called newly industrializing countries, the attraction is greater for poor countries. Although the Soviet Union has reportedly recently raised the prices of its weapon systems[18] and credit terms, both prices and credit conditions still compare favourably to those offered by other potential suppliers. It is therefore not surprising that the Soviet Union has many clients among the poor countries in the Third World (see figure 17.4). While the overall number of countries receiving weapons from the Soviet Union is low, the number of Soviet clients in the group of countries with low per capita income (as defined by the World Bank) is larger than the number of US clients. The share of total Soviet exports to this group of countries is also comparatively high. Among the middle-income countries, Soviet exports are highly concentrated to a few countries, notably Syria and Iraq.

There are signs that the Soviet Union is disenchanted with the current state of the arms market, its trends and possibly also its own role in it. A recent Soviet book states: 'The growing international sale and delivery of arms and the related process of drawing a large number of countries into the arms race tends to whip up psychosis and suspicion, fueling the volatile regions.'[19] On the other hand, it is also stated in this book that the Soviet Union and other socialist countries 'extend essential aid and assistance to peaceful states which are legitimately apprehensive for their security'.[20] In the final chapter a call is made to resume the talks on conventional arms transfer limitations that were held between the USA and the Soviet Union in 1977 and 1978. It is suggested that legal criteria such as aggression, the inviolability of borders and the right of people to fight against colonialism and racism should be negotiated.[21] A faint echo of calls for arms transfer limitations can also be found in the draft for the new party programme of the CPSU. Among the tasks in the field of disarmament are named: 'A freeze on and reductions in the troops and armaments in the more explosive parts of the world, dismantling of military bases on foreign territory, and measures to build up mutual trust and to lessen the risk of armed conflicts, accidental included.'[22] These statements must be viewed as rhetorical for the time being. The Soviet Union has not made any proposals in existing forums, nor has the Soviet Government taken any initiatives for arms transfer restraint.

West European countries

Among the many arms contracts won by arms producers in Western Europe, two are especially noteworthy. They are the sale of RITA (Reseau Integrées des Transmissions Automatiques), the French communications system, to the US Army, valued at $4 billion, and the sale of Tornados and other aircraft from the UK to Saudi Arabia, valued at up to $6 billion.

The first sale, won after hard competition with the British Ptarmigan system, nourishes the hope in many West European quarters that the USA could become the great arms export market of the future. Arms sales to the Third World have declined and markets in Western Europe are heavily protected, but the big and growing US market is largely untapped. So far, there has been

much US protectionism, and West European countries have found it difficult to offer weapons at the level of technology that US companies can offer. But there are signs that the USA is becoming more open to European competition—not least to gain political support for more spending on conventional weapons and on SDI (see also chapter 14).

The sale of 72 Tornado aircraft, 30 Hawk jet trainers, 30 PC-9 primary trainers and associated missiles to Saudi Arabia—won after heavy competition with the French Mirage-2000 aircraft—represents a joint West European approach. The Tornado is a multinational (British/Italian/West German) project. The PC-9 is a Swiss aircraft. The Royal Air Force had opted for the Brazilian Tucano trainer in early 1985, but as British Aerospace, the company that clinched the deal with Saudi Arabia, had teamed up with the Swiss company Pilatus for the British order, the PC-9 was included in the package.

Heavy salesmanship was used in these deals, with Prime Minister Thatcher and President Mitterrand lobbying personally in both cases. It obviously makes no difference whether arms companies are mostly state owned, as in France, or being privatized, as in Britain. The West European arms industry operates in a political-economic environment that is marked by strong government steering and the simultaneous imperative to maximize profits. This cut-throat competition both among West European producers and *vis-à-vis* other producers furthers some destabilizing trends in the arms market:

1. Private dealers are increasingly involved. Big companies often seem to lack the local expertise enjoyed by small trading companies and they are sometimes reluctant to be connected with deals to countries such as Iran. After the Lockheed scandal in the early 1970s, they are also anxious to avoid any connection with the payment of bribes. Although hard data are not readily available, there are indications that the market share of the arms dealers proper is increasing again.[23]

2. There is a sharp trend towards concentration in national arms industries. In 1985 this was most noticeable in FR Germany. The car and truck producer Daimler-Benz acquired large majority shares in Dornier, the second-largest airframe producer in FR Germany, and in MTU (Motoren- und Turbinen-Union), the largest producer of engines for aircraft, tanks and warships. Together with the Daimler-Benz production unit, the Stuttgart-centred holding has a potential for technological advance with financial backing. Messerschmidt-Bölkow-Blohm (MBB), the largest arms production company in FR Germany, in 1985 took effective control of Krauss-Maffei, the largest tank producer.

Efforts continue to concentrate the Italian arms industry, which is currently divided up among a number of state holdings and private industry, led by FIAT. A special industry-government committee has been established to make suggestions as to how to restructure the arms industry and how to increase exports.[24] In Spain, too, there are plans to streamline the arms industry. In the UK, General Electric, the second largest arms producer in the UK after British Aerospace, offered to take over Plessey, the sixth-largest arms producer. Both specialize in electronics.

3. Co-operation between West European arms industries is increasing. One example is the agreement between the British, Italian, West German and Spanish governments to develop and produce a European Fighter Aircraft (EFA) in the 1990s at a planned cost of $20 billion for about 800 aircraft. Increased European co-operation not only has the potential to enhance European competitiveness, but it may also increase pressures to export.[25] Differences in arms export policies among the West European countries are levelled out—at the level of the country with the least restraint—thus facilitating the broad coalitions necessary to finance the development of modern weapon systems. In the case of the Tornado, for example, the West German Government in 1983 gave up the right to veto any sales. In the case of the EFA, there was no talk of imposing export regulations on any participating country.

4. There is a growing willingness to supply arms production technology. In the past, second- and third-ranking arms suppliers like FR Germany or Austria could increase their market shares by specializing in the sale of arms production technology in addition to complete weapon systems. Later, other producers followed suit but until recently France, for example, has been reluctant to part with technology and thus nourish potential competitors. Since 1985, though, it is declared French policy to sell arms production technology. Italy was also reluctant to supply such technology in the past. However, in 1985 Italy signed technology transfer agreements, which included arms production technology, with Argentina, China and India.

5. A final trend concerns the financing of the arms trade. Financial difficulties lead many recipients to demand favourable credit conditions, a factor that is hampering Italian, Spanish and partly also West German and British companies. Both the British and West German governments, however, are now more willing to give guarantees for arms exports. Thus the sale of British parts for the Brazilian AM-X fighter aircraft was exempted by the British Treasury from the usual ban on official support for military exports. In FR Germany similar exemptions have also been made, for example, for the sale of frigates to Turkey. The debt burden of developing countries is further increased—and for the payment of goods that cannot contribute to the repayment of the debt. The possible dire consequences can be seen in the relationship between France and Iraq. Iraq has accumulated large debts for the delivery of French arms. During 1985 the rescheduling of a debt burden of about $4–5 billion continued. The French are banking on an Iraqi victory in the war with Iran.

Arms exports have become an important factor in some West European economics (see table 17.3). Many politicians in Western Europe are trying to increase arms exports. The main reason is economic: when the share of arms exports is as high as 50 per cent of total arms production or even higher, the military-strategic argument of recovering some money spent on weapon projects for national armed forces loses credibility.

In addition to superpower rivalries, the economic interests of West European suppliers are a main obstacle to any attempt at controlling the arms trade.

Table 17.3. Military-industrial data for selected West European and Third World countries, 1984

	Total arms exports according to national sources ($1000m.)	Estimated share of arms exports in		Estimated employment in arms production		Share in world-wide exports of major weapons 1981–5 (%)
		Conventional arms production (%)	Total exports (%)	In 1000s	As share of world-wide arms employment (%)	
France	3.8	50	3.9	330	2.8	10.6
UK	2.6	42	2.8	315	2.7	4.7
FRG	1.7	20	1.0	240	2.1	4.0
Italy	2.5	70	3.4	80	0.7	3.8
Spain	0.6	45	2.5	60	0.5	1.2
Israel	1.0	55	17.0	90	0.8	1.0
Brazil	0.8	90	3.0	100	0.9	0.7
Sweden	0.3	25	1.0	28	0.2	0.2

Sources:

Total exports: Direction of Trade Statistics Yearbook 1985 (International Monetary Fund: Washington, DC, 1985).

Arms production employment: Brzoska, M. and Ohlson, T., 'L'industrie des armes: protégée, secrète, malade . . .', *Le Temps Strategique*, no. 13, 1985.

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FR Germany: Statistisches Bundesamt, *Statistik des Aussenhandels* (Kohlhammer: Wiesbaden, 1985).

Italy: Melega, G., 'Al mercato dei missili', *L'espresso*, 14 July 1985, pp. 34–9; Buxton (see UK).

Spain: Yárnoz, C., 'El Govierno reconoce que no controla el destino final de las exportaciones de material bélico español', *El pais*, 7 Apr. 1985, p. 15; Conde Zabala, P., 'España exportó en 1984 armamento militar por un valor próximo a los 90.000 millones', *Diario 16*, 5 Apr. 1985, p. 8; Mir, P., 'Approximación a la industria militar española', *En peu de pau*, no. 5 (Jan./Feb. 1985), pp. 6–9.

Sweden: Thorsson, I., *In Pursuit of Disarmament, Volume I A* (Liber: Stockholm, 1984); *Report of the Swedish War Material Exports 1984* [in Swedish], Swedish Government report Skr. 1984/85:223.

Israel: Klieman, A. S., *Israel's Global Reach: Arms Sales as Diplomacy* (Pergamon-Brassey's: Washington, DC, 1985).

Brazil: Latin America Regional Reports, 18 Oct. 1985, p. 6; *Defence & Armament*, Feb. 1985, p. 9; *International Defense Review*, Sep. 1985, p. 1413.

Individual countries

Orders for *French* weapons most probably declined in 1985 after a record high in 1984, when the 'Al-Thakeb' deal, involving a mobile air defence system for Saudi Arabia, had driven the order total up to FF 61.8 billion ($7 billion). 1985 saw a reorganization of the machinery of French export sales as well as a reorientation towards new markets. The high proportion of French sales going to Arab countries (76.6 per cent of the official total in 1984) is generally regarded as a problem.[26] With a new policy of more use of industrial knowledge, for instance in marketing, more after-sales efforts and more

enthusiasm for technology transfer it is hoped that the potentially vulnerable Middle Eastern market can be substituted by other areas.

The sale of Tornado aircraft to Saudi Arabia and Oman made 1985 a record year for arms sales by the *UK*. After two meagre years, with sales of just over $1.5 billion in 1983 and little more than $1 billion in 1984, at least $6 billion worth of British weapons were sold in 1985.[27] In the attempt by the British Ministry of Defence to commercialize its arms sales efforts, the former marketing director of British Aerospace was appointed head of the newly reorganized Defence Sales Organization.

In *FR Germany*, the government's willingness to allow more and more arms exports is heavily criticized by many groups, including the churches and the trades unions. The main opposition party, the Social Democrats, has proposed a law restricting sales of 'weapons of war' to Western industrialized countries only. The bill was prompted by the general exemption of ASEAN (Association of South East Asian Nations) countries from close scrutiny in export licensing, the uncontrolled sale of Bo-105 helicopters to the South African police and the Chilean Army and of BK-117 helicopters to Iraq, and the government approval of a West German bid for a munitions plant in Saudi Arabia (said to value up to $3 billion). Although there is no chance of a parliamentary majority for the proposal, the signal to producers in FR Germany and customers in the Third World is clear since the Social Democrats could well regain power in the future.[28]

The reorganization of the *Italian* arms industry, which started in 1984, is making only slow progress. Industry wants more support from the government, in terms of both money and high-level political lobbying for individual sales, while the government wants industry to pool its resources. The government is also weary of the many deals that bypass its authorization machinery.[29] There was government authorization, though, for the main deals negotiated in 1985, for Wadi Class corvettes to Libya and helicopters to Syria. Both countries are on the 'black lists' of many Western suppliers, such as FR Germany and the USA.

Spain has become one of the more important exporters of major weapons. In 1985, sales of CASA aircraft to Jordan, Mexico, Panama and South Africa stand out. Unofficially, the government admits that it has no overview of or control over arms sales and some efforts are therefore being made to introduce stricter rules.[30]

Despite some Swedish sales in 1985, such as RBS-70 SAMs to Australia (and possibly Pakistan), anti-tank mines to FR Germany, AT-4 lightweight anti-tank weapons to the USA, and the BOFI 40-mm air-defence system to Brazil, the *Swedish* arms export industry has considerable problems. Public criticism mounted in connection with the alleged covert deliveries of weapons to countries that according to Swedish regulations may not receive military material from Sweden, such as Bahrein, Dubai and Iran. The largest arms producer, Bofors, is involved in several lawsuits; and the government imposed a temporary ban on exports to Singapore, which was suspected of having authorized false end-use certificates.[31] A public investigation into the foreign subsidiaries of Swedish arms production companies was authorized.

Third World exporters

Third World arms exports received much attention in 1985. Most importantly, Brazil won the British order for a new basic trainer for the Royal Air Force with the Embraer EMB-312 Tucano after fierce competition from Australian, British and Swiss designs. By late 1985 negotiations were also under way for large sales—including licensed production rights—of the Tucano to China, Nigeria and the United States. Brazil also negotiated a large contract with Saudi Arabia for the sale of Engesa EE-T2 Osorio tanks. Norinco (China) and FMC (USA) are negotiating for production rights for Engesa's Cascavel and Urutu armoured vehicles.

Table 17.4 Selected Third World major-weapon exporting countries, 1981–5

Figures are SIPRI trend indicator values, as expressed in US $m., at constant (1975) prices; shares in percentages.

Country	Value of total exports of major weapons	Export value excluding re-exports[a]	Domestically produced share of total exports
Israel	680	617	*91*
Brazil	506	501	*99*
Egypt	375	17	*5*
Korea, South	143	138	*97*
Singapore	79	33	*42*
South Africa	36	36	*100*
Indonesia	28	28	*100*
Argentina	17	17	*100*
Others[b]	570	6	*1*
Total	**2 434**	**1 393**	*57*

[a] Includes indigenous weapons and licensed- or co-production; excludes re-exports of imported weapons.

[b] Leading re-exporting countries are Jordan and Libya.

Production of major weapons is running into a structural dilemma in most Third World countries: there is—except in India—too little domestic demand for what can be efficiently produced and—except in Israel—the high-technology weapons in demand by the domestic armed forces cannot be produced. Arms exports are the obvious solution and, in general, Third World arms exports—booming since the mid-1970s—are still increasing. For the period 1981–5 Third World countries accounted for about 3.7 per cent of global exports of major weapons and for 5.5 per cent of exports of major weapons to the Third World. (Forty-three per cent of Third World exports of major weapons involve re-exports of previously imported weapons.) But there is a limit to the number of countries that can avoid the above-mentioned dilemma via exports. The export market for major weapons is not big enough—amply illustrated by the dominance of Brazil and Israel (see table 17.4). Instead, most Third World countries export small arms, ammunition and services, such as upgrading and modernization of old weapon systems. This explains the large discrepancy between national statistics and SIPRI figures.

Brazilian arms production was from the outset geared towards exports. The

strategy of the leading companies is to use off-the-shelf components from foreign firms and integrate them into 'indigenous' weapon systems. The Tucano and the Osorio exemplify this (see table 17.5). The advantages of using proven components are low costs, short development spans and easy maintenance and repair. Brazil's cheap and easy-to-handle weapon systems largely account for its current export successes. Two constraints might, however, affect Brazilian arms exports in the future. First, the government will face contradictions in the pursuit of its foreign policy goals because of the large and growing number of clients. Second, parts of the Brazilian military are pushing for a rapprochement with the United States which, it is claimed, is necessary in order to raise the qualitative level of future Brazilian weapon systems. This would reduce national control over arms exports. If, for example, the USA decides to produce Tucanos and Engesa vehicles and to supply US high-technology to Brazil, it might mean that Brazil will need US approval to export these weapons to third countries.

Weapons produced in *Israel* are competitive because of low prices, a high technological level and proven combat experience. With the help of the United States, top levels in several areas of military technology have been reached. Markets have been captured even in the industrialized countries. The USA, for example, has recently ordered Kfir fighters, electronics and communications systems, mortars and anti-tank rocket launchers. There is also a joint US–Israeli agreement to develop and produce diesel-powered submarines, corvettes and a new generation of anti-ship missiles. Israel also receives many orders for the upgrading of other countries' arsenals as well as for reconditioned weapons captured in combat.[32] There are two main constraints

Table 17.5. Selected foreign subsystems in the EMB-312 Tucano and the EE-T1/2 Osorio

Weapon system	Sub-system	Producer	Country
EMB-312 Tucano	Avionics (incl. communications)	Collins	USA
	Ejection seats	Martin Baker	UK
	Engine	Pratt & Whitney	Canada
		or Garrett	USA
	Landing gear	Piper	USA
	Propeller	Hartzell	USA
	Wheels and wheelbrakes	Parker-Hannifin	USA
EE-T1/2 Osorio	Engine	MWM	FR Germany
		or MTU	FR Germany
	Fire control	OIP	Belgium
		or SFIM/SAGEM/ Philips	France/ Netherlands
	Gun	GIAT	France
		or ROF	UK
	Image intensifier	Avimo	UK
	Laser detector	Racal	UK
	Suspension	Dunlop	UK
	Tracks	Diehl	FR Germany
	Transmission	ZF	FR Germany
	Turret	Vickers	UK

Source: SIPRI.

on Israeli arms sales. One is the need for US approval of sales of weapons incorporating US components: in 1985, for example, the USA blocked an Israeli sale of upgraded Skyhawk fighters to Argentina. The other bar to Israeli arms sales is the Arab boycott: many countries depend on oil imports from the Middle East and are therefore not inclined to buy arms from Israel.[33]

Partly because of the huge domestic market, *India*'s arms producers have so far avoided the imperative to export. Whereas in most countries the economic pressures to export have led to an almost complete lack of governmental restraint, India is a major exception among Third World arms exporters in that it has a restrictive arms export policy.

With the emphasis on financing arrangements and offsets and with the increasing number of suppliers, it is more and more difficult to find markets for Third World major weapons. This is being felt in *Indonesia*, *the Philippines* and *Taiwan*, but perhaps most of all in *Argentina* and *South Africa*. Argentina is competing in the same area—aircraft and armoured vehicles—as Brazil: only a handful of orders for the Pucará COIN aircraft and the TAM medium tank have been signed during recent years. In South Africa the arms export drive initiated in the early 1980s was intensified during 1985. Military journals were flooded with advertisements for South African weapons, and weapons were displayed at several arms exhibitions. In spite of modest increases, efforts by South Africa to increase exports adequately have so far failed. The recipient countries are few: for example, Chile, Israel, Morocco, Paraguay and Taiwan. Most weapon exports are of small arms and ammunition, including equipment bought on the world market and shipped to various guerrilla movements in Southern Africa. Furthermore, in December 1984 the UN Security Council adopted a resolution requesting all states to refrain from importing South African arms. This further decreases the prospects of the South African export drive.

Having less ambitious arms production policies, *Egypt* and *Singapore* have concentrated their arms export efforts on small arms and munitions and on overhaul and modernization work, mainly of aircraft and armoured vehicles.

With few exceptions, the goal of becoming large exporters of major weapons is illusory for Third World countries. The Brazilian model is difficult, if not impossible, to copy. On a more modest level—and with the emphasis on small arms and services—Third World arms exports can be expected to continue to increase. The increase would be more rapid if the arms market became less competitive, for example through supplier restraint agreements among the industrialized countries or through a reduction of US–Soviet competition for influence in the Third World.

III. Some recipient perspectives

If recipient countries are grouped according to economic characteristics, the influence of economic wealth and domestic arms production capacity on imports of major weapons becomes clear, suggesting likely future directions of the arms trade and Third World arms production. In table 17.6, a World Bank

system of economic regions based on per capita income and some other criteria is used.[34]

The low-income countries (annual per capita income below $440 in 1983) house more than half of the world's population. Their military activity, as measured in shares of world military expenditures and world arms imports, is high when compared to the measures of economic activity, but low when compared to population shares. The two groups of middle-income countries have, compared with their shares in world population, GNP and total imports, relatively low military expenditures. But their arms imports are large which suggests that for these groups arms imports take up a large share of the resources allocated to the military. Relative to the economic indicators, the group of high-income oil exporters includes the largest spenders on the military both internally and via imports of major weapons. Both in the industrial market economies and the East European non-market economies, arms imports are low when compared with the level of military expenditure and economic indicators. Table 17.6 shows that arms imports are relatively higher for countries that are beyond the poorest groups and in which the capacity to absorb modern weapons and to pay for them increases. But at the upper end of the spectrum arms imports decrease again, as domestic arms production becomes the main source of supply for the national armed forces.

The recent world economic crisis has widened the gaps between the poorer and richer Third World countries. Some have advanced considerably on the road to industrialization. They have also built up arms industries and have begun to add substantial domestic production to their imports of arms. Others are facing less favourable economic conditions now than a decade ago. Their capacity to import arms is reduced. Of course, there are specific circumstances in all regions that influence such basic trends, the most important being the incidence of conflicts and wars.

Table 17.6. Shares in world economic and military sectors by economic region, 1983

Economic regions	Percentage of world population	Percentage of world GNP	Percentage of total world imports	Percentage of world military spending	Percentage of world-wide imports of major weapons 1981–5
Low-income economies (per capita GNP <$440)	50.4	5.0	3.1	7.5	9.9
Lower middle-income economies (per capita GNP $440–$1639)	14.4	4.1	6.1	2.3	19.6
Upper middle-income economies (per capita GNP >$1639)	10.8	8.5	13.2	3.1	26.7
High-income oil exporters	0.4	1.8	3.8	5.0	10.8
Industrial market economies	15.7	66.8	65.0	52.4	25.4
East European non-market economies	8.3	13.7	8.8	24.7	7.5

Sources: World Bank, *World Development Report 1985* (Oxford University Press: New York, 1985); SIPRI.

Latin America

By the mid-1980s Latin American—or at least South American—arms procurement had decreased considerably, both in terms of deliveries and new weapon orders. This is largely the result of two factors: the huge external debt of the region—estimated at some $360 billion in late 1985—and the easing up of several intra-regional tensions. (Some Central American countries, e.g., El Salvador, Guatemala, Honduras and Nicaragua, do not follow this trend since their military sectors are being propped up by US or Soviet military aid programmes; see chapter 16.)[35]

The recent shift to civilian rule in many South American countries also contributed to the change in priorities. In 1985 *Peru* took the lead in attempting to cut military spending throughout the region. Early in the year the licensed production of 66 Italian MB-339A/K trainer and ground-attack aircraft was cancelled. When President Alan García came to power in the summer, he proposed a regional pact (much like the 1974 Declaration of Ayacucho) that would reduce military spending and the size of the armed forces on the sub-continent. As a first step he cut the number of Mirage-2000 fighters on order from 26 to 12. Peru, however, has to find a buyer for the remainder. Garciá also initiated high-level talks on mutual arms reductions with Chile and Ecuador—countries with which Peru has long-standing territorial disputes.

The Pinochet regime in *Chile*, facing severe economic problems and anxious to improve its international diplomatic status, responded favourably to the Peruvian proposal. Chile's relationship with *Argentina* was improved in 1985 after the signing of an agreement over the Beagle Channel. The Argentinian President Raúl Alfonsín reduced military spending and very few orders for new weapons were signed in 1984–5. *Brazil* is negotiating several large orders for weapons, technology and production co-operation with West European companies, especially with British firms as a result of the British order for the Tucano aircraft. Most of these orders are, however, connected to Brazil's arms export efforts and do not represent a major domestic arms buildup.[36]

The Ayacucho Declaration, followed by related meetings in 1975, 1978 and 1980, never attained the status of a binding agreement. Historically, disarmament proposals in Latin America are characterized by much rhetoric but few concrete measures. During 1985 Argentina, Chile, Ecuador and Uruguay came out in support of President García's pledge for arms reductions With the current economic situation the prospects for regional disarmament seem better than ever before.

Africa

Delivery of major weapons to Africa has been declining for some time now: the trend can be found throughout the continent. The decline in major arms imports coincides with numerous potential conflicts and wars in progress on the continent.

For some time *Libya* has been the largest arms importer in Africa. The Soviet Union has supplied large quantities of weapons since the early

1970s—according to US estimates, valued at a total of up to $15 billion. Libya reportedly still has to pay an estimated $4–5 billion with hard currency earned from sales of oil.[37] But the current oil glut, plus the costs of ongoing civilian and military programmes, make it difficult for Libya to pay. This is one reason for the substantial decline in Libyan arms imports in recent years. Another reason is political differences between Libya and the Soviet Union. These result from Libyan criticism of Soviet behaviour during the Israeli invasion of Lebanon in 1982, Soviet attempts at reconciliation with more moderate regimes in the Middle East and mutual criticism of conduct in the Iraq–Iran war (where the Soviet Union is the main supplier of major weapons to Iraq and Libya is a major supplier of second-hand equipment to Iran). Although Libya reportedly asked the Soviet Union to sign a treaty of friendship and co-operation in early 1983, no such accord is recorded so far. Agreements for new deliveries from the Soviet Union to Libya were limited to air defence systems in 1985. After the US hijacking of an Egyptian plane to Italy in November 1985 the Soviet Union speeded up the agreed supply of SA-5 Gammon surface-to-air missiles. When Colonel Qadhafi visited Moscow in October 1985, Libyan requests for arms were referred to a special Soviet–Libyan commission for study. Libya is increasingly turning to other suppliers: in 1985, corvettes were ordered from Italy, and negotiations for the supply of armoured vehicles and aircraft from Brazil are advancing. Political bridges that were broken in 1982, when the Brazilian armed forces stopped a Libyan transport aircraft loaded with weapons for Nicaragua from continuing its flight from a Brazilian airport, have been repaired. A further potential source of weapons, technical assistance and other military material is Greece, with agreements signed in both 1984 and 1985. Details have still to be worked out, but Greece has underutilized military-industrial capacities for the manufacture of ammunition, aircraft overhaul and Austrian-designed armoured vehicles.

Southern Africa continues to be harassed by a multitude of conflicts. In *South Africa* the various armed forces, notably the police, are used to combat civil strife. Police equipment has, in the interpretation of a number of important supplier governments, not fallen under the 1977 mandatory arms embargo against South Africa. Thus police equipment, such as helicopters (from FR Germany) and computers (from the UK and USA),[38] keeps coming into the country. The arms embargo is most effective when it comes to major weapons: here the South African forces are running into problems. New fighter aircraft, maritime surveillance aircraft, and major submarines and surface ships are overdue, but cannot be procured or produced in the country. Other weapons—less demanding in technology and more suited against poorly armed enemies—can be produced in South Africa. Only some components have to be procured from other countries. In some cases this can be done legally, for example from countries that do not have vital components on their embargo lists, in other cases it has to be done illegally.

In military terms, South Africa is vastly superior to its neighbours in the region. Substantial arms deliveries by the Soviet Union in the past have not reduced this superiority. *Angola* has turned to France for the supply of helicopters, and *Mozambique* has lobbied for military aid from the USA,

Portugal and the UK, though amounts granted are small. *Zimbabwe*, which received weapons from Brazil, China, North Korea and the UK in the past, is finding it increasingly costly to maintain its broad mix of weapons and has not been able to decide on a more concentrated procurement approach. The only real challenge to South African armed forces in the region are the 30 000–35 000 Cubans in Angola. Prospects for their withdrawal declined when the US Congress lifted the Clark Amendment on 10 July 1985.

The Middle East

The Middle East is the largest arms-importing region in the Third World. It has accounted for approximately half of total Third World arms imports ever since the Six-Day War of June 1967. The many conflicts in the region ensure a constant and high demand for new weapons. Six of the 10 highest-ranking Third World Arms importers are located there (table 17.7). In addition to being fuelled by the Arab–Israeli conflict, many of the arms acquisitions during 1981–5 arise from the Iraq–Iran War—now in its sixth year.

During 1985 this war was on both sides characterized by a higher level of risk-taking than before. Both sides stepped up their attempts to disrupt the main source of revenue of the other—the flow of oil. Attacks on shipping in the Gulf increased (with Iraq reportedly responsible for about 70 per cent of the attacks); Iraq also intensified its attempts to destroy Iran's main oil outlet, the Kharg Island terminal. The main danger is that if the terminal were to be totally destroyed, Iran would stand to lose nothing from attempting everything in its power to stop *all* oil flows through the Straits of Hormuz. This would probably lead to a geographical escalation of the conflict.

In spite of these risks, little restraint is shown by arms suppliers. During 1985 *Iraq* received from the Soviet Union additional MiG-23/-25 and Su-20 fighter aircraft armed with various missiles, T-55/-62/-72 tanks and additional

Table 17.7. Rank order of the 20 largest Third World major-weapon importing countries, 1981–5

Percentages are based on SIPRI trend indicator values, as expressed in US $m., at constant (1975) prices. Rank order for the period 1980–4 is given in brackets.

Importing country	Percentage of total Third World imports	Importing country	Percentage of total Third World imports
1. Iraq (3)	*13.7*	11. Pakistan (12)	*2.2*
2. Egypt (1)	*10.3*	12. Cuba (8)	*2.1*
3. Syria (2)	*7.8*	13. Nigeria (16)	*1.8*
4. India (4)	*7.4*	14. Algeria (18)	*1.8*
5. Libya (5)	*6.0*	15. Venezuela (20)	*1.6*
6. Saudi Arabia (6)	*5.5*	16. Morocco (14)	*1.5*
7. Israel (7)	*3.9*	17. Angola (–)	*1.5*
8. Argentina (9)	*3.5*	18. Peru (17)	*1.4*
9. Jordan (10)	*2.5*	19. Kuwait (–)	*1.3*
10. Taiwan (11)	*2.4*	20. Iran (–)	*1.2*
		Others	*20.6*
		Total	*100.0*
		Total value	**42 516**

surface-to-air missiles. France delivered about 100 AM-39 Exocet missiles and took an order for 24 Mirage F-1Cs (in addition to 89 already delivered). Brazil delivered Avibras Astros multiple rocket launch systems (MRLSs). Chile continued its supply of Cardoen cluster bombs. Other suppliers to Iraq include, for example, Jordan, re-exporting Austrian Noricum GHN-45 howitzers, and FR Germany, which delivered 6 BK-117 helicopters. Equipment-wise, Iraq has a substantial advantage and a qualitative edge over Iran: Iraq's two main suppliers, the USSR and France, deliver large quantities of high-quality major-weapon systems on favourable credit terms in open government-to-government transactions.

Iranian arms procurement is largely more circuitous and has a rather different composition (this explains Iran's low ranking in table 17.7). The reporting on Iranian arms imports is often speculative and unverifiable; there are also cases of deliberate disinformation. However, the following patterns are discerned: first, there are deliveries of mainly Soviet-made major-weapon systems and spares from Libya, North Korea and Syria; second, there are covert deliveries of subsystems and spares for Iran's largely US-made inventory from Israel, Western Europe and from private arms dealers and Iranian agents in the USA; and third, there are deliveries of civilian-labelled items which may be put to military use, such as British Hengam Class logistic ships or Swiss PC-6/-7 training aircraft. The category of unconfirmed deals includes alleged Iranian orders placed with China and Taiwan.[39] During 1985 Iran also reached agreement with the West German shipyard HDW on delivery of 6 Type-209 submarines once the Iraq–Iran War is over.

Saudi Arabia negotiated or finalized several major arms purchases during 1985, all illustrating the leverage many recipients now exert over the suppliers. Companies bidding for Saudi contracts are obliged to provide offset proposals amounting to at least 35 per cent of the contract value for programmes to create a high-technology industrial infrastructure in Saudi Arabia. The offset proposals were evidently a decisive factor when a US consortium headed by Boeing was awarded three contracts, valued at $1.2 billion, for the Saudi Arabian Peace Shield air defence command, control and communications (C^3) package.[40]

Supplier competition is also illustrated by the Saudi purchase of main battle tanks (in addition to US M-60s and French AMX-30s already in service). After evaluating the British Challenger, the French AMX-40 and the US M-1 Abrams, a decision has reportedly been taken to acquire the Brazilian EE-T2 Osorio. According to preliminary reports Saudi Arabia may purchase up to 1000 tanks and another 1000 on behalf of Iraq. Offset arrangements would include the setting up of a factory for local assembly of the tank in Saudi Arabia. Related to this deal are the ongoing negotiations with Rheinmetall and Thyssen of FR Germany on technology transfer for local production in Saudi Arabia of tank guns and howitzer and tank ammunition.

Syria, having carefully evaluated the lessons of the 1982 Lebanon War, is currently re-building its air defences with Soviet weapons, radar, communications and electronic warfare equipment. However, attempts at supplier diversification are visible: French helicopters are on order and negotiations are

under way with Italy for the purchase of US-designed helicopters (see appendix 17B). It is also reported that some 2000 Soviet military advisers—out of an estimated total of 5000—have been sent home by the Syrian Government.[41]

The Middle East is the Third World region in which the prospects for regional arms control measures are smallest. Conflicts, money and a desire for advanced weapons interact with the suppliers' hopes for political influence through arms transfers. One possible step would seem to be US–Soviet consultations on regulating and restraining the flow of arms to the region.

South Asia

South Asia is an exception to the general downturn in imports of major weapons. *Pakistan* and *India* continued to import large amounts of major weapons in the early 1980s. The USA and China are major suppliers for Pakistan, while the Soviet Union is the largest supplier for the Indian armed forces, followed by the UK and France. There were new orders in 1985 by both countries from their traditional suppliers. Pakistan in addition reportedly ordered Amazon Class frigates from the UK in a deal worth up to $1 billion. Indian efforts at diversification were only temporarily disrupted by the disclosure of extensive spying activity into Indian military affairs. Diplomats from France, the German Democratic Republic, Poland and the Soviet Union were forced to leave the country.

Pakistani military planners are now considering the procurement of US weapons after the end of the current six-year military aid programme in 1987. In addition to ground-force material, more F-16 fighter aircraft and missiles for these aircraft will be sought. Advanced early-warning aircraft are also needed. When Pakistan tried to obtain E-2C Hawkeye aircraft there was heavy opposition from India and, in July 1985, the US Administration made it clear that such aircraft would not be provided.[42]

Arms imports by *Sri Lanka* have increased sharply since internal fighting among different population groups began in July 1983. Arms imports are still at a low level, comprising some armoured vehicles from the UK and, reportedly, South Africa (via a third party), helicopters from Singapore and the USA, large command ships from Singapore and the Netherlands, and small gunboats from China, the USA and Israel. But they have led to a sharp increase in military expenditures in a country that was once ranked among those with the lowest military expenditures world-wide. If no settlement can be reached, more arms will be imported—negotiations for Brazilian armoured vehicles, small Italian aircraft and aircraft produced under licence in Thailand, for example, are under way. The Indian Government took part in negotiations for such a settlement in 1985, and there were also talks between Indian and Pakistani officials on security issues. The general rapprochement in the region mounted in a meeting of the heads of state of Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka in early December 1985 in Dacca. An agreement for a South Asian Association for Regional Co-operation was signed. Many conflicts remain to be solved.

The Far East

After reaching high levels in the 1960s and 1970s, Far Eastern arms purchases stabilized during the early 1980s at 9–10 per cent of total major-weapon imports by the Third World.

The steady level of arms flows to the Far East should be viewed mainly in an East–West perspective. The world economic recession during the early 1980s did not hit the region very hard and the credit flows are still open. In South-East Asia, the ASEAN countries (Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand) as well as Laos and Viet Nam are enhancing their ability to meet external threats (see appendix 17C).

On the Korean peninsula, the main development during 1985 was the revitalization of military ties between the Soviet Union and North Korea. Soviet Deputy Prime Minister Aliyev visited Pyongyang and three Soviet naval units, led by a Kara Class cruiser, made a call at the port of Wonsan (the first naval visit ever by Soviet warships to North Korea). These diplomatic overtures were accompanied by the delivery of some 30 of the 40–60 MiG-23s ordered by North Korea, reportedly in exchange for Soviet rights to use North Korean airspace for reconnaissance missions.[43] While not substantially shifting the balance of airpower, the MiG-23 deliveries indicate an assertive Soviet stance, no doubt partly prompted by the South Korean purchase of F-16s (delivery of which will start in 1986).

The current prospects for regional disarmament endeavours in the Far East are not good. The region is steadily growing in economic and strategic importance to the superpowers and there are more funds available for armaments than in, for example, Africa or Latin America. Mutual arms reductions are not on the agenda: current military co-operation—such as that within ASEAN—is more in the nature of a co-ordinated arms buildup.

IV. Conventional arms control in the Third World

Arms transfer control has been heading up a dead-end street for many years. No international treaty or other formal interstate arrangement aimed at reducing the level of conventional armaments is in force. Conventional weapons abound in all countries.

There are many reasons for this, all of them originating in the lack of political will among both suppliers and recipients of arms and military technology. With few exceptions the main producers/exporters—arms industries as well as government decision-makers—are pushing harder than ever to sell their products. Their national security policies usually emphasize the importance of keeping a broad arms production base to satisfy domestic needs should war occur. When there are simultaneous pressures to economize on peacetime domestic procurement expenditures, arms exports are seen as a way out. Export efforts are further strengthened by competition from new suppliers: fears of losing market shares and political influence in the recipient countries reduce the suppliers' propensity to restrain the arms trade.

The recipients, for their part, oppose restraint by suppliers since such

measures are seen as paternalistic and discriminatory. It is also argued that the legitimate security needs of the recipients are not taken into account. Furthermore, the increasing number of arms producers has made attempts to control the proliferation of conventional weapons even more difficult. Even if some measure of supplier control were to be implemented, the multitude of suppliers and the technological know-how already acquired in most industrialized and in many Third World countries would enable the recipients to continue purchasing or producing weapons.

Prospects for increased Third World military security through a reduction of conventional armaments do not appear encouraging. It can even be argued that the risk of conflicts is increased through enhanced capabilities to sustain war efforts. Similarly, it can be argued that most tensions within and among Third World countries are largely the result of local or regional economic, social and political problems. Such problems might be exacerbated through arms imports and arms production via diversion of scarce resources or distortion of the domestic industrial structure.

Furthermore, the current structure of the arms market may in itself complicate attempts at arms reductions. Offsets and barter agreements have commercialized and privatized the arms market. The civilian sectors are now more enmeshed in arms sales than before through civilian offsets, transfers of civil and dual-use technology and so on. Commercialization and privatization are detrimental to arms control, since control is by definition the *responsibility of the governments*. Nevertheless, the current state of the arms market invites some optimism.

First, the situation with a buyer's market and declining demand for weapons is a new and therefore unpredictable one. Increasing economic pressures to export and growing pressures not to import seem to leave some room for restraint. The opportunity-cost argument is gaining weight with recipients facing tremendous debt burdens. If a sufficient number of recipient countries were to reduce their military budgets—now under discussion in Latin America—the opportunity-cost argument could become more powerful also among the producers/exporters.

Second, the pressure on governments to take a firmer grip on arms transfers is mounting in many supplier countries as a result of politically embarrassing revelations of recent dubious arms export deals: US companies and trade agents have illegally smuggled spare parts and other military equipment to Iran; Austria has sold artillery pieces to Jordan for immediate retransfer to Iraq; Britain and the USA, among others, are being accused of circumventing the UN embargo on arms sales to South Africa; in Sweden police and customs investigators are looking into alleged arms smuggling to several states in the Middle East. Other examples include the sale of Swiss training aircraft to both Iran and Iraq, and of West German and US helicopters to Iraq on commercial, non-military terms on the pretext that they are for civilian use only.

Third, another reason for governments—especially those of the superpowers—to apply stricter control is the fear of high technology ending up in the hands of the 'other side'. This includes the fear of illegal or unintended technology transfers. Two much publicized examples of this during 1985 were

the diversion to North Korea of 87 US-made Hughes helicopters via a West German company and the defection to Pakistan of Afghan pilots in two modern Soviet Mi-24 Hind-D helicopter gunships.

Conventional arms control is currently the subject of much debate. The Interaction Council—a lobbying group of former heads of government—held a seminar in April 1985 on Third World military spending which resulted in a position paper; the Independent Commission on Disarmament and Security Issues (Palme Commission) held a conference on Third World security in early 1986; and a UN Special Conference on Disarmament and Development will take place in 1986. Even if this conference takes the form of an exchange of irreconcilable political statements, there will be renewed interest in such subjects as arms and conflict in the Third World, superpower rearmament and Third World security, the arms trade, Third World arms production, and so on.

Much of the accumulated knowledge and suggestions in this field—as well as some new proposals—were put together in a 1982 UN Report on Disarmament and Development.[44] There is also a large body of literature on various proposals for arms transfer control.[45] What is lacking is the effort to *link diagnosis to policy prescriptions*. Diplomats and politicians argue that, since there is little hope of changing the current situation, the effort is not worthwhile. In the academic field the feeling is that although many good suggestions have been made in the past—for example, on arms transfer control, open reporting of arms production and arms transfers, reductions of military budgets in favour of development funds, superpower codes of conduct, intervention-free zones, regional security arrangements and so on—there is a profound lack of political will.

In order to be successful any restriction on military transfers must offer advantages for all concerned parties—no agreement will be reached for its own sake. Such advantages may be found in the growing awareness, enhanced by the bad performance of the world economy in the early 1980s, that security (national, regional or global) not only includes the absence of foreign intervention and domination by military means, but also includes some minimum of economic well-being. Disarmament does not automatically generate development, but—given the scantiness of resources—it is in many cases *one* important prerequisite for development.

Notes and references

[1] The facts, problems and achievements of Third World arms production and exports are described in Brzoska, M. and Ohlson, T. (eds), SIPRI, *Arms Production in the Third World* (Taylor & Francis: London, 1986).

[2] In general, SIPRI's coverage of Soviet arms exports is less reliable than the coverage of exports by Western countries due to the uncertainty and irregularity of data. In particular, SIPRI perhaps underestimates intra-Warsaw Pact arms transfers. Statements to the opposite effect are unfounded. For such a statement, see for example Kozyrev, A., *The Arms Trade: A New Level of Danger* (Progress: Moscow, 1985), p. 10.

[3] *DMS-International Defense Intelligence*, vol. 7, no. 47 (25 Nov. 1985), pp. 1–3. The total figure given in the Pentagon report includes both arms sales and contracts for overseas military construction. Leading Third World recipients on the list are Saudi Arabia, Taiwan, Thailand, Egypt, South Korea and Pakistan.

[4] Neuman, S., 'Coproduction, Barter and Countertrade: Offsets in the International Arms Market', *Orbis*, vol. 29, no. 1 (Spring 1985), pp. 183–214.

[5] Gwertzman, B., 'Report says U.S. may use Saudi bases', *International Herald Tribune*, 6 Sep. 1985.

[6] Shapiro, M., 'House approves ban on arms sales to Jordan', *Washington Post*, 13 Nov. 1985, p. 6.

[7] Such contributions include US savings through joint development of intelligence systems, more US arms exports resulting from Israel's military reputation (for example, F-16s, E-2C, Model-500MDs and other weapon systems whose quality the Israelis have demonstrated) and sharing with the United States improvements made to US weapons in the light of Israeli combat experiences. See also 'The reaffirmation of US–Israeli strategic relations', *Contemporary Mideast Backgrounder* (Media Analysis Center: Jerusalem), no. 211 (23 June 1985), p. 1–6.

[8] The US DoD negotiated offset arrangements between US arms industries and other countries in connection with FMS sales until May 1978. At that time a DoD directive stated that the government should withdraw from such negotiations mainly on the grounds that offset commitments were pure business judgements and that the responsibility for fulfilling the offset should be the contractor's, not the government's. In 1984 a Defense Production Act extension introduced a provision stating concern about the lack of data on the effect of offsets on US technology leadership, defence preparedness and employment. This was prompted by a General Accounting Office (GAO) report of April 1984. Federal agencies conducting investigations into the extent and effect of offsets during 1985 included the Office of Management and Budget, the International Trade Commission and the Departments of Defense, Labor and Commerce.

[9] See Neuman (note 4).

[10] A 1985 Pentagon study on technology transfers claimed that more than 5000 Soviet weapon projects have benefited from research data and technology obtained from the USA and its allies. A North Atlantic Assembly report recommended improved and co-ordinated export regulations and procedures, *Interim Report by the Sub-Committee on Advanced Technology and Technology Transfer* (North Atlantic Assembly: Brussels, Oct. 1985), AC 187-STC/AT (85). Recent US measures on technology transfers include (*a*) new regulations for the control of commercial exports of defence articles (ITAR), (*b*) a revised Export Administration Act (EAA) including a merger of the Commodity Control List (CCL) with the (updated) Military Critical Technology List (MCTL) and (*c*) a Senate provision requiring the Administration to notify Congress of upgrades in the technology or mission capability of equipment sold under FMS, if the upgrades are made after approval of the sale.

[11] *DMS-International Defence Intelligence*, vol. 7, no. 39 (30 Sep. 1985), p. 2.

[12] 'New draft of CPSU programme', *Soviet News*, 30 Oct 1985, p. 401 (Part III).

[13] Lewis, W. H. and Moss, S. C., 'The Soviet arms transfer program', *Journal of Northeast Asian Studies*, Fall 1984, p. 5.

[14] Dyker, D. A., 'The economy', *Soviet Armed Forces Review Annual, Vol. 8 (1983/84)*, ed. D. R. Jones (Academic International Press: Orlando, FL, 1984), pp. 202–3.

[15] Ali, S., 'The Soviet connection', *Far Eastern Economic Review*, 7 Mar. 1985, p. 34.

[16] See Ali (note 15), p. 36.

[17] See Kozyrev (note 2), p. 18.

[18] Lewis, W. H., 'Emerging choices for the Soviets in Third World arms transfer policy', *World Military Expenditures and Arms Transfers 1985* (US Arms Control and Disarmament Agency: Washington, DC, 1985), p. 31.

[19] See Kozyrev (note 2), pp. 17–18.

[20] See Kozyrev (note 2), p. 25.

[21] See Kozyrev (note 2), pp. 173–96.

[22] See *Soviet News* (note 12), p. 402 (Part III:3).

[23] Ralet, O., *Illegale Wapenhandel* (EPO: Berchem, 1982).

[24] De Brigantini, G., 'Italian defence industry's status threatened', *Armed Forces Journal International*, vol. 122, no. 10 (May 1985), p. 113.

[25] Hagelin, B., 'Multinational weapon projects and the international trade', in SIPRI. *World Armaments and Disarmament, SIPRI Yearbook 1984* (Taylor & Francis: London, 1984), pp. 151–63.

[26] Isnard, J., 'Ventes d'armes records pour la France en 1984: 61,8 milliards de francs', *Le Monde*, 17 Apr. 1985.

[27] *Defense & Economy World Report*, 1/8 July 1985, p. 1; *Milavnews*, June 1985, p. 15.

[28] Feazel, M., 'New liberal arms export rules force review of German policy', *Aviation Week & Space Technology*, 2 Dec. 1985, p. 27–8.

[29] Melega, G., 'Al mercato dei missili', *L'Espresso*, 14 July 1985, pp. 34–6.

[30] Yárnoz, C., 'El gobierno reconoce que no controla el destino final de las exportaciones de material bélico español', *El País*, 7 Apr. 1985, p. 15.

[31] End-use certificates are required by almost all governments. The state issuing the end-use certificate guarantees that weapons delivered stay in the country. End-use certificates are a minimum requirement for government control by international law—without them, the UN arms embargo on South Africa could not be followed by a government. End-use certificates can be obtained illegally, however. Private dealers estimate that a mark-up of 10–30 per cent of the weapons price is sufficient to secure an end-use certificate. See Ralet (note 23), pp. 84–5.

[32] The most publicized such arrangement, denied in Israel, is an alleged agreement which includes the modification of up to 9000 Chinese tanks with new guns and fire control systems. It has been suggested that the affair is being handled via Hong Kong. A conspicuous fact is that Israel is one of very few non-oil-exporting countries to have a trade surplus with Hong Kong. Reports suggesting that there are links between Israeli sales to China and Chinese arms exports to Iran (see note 39) are emphatically denied by all parties. See also Howe, R. W., 'Israel's arms sales to China believed to exceed $1 billion', *Washington Post*, 24 Jan. 1985, p. 1.

[33] Israeli arms sales are extensively analysed in Klieman, A. S., *Israel's Global Reach: Arms Sales as Diplomacy* (Pergamon-Brassey's: Washington, DC, 1985).

[34] World Bank, *World Development Report* (Oxford University Press: New York, 1985), p. 168.

[35] Support for the contras in Honduras and Nicaragua also reached a higher level in 1984–5 with the receipt of Soviet-made SA-7 Grail shoulder-fired SAMs (*Milavnews*, Aug. 1985, p. 13); in late 1985 a Nicaraguan Mi-8 helicopter was downed by one of these missiles.

[36] The Brazilian Navy is an exception. Ferranti (UK) and Aérospatiale (France) have received orders for equipping V-28 Class frigates; the Navy has also ordered US and French helicopters and is considering a purchase of BAe Sea Harrier fighters for its aircraft carrier *Minais Gerais*. British Sea Skua anti-ship missiles are also on order.

[37] Ramet, P., 'Soviet–Libyan relations under Qaddafi', *Survey*, vol. 29, no. 1 (1985), p. 110; *Milavnews*, Nov., 1985, p. 11.

[38] *DMS—International Defence Intelligence*, vol. 7, no. 39 (30 Sep. 1985), pp. 2–3 (the sale of computers to the police was officially embargoed from 1978, a provision that was made again by President Reagan in August 1985); *New Scientist*, 12 Sep. 1985.

[39] In early 1985 the London-based Arabic newsletter *Al Taqrir* reported that Iran had signed a $1.6 billion arms-for-oil deal with China. The report contained detailed information on the content of the contract—allegedly signed during a visit of a 100-man Iranian delegation to Beijing. It also suggested that Iran would supply China with 2 million tonnes of crude oil over two years and pay a quarter of the bill in hard currency. Iran denied the report and China dismissed it as fabrication. See, for example, *The Times*, 27 Mar. 1985 and *Daily Telegraph*, 2 July 1985. The alleged purchase from Taiwan is said to cover $300–400 million worth of mortars, rifles, munitions and other equipment to be paid for with crude oil. Taiwanese government officials either denied, or denied knowledge of, such an arrangement. See *Financial Times*, 27 July 1985.

[40] Offset negotiations were not finalized by late 1985, but are thought to include, among other things, the creation of a telecommunications manufacturing capability.

[41] *Defense & Foreign Affairs*, July 1985, p. 1.

[42] *Far Eastern Economic Review*, 26 Sep. 1985, p. 34.

[43] Nations, R., 'Love boat to Wonsan', *Far Eastern Economic Review*, 29 Aug. 1985, pp. 22–3 and 'China's Korea fiasco', *Far Eastern Economic Review*, 26 Sep. 1985, p. 56.

[44] *Development and International Economic Co-operation. Study on the Relationship between Disarmament and Development* [The Thorsson report], UN document A/36/356 (United Nations: New York, 1981).

[45] Some important early proposals and measures for regulating arms transfers include the 1890 Brussels Act (regulating arms sales to Africa), the 1919 Covenant of the League of Nations (concerning restrictions on private arms manufacture and international supervision of the arms trade), the 1919 St Germain Convention (which attempted to regulate arms transfers in Europe and some parts of Asia and Africa) and the 1925 Geneva Convention (which mainly dealt with open reporting on arms transfers—this was also the first time that the inequity argument was forcefully voiced). In the 1950s there were various proposals from France and the USSR suggesting the creation of development funds through the reduction of military budgets in industrialized and Third World countries. Detailed accounts of these and other early proposals are given in SIPRI, *The Arms Trade with the Third World* (Almqvist & Wiksell: Stockholm, 1971), pp. 86–132 and in Brzoska, M., *Rüstung und Dritte Welt* (Weltforum Verlag: Köln-London, 1981), pp. 91–114.

Appendix 17A. Aggregate tables of the value of the trade in major weapons with the Third World, 1966–85

Table 17A.1. Values of imports of major weapons by the Third World: by region, 1966–85[a]

Figures are SIPRI trend indicator values, as expressed in US $m., at constant (1975) prices.
A = yearly figures, B = five-year moving averages.[b]

Region code	Region[c]		1966	1967	1968	1969	1970	1971	1972
8	Middle East	A	440	1 063	1 258	1 212	1 462	1 758	1 076
		B	718	883	1 087	1 351	1 353	1 544	1 869
9	South Asia	A	391	271	297	312	300	499	409
		B	250	297	314	336	363	362	374
12	North Africa	A	122	135	83	87	121	123	167
		B	92	102	110	110	116	129	157
15	South America	A	138	128	208	158	148	222	310
		B	127	148	156	173	209	238	296
10	Far East (excl. Viet Nam)[d]	A	497	199	266	586	271	419	162
		B	339	378	364	348	341	348	281
13	Sub-Saharan Africa (excl. S. Africa)	A	93	81	55	71	121	134	89
		B	78	79	84	92	94	113	176
14	Central America	A	21	16	8	10	6	47	35
		B	19	15	12	17	21	31	46
	South Africa	A	92	78	45	46	77	69	25
		B	90	89	68	63	52	51	96
11	Oceania	A	—	—	—	—	—	—	—
		B	—	—	—	—	—	—	—
	Total (excl. Viet Nam)[e]	**A**	**1 794**	**1 971**	**2 220**	**2 482**	**2 506**	**3 272**	**2 273**
		B	**1 715**	**1 990**	**2 195**	**2 490**	**2 551**	**2 816**	**3 295**
	Viet Nam	A	237	494	473	298	433	435	1 200
		B	274	315	387	427	568	490	467
	Total[e]	**A**	**2 031**	**2 465**	**2 693**	**2 780**	**2 939**	**3 707**	**3 473**
		B	**1 989**	**2 305**	**2 582**	**2 917**	**3 118**	**3 305**	**3 762**

[a] The values include licensed production of major weapons in Third World countries (see appendix 17C). For the values for the period 1950–6, see *SIPRI Yearbook 1976*, pp. 250–1; and for 1957–65, *SIPRI Yearbook 1978*, pp. 254–5.

[b] Five-year moving averages are calculated from the year arms imports began, as a more stable measure of the trend in arms imports than the often erratic year-to-year figures.

[c] The regions are listed in rank order according to their five-year average values in the column for 1983. The region code numbers in the first column correspond to those used in the arms trade registers (appendices 17B and 17C).

[d] Viet Nam is included in the figures for the Far East after 1975, the year the Viet Nam War ended.

[e] Items may not add up to totals due to rounding.

— Nil.
.. Not applicable.

Source: SIPRI computer-stored data base.

1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2 211	2 836	3 527	3 613	5 190	4 018	3 512	4 859	3 480	4 332	4 446	5 165	3 928
2 282	2 653	3 475	3 837	3 972	4 238	4 212	4 040	4 126	4 456	4 270	..	..
289	373	177	414	663	1 077	541	765	938	971	749	780	1 006
349	332	383	541	574	692	797	858	793	841	889	..	..
145	228	761	929	948	1 337	2 281	1 524	1 164	1 357	690	579	391
285	444	602	841	1 251	1 404	1 451	1 533	1 403	1 063	836	..	..
352	446	630	710	826	713	798	649	816	769	1 006	993	476
392	490	593	665	735	739	760	749	808	847	812	..	..
302	249	640	1 035	653	2 367	1 964	1 180	876	659	872	748	810
354	478	579	989	1 332	1 440	1 408	1 409	1 110	867	793	..	..
152	386	232	432	1 148	1 269	299	788	709	603	459	774	414
199	258	470	693	676	787	843	734	572	667	592	..	..
56	87	137	58	60	110	80	605	453	470	252	159	105
72	75	80	90	89	183	262	344	372	388	288	..	..
37	274	179	118	211	253	120	80	10	11	73	2	2
117	127	164	207	176	156	135	95	59	35	20	..	..
—	—	—	3	—	3	3	1	2	4	9	2	2
—	—	—	—	2	2	2	3	4	4	4	..	..
3 545	**4 878**	**6 284**	**7 312**	**9 699**	**11 147**	**9 598**	**10 451**	**8 448**	**9 176**	**8 558**	**9 202**	**7 134**
4 050	**4 858**	**6 344**	**7 864**	**8 807**	**9 641**	**9 869**	**9 764**	**9 246**	**9 167**	**8 503**	..	..
82	185	20										
384	—	—										
3 627	**5 064**	**6 304**	**7 312**	**9 699**	**11 147**	**9 598**	**10 451**	**8 448**	**9 176**	**8 558**	**9 202**	**7 134**
4 435	**5 156**	**6 401**	**7 905**	**8 810**	**9 641**	**9 869**	**9 764**	**9 246**	**9 167**	**8 503**	..	..

Table 17A.2. Values of exports of major weapons listed in table 17A.1: by supplier, 1966–85[a]

Figures are SIPRI trend indicator values, as expressed in US $m., at constant (1975) prices.
A = yearly figures, B = five-year moving averages.

Country[b]		1966	1967	1968	1969	1970	1971	1972
USSR[c]	A	970	1 545	1 116	834	1 136	1 515	1 225
	B	910	1 002	1 120	1 229	1 615	1 249	1 469
USA[c]	A	514	481	754	1 244	1 258	1 179	1 166
	B	533	707	850	983	1 120	1 182	1 214
France[c]	A	140	68	288	172	203	276	351
	B	146	153	174	201	258	308	363
Italy	A	1	20	67	53	43	41	52
	B	23	30	37	49	51	49	66
UK	A	193	203	294	348	185	393	369
	B	227	261	245	285	318	322	368
FR Germany	A	83	4	11	17	1	25	37
	B	27	26	23	12	18	17	36
China[c]	A	47	17	5	10	22	106	158
	B	26	18	20	32	60	65	83
Canada[c]	A	12	11	48	19	37	55	39
	B	20	22	25	34	40	31	28
Switzerland	A	1	1	1	—	2	2	2
	B	1	1	1	1	1	2	2
Netherlands	A	1	—	5	25	10	34	27
	B	8	11	8	15	20	27	29
Czechoslovakia	A	8	11	39	22	31	14	14
	B	14	17	22	23	24	16	15
Sweden	A	2	—	—	*	—	—	5
	B	—	—	—	1	1	2	7
Japan[c]	A	11	30	49	2	*	*	—
	B	19	20	18	16	10	—	1
Third World	A	25	15	9	20	8	15	18
	B	11	15	15	13	14	16	67
Other industrialized, West	A	23	58	7	11	3	46	11
	B	24	26	20	25	16	18	18
Other industrialized, East	A	—	2	—	2	—	5	—
	B	—	1	1	2	1	1	1
Total[d]	**A**	**2 031**	**2 465**	**2 693**	**2 780**	**2 939**	**3 707**	**3 473**
	B	**1 989**	**2 305**	**2 581**	**2 917**	**3 118**	**3 305**	**3 762**

[a] The values include licences sold to Third World countries for production of major weapons (see appendix 17C). For the values for the period 1950–6, see *SIPRI Yearbook 1976*, pp. 252–3; and for 1957–65, *SIPRI Yearbook 1978*, pp. 256–7.

[b] The countries are listed in rank order according to their five-year average values in the column for 1983.

[c] Including exports to Viet Nam.

[d] Items may not add up to totals due to rounding.

* < $0.5 million.
— Nil.
.. Not applicable.

Source: SIPRI computer-stored data base.

1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1 537	1 930	2 160	1 554	2 156	3 526	4 565	5 265	2 785	2 904	2 372	2 856	2 651
1 673	1 681	1 867	2 265	2 792	3 413	3 659	3 809	3 578	3 236	2 714	..	..
1 061	1 404	2 343	3 892	4 826	4 727	2 036	3 029	2 419	2 782	2 465	2 139	1 563
1 431	1 973	2 705	3 438	3 565	3 702	3 407	2 999	2 546	2 567	2 274	..	..
538	449	593	553	1 282	1 070	1 161	874	1 142	1 013	1 063	1 312	1 111
441	497	683	789	932	988	1 106	1 052	1 051	1 081	1 128	..	..
56	139	72	159	348	341	423	314	481	689	395	398	387
72	96	155	212	269	317	381	450	460	455	470	..	..
316	579	647	587	536	553	383	302	403	471	314	520	378
461	500	533	580	541	472	435	422	375	402	417	..	..
3	116	138	131	60	41	229	136	332	156	382	552	217
64	85	90	97	120	119	160	179	247	312	328	..	..
27	104	63	57	66	154	26	80	148	245	252	536	264
92	82	63	89	73	77	95	131	150	252	289	..	..
6	1	6	34	29	116	28	17	40	95	21	11	17
21	17	15	37	43	45	46	59	40	37	37	..	..
2	*	1	8	5	6	22	15	31	25	42	58	6
1	3	3	4	8	11	16	20	27	34	32	..	..
39	33	42	29	72	64	169	62	48	14	—	25	37
35	34	43	48	75	79	83	71	59	30	25	..	..
1	15	6	6	—	18	45	53	32	19	30	29	—
10	8	6	9	15	24	30	33	36	33	22	..	..
1	6	21	21	5	16	69	76	10	25	10	16	17
6	11	11	14	26	37	35	39	38	27	16	..	..
—	3	—	3	—	14	21	—	—	—	—	14	14
1	1	1	4	8	8	7	7	4	3	6	..	..
20	276	185	202	134	382	338	187	403	436	738	489	259
103	140	163	236	248	249	289	349	420	451	465	..	..
19	11	13	46	162	113	51	13	77	301	461	202	199
20	20	50	69	77	77	83	111	181	211	248	..	..
—	—	2	30	18	6	32	26	97	—	13	46	12
1	6	10	11	18	22	36	32	34	36	34	..	..
3 627	**5 064**	**6 304**	**7 312**	**9 699**	**11 147**	**9 598**	**10 451**	**8 448**	**9 176**	**8 558**	**9 202**	**7 134**
4 435	**5 156**	**6 401**	**7 905**	**8 810**	**9 641**	**9 869**	**9 764**	**9 246**	**9 167**	**8 503**	..	..

Appendix 17B. Register of the trade in major conventional weapons with industrialized and Third World countries, 1985

This appendix lists major weapons on order or under delivery during 1985. Certain deals close to finalization by early 1986 are included with order year *(1986)*. Deliveries made before 1981 for the same sales agreement have been excluded for space reasons. The sources and methods for the data collection, and the conventions, abbreviations and acronyms used, are explained in appendix 17D. The entries are made alphabetically, by recipient, supplier and weapon designation.

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
I. Industrialized countries								
6 Albania	China	(25)	F-6	Fighter	(1983)	(1984)	(10)	
						(1985)	(15)	
11 Australia	France	.	Milan	ATM	(1983)	1985	(200)	Unspecified number of missiles and 10 launchers ordered; follow-on orders expected; total cost: $6 m.
	Sweden	60	RBS-70	Port SAM	1985	(1986)	(60)	Total value: A$12 m.; local development and production work share expected; follow-on orders expected; deal incl obligation for Sweden not to apply embargo on military sales to Australia
	UK	6	SH-3D Sea King	Hel	(1985)			In addition to 2 ordered 1980
		.	Rapier	Landmob SAM	1975	1981	(50)	Final assembly in Australia from 1983
						1982	(50)	
						1983	(50)	
						1984	(50)	
						1985	(50)	
	USA	2	F/A-18 Hornet	Fighter/strike	1981	1985	2	Delivered prior to licensed production
		2	KC-135	Tanker/transport	1982	(1985)	(2)	For in-flight refuelling of RAAF F-111s and F/A-18 Hornets
		10	P-3C Orion	Mar patrol/ASW	1982	1984	(1)	Update-2 version; in addition to 20 P-3B/Cs in service; will probably replace 10 P-3Bs
						1985	(4)	
						(1986)	(5)	
		8	SH-60B Seahawk	Hel	1985			Total requirement: 32; first batch of

								FFG-7 frigates; also designated S-70B; total cost incl weapons: A$317 m.
		(30)	AGM-84A Harpoon	AShM	1982	1984	(10)	To arm P-3C Orions, F-111s and F/A-18s
						1985	(10)	
						(1986)	(10)	
		..	AIM-7F Sparrow	AAM	1984			Arming F/A-18 Hornets; for delivery from 1986
		..	AIM-9L	AAM	1984			Arming F/A-18 Hornets; for delivery from 1986
7	Austria	Netherlands	300	Centurion	MBT	1984			Unit cost: $5 300; ammunition to be produced by Voest-Alpine
		Sweden	24	J-35 Draken	Fighter/strike	1985			Total cost incl refurbishment: $127 m.; 130% offsets; first delivery due 1987
		Switzerland	6	PC-7	Trainer	1985	1985	6	In addition to 10 delivered earlier
4	Belgium	France	(1 000)	SATCP Mistral	Port SAM	1985			Order incl 150 launchers; total cost: approx. $66 m.; for delivery from 1988; local production of some components; 100% offsets
		USA	124	M-109-A2 155mm	SPH	1983	1984	(62)	
							(1985)	(62)	
5	Bulgaria	USSR	..	T-72	MBT	(1978)	(1981)	(15)	
							(1982)	(15)	
							(1983)	(15)	
							(1984)	(15)	
							(1985)	(15)	
4	Canada	USA	2	C-130H Hercules	Transport	1984	1985	2	
			138	F/A-18 Hornet	Fighter/strike	1980	1982	2	Order incl 113 single-seat fighters and 25 two-seat operational trainers; delivery schedule: 1982-9; Canadian designation: CF-18
							1983	(19)	
							1984	(17)	
							1985	(24)	
							(1986)	(24)	
			26	M-109-A2 155mm	SPH	1983	(1985)	(26)	
			408	AIM-7M Sparrow	AAM/SAM	1984	1985	(124)	Arming F/A-18 Hornets; total cost incl spares and training: $113 m.; for delivery from 1985
			184	AIM-7M Sparrow	AAM/SAM	1985			To arm CF-18 Hornet aircraft
			416	AIM-9M	AAM	1984	1985	(124)	Arming F/A-18 Hornets; total cost incl 40 training missiles: $41 m.; for delivery from 1985

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		. .	Seasparrow	ShAM/ShShM	1984			To arm Halifax Class destroyers; RIM-7M version; total value: $92 m.
3 China	France	6	AS-332	Hel	(1984)			
		50	AS-365N	Hel	1980	1982	(1)	Ordered Jul 1980; second batch to be assembled locally; for offshore oil operations; may carry HOT ATMs
						1983	(10)	
						1984	(10)	
						1985	(10)	
	USA	24	S-70C	Hel	1984	1984	(4)	Ordered Jul 1984; total cost: $140 m.; commercial version of UH-60A US Army helicopter sold to civilian company; contract does not prohibit military use
						(1985)	(20)	
		. .	BGM-71A TOW	ATM	(1986)			Agreed in principle Jun 1984
		. .	MIM-23B Hawk	Landmob SAM	(1986)			Agreed in principle Jun 1984
7 Cyprus	France	84	VAB	APC	1984			
5 Czechoslovakia	USSR	. .	MiG-23MF	Fighter/interceptor	(1977)	1981	(30)	Incl interceptor, ground attack and trainer versions
						1982	(30)	
						(1983)	(5)	
						(1984)	(5)	
						(1985)	(5)	
		. .	Su-25 Frogfoot	Fighter/grd attack	(1985)	(1985)	(12)	Reportedly first export customer; unconfirmed
		. .	BMP-1 Spigot	TD(M)	1979	1981	(24)	
						1982	(24)	
						1983	(24)	
						1984	(24)	
						(1985)	(24)	
		. .	BTR-40PB Gaskin	AAV(M)	1979	(1981)	(10)	
						(1982)	(10)	
						(1983)	(10)	
						1984	(10)	
						(1985)	(10)	
		. .	AT-4 Spigot	ATM	1979	(1981)	(240)	
						(1982)	(240)	
						(1983)	(240)	
						1984	(240)	
						(1985)	(240)	

		. .	SA-9 Gaskin	Landmob SAM	1979	(1981)	(200)	
						(1982)	(200)	
						(1983)	(200)	
						(1984)	(200)	
						(1985)	(200)	
4 Denmark	Germany, FR	. .	RAM	ShAM/PDM	(1985)			To arm Niels Juel Class frigates
	Norway	3	Type-207	Submarine	1985			Agreement to first borrow and then buy 3 Kobben Class submarines
	USA	8	F-16A	Fighter/strike	1985			For delivery 1987-9; in addition to 58 in service; total cost incl spares and technical support: $210 m.
		4	F-16B	Fighter/trainer	1985			For delivery 1987-9
		200	AIM-9L	AAM	1983	1983	(50)	Arming F-16s
						1984	(50)	
						1985	(100)	
		33	RGM-84A Harpoon	ShShM	(1983)	(1985)	(33)	US LoO Jul 1983; arming Niels Juel Class frigates; in addition to earlier deliveries
7 Finland	Italy	3	AB-412 Griffon	Hel	(1984)	1985	1	For patrol, search and rescue duties
	Sweden	(20)	J-35 Draken	Fighter/strike	1984	1984	(2)	Two 2-seat trainers and 18 interceptors
						1985	(8)	
						(1986)	(10)	
		. .	RBS-15	ShAM/ShShM	1983			Ordered Mar 1983; first export order
	UK	50	Hawk	Jet trainer/strike	1977	1981	4	4 delivered complete from the UK, the rest locally assembled 1981-5; Mk 51
						1982	12	
						1983	12	
						1984	11	
						1985	(9)	
	USSR	. .	MiG-21bis	Fighter	1984			Unspecified number ordered Dec 1984; in addition to 28 delivered 1978-80
		(65)	T-72	MBT	1984	(1985)	(10)	Unspecified number ordered; to replace T-55 MBTs
5 German DR	USSR	20	Mi-8 Hip	Hel	(1984)	(1984)	(10)	In addition to 30 delivered earlier
						(1985)	(10)	
		. .	MiG-23MF	Fighter/interceptor	(1978)	1981	(12)	Reportedly 4 squadrons equipped with MiG-23s by early 1985
						1982	(12)	
						1983	(12)	
						(1984)	(12)	
						(1985)	(8)	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		. .	Su-22 Fitter-J	Fighter/grd attack	(1981)	(1982)	(3)	Unconfirmed
						(1983)	(6)	
						(1984)	(6)	
						(1985)	(6)	
		. .	BTR-40PB Spigot	TD(M)	1978	1981	(12)	
						(1982)	(12)	
						(1983)	(12)	
						(1984)	(12)	
						(1985)	(12)	
		. .	BTR-70	APC	(1982)	(1983)	(50)	Replacing BTR-60; also designated SPW-70
						(1984)	(100)	
						(1985)	(100)	
		. .	M-1973 152mm	SPG	(1978)	(1981)	(12)	
						(1982)	(12)	
						(1983)	(12)	
						(1984)	(12)	
						(1985)	(6)	
		. .	M-1974 122mm	SPH	(1979)	(1981)	(20)	
						(1982)	(20)	
						(1983)	(20)	
						(1984)	(20)	
						(1985)	(10)	
		. .	SA-13 TELAR	AAV(M)	(1984)	(1985)	(10)	Unconfirmed
		. .	T-72	MBT	(1978)	1981	(100)	
						1982	(100)	
						1983	(100)	
						1984	(100)	
						1985	(100)	
		. .	T-74	MBT	(1981)	1982	(15)	
						1983	(15)	
						(1984)	(15)	
						(1985)	(15)	
		. .	AA-8 Aphid	AAM	(1981)	(1982)	(10)	Arming Su-22s; unconfirmed
						(1983)	(20)	
						(1984)	(20)	
						(1985)	(20)	
		. .	AT-4 Spigot	ATM	1978	(1981)	(240)	
						(1982)	(240)	
						(1983)	(240)	

						(1984)	(240)	
						(1985)	(240)	
		. .	SA-13 Gopher	Landmob SAM	(1984)	(1985)	(10)	Unconfirmed
		. .	SA-N-5	ShAM	1981	1981	(120)	Arming Parchim Class corvettes
						1982	(72)	
						1983	(120)	
						1984	(24)	
						1985	(48)	
		. .	SA-N-5	ShAM	(1982)	1984	(24)	Arming Tarantul Class FACs
						(1985)	(24)	
		. .	SSC-3	SShM	(1983)	1984	(15)	Coastal defence missile derived from Styx ShShM; unspecified numbers deployed since 1984
						1985	(15)	
		. .	SSN-2 Styx	ShShM	(1982)	1984	(12)	Arming Tarantul Class FACs
						(1985)	(12)	
		. .	Tarantul Class	Corvette	(1982)	1984	1	More expected; to replace 15 Osa-1 Class
						(1985)	(1)	
4	Germany, FR	Canada	7	Challenger-601	Transport	1984	(1985)	(3)	
							(1986)	(4)	
		UK	2	Lynx	Hel	1984	(1986)	(2)	For delivery 1986; in addition to 12 in service
			5	Lynx	Hel	1985			For new F-122 Class frigates; for delivery 1987-8
			(100)	Sea Skua	AShM	(1985)			
		USA	(450)	AGM-65B	ASM	1981	(1985)	(450)	Arming F-4Fs and Alpha Jets
			120	AGM-65B	ASM	1985			
			310	AGM-65B	ASM	(1985)			US LoO; in addition to 450 ordered 1981 and 120 ordered earlier 1985; total value: $25 m.
			400	AGM-88 Harm	ARM	1985			To arm Tornado fighters; initial West German request for 866 missiles; US LoO covered 944 missiles
			(1 792)	MIM-104 Patriot	Landmob SAM	1984			28 fire units with 64 missiles each; FRG will pay for 14 units and get the rest in exchange for Roland-2 air defence of West German and US air bases in FRG; total cost: $1000 m.
			(150)	RAM	ShAM/PDM	(1985)			Prior to licensed production
			110	RIM-66A/SM-1	ShAM/ShShM	1985			Total cost incl 70 containers and spares: $44 m.

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
4 Greece	France	(40)	Mirage-2000	Fighter/strike	1985			Part of $2 b. purchase of Mirages/F-16s; 60 % offsets, of which at least 30% to the Greek arms industry; option on 20 more; first delivery due 1988
	Germany, FR	(2)	Do-28D-2	Transport	(1985)	(1985)	(2)	In addition to 8 delivered earlier; West German military aid
		(10)	F-104G	Fighter	(1985)	(1985)	(10)	Ex-Luftwaffe
	Italy	25	A-109 Hirundo	Hel	(1986)			Negotiating
		(30)	G-222	Transport	(1986)			Negotiating; competing with F-27 and HS-748
		20	Model 300C	Hel	(1985)	(1985)	(20)	For Army training and observation; in addition to 6 for civilian duties
	USA	40	F-16C	Fighter/strike	1985			Some version D trainers; part of Mirage/ F-16 purchase; option on 20 more
		8	Model 209 AH-1S	Hel	1980			Ordered Sep 1980; armed with TOW ATMs; US LoO 1983; total cost: $66 m.
		48	M-109-A2 155mm	SPH	1985	(1985)	(36)	
		58	M-198 155mm	TH	1982	(1984)	(20)	
						(1985)	(20)	
		(110)	M-60-A3	MBT	(1984)			US LoO Aug 1983; total cost: $186 m.
		1 097	AGM-65B	ASM	(1984)			
		280	AIM-7M Sparrow	AAM/SAM	1982	1985	(140)	Incl in sale of Skyguard SAM system;
						(1986)	(140)	test firings on Crete Dec 1984
		300	AIM-9L	AAM	1984			To arm A-7H Corsairs
		(160)	BGM-71A TOW	ATM	(1983)			Arming 8 Model 209 AH-1S helicopters
		1 097	BGM-71A TOW	ATM	1984			Improved TOW; total cost incl 54 launchers: $19 m.
7 Ireland	France	5	AS-365F	Hel	1982	1985	3	
						(1986)	(2)	
4 Italy	France	2	Falcon-50	Transport	1984			
		(3 510)	Milan	ATM	1981	1982	(1 000)	Italy plans to procure 37 750 missiles;
						(1983)	(1 000)	the remainder will be produced under
						1984	(1 000)	licence by OTO-Melara over a 10-year
						1985	(510)	period; order incl 1850 launchers of which 286 are purchased directly
	USA	1	Gulfstream-3	Transport	(1985)			For VIP use

		6 629	BGM-71A TOW	ATM	1984			Total cost incl 1239 practice missiles: $67 m.
		450	FIM-92A Stinger	Port SAM	1984			Total cost incl 150 launchers: $51 m.
10 Japan	France	3	SA-330L Puma	Hel	(1985)			For VIP use; total cost: $22 m.
	UK	(100)	FH-70 155mm	TH	1984	(1985)	(43)	Ordered Jul 1984; some to be produced under licence
						(1986)	(43)	
	USA	2	C-130H Hercules	Transport	1984	(1986)	(2)	In addition to 4 in service; total cost: $54 m.; for delivery 1986
		2	C-130H Hercules	Transport	1985			Third order; total cost: $51 m.
		4	CH-47D Chinook	Hel	1984	(1986)	(4)	For delivery 1986; planned procurement of 55; prior to licensed production
		4	E-2C Hawkeye	AEW	1981	1984	(2)	In addition to 4 delivered 1982-3
						1985	(2)	
		12	F-15C Eagle	Fighter	1978	1981	3	In addition to 133 being produced under licence; incl some F-15D trainers
						1982	3	
						1983	2	
						1984	2	
						1985	(2)	
		16	King Air C-90	Trainer	(1979)	1981	4	
						1982	3	
						1983	2	
						1984	1	
						(1986)	(1)	
		1	Learjet-35A	Mar patrol/trpt	1985	(1985)	(1)	
		4	MH-53E	Hel	(1985)	(1986)	(4)	
		2	SH-60B Seahawk	Hel	1983	1985	1	Replacing SH-3Bs; for ASW
		1	UH-60A	Hel	1984	1985	1	To serve as test bed for Japanese ASW helicopter designated SH-X
		..	AGM-84A Harpoon	AShM	(1980)	(1982)	(10)	Arming P-3C Orions
						(1983)	(20)	
						(1984)	(20)	
						(1985)	(20)	
		..	FIM-92A Stinger	Port SAM	1982	(1984)	(50)	51 launchers approved in FY 1985
						(1985)	(100)	
						(1986)	(150)	
		..	RGM-84A Harpoon	ShShM	(1979)	(1981)	(24)	Arming various Japanese destroyers and frigates
						(1982)	(24)	
						(1983)	(72)	
						(1984)	(72)	
						(1985)	(72)	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
4 Netherlands	Germany, FR	445	Leopard-2	MBT	1979	1981	4	Contract signed Jun 1979; chosen
						1982	(50)	instead of US M-1 Abrams; offsets to
						1983	(60)	Dutch industry at 59% of purchase value,
						1984	(60)	may reach 100%; to replace 369
						1985	(60)	Centurions and 130 AMX-13s
	USA	900	AIM-9L	AAM	1983			Total cost: $78 m.
		2 477	BGM-71D TOW-2	ATM	1985			US LoO Oct 1985; for Army
		646	FIM-92A Stinger	Port SAM	1982	(1983)	(100)	
						(1984)	(200)	
						(1985)	(200)	
		160	MIM-104 Patriot	Landmob SAM	1983			Contract signed Dec 1983; total cost: $300 m. incl 20 launchers and 4 AN/ MPQ-533 radar sets in 4 units
		(48)	RGM-84A Harpoon	ShShM	(1983)	1985	(24)	Arming 2 Heemskerck Class frigates
						(1986)	(24)	
		.	RGM-84A Harpoon	ShShM	(1984)			To arm M Class frigates
		(48)	RIM-24 Tartar	ShAM	(1983)	1985	(24)	Arming 2 Heemskerck Class frigates
						(1986)	(24)	
		78	RIM-67A/SM-1	ShAM/ShShM	1985			Replacing older missiles
		(48)	Seasparrow	ShAM/ShShM	(1983)	(1985)	(24)	Arming 2 Heemskerck Class frigates
						(1986)	(24)	
11 New Zealand	Australia	1	P-3B Orion	Mar patrol/ASW	(1983)	1985	1	In addition to 5 in service; refurbished in the USA
	UK	. .	Seacat	ShAM/ShShM	1985			Replacement order; for Leander Class
4 Norway	Germany, FR	6	Type 210	Submarine	1982			Contract signed Sep 1983; for delivery 1989-92; offsets incl delivery of 12 fire control systems for West German submarines; designated Ula Class
	Sweden	. .	RBS-70	Port SAM	1983	(1984)	(100)	Fourth order
						(1985)	(100)	
		. .	RBS-70	Port SAM	1985			Fifth order; total value: $90 m.; some production in Norway
	USA	(24)	F-16A	Fighter/strike	1983			Ordered as attrition aircraft; for delivery early 1990s; F-16 A/Bs
		432	AIM-9L	AAM	1977	(1982)	(60)	NATO co-production programme; production
						(1983)	(100)	started Dec 1980 at Raufoss; also pro-

						(1985)	(100)	winder; formal contract signed Mar 1981
		7 612	BGM-71D TOW-2	ATM	1985			Total cost incl 300 launchers, spares etc.: $126 m.
		(162)	MIM-23B Hawk	Landmob SAM	1983			Leasing agreement; 4 btys with a total of 54 launchers
4	Portugal	Germany, FR	(2)	Meko-200 Type	Frigate	(1986)			
		Italy	12	A-109 Hirundo	Hel	(1986)			Delayed due to funding problems
		Norway	(4)	F-5A	Fighter	1984	1985	4	NATO aid
		USA	30	A-7P Corsair-2	Fighter	1983	1984	(10)	Refurbished
							1985	(20)	
			6	P-3B Orion	Mar patrol/ASW	1985			Ex-Australian; one to be refurbished in USA, five in Portugal
5	Romania	France	4	AS-365N	Hel	(1980)			Unconfirmed
4	Spain	Chile	40	T-35 Pillan	Trainer	1984	1985	(30)	Offsetting Chilean purchase of C-101s;
							(1986)	(10)	selected as new primary trainer for Air Force; Spanish designation: E-26 Tamiz
		France	. .	HOT	ATM	1984			Ordered Dec 1984; incl 150 launchers
			. .	Milan	ATM	1984			Ordered Dec 1984; incl 250 launchers
			414	Roland-2	Landmob SAM	1984			Total cost incl 18 AMX-30 Roland launch units: $124 m.; 50% of work to be done by Spanish industry; offsets at 65% of order value
		Italy	24	AB-412 Griffon	Hel	1984			For Army mountain brigades
			(200)	Aspide	AAM/SAM/ShAM	1985			6 btys; total cost incl Skyguard launch systems: $150 m.; 40% of value assigned to Spanish industry as offset
		UK	17	FV-101 Scorpion	LT	1985	1985	17	
		USA	12	AV-8B Harrier	Fighter	1983			For delivery 1987-8; total value: $378 m.; offset value: $130 m.; to equip new AC carrier 'Principe de Asturias'
			6	CH-47D Chinook	Hel	1985			For Army; in addition to 12 in service; for delivery 1986 (4) and 1987 (2); total cost: $80 m.; Model 414
			72	F/A-18 Hornet	Fighter/strike	1983	1985	1	For delivery 1986-9; option on 12 more; total cost: $2600 m.
			2	KC-135	Tanker/transport	(1985)			For delivery 1987
			10	SH-60B Seahawk	Hel	1984			Total value: $275 m.; assembly and some component production in Spain; for delivery from 1988

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		11	LVTP-7A1	Amph ASSV	(1984)	(1985)	(11)	US LoO Aug 1984
		..	AIM-7F Sparrow	AAM	(1983)			Arming F/A-18A Hornet fighters
		1 760	MIM-72C	Landmob SAM	1981			
		55	RGM-84A Harpoon	ShShM	1983	(1983)	(12)	Arming Lazaga Class FACs and FFG-7s
						(1984)	(12)	
						(1985)	(12)	
						(1986)	(19)	
		25	RGM-84A Harpoon	ShShM	1985			Total cost incl spares: $20 m.; arming frigates and corvettes; for delivery 1987-90
		(120)	RIM-67C/SM-2	ShAM/ShShM	1982			To arm 5 FFG-7 Class destroyers under construction
7 Sweden	Germany, FR	20	Bo-105CB	Hel	1984			For Army; to carry 4 TOW ATMs; for delivery 1986-7
		4	Bo-105CB	Hel	1985	1985	2	For AF search and rescue duties; in addition to 20 ordered 1984 for anti-tank use; option on 7 more
						(1986)	(2)	
	UK	.	Sky Flash	AAM	1981	(1983)	(50)	Additional quantity for JA-37 Viggen; total cost: approx. $26.5 m.
						(1984)	(100)	
						(1985)	(100)	
	USA	16	Model 300C	Hel	1985			For training; total value: SEK28 m.
		1 000	AGM-114A	ASM/ATM	1984			First export sale of Hellfire; to be adapted for shore defence; Sweden will develop new warhead, container and one-rail launcher; projected requirement is 1000 missiles; for delivery 1987-8
		(390)	AIM-9M	AAM	1984			US DoD agreed to sell May 1982; delay due to funding problems; to arm JA-37 Viggen; Sweden already has AIM-9J; total cost: approx. $75 m.
		1 000	BGM-71D TOW-2	ATM	1984			
7 Switzerland	Germany, FR	35	Leopard-2	MBT	1983			345 more to be built under licence; for delivery from 1988; reduced from original order for 420
	UK	(240)	Rapier	Landmob SAM	1980	1984	(24)	60 towed Rapier systems with Blindfire radar ordered Dec 1980
						1985	(40)	
	USA	3	UH-60A	Hel	1984			

		500	AGM-65A	ASM	1981			Arming F-5Es
		12 000	BGM-71D TOW-2	ATM	(1985)			12 000 missiles and 3000 inert practice rounds; total cost incl 400 night vision sights, 400 components for launcher assembly and support equipment: $209 m.
4	Turkey	Canada	(20)	CF-104	Fighter/strike	(1984)	(1986)	(20)	
			(50)	CF-104	Fighter/strike	(1985)			Military aid
		Egypt	33	F-4E Phantom	Fighter	(1986)			USA approved of resale Mar 1983; Saudi financing expected; negotiating
		Germany, FR	(2 500)	Milan	ATM	1981	(1981)	(500)	
							(1982)	(500)	
							(1983)	(500)	
							(1984)	(500)	
							(1985)	(500)	
			2	Meko-200 Type	Frigate	1983			Followed by licensed production of 2; armed with 1x4 Harpoon ShShMs and Aspide SAMs
		Italy	40	AB-205	Hel	1983	(1984)	(20)	For Army
							(1985)	(20)	
			2	G-222	Transport	(1986)			To be supplied as pattern aircraft prior to licensed production of 50 in Turkey; may be cancelled in favour of Spanish CN-235s
			. .	Aspide	AAM/SAM/ShAM	(1986)			Negotiating; to arm Meko-200 frigates; credit arrangement not finalized
		Norway	(16)	F-5A	Fighter	(1984)	(1985)	(16)	In addition to 11 received earlier
		Spain	52	CN-235	Transport	(1986)			Negotiating; part of production co-operation package; 3 from Spain, 49 to be built under licence
			(35)	F-4C Phantom	Fighter	(1986)			Negotiating
		UK	5	T-67M	Trainer	1985			
			(432)	Improved Rapier	Landmob SAM	1983	1983	(12)	Total value incl 36 launch units and 18 Blindfire radars: $225 m.; deal incl technology transfers and assembly rights
							1984	(180)	
							(1985)	(240)	
		USA	4	Citation-2	Transport	1985			For VIP use
			160	F-16C	Fighter/strike	1983	1984	8	8 two-seat trainers delivered directly; 32 fighters to be assembled in Turkey; licensed production of 24 trainers and 96 fighters to start 1988
							(1985)	(12)	
			(15)	F-4E Phantom	Fighter	(1984)			Total cost: $70 m.; from US surplus stocks; to be refurbished before delivery

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		25	Model 205 UH-1H	Hel	1982	1984	(12)	
						(1985)	(13)	
		15	Model 205 UH-1H	Hel	(1985)			For assembly in Turkey; total cost: $33 m.
		(18)	S-2E Tracker	Fighter/ASW	1984	1985	(18)	From US stocks; to be refurbished by Grumman after delivery; some for cannibalization
		18	S-2E Tracker	Fighter/ASW	(1985)			MAP; in addition to 18 in service
		750	AIM-9P	AAM	1982	(1983)	(250)	AIM-9P-3 version
						(1984)	(250)	
						(1985)	(250)	
		..	FIM-92A Stinger	Port SAM	(1983)			To be followed by NATO Stinger; unconfirmed
		(32)	RGM-84A Harpoon	ShShM	1983			To arm 4 Meko-200 frigates
4 UK	France	(5)	Falcon-20G	Mar patrol	1985			Ordered number reportedly 5-10
		(48)	MM-38 Exocet	ShShM	(1981)	1983	(12)	Arming 4 Broadsword Class destroyers
						1984	(12)	
						1985	(12)	
	Germany, FR	130	TM-170	APC	1985			For UK forces in Berlin
	Switzerland	30	PC-9	Trainer	1985			For delivery to Saudi Arabia
	USA	8	CH-47D Chinook	Hel	1982	1984	(3)	First 3 to replace losses in Falkland/ Malvinas conflict
						(1985)	(5)	
		4	L-1011 Tristar	Tanker	1984	(1984)	(4)	For conversion to tanker for RAF; in addition to 6 bought from British Airways
		(300)	RGM-84A Harpoon	ShShM	1984			Arming 4 Type 22 destroyers and 8 Type 23 frigates; offsets worth 130% of order value
		(200)	UGM-84A Harpoon	SuShM	1975	1981	(8)	Arming Valiant, Swiftsure, Trafalgar and Type 2400 submarines
						1982	(16)	
						1983	(16)	
						1984	(16)	
		(31)	UGM-84A Harpoon	SuShM	1985			For nuclear submarines; total cost incl spares: $33 m.; version D
1 USA	Canada	758	LAV-25	APC	1982	1983	(75)	For US Marine Corps; developed from Swiss Piranha APC
						1984	(100)	

	France	10	Milan-2	ATM	1985	(1986)	(10)	For evaluation as replacement for Dragon ATM
	Israel	12	Kfir-C1	Fighter/MRCA	1984	(1985)	(12)	On loan; $70 m. maintenance contract for IAI; to simulate MiG-21s in air combat training
		12	Kfir-C1	Fighter/MRCA	1985			For US Navy; in addition to 12 leased 1985
	Netherlands	2	F-27 MK-400M	Transport	(1984)	1985	2	For US Army aerial demonstration units
	Norway	193	Penguin-3	AShM	1984			In part offsetting Norwegian purchase of Hawk SAMs; to arm LAMPS helicopter
	UK	2	SD3-MR Seeker	Transport	(1985)	1985	2	Lease
		18	Sherpa	Transport	1984	1984	(2)	For transport of US troops in Europe;
						(1985)	(16)	total cost: $54.5 m.; deal incl 10-year operation by Shorts at cost of $96 m.; option on additional 48
		(200)	Rapier	Landmob SAM	1981	(1983)	(64)	Offset for Trident SLBM; for defence
						(1984)	(64)	of US air bases in the UK; 32 launch
						(1985)	(62)	units with 4 missiles/launcher; second order for approx. 70 missiles in 1982
		(100)	Rapier	Landmob SAM	1985			To protect 2 USAF bases in Turkey
2 USSR	Czechoslovakia	..	L-39 Albatross	Jet trainer	1972	1981	(20)	Replacing L-29 Delfin
						1982	(20)	
						1983	(20)	
						1984	(20)	
						1985	(20)	
6 Yugoslavia	USSR	..	AT-3 Sagger	ATM	(1978)	1981	(60)	Arming Gazelle helicopters
						1982	(60)	
						1983	(60)	
						1984	(60)	
						1985	(60)	
		..	SA-7 Grail	Port SAM	(1978)	1981	(60)	Arming Gazelle helicopters
						1982	(60)	
						1983	(60)	
						1984	(60)	
						1985	(60)	
		..	SSC-3	SShM	1983	1984	(10)	Coastal defence missile derived from
						1985	(10)	Styx ShShM; replacing Samlet SShMs

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
II. Third World countries								
12 Algeria	Brazil	. .	EE-9 Cascavel	AC	(1986)			Negotiating package incl Urutu APCs, trucks and technology transfers: total value: approx. $400 m.
	France	(4 000)	VP-2000	APC	1983	(1984)	(500)	
						(1985)	(1 000)	
	UK	(16)	Hawk	Jet trainer/strike	(1985)			Reportedly ordered
	USSR	. .	D-30 122mm	TH	(1982)	(1983)	(50)	
						(1984)	(50)	
						(1985)	(50)	
	Yugoslavia	. .	G-4 Super Galeb	Jet trainer	(1986)			Negotiating
13 Angola	France	4	AS-365N	Hel	1985			Reportedly part of order for Dauphin and Gazelle helicopters worth $50 m.: possibly option on 3 more
		6	SA-342K Gazelle	Hel	1985			Part of Mar 1985 order incl 4 SA-365N at total cost of $47 m.: armed with HOT ATMs: possibly option on 6 more
		(72)	HOT	ATM	1985			Arming Gazelle helicopters
	Spain	8	C-212-200	Transport	(1984)	(1985)	(8)	
	Switzerland	(25)	PC-7	Trainer	1982	1983	(6)	
						1984	(4)	
						(1985)	(3)	
	USSR	(12)	An-12 Cub-A	Transport	(1982)	(1983)	(5)	
						(1984)	(5)	
						(1985)	(2)	
		(30)	An-26 Curl	Lightplane	(1982)	(1983)	(1)	
						(1984)	(10)	
						(1985)	(10)	
						(1986)	(9)	
		. .	Mi-8 Hip	Hel	(1982)	(1983)	(21)	
						(1984)	(11)	
						(1985)	(10)	

						(1984)	(7)	
						(1985)	(5)	
		(6)	Su-22 Fitter-J	Fighter/grd attack	(1985)	(1985)	(6)	Unconfirmed
		(20)	BTR-40PB Gaskin	AAV(M)	(1983)	(1983)	(6)	
						(1984)	(6)	
						(1985)	(5)	
		(4)	SA-13 TELAR	AAV(M)	(1984)	(1985)	(2)	Unconfirmed
		. .	T-62	MBT	(1980)	(1981)	(35)	
						(1982)	(35)	
						(1983)	(35)	
						(1984)	(35)	
						(1985)	(35)	
		(40)	SA-13 Gopher	Landmob SAM	(1984)	(1985)	(20)	Unconfirmed
		(165)	SA-3 Goa	Landmob SAM	(1980)	(1981)	(24)	Unconfirmed
						(1982)	(24)	
						(1983)	(24)	
						(1984)	(24)	
						(1985)	(24)	
		(96)	SA-8 Geeko	Landmob SAM	(1983)	(1983)	(24)	Unconfirmed; reportedly manned by Soviet personnel; to protect 2 bases
						(1984)	(48)	
						(1985)	(24)	
		(240)	SA-9 Gaskin	Landmob SAM	(1983)	(1983)	(72)	
						(1984)	(72)	
						(1985)	(72)	
15	Argentina	France	(12)	AS-332	Hel	1983	(1984)	(5)	
							(1985)	(7)	
			(72)	MM-40 Exocet	ShShM/SShM	1980	1985	(24)	Arming 6 Meko-140 frigates
		Germany, FR	2	Type TR-1700	Submarine	1977	1984	1	Delivered prior to licensed production of 4
							(1985)	(1)	
		Israel	1	B-707-320C	Transport	(1985)	(1986)	(1)	For electronic intelligence duties
		Italy	(15)	Palmaria 155mm	SPH	(1983)			Possibly order for turret only; if so for adaption on TAM chassis
		Korea, South	1	Tacoma Type	LS	1982	(1985)	(1)	Ordered from Hyundai Shipyard; further orders possible
		Spain	12	C-212-200	Transport	1984			
14	Bahamas	UK	3	Protector Class	PC	1985	(1986)	(3)	
8	Bahrain	Egypt	. .	Fahd	APC	(1984)			Unconfirmed order for unspecified number
		Germany, FR	2	Type 62-001	Corvette	1985			
		UK	3	Guardian Class	PC	1984	(1986)	(3)	Total cost: 9 m. pounds; gun-armed
		USA	4	F-4E Phantom	Fighter	1985	(1986)	(4)	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		4	F-5E Tiger-2	Fighter	1985	(1986)	(4)	Originally offered in 1982; delayed for financial reasons; total cost incl 2 F-5Fs and 60 AIM-9P AAMs: $114 m.
		6	F-5E Tiger-2	Fighter	1985			US LoO June 1985; in addition to 6 F-5s ordered earlier in 1985
		2	F-5F Tiger-2	Jet trainer	1985	(1986)	(2)	
		(54)	M-60-A3	MBT	(1985)			US LoO; total cost incl spares, ammunition and training: $90 m.
		60	AIM-9P	AAM	1985	(1986)	(60)	Arming F-5E/F fighters
9 Bangladesh	China	(36)	F-6	Fighter	(1986)			Negotiating
		(6)	Romeo Class	Submarine	(1983)	(1984)	(1)	
	France	5	Magister	Jet trainer	(1985)	1985	5	
13 Benin	France	2	AS-350 Ecureuil	Hel	(1983)	1984	1	Gift
						1985	1	
15 Bolivia	Brazil	3	HB-315B Gavaio	Hel	1985			In addition to 3 ordered 1984; total cost: $3.8 m.
	France	18	T-33A	Jet trainer	1984	1985	(9)	Total cost incl spares $6.2 m.; to be refurbished in USA
						(1986)	(9)	
13 Botswana	France	2	AS-350 Ecureuil	Hel	(1984)	1985	2	
	UK	1	Trislander M	Transport	1984	1985	1	
15 Brazil	France	6	AS-332	Hel	1985			For AF; order reduced from 15; used Brazilian Pumas part of payment
		6	AS-332	Hel	1985			For Navy; reduced from 10; possibly from Brazilian production line
		11	AS-350 Ecureuil	Hel	1985			For Navy; reduced from 15
		(30)	AS-350 Ecureuil	Hel	(1986)			Negotiating; for AF
		(60)	AM-39 Exocet	AShM	1985			To arm 15 AS-332 helicopters on order
		(24)	MM-40 Exocet	ShShM/SShM	1984			Arming 2 corvettes under construction
	Germany, FR	1	Type 209/3	Submarine	1982			Order incl 1 submarine to be built under licence; also designated Type 1400; part of barter deal for iron ore
	UK	(40)	Sea Skua	AShM	1985			Arming Lynx helicopters
	USA	3	B-707-320C	Transport	1985	(1986)	(3)	Bought from civilian airline and re-

		18	Model 206B	Hel	(1986)			For Navy; number changed from 16 to 18
		12	UH-60A	Hel	(1986)			US LoO; licensed production may follow
		12	LVTP-7A1	Amph ASSV	1983	(1985)	(12)	For Brazilian Marines
10 Burma	Italy	(4)	SF-260M	Trainer	(1984)	(1985)	(4)	Unconfirmed
	Switzerland	. .	PC-9	Trainer	(1985)			Unconfirmed
13 Cameroon	Canada	4	DHC-5D Buffalo	Transport	(1983)	1984	2	
						1985	2	
		1	DHC-5D Buffalo	Transport	1985	1985	(1)	Replacing crashed aircraft
	Germany, FR	4	Do-228-200	Transport	(1985)			
	Switzerland	1	BN-2A Defender	Lightplane	1985	1985	1	Gift
		1	PC-6	Lightplane	1985	1985	1	Gift
		1	PC-7	Trainer	1985	1985	1	Gift
	USA	24	V-150 Commando	APC	1981	1985	24	
13 Central African Republic	Argentina	12	IA-58A Pucara	COIN	(1986)			Negotiating
13 Chad	France	2	PC-7	Trainer	(1984)	1985	2	Taken over from French company CIPRA; armed with twin 20mm gun
15 Chile	France	(30)	Mirage-50	Fighter/MRCA	(1986)			Negotiating; in addition to 16 in service
	Germany, FR	(50)	Bo-105CB	Hel	1985			Both civil and military versions; assembly planned
	Spain	(6)	C-212-200	Transport	(1984)			Unconfirmed
15 Colombia	Australia	2	C-130A Hercules	Transport	1984			
	Germany, FR	4	Bo-105C	Hel	(1983)	1984	2	On 4 FS-1500 Type frigates
						1985	2	
	Netherlands	3	F-27 Mk-600	Transport	(1984)	1984	1	
						1985	2	
	Spain	5	C-212-200	Transport	1984			Total cost: $14.5 m.
	Switzerland	(6)	PC-6	Lightplane	(1984)	1984	(4)	
						1985	(2)	
	USA	2	C-130H Hercules	Transport	(1983)	(1985)	(2)	
		2	Model 212	Hel	(1985)	1985	2	Probably for AF
		2	Model 412	Hel	(1985)	1985	2	Probably for AF
13 Congo	France	1	SA-360 Dauphin	Hel	(1984)	1985	1	Designation unconfirmed; possibly SA-365
14 Costa Rica	USA	3	Model 500E	Hel	(1984)	1985	3	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		2	T-41A	Lightplane	(1984)	(1985)	(2)	Designation unconfirmed
		2	Swift 105 Type	PC	(1984)	(1985)	(2)	
14 Cuba	USSR	. .	BMP-1	MICV	(1980)	(1981)	(25)	Unconfirmed
						(1982)	(25)	
						(1983)	(25)	
						(1984)	(25)	
						(1985)	(25)	
		. .	BTR-152	APC	(1984)	(1985)	(50)	Replacements
		. .	BTR-60PB	APC	(1984)	(1985)	(50)	Replacements
		. .	D-1 152mm	TH	(1985)	(1985)	(50)	
		. .	M-46 130mm	TG	(1984)	(1985)	(50)	
		. .	PT-76	LT	(1984)	(1985)	(20)	Replacements
		. .	SU-100	TD	(1984)	(1985)	(50)	
		. .	T-62	MBT	(1984)	(1985)	(20)	Replacements
		. .	SA-6 Gainful	Landmob SAM	(1980)	(1981)	(50)	Part of air defence deal incl SA-3s;
						(1982)	(50)	demand for reloads to replace SAMs fired
						(1983)	(50)	unsuccessfully at US Lockheed SR-71
						(1984)	(50)	reece aircraft
						(1985)	(50)	
						(1986)	(50)	
		1	Sonya Class	MSC	(1984)	1985	1	
13 Djibouti	France	1	Alouette-2	Hel	(1985)	(1985)	(1)	French military aid
		1	Noratlas 2501	Transport	(1985)	(1985)	(1)	French military aid
	Spain	2	C-212-200	Transport	1985			French military aid
15 Ecuador	Canada	1	DHC-5D Buffalo	Transport	1985			
		3	DHC-6	Transport	1985			
	UK	6	BAC-167	Trainer/COIN	(1985)	1985	6	Aircraft originally destined for Sudan
	USA	19	T-33A	Jet trainer	1985			Ex US reserves; refurbished to AT-33 standard before transfer
8 Egypt	China	(110)	F-7	Fighter	1980	1983	(10)	Last 80 assembled in Egypt
						1984	(35)	
						1985	(35)	
		(2)	Jianghu Class	Frigate	1983	1984	1	
						1985	1	

	2	Romeo Class	Submarine	(1984)	(1985)	(2)	Third pair of ex-Chinese navy submarines
France	20	Mirage-2000	Fighter/strike	1981	(1986)	(20)	Ordered Dec 1981, total cost: $1000 m.
	(20)	Mirage-2000	Fighter/strike	(1985)			Option on 16-20 more taken up 1984 but still under discussion; assembly in Egypt possible
	(60)	ARMAT	ARM	1984	(1985)	(20)	Arming Mirage-2000s
	. .	AS-30L	ASM	1983	(1985)	(50)	Arming Mirage-2000s
	(288)	HOT	ATM	1981	1984	(240)	Arming 24 of 36 Gazelle helicopters ordered 1981
					1985	(48)	
	. .	R-440 Crotale	Landmob SAM	(1984)	(1985)	(48)	Third order
	. .	R-550 Magic	AAM	1983	(1985)	(60)	Arming Mirage-2000s
	. .	Super-530	AAM	1983	(1985)	(60)	Arming Mirage-2000s
Netherlands	2	Alkmaar Class	Minehunter	(1986)			Tripartite type; negotiating; total cost approx. $80 m.
Spain	600	BMR-600	ICV	1982	1984	(250)	Total cost incl 3000 trucks and 700
					1985	(350)	coaches: $400 m.
	6	Cormoran Class	FAC	(1986)			Negotiating; competing with shipyards in South Korea, Italy, UK and USA
	4	S-70 Class	Submarine	(1986)			Negotiating
USA	6	Commuter-1900	Transport	(1985)			For electronic surveillance
	4	E-2C Hawkeye	AEW	1983	1985	1	First 2 for delivery 1985-6; total cost
					(1986)	(1)	for 4 aircraft: $689 m.; remaining 2 for delivery 1987 along with fifth aircraft ordered 1984
	1	E-2C Hawkeye	AEW	1984			In addition to 4 on order; for delivery May 1987; total cost incl spares: $50 m.
	34	F-16C	Fighter/strike	1982	(1986)	(8)	Agreement in principle for a total of 150 aircraft; total cost incl 6 F-16D trainers: $1.2 b.
	6	F-16D	Fighter/trainer	1982	(1986)	(6)	
	3	Gulfstream-3	Transport	(1983)	1985	3	For VIP use
	48	M-109-A2 155mm	SPH	(1985)			In addition to 100 supplied in 1984
	472	M-113-A2	APC	(1984)			US LoO Mar 1984; 354 A2s, 43 M-806 ARVs, 52 fitter vehicles and 23 ambulance vehicles; total value incl M-125-A2s, M-577-A2s and M-548s: $157 m.
	19	M-125-A2	APC	1984			US LoO Mar 1984
	42	M-198 155mm	TH	1983			US LoO Oct 1983
	33	M-548	APC	1984			US LoO Mar 1984
	13	M-577-A2	CPC	1984			US LoO Mar 1984
	220	M-60-A3	MBT	1982	1984	(100)	In addition to 439 already on order;
					1985	(120)	for delivery from 1984; deal incl 23 M-88-A1 ARVs

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		94	M-60-A3	MBT	1985			Exempted from temporary US ban on arms sales to Middle East imposed Jan 1985
		36	M-60-A3	MBT	(1985)			US LoO Dec 1985; pending congressional approval; in addition to 94 ordered earlier 1985
		23	M-88-A1	ARV	1982	(1984)	(11)	
						(1985)	(12)	
		56	M-88-A1	ARV	1984			Total cost: $63 m.
		424	AIM-7M Sparrow	AAM/SAM	(1984)	1985	(48)	To arm Skyguard air defence system;
						(1986)	(144)	US LoO Feb 1984
		150	AIM-9L	AAM	1983	(1984)	(75)	In addition to 300 delivered Apr 1983
						(1985)	(75)	
		72	MIM-23B Hawk	Landmob SAM	1982	(1985)	(36)	Order incl 24 launch units in 4 btys;
						(1986)	(36)	in addition to 12 btys ordered 1979
		(120)	MIM-23B Hawk	Landmob SAM	(1985)			Third order
		483	MIM-72F	SAM/ShAM	1984			Total cost incl 26 towed launchers: $160 m.; total requirement to replace Soviet systems: about 60 launchers
14 El Salvador	USA	3	A-37B Dragonfly	Fighter/COIN	1984	1985	3	Delivered Jan 1985
		7	AC-47	Transport	(1984)	1984	2	To replace old C-47s
						1985	(5)	
		10	Model 205 UH-1H	Hel	1985	(1985)	(4)	6 UH-1H and 4 UH-1M with night vision
						(1986)	(6)	equipment
		4	Model 500MD	Hel	1985	(1985)	4	Gunship version; in addition to 2 AC-47s also delivered as gunships
13 Ethiopia	Italy	(11)	SF-260TP	Trainer	(1985)			In addition to 10 received earlier; also for civilian use
13 Gabon	France	2	AS-350 Ecureuil	Hel	(1985)			Part of arms package
		1	ATR-42	Transport	(1985)			For Presidential Guard
		6	Mirage-5	Fighter	1983	(1984)	(3)	
						(1985)	(3)	
		3	Mirage-5R	Recce	(1983)	(1985)	(3)	
			SA-342L Gazelle	Hel	(1985)			3 armed with HOT ATMs; part of package incl aircraft, missiles and ships
		4	ERC-20 Kriss	Recce/AAV	1985			

		(100)	Milan	ATM	(1985)			Part of arms package
		2	P-400 Class	PC/FAC	1984			
	USA	(15)	V-150 Commando	APC	(1985)			
14 Guatemala	Netherlands	4	F-27 Mk-400	Transport	(1984)	1984	(1)	
						1985	(3)	
15 Guyana	Brazil	1	EMB-110	Transport	1985	1985	1	
		1	Model 412	Hel	1985	1985	1	
14 Haiti	Italy	4	S-211	Trainer	1984	1985	4	
14 Honduras	Brazil	(8)	EMB-312 Tucano	Trainer	(1984)	(1985)	(8)	Order may have been increased to 12
	Spain	(4)	C-101 Aviojet	Jet trainer	1983	1984	(2)	Option on 4 more
						(1985)	(2)	
	USA	6	A-37B Dragonfly	Fighter/COIN	(1984)			Delivery of 6 A-37s and 28 transport aircraft of unspecified types allegedly pending; order incl 36 105mm howitzers
		(36)	M-101-A1 105mm	TH	(1984)			Pending congressional approval
9 India	France	40	Mirage-2000	Fighter/strike	1982	1985	(20)	36 fighters and 4 trainers; flight tests
						(1986)	(20)	began in France Sep 1984; first 7 delivered Jun 1985; final deliveries 1986; option for licensed production cancelled
		..	AMX-30-155 GCT	SPG	(1986)			Negotiating sale of small number; to be followed by licensed production
			AM-39 Exocet	AShM	(1986)			Negotiating; to arm 6 Jaguars; competing with British Sea Eagle AShM and Soviet missiles
		..	MM-38 Exocet	ShShM	(1983)			To arm new missile corvettes
		(240)	R-550 Magic	AAM	(1984)	(1985)	(120)	Arming 40 Mirage-2000s and possibly also
						(1986)	(120)	Jaguars; for delivery from 1986
		(240)	Super-530	AAM	1984	(1985)	(20)	Arming 40 Mirage-2000s
						(1986)	(120)	
	Germany, FR	2	Type 1500	Submarine	(1981)	(1986)	(1)	Licensed production to follow
	Poland	1	Polnocny Class	LS	(1984)	1985	1	In addition to 6 in service; a further 6 will reportedly be built under licence
	UK	10	Sea Harrier	Fighter/strike	1985			In addition to 8 in service; total value incl 1 trainer: $230 m.
		1	Sea Harrier T-4	Fighter/trainer	1985			
		12	Sea King HAS-5	Hel	1983	1984	2	Contract signed Jun 1983; option on 8
						1985	(4)	more; to be armed with Sea Eagle AShMs;
						(1986)	(6)	total value: approx. $125 m.

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		20	Sea King HAS-5	Hel	1985			In addition to 12 ordered 1983; to carry Sea Eagle AShMs; total cost: $80 m.
		21	Westland 30	Hel	(1986)			Negotiations resumed late 1985
		(24)	Sea Eagle	AShM	1983			Arming 12 Sea King helicopters; follow-on orders expected; for delivery 1987
		. .	Sea Eagle	AShM	1985			To arm Sea Harriers
	USSR	95	An-32 Cline	Transport	1980	1984	(9)	Delivery rate: 2/month; some Western
						1985	(24)	avionics integrated
		20	Il-20	Transport	(1985)			Unconfirmed
		(20)	Il-76 Candid	Transport	(1984)			Possibly Il-76 Mainstay AEW version; order may be reduced to 8
		(18)	Ka-27 Helix	Hel	(1984)	(1985)	(3)	Helix-A version
		(100)	Mi-17 Hip-H	Hel	(1984)	1984	(10)	Replacing Mi-8s
						1985	(20)	
		. .	Mi-24 Hind-D	Hel	(1984)			Unconfirmed
		(10)	Mi-26 Halo	Hel	(1985)			Reportedly ordered
		(40)	MiG-29	Fighter	1984	(1986)	(10)	Ordered Aug 1984; first locally assembled aircraft expected 1987
		(3)	Tu-142 Bear	Recce/ASW	(1984)	(1985)	(1)	Bear-F version for maritime recce and ASW duties
		(100)	BMP-1	MICV	(1983)	(1984)	(50)	Licensed production to follow initial
						(1985)	(50)	deliveries from USSR
		80	AA-7 Apex	AAM	(1984)	(1986)	(30)	To arm MiG-29s
		160	AA-8 Aphid	AAM	(1984)	(1986)	(30)	To arm MiG-29s
		(200)	SA-8 Gecko	Landmob SAM	(1982)	(1984)	(50)	Operational early 1984; unspecified
						(1985)	(100)	number
						(1986)	(50)	
		(36)	SA-N-4	ShAM	(1978)	1983	(12)	Arming Godavari Class frigates
						1984	(12)	
						(1986)	(12)	
		(36)	SSN-2 Styx	ShShM	1978	1983	(12)	Arming Godavari Class frigates
						1984	(12)	
						(1986)	(12)	
		4	Foxtrot Class	Submarine	1982			Possibly cancelled in favour of Kilo Class
		3	Kashin Class	Destroyer	1982			In addition to 3 previously delivered; further 3 projected April 1984
		(3)	Nanuchka Class	Corvette	1982			In addition to 3 in service

						(1986)	(1)	
		(5)	Tarantul Class	Corvette	(1985)			Unconfirmed
10 Indonesia	France	(48)	MM-38 Exocet	ShShM	(1982)			Arming 4 PSMM-5 Class FACs
	Germany, FR	2	Type 209/2	Submarine	(1986)			Negotiating; in addition to 2 in service; total of 6 planned
	Korea, South	4	PSMM-5 Type	FAC	1982			In addition to 4 in service; armed with Exocet ShShMs
	Netherlands	2	Alkmaar Class	Minehunter	1985			First export order of Tripartite design; for delivery 1987-8
	UK	. .	Improved Rapier	Landmob SAM	1984			Ordered Dec 1984; total value: $128 m.; offsets for Indonesian electronics industry; approx. 25 fire units
		. .	Improved Rapier	Landmob SAM	1985			In addition to 1984 order; number of missiles and type of launcher not disclosed
		3	Tribal Class	Frigate	1984			Ex-Royal Navy; to be refurbished at cost of more than $40 m. before delivery
	USA	4	Jetfoil	Hydrofoil FAC	1983	1984	(2)	In addition to 1 in service; total cost: $150 m.; option on 6 more and licensed production of 36
						1985	(1)	
						(1986)	(1)	
8 Iran	China	12	F-6	Fighter	(1985)	(1985)	(3)	Unconfirmed; reportedly part of $1.6 b. deal allegedly signed Mar 1985; two-thirds to be paid for in oil over two years
						(1986)	(6)	
		200	T-59	MBT	(1985)	(1985)	(100)	Incl in $1.6 b. deal; unconfirmed
						(1986)	(100)	
		(100)	Type 59/1 130mm	TG	(1985)	(1985)	(50)	Incl in $1.6 b. deal; unconfirmed
						(1986)	(50)	
		(100)	Type-60 122mm	TG	(1985)	(1985)	(50)	Incl in $1.6 b. deal; unconfirmed
						(1986)	(50)	
		(100)	CSA-1	SAM	(1985)	(1985)	(50)	Incl in $1.6 b. deal; unconfirmed
						(1986)	(50)	
		(300)	Hong Ying-5	Port SAM	(1985)	(1985)	(150)	Incl in $1.6 b. deal; unconfirmed
						(1986)	(150)	
	Germany, FR	6	Type 209/3	Submarine	1985			Originally ordered in 1979; cancelled same year; order reopened for delivery after end of Iraq-Iran War
	Korea, North	(60)	F-6	Fighter	(1985)			Unconfirmed
		. .	SA-2 Guideline	Landmob SAM	(1985)	(1985)	(60)	Unconfirmed
	Syria		SCUD-B	Landmob SSM	(1984)	(1984)	(40)	
						(1985)	(40)	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
	UK	2	Hengam Class	LS	1977	1984	1	Originally 4 ships ordered
						1985	1	
		1	Kharg Type	Support ship	1974	1985	1	Gun-armed support ship; displacement: 10 900t; can carry 3 helicopters
8 Iraq	Argentina	. .	IA-58A Pucara	COIN	(1986)			Negotiations led by Cordoba province officials; deal opposed by central government
	Brazil	(300)	EE-3 Jararaca	SC	1982	(1984)	(150)	
						(1985)	(150)	
		26	EE-9 Cascavel	AC	(1984)	1985	26	May incl some Urutu vehicles; deal also incl Astro rockets and MRLs; total value: $30 m.
	Egypt	(80)	EMB-312 Tucano	Trainer	1983	1985	(10)	From Brazil and from Egyptian licensed production
		(10)	EMB-312 Tucano	Trainer	(1983)	(1985)	(10)	Delivered from Egypt; number also reported to be 12
		. .	F-7	Fighter	(1983)	1983	(40)	Chinese version of MiG-21 assembled
						(1984)	(20)	in Egypt; 3-5/month
						(1985)	(20)	
	France	. .	Alpha Jet	Jet trainer/strike	(1986)			Negotiating; assembly in Egypt possible
		29	Mirage F-1C	Fighter/interceptor	1982	(1984)	(15)	Incl 6 trainers; armed with Magic AAMs
						(1985)	(14)	
		24	Mirage F-1C	Fighter/interceptor	1985	(1986)	(24)	In addition to 89 acquired earlier
		(150)	AMX-30 Roland	AAV(M)	1981	(1982)	(15)	Ordered Feb 1981; number unconfirmed; at
						(1983)	(15)	least 30 delivered by 1983
						(1984)	(15)	
						(1985)	(15)	
		85	AMX-30-155 GCT	SPG	1982	1983	(30)	
						1984	(30)	
						1985	(25)	
		. .	AM-39 Exocet	AShM	1983	1983	(70)	Arming Super Etendards and Mirages
						1984	(280)	
						1985	(96)	
		. .	ARMAT	ARM	(1984)	(1985)	(12)	Unconfirmed
		(100)	AS-30L	ASM	(1984)	1985	(100)	Unconfirmed; to arm Mirage F-1s
		(267)	R-530	AAM	1977	(1981)	(108)	Arming Mirage F-1s
						(1983)	(36)	

	(534)	R-550 Magic	AAM	1977	1981	(216)	Arming Mirage F-1s
					1983	(72)	
					1984	(162)	
					1985	(84)	
	(600)	Roland-2	Landmob SAM	1981	(1982)	(150)	
					(1983)	(150)	
					(1984)	(150)	
					(1985)	(150)	
Germany, FR	(6)	BK-117	Hel	(1984)	(1984)	(2)	Refurbished with modern electronics in Austria
					(1985)	(4)	
Italy	2	A-109 Hirundo	Hel	1984	(1984)	(1)	On 2 Wadi Class corvettes; total cost incl 5 AB-212ASW helicopters: $164 m.
					(1985)	(1)	
	5	AB-212ASW	Hel	1984	(1985)	(2)	On 4 Lupo Class frigates
					(1986)	(3)	
	(224)	Aspide	AAM/SAM/ShAM	(1981)	1984	(64)	Arming 4 Lupo Class frigates and 6 Wadi Class corvettes
					1985	(64)	
					(1986)	(96)	
	(60)	Otomat-2	ShShM	(1981)	1984	(24)	Arming 4 Lupo Class frigates and 6 Wadi Class corvettes
					1985	(12)	
					(1986)	(24)	
	4	Lupo Class	Frigate	1981	1985	1	Order incl 6 Wadi Class corvettes and 1 Stromboli Class support ship
					(1986)	(3)	
	6	Wadi Class	Corvette	1981	1984	4	Iraqi designation: Assad Class
					1985	2	
Jordan	(200)	GHN-45 155mm	TH/TG	(1984)			Unconfirmed
Spain	. .	BMR-600	ICV	(1981)	(1982)	(50)	Unconfirmed
					(1983)	(50)	
					(1984)	(50)	
					(1985)	(50)	
USA	45	Model 214ST	Hel	1985	(1985)	(10)	Commercially sold; allegedly for civil use
	24	Model-530MG	Hel	1985	1985	24	Possibly for civilian use
USSR	50	MiG-23BN	Fighter/grd attack	1984	(1984)	(20)	Part of large deal signed May 1984; estimated total cost: $2500 m.; reportedly guaranteed by Saudi Arabia
					(1985)	(30)	
	. .	MiG-25	Fighter/interceptor	1984	(1984)	(15)	Part of large deal signed May 1984
					(1985)	(15)	
	(30)	Su-20 Fitter-C	Fighter/grd attack	(1983)	(1985)	(30)	Unconfirmed
	. .	BTR-40PB Gaskin	AAV(M)	1982	(1982)	(5)	On BRDM-2 (BTR-40PB) vehicles
					(1983)	(5)	
					(1984)	(5)	
					(1985)	(5)	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		(200)	T-55	MBT	1984	(1984)	(100)	Part of large deal signed May 1984
						(1985)	(100)	
		(300)	T-62	MBT	1984	(1984)	(150)	Part of large deal signed May 1984
						(1985)	(150)	
			T-72	MBT	1984	(1984)	(300)	Part of large deal signed May 1984
						(1985)	(300)	
		(840)	AA-2 Atoll	AAM	(1975)	(1984)	(120)	Arming MiG-23s
						(1985)	(180)	
		(330)	AA-2 Atoll	AAM	(1979)	1981	(78)	Arming MiG-21s and MiG-25s
						1984	(90)	
						1985	(90)	
			SA-6 Gainful	Landmob SAM	1979	(1981)	(60)	
						(1982)	(60)	
						(1983)	(60)	
						(1984)	(60)	
						(1985)	(60)	
			SA-8 Gecko	Landmob SAM	(1982)	1982	(72)	
						1983	(72)	
						1984	(72)	
						(1985)	(72)	
			SA-9 Gaskin	Landmob SAM	1982	(1982)	(40)	On BRDM-2 (BTR-40PB Gaskin) vehicles
						(1983)	(40)	
						(1984)	(40)	
						(1985)	(40)	
8 Israel	USA	11	F-15A Eagle	Fighter	1982			Compensatory offer due to sale of extra equipment for Saudi F-15s; order incl 22 fuel tanks, 6 spare engines and support equipment
		75	F-16C	Fighter/strike	1983			In addition to 75 in service; total cost: $2700 m. of which half is grant and half is credit; offset purchases of F-16 components in Israel valued at $300 m.; for delivery 1985-8
		(10)	Model 209 AH-1S	Hel	(1985)	(1985)	(10)	In addition to 36 delivered earlier
		2	SA-366	Hel	(1985)	1985	2	Ex-US Coast Guard; for evaluation; requirement for 16-20
		300	M-60-A3	MBT	1979	1981	(50)	

						1983	(50)	
						1984	(50)	
						1985	(35)	
		150	AIM-7M Sparrow	AAM/SAM	1983			Arming F-15s; US LoO Jul 1983; total cost: $52 m.
		200	AIM-9L	AAM	1983			US LoO Mar 1983
		. .	RGM-84A Harpoon	ShShM	(1978)	(1981)	(20)	At least 100 ordered to complement Gabriel ShShM; AShM version for F-4 probably also ordered
						(1982)	(20)	
						(1983)	(20)	
						(1984)	(20)	
						(1985)	(20)	
13	Ivory Coast	USA	(2)	C-130H Hercules	Transport	(1985)			Reportedly ordered
8	Jordan	Austria	(200)	GHN-45 155mm	TH/TG	(1984)	(1985)	(100)	Unconfirmed; reportedly being delivered; in addition to 200 delivered 1982-3; possibly to be sent on to Iraq
		Egypt	. .	Fahd	APC	(1984)	(1985)	(10)	Unconfirmed order for unspecified number
		France	(12)	Mirage F-1C	Fighter/interceptor	(1986)			Negotiating; in addition to 34 F-1Cs in service
			. .	SATCP Mistral	Port SAM	(1984)			Unconfirmed
		Italy	. .	Aspide	AAM/SAM/ShAM	(1986)			Negotiating purchase of Aspide/Spada air defence system
		Spain	14	C-101 Aviojet	Jet trainer	1985			Total cost incl 1 C-212-200 and 2 CN-235 transports: $80 m.
			1	C-212-200	Transport	1985			Option taken Jun 1985; photo-recce version
			2	CN-235	Transport	1985			Option taken Jun 1985
		UK	(248)	Khalid	MBT	(1986)			Negotiating; in addition to 278 in service
			(1 500)	Blowpipe	Port SAM	(1986)			May order as result of US withdrawal of offer to sell Stinger SAMs
			(1 500)	Javelin	Port SAM	(1986)			Reportedly negotiating
		USA	40	F-20 Tigershark	Fighter	(1986)			Part of large arms package temporarily blocked by Congress; F-16 option open; total package cost approx $1.9 b.
			24	Model 209 AH-1S	Hel	1982	(1985)	(12)	Armed with TOW ATMs
							(1986)	(12)	
			78	M-109-A2 155mm	SPH	1980	(1983)	(40)	Status of deal uncertain
							(1985)	(38)	
			32	M-3 Bradley	MICV	(1986)			

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		200	M-60-A3	MBT	1980	(1982)	(60)	To replace M-47s and Centurions; 118
						(1983)	(60)	conversion kits for older models also
						(1984)	(40)	being offered by USA
						(1985)	(40)	
		300	AIM-9P	AAM	(1986)			To arm F-20 or F-16 fighters
		(192)	BGM-71A TOW	ATM	1981	(1985)	(96)	Arming 24 Model 209 Cobras
						(1986)	(96)	
		72	FIM-92A Stinger	Port SAM	(1986)			Number ordered refers to systems
		222	MIM-23B Hawk	Landmob SAM	(1986)			For 12 I-Hawk SAM systems
	USSR	. .	BTR-40PB Gaskin	AAV(M)	1984			Unspecified number ordered
		. .	ZSU-23-4 Shilka	AAV	(1984)			Unconfirmed
		. .	SA-7 Grail	Port SAM	1984			
		. .	SA-8 Gecko	Landmob SAM	1984			Part of air defence package incl SA-7s, SA-9s and radars
		.	SA-9 Gaskin	Landmob SAM	1984			
10 Kampuchea	USSR	(3)	Mi-24 Hind-D	Hel	(1985)	1985	(3)	First aircraft in re-established AF
		(50)	T-54	MBT	(1985)	(1985)	(50)	Unconfirmed
13 Kenya	Italy	(24)	Otomat-2	ShShM	1984	(1986)	(24)	To arm 2 Type 56M FACs on order from UK
	UK	2	Type 56M	PC	1984	(1986)	(2)	Ordered from Vosper Sep 1984; to be armed with Otomat-2 ShShMs; similar to Province Class for Oman
	USA	8	Model 500MD	Hel	(1984)	(1985)	(8)	Part of $3 m. aid package
10 Korea, North	USSR	(50)	MiG-23	Fighter/interceptor	(1984)	1985	(30)	Unconfirmed; possibly gift
10 Korea, South	Germany, FR	2	Type 209/3	Submarine	(1986)			Negotiating; to be followed by licensed production of up to 12 ships
	USA	1	B-707-320C	Transport	(1985)	1985	1	For VIP use
		(2)	CH-47C Chinook	Hel	(1985)	(1985)	(2)	Unconfirmed
		30	F-16C	Fighter/strike	1981	(1986)	(8)	Reagan Administration lifted ban on F-16 sales to South Korea; total cost incl 6 F-16Ds: $931 m.
		6	F-16D	Fighter/trainer	1981	(1986)	(2)	
		4	F-4E Phantom	Fighter	1985	1985	4	US surplus; to be refurbished; replacing South Korean losses
		20	Model 205 UH-1H	Hel	1984	1985	20	For Army

		21	Model 209 AH-1S	Hel	(1985)			US LoO: total cost incl spares and training: $178 m.; armed with TOW ATMs
		24	OV-10F Bronco	Trainer/COIN	(1985)	(1985)	(7)	In addition to 24 in service
		(504)	BGM-71A TOW	ATM	(1985)			To arm 21 Model 209 Cobra helicopters
		(732)	FIM-92A Stinger	Port SAM	(1985)			US LoO Dec 1985
		170	MIM-23B Hawk	Landmob SAM	1982	(1984)	(85)	Total cost incl 723 rocket motors:
						(1985)	(85)	$68 m.
		(298)	MIM-23B Hawk	Landmob SAM	(1983)			Unconfirmed
		(72)	RGM-84A Harpoon	ShShM	(1985)	(1985)	(24)	Arming 3 indigenous Ulsan Class frigates
8	Kuwait	Argentina	20	IA-58A Pucara	COIN	(1985)			Total cost: $120 m.; option on 40 more
		France	6	AS-332	Hel	1983			Total cost incl AM-39 Exocet AShMs: $95 m.
			1	Mirage F-1B	Jet trainer	(1984)	(1985)	(1)	Attrition aircraft
			(13)	Mirage F-1C	Fighter/interceptor	1983	1984	(3)	Ordered Mar 1983; armed with Super-530
							(1985)	(10)	AAMs; total cost: $400 m.
			12	AM-39 Exocet	AShM	1983			To arm 6 AS-332 Super Pumas
			. .	ARMAT	ARM	1983			To arm 6 AS-332 Super Pumas
			(96)	MM-40 Exocet	ShShM/SShM	1980	1983	(12)	Arming 6 TNC-45 and 2 Type 57 FACs
							1984	(60)	
							1985	(24)	
			(78)	Super-530	AAM	1983	1984	(18)	Arming 13 Mirage F-1Cs
							1985	(60)	
		Germany, FR	6	TNC-45	FAC	1980	(1984)	(4)	Armed with MM-40 Exocet ShShMs
							(1985)	(2)	
		UK	12	Hawk	Jet trainer/strike	1983	(1985)	(2)	Mk-64 trainer/ground attack version;
							(1986)	(10)	for delivery from 1985; total cost: $105 m.
			(100)	Chieftain-5	MBT	(1986)			Negotiating
			4	Loadmaster Type	LC	1982	(1985)	4	
		USA	(188)	M-113-A2	APC	1982	1984	(50)	
							(1985)	(50)	
			56	M-901 TOW	APC	1982	1984	(20)	
							1985	(36)	
			20	V-150 Commando	APC	1984	(1985)	(20)	Ordered Jul 1984 together with 62 V-300 Commandos; total cost: $40 m.
			62	V-300 Commando	APC	1984	(1985)	(30)	
							(1986)	(32)	
			4 840	BGM-71C I-TOW	ATM	1982	(1984)	(1 000)	US LoO Feb 1982; order incl M-901 and
							(1985)	(1 000)	and M-113 APCs; total cost: $97 m.
		USSR	. .	FROG-7	Landmob SSM	(1984)			Unconfirmed
			. .	SA-7 Grail	Port SAM	1984	1984	(100)	
							(1985)	(100)	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		(96)	SA-8 Gecko	Landmob SAM	(1984)	(1984) (1985)	(48) (48)	Unconfirmed; reportedly incl some Frog-7s
10 Laos	USSR	(12)	MiG-21F	Fighter	(1985)	(1985)	(12)	In addition to approx. 20 delivered 1983
8 Lebanon	France	2	EDIC/EDA Type	LS	(1982)	1985	2	
	Syria	18	D-74 122mm	TG	(1985)	(1985)	(18)	For Amal militia; unconfirmed
		(50)	T-54	MBT	(1985)	(1985)	(50)	For Amal militia; acc to Phalangist reports; 18 122mm artillery pieces and some rocket launchers reportedly also received
	USA	35	M-60-A3	MBT	(1984)			US LoO 1984
13 Liberia	India	. .	HJT-16 Kiran-2	Jet trainer	(1986)			Negotiating sale of small number
		6	SA-316B Chetak	Hel	(1986)			Negotiating
	Israel	3	IAI-201 Arava	Transport	(1984)	(1985)	(3)	In addition to 3 delivered 1984
12 Libya	Brazil	(8)	EMB-111	Mar patrol	(1986)			Negotiating
		25	EMB-121 Xingu	Transport	(1986)			Negotiating
		(100)	EMB-312 Tucano	Trainer	(1986)			Negotiating for 100-150 aircraft
		. .	EE-11 Urutu	APC	(1986)			Negotiating
		. .	EE-9 Cascavel	AC	(1986)			Negotiating
		. .	EE-T1 Osorio	MBT	(1986)			Negotiating
	Czechoslovakia	6	Let L-410	Transport	1985			Ordered Jun 1985; in addition to 12 in service
	Greece	. .	Steyr-4K 7FA	APC	(1986)			Negotiating
	Italy	210	Palmaria 155mm	SPH	1981	1982 1983 1984 1985	12 (50) (80) (68)	
		. .	Otomat-2	ShShM	(1985)			To arm 4 new Wadi Class corvettes
		4	Wadi Class	Corvette	(1985)			In addition to 4 in service; to be armed with Otomat-2 ShShMs; named Assad Class
	Spain	4	S-70 Class	Submarine	(1986)			Spanish offer renewed
	USSR	(15)	An-26 Curl	Lightplane	(1985)	(1985)	(15)	Unconfirmed
		. .	SA-5 Gammon	SAM	(1985)	(1985)	(30)	Some systems reportedly delivered Nov 1985

						1983	(3)	
						1984	(3)	
						1985	(3)	
		(48)	SSN-2 Styx	ShShM	1980	1981	(12)	Arming Nanuchka Class corvettes
						1983	(12)	
						1984	(12)	
						1985	(12)	
		..	SSN-2 Styx	ShShM	(1982)	1983	(36)	Land-based version for protection of Gulf of Sirte
						1984	(36)	
						1985	(36)	
		4	Nanuchka Class	Corvette	1980	1981	1	Armed with SSN-2 Styx ShShMs and SA-N-4 SAMs
						1983	1	
						1984	1	
						1985	1	
		1	Natya Class	MSO	1984	1985	1	In addition to 6 in service
	Yugoslavia		G-2AE Galeb	Jet trainer	(1983)	(1984)	(6)	Unspecified number ordered; in addition to some in service
						(1985)	(6)	
		4	Koncar Class	FAC	1981			Reconfirmed 1985; based on Swedish Spica design; armed with 4 Styx ShShMs and 76mm, 40mm and 30mm guns
	'alawi	France	1	AS-350 Ecureuil	Hel	(1985)	1985	1	
			1	AS-365	Hel	(1985)			For VIP use
		Germany, FR	3	Do-228-200	Transport	1985	(1986)	(3)	
10	Malay	Indonesia	4	CN-212	Transport	(1986)			Re-negotiating original order from 1981
		Italy	4	Lerici Class	Minehunter	1980	1985	(4)	Different engines and armament than version produced for Italian Navy
		Korea, South	1	Mash Class	OPV	(1983)	1985	1	
			2	Tacoma Type	LS	(1986)			Negotiating
		USA	40	A-4E Skyhawk	Fighter/bomber	1981	1984	10	63 A-4Ls and 25 A-4Cs; 40 A-4Ls to be refurbished by Grumman; remaining 23 A-4Ls to be stored in USA; the A-4Cs to be used for spares
							1985	(30)	
			2	[illegible] Albatros	Mar patrol/ASW	1985	1985	2	Refurbished by Grumman; for amphibious transport, SAR and mar patrol; unit cost: $4 m.
14	Mexico	France	(40)	VBL-M[illegible]	AC	1984	(1984)	(27)	Also designated Ultrav; some armed with Milan ATMs; order number also reported as 80
							(1985)	(13)	
			..	Milan	ATM	1984			Unspecified number ordered; to arm M-11 VBL vehicles

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
	Spain	10	C-212-200	Transport	1985			For Navy; also negotiating licensed production
	Switzerland	25	PC-7	Trainer	(1985)			Reportedly ordered; in addition to 55 in service
	USA	21	F-33C Bonanza	Trainer	1985	(1986)	(21)	
12 Morocco	Argentina	(20)	IA-58A Pucara	COIN	(1985)			
	Brazil	60	EE-11 Urutu	APC	(1985)			17 on loan from Libya for training prior to delivery from Brazil
	France	24	Mirage-2000	Fighter/strike	(1986)			Negotiating
		..	AML-90	AC	(1978)	(1981)	(20)	
						(1982)	(30)	
						(1983)	(30)	
						(1984)	(30)	
						(1985)	(30)	
		108	AMX-10RC	Recce AC	1978	1982	(10)	Delivery started 1982 but stopped in 1984 due to funding problems
						1983	(20)	
						(1984)	(10)	
		423	VAB	APC	1975	1981	(75)	Several versions; last 32 (VAB Mephisto) held up for financial reasons
						1982	(75)	
						1983	(75)	
						1984	(75)	
	Spain	3	Lazaga Class	PC/FAC	(1985)			Option on 3 more
	USA	1	KC-130H	Tanker/transport	(1985)			In addition to 4 in service
13 Mozambique	USSR	..	BTR-60P	APC	1979	(1981)	(10)	
						(1982)	(10)	
						(1983)	(10)	
						(1984)	(10)	
						(1985)	(10)	
		..	T-55	MBT	(1982)	(1983)	(20)	Unconfirmed
						(1984)	(20)	
						(1985)	(20)	
		2	SO-1 Class	PC	(1984)	1985	2	
14 Nicaragua	Poland	(2)	Mi-2 Taurus-2	Hel	1985	1985	(2)	
	USSR	(10)	Mi-24 Hind-C	Hel	(1984)	(1984)	(5)	
						(1985)	(5)	

						(1985)	(150)	
13 Niger	Germany, FR	1	Do-228-200	Transport	1985	(1986)	(1)	
13 Nigeria	Brazil	(50)	EMB-312 Tucano	Trainer	(1986)			Negotiating
		(100)	EE-9 Cascavel	AC	(1986)			Ongoing negotiations since 1981 after demonstration of vehicle
	France	28	AMX-30 Roland	AAV(M)	1982	(1984)	(14)	
						(1985)	(14)	
		..	Milan	ATM	(1983)			Unspecified number of missiles and launchers ordered
		595	Roland-2	Landmob SAM	1982	(1984)	(300)	Total value incl 28 launch vehicles: $170 m.; contract signed Mar 1982
						(1985)	(295)	
	Germany, FR	12	Alpha Jet	Jet trainer/strike	1983	1985	(4)	In addition to 12 in service
						(1986)	(8)	
		16	Do-128-6	Transport	1982	1982	3	
						1983	3	
						1984	3	
						1985	7	
		3	Do-228-100	Transport	(1985)	1985	3	
	Italy	12	MB-339A	Jet trainer	1983	1985	12	To replace L-29 Delfins; total cost incl training, spares and support: $82 m.
		25	Palmaria 155mm	SPH	1982	1983	2	
						1985	8	
						(1986)	(15)	
		2	Lerici Class	Minehunter	1983			Ordered Jun 1983; for delivery 1986; option for second ship taken up 1984
	Netherlands	2	F-27 Maritime	Mar patrol	(1982)	1985	2	
	Sweden	42	FH-77 155mm	TH	1982	1983	(12)	
						1984	(14)	
						(1985)	(16)	
	UK	18	Jaguar	Fighter	1983	1984	(8)	Option on 18 more
						(1985)	(10)	
		36	MBT Mk-3	MBT	1981	1983	(18)	Order incl 6 ARVs and 5 BLs
						1984	(15)	
						(1985)	(3)	
		(50)	MBT Mk-3	MBT	1984	(1985)	(12)	In addition to 47 ordered 1981
		6	MBT-3 ARV	ARV	1981	1983	(3)	
						1984	(2)	
						(1985)	(1)	
	USA	5	CH-47C Chinook	Hel	(1985)			Ordered Feb 1983; delivery halted due to funding problems; being re-negotiated by late-1985

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
	USSR	18	MiG-21MF	Fighter	1984	(1985)	(18)	In exchange for 17 MiG-21s in service but not in operational condition; order incl 6 MiG-21UTIs
		12	MiG-21MF	Fighter	1984			Agreed late 1984; in addition to 18 ordered earlier
		6	MiG-21UTI	Jet trainer	1984	(1985)	(6)	
		..	MiG-21UTI	Jet trainer	1984			Agreed late 1984; in addition to 6 in service
8 Oman	France	6	VBC-90	AC	(1983)	(1984)	(4)	
						(1985)	(2)	
	Italy	..	Palmaria 155mm	SPH	(1983)			Undisclosed number on order
	UK	1	BAC-167	Trainer/COIN	(1985)	1985	1	
		1	Jaguar	Fighter	(1985)	1985	1	Replacing lost aircraft
		8	Tornado ADV	Fighter/MRCA	1985			Option on 8 more
		(15)	Chieftain-5	MBT	1983	(1984)	(7)	12-15 ordered in addition to 12 already
						(1985)	(8)	in service
		(200)	Blowpipe	Port SAM	1982	(1984)	(100)	Ordered Dec 1982
						(1985)	(100)	
		48	Sky Flash	AAM	1985			Arming 8 Tornado ADV fighters
		1	Brooke Logistic	LS	1982	1985	1	In addition to 1 delivered 1979; ship named 'Nasr Al Bahr'
	USA	1	C-130H Hercules	Transport	(1985)	(1986)	(1)	In addition to 3 in service
		300	AIM-9P	AAM	1985			To arm Jaguar and Hunter fighters
9 Pakistan	China	42	Q-5 Fantan-A	Fighter/grd attack	1982	(1984)	(24)	
						(1985)	(18)	
		(100)	Q-5 Fantan-A	Fighter/grd attack	1984	(1985)	(26)	In addition to approx. 60 in service; for delivery 1985-7
		..	T-59	MBT	(1975)	(1981)	(50)	China has delivered about 50/year
						(1982)	(50)	
						(1983)	(50)	
						(1984)	(50)	
						(1985)	(50)	
		(20)	CSA-1	SAM	(1985)	(1985)	(20)	Unconfirmed; copy of SA-2 SAM
	Netherlands	1	F-27 Maritime	Mar patrol	(1984)	1985	1	Ex-civilian Pakistani F-27 refurbished by Fokker for use by Navy for navigation training and maritime patrol

	Sweden	(125)	RBS-70	Port SAM	(1985)			Version RBS-70+; export licence withheld by Swedish Government summer 1985
	UK	2	Amazon Class	Frigate	(1985)			Part of Pakistani fleet modernization programme; 1 more ship to be built in Pakistan; negotiating loan of $368.4 m.
	USA	36	F-16A	Fighter/strike	1981	1983	6	In addition to 4 F-16Bs delivered 1982; total cost for 40 aircraft: $1100 m.
						1984	18	
						1985	12	
		4	G-134 Mohawk	Reece	1984			US LoO Aug 1984
		12	Model 209 AH-1S	Hel	1981	1985	12	Deal incl TOW missiles, MBTs, ARVs, anti-tank vehicles and howitzers
		..	Model 209 AH-1S	Hel	1982	(1985)	(8)	In addition to 12 ordered 1981
						(1986)	(4)	
		4	OV-10A Bronco	Trainer/COIN	(1983)			Ordered Jun 1983; unconfirmed
		36	M-109-A2 155mm	SPH	1982	(1984)	(18)	In addition to 64 ordered 1981
						(1985)	(18)	
		88	M-109-A2 155mm	SPH	(1985)			US LoO Sep 1985; total value: $78 m.
		40	M-110-A2 203mm	SPH	1981	(1984)	(20)	
						(1985)	(20)	
		110	M-113-A2	APC	(1985)			US LoO Sep 1985; total value: $25 m.
		75	M-198 155mm	TH	1981	(1984)	(20)	
						(1985)	(25)	
		..	M-48-A5	MBT	(1984)	1985	35	
		35	M-88-A1	ARV	1981	(1984)	(15)	
						(1985)	(20)	
		24	M-901 TOW	APC	1981	(1984)	(12)	
						(1985)	(12)	
		500	AIM-9L	AAM	1985	1985	100	Arming F-16 fighters; total cost: $50 m.; delivery of first 100 speeded up due to violations of Pakistani airspace
		1 005	BGM-71A TOW	ATM	1981	1983	(100)	Arming Model-209 helicopters and M-901 AVs
						1984	(240)	
						1985	(300)	
		2 030	BGM-71C I-TOW	ATM	1985			Total cost: $19 m.
		(100)	FIM-92A Stinger	Port SAM	1985	1985	(100)	Undisclosed number delivered
		16	RGM-84A Harpoon	ShShM	(1985)			To arm 1 Gearing Class destroyer; Harpoons planned for more Gearing Class; pending US congressional approval
14 Panama	Argentina	(60)	TAM	MT	1984			Possibly incl vehicles for resale
	Spain	7	C-212-200	Transport	(1986)			Negotiating
	USA	2	Model 212	Hel	(1984)	1985	2	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
11 Papua New Guinea	Israel	3	IAI-201 Arava	Transport	1984	(1984) (1985)	(1) (2)	Total cost: $10 m.
15 Paraguay	Brazil	(10)	EMB-110	Transport	(1985)	(1985)	(4)	
		2	HB-350M Esquilo	Hel	1985	1985	2	Total cost: $2.7 m.
		..	EE-11 Urutu	APC	(1984)			Unspecified number ordered
		..	EE-9 Cascavel	AC	(1984)			Unspecified number ordered
		1	Roraima Class	PC	1983	(1985)	(1)	Paraguayan designation: P-2 Itaipu
	Israel	..	IAI-201 Arava	Transport	(1985)			Unconfirmed
	Spain	2	C-212-200	Transport	1984			Original order for 4
15 Peru	Argentina	80	TAM	MT	(1986)			Negotiating
	Canada	8	DHC-6	Transport	1985			Total cost: $21.1 m.; financed by Canadian Export Development Corp.
	France	12	Mirage-2000	Fighter/strike	1982	(1986)	(12)	Order reduced from 26 for financial reasons
		(26)	Mirage-5	Fighter	(1981)	1984 (1985)	(13) (13)	Possibly Mirage-50
		40	AM-39 Exocet	AShM	1982			Ordered Dec 1982; arming Mirage-2000s
	Italy	4	SH-3D Sea King	Hel	(1984)	(1985)	(4)	In addition to 6 in service
		96	Aspide	AAM/SAM/ShAM	1975	1984 1985	(24) (24)	Arming Lupo Class frigates
		96	Otomat-1	ShShM	1974	1984 1985	(24) (24)	Arming Lupo Class frigates
	Spain	(24)	BMR-600	ICV	(1985)			Unconfirmed
	USA	3	L-100-30	Transport	(1985)			Delivery delayed for financial reasons
		5	UH-60A	Hel	(1984)			Barter deal; unconfirmed
	USSR	..	Mi-17 Hip-H	Hel	(1985)	(1985)	(6)	Unconfirmed; reportedly traded against older helicopters from Peruvian inventory
		(12)	Mi-24 Hind-D	Hel	(1984)			
10 Philippines	USA	2	S-70C	Hel	(1985)			Unconfirmed
		2	UH-60A	Hel	1983	(1985)	(2)	Contract negotiated with Sikorsky; total cost incl 17 S-76s: $60 m.
		55	LVTP-7A1	Amph ASSV	1982	(1984) (1985)	(20) (35)	For Marine Corps; total cost incl spares and support equipment: $64 m.

						(1985)	(44)	
8 Qatar	Egypt	..	Fahd	APC	(1984)	(1985)	(10)	Unconfirmed order for unspecified number
	France	12	Mirage F-1C	Fighter/interceptor	1980	1984	(6)	
						1985	(6)	
		..	HOT	ATM	1982			Total cost incl Milan ATMs: $20 m.; unconfirmed whether in service
		..	Milan	ATM	(1982)			Unconfirmed
	UK	6	Saracen FV-603	APC	(1985)	(1985)	6	Part of deal incl 10 patrol craft, rifles and grenades; UK military aid
		..	Blowpipe	Port SAM	(1984)			Reportedly on order
8 Saudi Arabia	Austria	(400)	Cuirassier	LT/TD	(1986)			Discussing purchase of up to 400; status of deal uncertain
	Brazil	(30)	EE-11 Urutu	APC	(1982)	1985	(30)	
		..	EE-T2 Osorio	MBT	(1985)			Basic agreement incl possible assembly in Saudi Arabia; quantity may be up to 2000; some possibly for transfer to Iraq
	France	24	AS-365F	Hel	1980	1983	(6)	20 to be armed with AS-15TT; some to arm 4 F-2000 Class frigates
						1984	(6)	
						1985	(6)	
						(1986)	(6)	
		(2)	ATL-2	Mar patrol	(1983)			Unconfirmed
		(80)	AMX-30 Shahine	AAV(M)	1984			Improved version to be developed with Saudi financial assistance; in addition to earlier version in service; minimum of 80 tanks, 140 launch systems and 20 radar acquisition units
		600	ERC-90 Sagaie	AC	(1986)			Negotiating; deal incl modernization of French vehicles in Saudi arsenal
		(200)	AS-15TT	AShM	1980	1983	(50)	Arming SA-365F helicopters
						1984	(50)	
						1985	(50)	
						(1986)	(50)	
		104	Crotale Naval	ShAM	1980	1985	(52)	First export order of naval version; arming F-2000 Class frigates
						(1986)	(52)	
		(96)	Otomat-2	ShShM	1980	1985	(48)	Arming 4 F-2000 Class frigates
						(1986)	(48)	
			Otomat-2/Teseo	SShM	1984			Otomat Mk-2 coastal defence version; part of 'Al Thakeb' contract for Shahine SAMs and radar systems; unspecified number of btys ordered

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		(1 000)	Shahine-2	Landmob SAM	1984			Contract name: 'Al Thakeb'; total value: $4100 m.
		2	Durance Class	Support ship	1980	1984	1	Fuel supply ship; displacement: 10 000t
						1985	1	
		4	F-2000 Class	Frigate	1980	1985	(2)	All 4 ships launched by end-1984; part of large turnkey naval 'Sawari' deal
						(1986)	(2)	
	Germany, FR	(300)	Gepard	AAV	(1986)			Ongoing negotiations; general go-ahead by West German government Oct 1983; reportedly followed by offer Feb 1984; one vehicle sent for testing
	Indonesia	40	CN-212	Transport	1979	(1983)	(2)	
						(1984)	(5)	
						(1985)	(8)	
	Italy	1	SH-3D Sea King	Hel	(1985)	1985	1	
		200	VCC-1	APC	1982	(1984)	(50)	Some armed with TOW ATMs
						(1985)	(50)	
	Japan	10	KV-107/2A	Hel	1982	1984	(4)	
						1985	(4)	
						(1986)	(2)	
	Spain	4	CN-235	Transport	1984	(1986)	(1)	Total cost incl BMR-600 AVs, tugs and ammunition: $150 m.; order may be increased to 10
		140	BMR-600	ICV	1984			Total cost: $62 m.
	Switzerland	30	PC-9	Trainer	1985			Part of large Saudi order from the UK; possibly to be assembled in UK
	UK	30	Hawk	Jet trainer/strike	1985			
		2	Jetstream-31	Transport	(1986)			Negotiating; to be equipped with Tornado avionics
		24	Tornado ADV	Fighter/MRCA	1985			
		48	Tornado IDS	Fighter/MRCA	1985			Total value incl 72 Tornados, 30 Hawks, 30 PC-9s and missiles: approx. $5.5 b.
		72	FH-70 155mm	TH	1982	1983	(10)	Unit cost: $0.75 m.
						1984	(36)	
						(1985)	(26)	
		. .	ALARM	ARM	1985			To arm Tornado fighters
		. .	Sky Flash	AAM	1985			To arm Tornado fighters
	USA	5	E-3A Sentry	AEW	1981			4 USAF AWACS to be kept in Saudi Arabia until deliveries begin 1986

		2	F-15C Eagle	Fighter	1980			DoD offered to sell; to be retained in USA until needed as replacement
		1	Gulfstream-3	Transport	(1983)	1985	1	For VIP use
		8	KC-135	Tanker/transport	1981			Order increased from 6 to 8 in 1984; Saudi designation: KE-3; total cost: $2.4 b.; for delivery 1987-8
		10	RF-5E Tigereye	Recce	1982	1984	(5)	
						(1985)	(5)	
		18	M-109-A2 155mm	SPH	1983	(1984)	(8)	
						(1985)	(10)	
		(505)	M-113-A2	APC	1983	(1984)	(100)	Incl 176 A2s, 33 M-578s, 111 M-992, 24 M-106s, 80 M-577s, 19 M-88s and 62 M-125s; total cost incl MGs and ammunition vehicles: $271 m.
						(1985)	(200)	
						(1986)	(205)	
		42	M-198 155mm	TH	1983	(1984)	(20)	
						(1985)	(22)	
		100	M-60-A3	MBT	1983	1984	(60)	US LoO Jul 1983; equipped with 105mm gun, laser rangefinder and infra-red night sights
						(1985)	(40)	
		579	V-150 Commando	APC	(1980)	1981	(100)	For modernization of National Guard
						1982	(100)	
						1983	(100)	
						1984	(100)	
						1985	(100)	
						(1986)	(79)	
		1 600	AGM-65D	ASM	(1984)			Arming F-15s
		(1 000)	AIM-7F Sparrow	AAM	1978	1981	(200)	
						1982	(200)	
						1983	(200)	
						1984	(200)	
						1985	(200)	
		1 177	AIM-9L	AAM	1981	1982	(200)	Arming F-15 fighters
						1983	(150)	
						1984	(200)	
						1985	(200)	
		(1 700)	AIM-9L	AAM	(1984)			To arm F-15s; unconfirmed
		2 500	BGM-71C I-TOW	ATM	(1982)			Probably not delivered; not identical with US LoO for 2538 TOWs in 1983
		2 538	BGM-71C I-TOW	ATM	1983			US LoO; improved version; total cost: $26 m.
13	Senegal	France	4	Rallye-235GT	Lightplane	1984	1985	4	

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
13 Sierra Leone	France	2	AS-350 Ecureuil	Hel	(1984)	(1985)	(2)	Only other military aircraft is 1 Bo-105 helicopter
10 Singapore	France	22	AS-332	Hel	1984	(1985)	(5)	Five delivered early 1985; 17 to be assembled by Samaero; option on 12 more for Navy (missile-armed)
	Italy	30	S-211	Trainer	1983	1984	2	First 6 to be delivered directly; last 24 to be assembled in Singapore; total cost approx. $60 m.
						1985	8	
						(1986)	(20)	
		6	SF-260 Warrior	Trainer/COIN	1982			In addition to 6 delivered 1980; status unclear
	UK	. .	Rapier	Landmob SAM	1981	(1984)	(48)	Unspecified number on order; in addition to 10 btys previously acquired
						(1985)	(48)	
	USA	4	E-2C Hawkeye	AEW	1983	(1986)	(2)	Total cost: $601 m.; for delivery from 1986
		8	F-16A	Fighter/strike	1985			Order changed from F-16/79s to F-16A/Bs; contract value unchanged at $280 m.
		(20)	AGM-84A Harpoon	AShM	1985			20-35 missiles to arm AS-332 helicopters
		(162)	MIM-23B Hawk	Landmob SAM	(1982)			Additional missiles and launchers reportedly on order
13 Somalia	China	(4)	F-7	Fighter	(1986)			Negotiating
	France	50	VLRA	Recce AC	(1983)			
	Italy	(6)	S-211	Trainer	(1985)			Unconfirmed
		100	M-47 Patton	MBT	(1983)	(1985)	(100)	All of Italy's 500 M-47s to be returned to USA for refurbishing before transfer to Third World countries
		(50)	M-47 Patton	MBT	(1985)			In addition to 100 delivered earlier
	Spain	6	C-212-200	Transport	1984			
		. .	BMR-600	ICV	(1984)			Unspecified number reportedly ordered
		. .	M-41E Cazador	TD	(1984)			Unspecified number reportedly ordered
		2	Cormoran Class	FAC	1984			Total cost: $45 m.; 50% financed by Saudi Arabia and 50% by Spain; ordered Feb 1984
16 South Africa	Germany, FR	2	BK-117	Hel	(1984)	1985	2	For Ciskei and Venda
	Spain	(1)	C-212-200	Transport	(1984)	1985	1	For Bhoputatswana Air Force

								addition to 1 delivered Apr 1985
9	Sri Lanka	Israel	(2)	Dvora Class	FAC	(1985)		Unconfirmed; may be Taiwanese Hai Ou Class
		Italy	(6)	SF-260TP	Trainer	1985		Number ordered also reported to be 8
		Singapore	2	Type 30M	LC	(1985)		200t mechanized-infantry landing craft; ordered from Vosper Aug 1985
		South Africa	6	Samil-100	APC	(1985)	(1985) 6	Via a third country
		USA	6	Model 212	Hel	(1984)	1985 6	Sold via Bell Asia in Singapore
			1	Super King Air	Transport	(1985)	1985 1	
13	Sudan	Egypt	..	Swingfire	ATM	(1982)		Reportedly on order
		Italy	12	AB-212	Hel	1984		For COIN duties in south Sudan; designation unconfirmed
		Romania	10	SA-330 Puma	Hel	1984	1984 (5)	
							1985 (5)	
		Spain	6	C-212-200	Transport	1984	(1985) (2)	
							(1986) (4)	
			..	BMR-600	ICV	(1984)		Unspecified number of tanks and APCs reportedly ordered
			..	M-41E Cazador	TD	(1984)		Unspecified number of tanks and APCs reportedly ordered; designation unconfirmed
			2	Cormoran Class	FAC	1984		Ordered Apr 1984; total value incl 18 river patrol boats: $50 m.; 50% financed by Saudi Arabia
8	Syria	France	15	SA-342K Gazelle	Hel	1984		Replacing losses in Lebanon War; to be armed with Hot ATMs
			(180)	HOT	ATM	1984		Arming 15 Gazelle helicopters
		Italy	18	AB-212ASW	Hel	(1986)		Order pending
			6	CH-47C Chinook	Hel	(1986)		Order pending
			12	SH-3D Sea King	Hel	(1986)		Order pending
		Poland	3	Polnocny Class	LS	(1983)	1984 1	
							1985 2	
		USSR	(35)	Mi-24 Hind-D	Hel	(1983)	(1983) (12)	
							(1984) (12)	
							(1985) (11)	
			..	MiG-23M	Fighter/intereceptor	1981	1982 (15)	Incl some MiG-23BNs (ground attack version)
							1983 (30)	
							1984 (30)	
							(1985) (30)	
			..	MiG-25 Foxhound	Fighter	(1984)		Unconfirmed

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		..	MiG-27	Fighter/strike	(1980)	1981	(6)	
						1982	(6)	
						1983	(6)	
						1984	(6)	
						1985	(6)	
		..	MiG-29	Fighter	(1984)			Unconfirmed
		2	Tu-126	AEW	(1981)			Unconfirmed
		(800)	BMP-1	MICV	1981	1982	(100)	
						1983	(100)	
						1984	(100)	
						1985	(100)	
		(36)	BTR-40PB Gaskin	AAV(M)	1978	(1981)	(6)	
						(1982)	(6)	
						(1983)	(6)	
						(1984)	(6)	
						(1985)	(6)	
		(200)	M-1973 152mm	SPG	1981	1982	(50)	Designation unconfirmed
						1983	(50)	
						1984	(50)	
						1985	(50)	
		(500)	M-1974 122mm	SPH	1981	1982	(100)	Designation unconfirmed
						1983	(100)	
						1984	(100)	
						1985	(100)	
		..	SA-13 TELAR	AAV(M)	(1984)			Unconfirmed
		..	T-72	MBT	1980	1981	(150)	
						1982	(150)	
						1983	(200)	
						1984	(200)	
						1985	(200)	
		(250)	T-74	MBT	(1985)	(1985)	(100)	Unconfirmed reports of deliveries of up to 250
		..	ZSU-23-4 Shilka	AAV	1981	(1982)	(25)	
						(1983)	(25)	
						(1984)	(25)	
						(1985)	(25)	
		(1 380)	AA-2 Atoll	AAM	(1979)	1981	(120)	Arming MiG-23/-25/-27s
						1982	(120)	

						1985	(210)	
		..	AA-6 Acrid	AAM	(1984)	(1984)	(50)	Unconfirmed; arming MiG-25s
						(1985)	(50)	
		.	AA-7 Apex	AAM	(1984)	(1984)	(50)	Unconfirmed; arming MiG-21s and MiG-23s
						(1985)	(50)	
		.	AA-8 Aphid	AAM	(1984)	(1984)	(20)	Unconfirmed; arming MiG-21s and MiG-23s
						(1985)	(20)	
		..	AT-4 Spigot	ATM	(1980)	(1981)	(50)	Captured by Israeli forces in Lebanon
						(1982)	(50)	
						(1983)	(100)	
						(1984)	(100)	
						(1985)	(100)	
		.	AT-5 Spandrel	ATM	(1984)	(1984)	(100)	Unconfirmed
						(1985)	(100)	
		.	SA-13 Gopher	Landmob SAM	(1984)			Acc to Israeli reports; to replace SA-9s
		..	SA-7 Grail	Port SAM	1978	(1981)	(25)	
						(1982)	(25)	
						(1983)	(50)	
						(1984)	(50)	
						(1985)	(50)	
		.	SA-8 Gecko	Landmob SAM	1982	(1982)	(64)	Designation unconfirmed; part of up-grading of SAM network around major Syrian cities; deal incl MiG-27 fighter aircraft
						(1983)	(64)	
						(1984)	(64)	
						(1985)	(64)	
		.	SA-9 Gaskin	Landmob SAM	1978	(1981)	(48)	
						(1982)	(48)	
						(1983)	(48)	
						(1984)	(48)	
						(1985)	(48)	
		(12)	SSN-2 Styx	ShShM	(1985)	1985	(12)	Arming Osa-2 Class FACs
		1	Natya Class	MSO	(1984)	1985	1	
		2	Osa-2 Class	FAC	(1985)	1985	2	
10	Taiwan	Indonesia	(15)	AS-332	Hel	(1986)			Negotiating
		Netherlands	2	Zwaardvis Class	Submarine	1981			Request for 2 more turned down by Dutch Government 1983; for delivery 1986-7
		Singapore	2	Type 32M	LC	(1984)	(1985)	2	Modified design; licensed production of 20-24 more planned
		USA	12	C-130H Hercules	Transport	1984	(1986)	(12)	Total cost incl spares and training: $325 m.
			20	F-104G	Fighter	(1985)	(1985)	(20)	In addition to 66 received 1982-3
			9	S-2G Tracker	Mar patrol/ASW	(1985)	1985	9	From US Navy surplus stocks
			42	T-34C-1	Trainer	1984			

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		357	M-113-A2	APC	1982	(1983) (1984) (1985)	(100) (100) (100)	140 APCs, 90 M-106-A2 and 72 M-125-A2 mortar carriers, 31 CPCs and 24 of the ambulance version
		33	M-88-A1	ARV	(1983)			US LoO Jul 1983
		100	AIM-7F Sparrow	AAM	(1983)			May be cancelled due to Swiss refusal to sell Skyguard air defence system
		262	MIM-72F	SAM/ShAM	(1985)			For Army; total cost incl 16 launchers incl vehicles and support; $94 m.
		170	RIM-66A/SM-1	ShAM/ShShM	(1983)	(1985) (1986)	(85) (85)	For corvettes under construction
		(120)	Sea Chaparral	ShAM	(1983)	(1984) (1985)	(60) (60)	For corvettes under construction
		(3)	Asheville Class	Frigate	(1985)			Unconfirmed
10 Thailand	Australia	1	N-22B Nomad	Mar patrol	1984	(1985)	(1)	For maritime patrol in piracy areas; financed by UN High Commission for Refugees
		4	N-24A Nomad	Transport	(1985)	1985	4	Military aid
	Brazil	56	EE-9 Cascavel	AC	1982	(1984) (1985)	(28) (28)	
	China	24	T-59	MBT	(1985)	1985	24	Gift
		18	Type 59/1 130mm	TG	(1985)	1985	18	Gift
	France	. .	MM-40 Exocet	ShShM/SShM	(1983)			For coastal defence; unconfirmed
	Germany, FR	(2)	M-40 Type	MSC/PC	1984			Option on 3-5 more; unit cost: $18 m.
	Indonesia	3	CN-212	Transport	1985			In addition to 5 in service (4 from Spain and 1 from Indonesia)
		(25)	NBo-105	Hel	(1979)	(1983) (1984) (1985)	(2) (3) (5)	
	Italy	(48)	Aspide	AAM/SAM/ShAM	1984			To arm 2 corvettes ordered from USA
	Netherlands	1	F-27 Maritime	Mar patrol	1985			In addition to 3 in service
	UK	. .	MBT Mk-3	MBT	(1986)			For use on Kampuchean border; unconfirmed; drawn out local testing
	USA	8	F-16A	Fighter/strike	1985			US LoO Apr 1984; F-16Cs sought; F-16/79 rejected by Thai AF; total cost incl 4 F-16B: $378 m.; order number reduced from 16 for financial reasons; for delivery 1988-9

		(6)	Model 212	Hel	(1984)	(1985)	(8)	For border surveillance; delivered via Bell, Singapore
		21	LVTP-7A1	Amph ASSV	1984	1984	(8)	
						1985	(13)	
		148	M-113-A2	APC	1982	(1984)	(40)	Total cost incl 40 trucks: $33 m.
						(1985)	(40)	
		(20)	M-198 155mm	TH	1984	1985	(20)	
		40	M-48-A5	MBT	1984	(1984)	(20)	Ordered Jun 1984; order for 60 more to follow; total cost incl machine guns, spares and support: $32 m.; from US Army stocks
						(1985)	(20)	
		(164)	V-150 Commando	APC	1978	(1981)	(20)	
						(1982)	(20)	
						(1983)	(20)	
						(1984)	(20)	
						(1985)	(20)	
		(48)	RGM-84A Harpoon	ShShM	1983			Arming 2 corvettes on order from USA
		2	Tacoma Type	Corvette	1983			Ordered May 1983; for delivery 1986-7; similar to Badr Class for Saudi Arabia; a third ship to be built in Thailand; armed with Harpoon ShShMs and Aspide AShMs
13	Togo	France	3	TB-30 Epsilon	Trainer	1984	(1985)	(3)	First export order
		USA	(1)	C-130H Hercules	Transport	(1985)			Reportedly ordered
12	Tunisia	Brazil	..	EE-3 Jararaca	SC	(1984)			Unconfirmed
		USA	2	C-130H Hercules	Transport	1984	(1985)	(2)	To replace old transport aircraft
			(8)	F-5E Tiger-2	Fighter	1982	(1984)	(1)	Order number reportedly changed from 6
							(1985)	(7)	
8	United Arab Emirates	Brazil	30	EE-11 Urutu	APC	(1983)	1985	30	
		Egypt	..	Fahd	APC	(1984)	(1985)	(10)	Unconfirmed order for unspecified number
		France	18	Mirage-2000	Fighter/strike	1983	(1985)	(1)	For Abu Dhabi; for delivery from Nov 1985; incl recce version
			(20)	Mirage-2000	Fighter/strike	1984			For Abu Dhabi; in addition to 18 ordered 1983; reportedly in exchange for 15 m. barrels of oil
		Italy	(30)	A-129 Mangusta	Hel	(1986)			Negotiating; possibly first export sale; first time Italian Government actively assisted export efforts of Italian arms industry; for Abu Dhabi

Region code/ Recipient	Supplier	No. ordered	Weapon designation	Weapon description	Year of order	Year of delivery	No. delivered	Comments
		4	MB-339A	Jet trainer	(1984)	1984	(2)	For Dubai; unconfirmed
						(1986)	(2)	
		(6)	SF-260TP	Trainer	1982	1984	(2)	For Dubai
						1985	(4)	
		(21)	OF-40	MBT	(1982)	1984	(9)	Mk 2 version incl some ARVs; for Dubai;
						1985	(12)	in addition to 18 delivered 1982-3
	Switzerland	10	PC-7	Trainer	1984	(1985)	(2)	In addition to 14 delivered 1982
						(1986)	(8)	
	UK	24	Hawk	Jet trainer/strike	1983	1984	(2)	Ordered Jan 1983; Mk 61
						1985	(12)	
						(1986)	(10)	
		(44)	FV-101 Scorpion	LT	(1983)	(1984)	(15)	Unconfirmed
						(1985)	(15)	
						(1986)	(14)	
		. .	Rapier	Landmob SAM	(1984)			For Dubai; unconfirmed
	USA	1 085	BGM-71A TOW	ATM	1981	(1984)	(540)	Total cost incl 54 launchers and 101
						(1985)	(545)	practice missiles: $28 m.
		45	MIM-23B Hawk	Landmob SAM	(1985)	(1985)	(45)	Replacing missiles used for practice
15 Uruguay	Brazil	(15)	EE-11 Urutu	APC	(1984)			Unconfirmed
15 Venezuela	Argentina	24	IA-58A Pucara	COIN	1983			Negotiations suspended 1984; may have been cancelled
	Brazil	(30)	EMB-312 Tucano	Trainer	1985			Total cost: $50 m.; option on 14 more
		. .	EE-3 Jararaca	SC	(1984)			Unconfirmed
	France	. .	AMX-13-90	LT	(1986)			Advanced negotiations for several dozen AMX-13 vehicles
	Italy	(10)	A-109 Hirundo	Hel	(1984)	(1985)	(10)	
		8	G-222	Transport	(1982)	1984	2	6 for AF, 2 for Army
						1985	(6)	
		8	G-222	Transport	(1986)			Negotiating; in addition to 8 in service
		4	S-61R	Hel	1984	1984	(2)	
						1985	(2)	
		5	Type 42M	PC	1983			
	Korea, South	(6)	Tacoma Type	LS	1982	1984	4	
						(1985)	(2)	
	USA	18	F-16A	Fighter/strike	1981	1983	(3)	Total cost for 24 F-16s: $500 m.

						1984	(9)	
						1985	(6)	
		3	Falcon-20G	Mar patrol	(1985)	1985	3	Bought from civilian airline
10 Viet Nam	USSR	30	Mi-24 Hind-D	Hel	(1984)	(1984)	(15)	Unconfirmed
						(1985)	(15)	
		. .	MiG-23	Fighter/interceptor	(1984)	(1985)	(6)	Unconfirmed
		. .	AS-7 Kerry	ASM	1982	1983	(20)	
						1984	(20)	
						(1985)	(20)	
		6	Shershen Class	FAC	(1984)	(1985)	(6)	Unconfirmed
		(2)	Turya Class	Hydrofoil FAC	(1984)	(1985)	(2)	Unconfirmed
8 Yemen, North	New Zealand	(5)	F-27 Mk-400	Transport	(1984)	(1984)	3	Supplier unconfirmed for last 2 aircraft
						(1985)	2	
	USSR	1	An-12 Cub-A	Transport	(1984)	(1985)	(1)	
		(25)	Mi-8 Hip	Hel	(1984)	(1984)	(13)	
						(1985)	(12)	
		(24)	MiG-21F	Fighter	(1985)	(1985)	(24)	Unconfirmed
		(12)	T-62	MBT	(1985)	(1985)	(12)	Unconfirmed
13 Zambia	Yugoslavia	. .	G-4 Super Galeb	Jet trainer	(1984)			Unconfirmed
13 Zimbabwe	China	(15)	F-7	Fighter	(1983)			Unconfirmed offer for 1 squadron; may be cancelled due to absorption problems
		(35)	T-59	MBT	(1984)			Unconfirmed
	Italy	10	AB-412 Griffon	Hel	1984			

Appendix 17C. Register of licensed production of major conventional weapons in industrialized and Third World countries, 1985

This appendix lists licensed production of major weapons for which either the licence was bought, production was under way, or production was completed during 1985. Certain deals close to finalization by early 1986 are included with licence year *(1986)*. Deliveries made before 1981 for the same sales agreement have been excluded for space reasons. The sources and methods for the data collection, and the conventions, abbreviations and acronyms used, are explained in appendix 17D. The entries are made alphabetically, by recipient, licenser and weapon designation.

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
I. Industrialized countries								
11 Australia	France	1	Durance Class	Support ship	1977	1985	1	
	Switzerland	(69)	PC-9	Trainer	1985			Selected as new basic trainer for RAAF; to proceed from assembly to local manufacture after initial deliveries from Switzerland
	UK	61	Hamel 105mm	TG	(1982)	(1985)	(2)	To be produced 1985-9
	USA	73	F/A-18 Hornet	Fighter	1981	1985	3	In addition to 2 delivered directly; total cost: A$3396 m.; production suspended late-1985 due to technical problems
		2	FFG-7 Class	Frigate	1983			For completion 1991-2
4 Belgium	USA	44	F-16A	Fighter/strike	1983			In addition to 116 F-16A/Bs in service; offset share: 80%
		514	AIFV	MICV	1979	1982	(100)	Total number ordered: 1189 incl 525 M-113s; unit cost: $100 000
						1983	(100)	
						1984	(100)	
						1985	(100)	
		525	M-113-A2	APC	1979	1982	(50)	
						1983	(50)	
						1984	(50)	
						1985	(50)	

						(1984)	(100)	
						(1985)	(100)	
4 France	USA	. .	FTB-337	Trainer	1969	1981	(5)	Designation: FTB-337 Milirole; exported to Africa
						1982	(5)	
						1983	(5)	
						(1984)	(5)	
						(1985)	(5)	
4 Germany, FR	USA	. .	AIM-9L	AAM	1977	1981	(800)	For delivery 1981-7; NATO co-production programme
						1982	(1 600)	
						1983	(2 600)	
						1984	(2 400)	
						1985	(2 400)	
		10 000	NATO Stinger	Port SAM	1983			Dornier/Diehl (FRG) main contractor for FRG, Belgium, Greece, Italy, Holland and Turkey; production to begin 1986
		(10 000)	RAM	ShAM/PDM	1985			MoU signed between USA, FRG and Denmark 4 West German companies to provide second-source production
4 Italy	France	23 000	Milan	ATM	1980	(1985)	(100)	
		. .	Roland-2	Landmob SAM	(1986)			OTO-Melara negotiating with Euromissile for licensed production
	USA	. .	AB-205	Hel	1969	1981	(60)	
						1982	(60)	
						1983	(60)	
						1984	(30)	
						1985	(30)	
		. .	AB-206B	Hel	1972	1981	(50)	Jetranger-3 version available from 1984
						1982	(50)	
						1983	(50)	
						1984	(50)	
						1985	(50)	
		. .	AB-212	Hel	1970	1981	(10)	In production since 1971
						1982	(10)	
						1983	(10)	
						1984	(10)	
						1985	(10)	
		. .	AB-212ASW	Hel	1975	1981	(15)	
						1982	(20)	
						1983	(25)	
						1984	(25)	
						1985	(20)	

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
			AB-412 Griffon	Hel	1980	1983	(3)	Military version of Bell Model 412; Italy holds marketing rights
						1984	(5)	
						1985	(10)	
		(170)	CH-47C Chinook	Hel	1968	1981	(12)	Licensed production began 1970
						1982	(12)	
						1983	(12)	
						1984	(12)	
						1985	(12)	
		.	S-61R	Hel	1972	1981	(3)	In production since 1974
						1982	(3)	
						1983	(3)	
						1984	(3)	
						1985	(3)	
		. .	SH-3D Sea King	Hel	1965	1981	(2)	In production since 1969
						1982	(2)	
						1983	(2)	
						1984	(2)	
						1985	(3)	
		. .	M-113-A1	APC	1963	1981	(150)	
						1982	(150)	
						1983	(150)	
						1984	(150)	
						1985	(100)	
		(15 000)	AGM-65D	ASM	(1983)			Undecided whether joint NATO-European or only Italian production for NATO Europe
10 Japan	USA	(51)	CH-47D Chinook	Hel	(1984)	(1986)	(7)	For Army and AF; in addition to 4 delivered directly
		88	F-15J Eagle	Fighter/interceptor	1978	1981	(8)	In addition to 12 delivered directly from USA; total order of 100 incl 12 trainers
						1982	(10)	
						1983	(13)	
						1984	(17)	
						1985	(14)	
						(1986)	(12)	
		55	F-15J Eagle	Fighter/interceptor	1985			MoU signed Dec 1984; in addition to 100 on order; for delivery 1986-90
		. .	KV-107/2A	Hel	(1982)	1984	(3)	In addition to 61 produced earlier; improved version
						1985	(5)	

				1982	(6)	
				1983	(6)	
				1984	(4)	
				1985	(5)	
				(1986)	(4)	
54	Model 209 AH-1S	Hel	1982	1984	(6)	
				1985	(8)	
				(1986)	(8)	
..	OH-6D	Hel	1977	1981	(8)	Identical to Hughes Model-500D
				1982	(8)	
				1983	(4)	
				1984	(9)	
				1985	(7)	
				(1986)	(12)	
42	P-3C Orion	Mar patrol/ASW	1978	1982	(5)	
				1983	(7)	
				1984	(8)	
				1985	(10)	
				(1986)	(12)	
30	P-3C Orion	Mar patrol/ASW	1985	(1986)	(2)	MoU signed Oct 1985: in addition to 45 previously ordered
90	S-61B	Hel	1965	1981	(10)	
				1982	(4)	
				1983	(4)	
				1984	(1)	
				1985	(1)	
51	SH-3B	Hel	1979	1981	(6)	
				1982	(8)	
				1983	(5)	
				1984	(7)	
				1985	(10)	
				(1986)	(13)	
(72)	M-110-A2 203mm	SPH	(1981)	1983	(6)	
				1984	(12)	
				1985	(12)	
				(1986)	(12)	
1 350	AIM-7F Sparrow	AAM	(1979)	1981	(100)	Arming F-15s
				1982	(200)	
				1983	(250)	
				1984	(250)	
				1985	(150)	
..	AIM-9L	AAM	(1982)	1983	(225)	
				1984	(500)	
				1985	(750)	

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
		..	MIM-104 Patriot	Landmob SAM	1984	(1985)	(40)	For delivery 1985-91; 130 launchers (10 for training); 24 Patriot launch units; to be produced under licence after delivery of initial batch from USA; total cost: $2800 m.
						(1986)	(80)	
		..	MIM-23B Hawk	Landmob SAM	1978	1981	(300)	
						1982	(280)	
						1983	(260)	
						1984	(260)	
						1985	(260)	
		..	Seasparrow	ShAM	1980	(1981)	(18)	Arming various Japanese-built frigates and destroyers
						(1982)	(18)	
						(1983)	(18)	
						(1984)	(36)	
						(1985)	(10)	
4 Netherlands	USA	22	F-16A	Fighter/strike	1981	1984	(11)	Order incl 18 F-16As and 4 F-16Bs
						1985	(11)	
		18	F-16A	Fighter/strike	1982	(1985)	(6)	For delivery 1985-7
						(1986)	(6)	
		57	F-16A	Fighter/strike	1983			For delivery 1987-92
		840	AIFV	MICV	1981	(1983)	(200)	In addition to 880 in service; 173 will be M-901 TOW version; Dutch designation: YPR-765
						(1984)	(200)	
						(1985)	(200)	
		86	M-109-A2 155mm	SPH	(1980)	1981	(12)	First 6 delivered Jul 1981; Dutch Army already has 118 old M-109s
						1982	(24)	
						1983	(24)	
						1984	(24)	
						1985	(2)	
5 Poland	USSR	..	An-28	Transport	1978	1983	(5)	
						(1984)	(10)	
						(1985)	(10)	
		..	Mi-2 Hoplite	Hel	(1956)	1981	(200)	In production since 1957; 3000 built by end-1979
						1982	(200)	
						1983	(200)	
						1984	(200)	
						1985	(200)	

						(1982)	(50)	
						(1983)	(100)	
						(1984)	(100)	
						(1985)	(100)	
5 Romania	France	..	SA-316B	Hel	1971	1981	25	More than 200 produced by 1981
						1982	(25)	
						1983	(25)	
						1984	(25)	
						1985	(25)	
		..	SA-330 Puma	Hel	1977	1981	(20)	
						1982	(19)	
						1983	(25)	
						1984	(20)	
						1985	(20)	
	UK	20	BAC-111	Transport	1979	1981	(3)	Total cost: $410 m. plus $205 m. for licensed production of Rolls-Royce Spey engine; 20 aircraft for Romanian AF
						1982	(3)	
						1983	(3)	
						1984	(3)	
						1985	(3)	
						(1986)	(2)	
	USSR	..	Yak-52	Trainer	(1979)	1982	(20)	Two-seat piston-engined primary trainer
						1983	(20)	
						1984	(20)	
						1985	(20)	
		..	T-72	MBT	(1984)			Reportedly to be built with French engine; unconfirmed
4 Spain	France	18	AMX-30R	AAV(M)	1984			
		4	S-70 Class	Submarine	1975	1983	2	
						1985	2	
	USA	3	FFG-7 Class	Frigate	1977	(1986)	(2)	
		2	FFG-7 Class	Frigate	1984			In addition to 3 now under construction; replacing 2 F-30 Class sold to Egypt
7 Switzerland	Germany, FR	345	Leopard-2	MBT	1983			Total cost incl 35 delivered directly: $1400 m.
	USA	32	F-5E Tiger-2	Fighter	1981	1981	(4)	Order incl 32 F-5E fighters and 6 F-5F trainers; local assembly; in addition to 72 in service
						1982	(8)	
						1983	(8)	
						1984	(4)	
						1985	(4)	

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
4 Turkey	Germany, FR	2	Meko-200 Type	Frigate	1983			In addition to 2 built in FR Germany; will probably be armed with 2x4 Harpoon ShShMs and Aspide ShAMs using 1x8 Seasparrow launcher
		13	SAR-33	PC	1976	1981	(1)	Prototype delivered from FR Germany 1977 for trials; 13 built in Turkey; for Coast Guard; can carry ShShMs
						1982	(2)	
						1983	(2)	
						1984	(2)	
						1985	(2)	
						(1986)	(2)	
		(9)	Type 209/1	Submarine	1974	1981	1	Built under licence in addition to 3 delivered from FR Germany; planned production rate: 1 ship/year
						1984	1	
						1985	1	
	Italy	(50)	G-222	Transport	(1984)			To commence as assembly from kits and then progress to complete indigenous production; partly financed by US MAP; may be cancelled in favour of Spanish CN-235s
4 UK	Brazil	130	EMB-312 Tucano	Trainer	1985			Total cost: $145-150 m.; powered by Garrett TPE-12B turboprop engine; for delivery 1986-91
	France	. .	Milan	ATM	1976	1981	(6 000)	UK requirement: 50 000; also produced for export as Euromissile production is phased out
						1982	(6 000)	
						1983	(11 500)	
						1984	(11 500)	
						1985	(7 500)	
	USA	. .	BGM-71A TOW	ATM	1980	1982	(400)	
						1983	(1 500)	
						1984	(4 100)	
						1985	(6 000)	
1 USA	UK	300	T-45 Hawk	Jet trainer/strike	1981			First deliveries expected 1990; total cost incl simulators and training: $3 200 m.
6 Yugoslavia	France	. .	SA-342 Gazelle	Hel	1971	1981	(10)	SA-341/342 Gazelles produced since 1973
						1982	(10)	

						1984	(10)	
						1985	(10)	
	USSR	..	T-72	MBT	(1977)	(1984)	(10)	Upgraded T-72 with Yugoslavian-designed laser aiming device
						(1985)	(30)	

II. Third World countries

12	Algeria	Bulgaria	..	Kebir Type	Corvette	1983			Unconfirmed whether licensed production, assembly or sale; possibly similar to Soviet Nanuchka Class; ordered July 1983
		UK	4	Kebir Class	PC	1981	1985	(3)	In addition to 2 delivered from UK
			3	Kebir Class	PC	1985			For delivery by 1987
15	Argentina	Germany, FR	(300)	TAM	MT	1976	(1981)	(40)	220 for Argentina plus for export; developed by Thyssen (FRG)
							(1982)	(55)	
							(1983)	(55)	
							(1984)	(40)	
							(1985)	(40)	
			300	VCTP	ICV	1976	1981	(25)	Similar to Marder MICV
							1982	(100)	
							1983	(100)	
							1984	(50)	
							1985	(25)	
			6	Meko-140 Type	Frigate	1980	(1985)	(2)	
							(1986)	(2)	
			4	Type TR-1700	Submarine	1977			In addition to 2 delivered directly; first ship laid down Oct 1983
15	Brazil	Austria	..	GC-45 155mm	TH/TG	(1985)			Unconfirmed
		France	..	HB-315B Gavaio	Hel	(1977)	(1981)	(6)	
							(1982)	(6)	
							(1984)	(3)	
			..	HB-350M Esquilo	Hel	1977	1981	(3)	
							1982	(7)	
							1983	(5)	
							(1985)	(2)	
		Germany, FR	1	Type 209/3	Submarine	1982			In addition to 1 purchased directly; hull and some components to be built in Brazil; barter agreement for iron ore worth more than $200 m.

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
	UK	1	Niteroi Class	Frigate	1981	(1986)	(1)	Ordered Jun 1981; training ship; completion delayed
15 Chile	Spain	21	T-36 Halcon	Jet trainer	1984	(1985)	(4)	Developed from C-101 Aviojet with Chilean engineers; offset by Spanish order for T-35 Pillan; in addition to 12 delivered 1982-3
	Switzerland	(150)	Piranha	APC	1980	1981	(10)	4x4 and 6x6 versions. Swiss or Brazilian gun
						1982	(20)	
						1983	(20)	
						1984	(20)	
						1985	(20)	
	USA	(120)	T-35 Pillan	Trainer	1980	(1985)	(10)	Developed from Piper PA-28 by US and Chilean engineers; 80 for Chile, 40 for Spain
8 Egypt	Brazil	110	EMB-312 Tucano	Trainer	1983	1985	(12)	In addition to 10 delivered directly;
						(1986)	(48)	for delivery from 1985; 30 for Egypt, 80 for Iraq; option on 60 more; reportedly $180 m. loan from Saudi Arabia
	France	...	AS-332	Hel	1983			Ordered Dec 1983; mainly assembly
		37	Alpha Jet	Jet trainer/strike	1981	1982	(1)	Following delivery of 8 directly from
						1983	(12)	France; local component share increased
						1984	(12)	from 10% (1982) to 48% (1984); last 15
						1985	(12)	NG-version (MS2)
		15	Alpha Jet	Jet trainer/strike	(1986)			Negotiating; in addition to 45 in service
		36	SA-342L Gazelle	Hel	1981	1983	(1)	
						1984	(15)	
						1985	(15)	
						(1986)	(5)	
		...	SA-342L Gazelle	Hel	(1986)			Negotiating continued production
	UK	(5 000)	Swingfire	ATM	1977	1981	(500)	
						1982	(500)	
						1983	(500)	
						1984	(500)	
						1985	(500)	

						1982	(15)	production of 100 from local raw
						1983	(15)	materials; also for civilian use
						1984	(15)	
						1985	(9)	
		..	SA-316B Chetak	Hel	(1962)	1981	(30)	257 built by 1983; also for civilian
						1982	(20)	customers
						1983	(20)	
						1984	(20)	
						1985	(20)	
		(10 000)	Milan	ATM	1981	(1985)	(100)	First missile completed early 1985
	Germany, FR	(150)	Do-228	Transport	1982	(1984)	(3)	Complementing HS-748 aircraft produced
						(1985)	(20)	in India
		4	Type 1500	Submarine	1984			Option from 1981 taken up Feb 1984; in addition to 2 delivered directly
	UK	45	Jaguar	Fighter	1978	1982	(1)	Local production of components; in
						1983	(4)	addition to 40 purchased directly
						1984	(5)	
						1985	(10)	
		31	Jaguar	Fighter	1983			In addition to 45 now being assembled under licence
		3	Godavari Class	Destroyer	1978	1983	1	Improved Leander Class design; follow-
						1984	1	on to Nilgiri Class
						(1986)	(1)	
	USSR	(170)	MiG-21bis	Fighter	1976	(1981)	(20)	In addition to 100 assembled from kits;
						(1982)	(20)	production expected to end 1987
						(1983)	(20)	
						(1984)	(20)	
						(1985)	(20)	
						(1986)	(20)	
		(200)	MiG-27	Fighter/grd attack	1983	1984	(2)	Agreement signed Jul 1983; first flight
						1985	(10)	Nov 1984
		..	BMP-1	APC/ICV	1983	(1984)	(10)	Production began Jul 1984
						(1985)	(25)	
		(1 000)	T-72	MBT	(1980)			Prototype ready Mar 1984; for entry into service 1987; production initially 10% indigenous; Indian designation: T-72M; possibly similar to Soviet T-74
10	Indonesia	France	(56)	AS-332	Hel	(1982)	1983	(1)	Production switched from Puma to Super
							1984	(1)	Puma 1983; total orders by end-1984: 69;
							1985	(2)	military orders: 56
		Germany, FR	(100)	BK-117	Hel	1982	1984	2	Total production schedule: 100; 2 pre-production aircraft delivered 1984

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
		(50)	NBo-105	Hel	1976	1981	(4)	Produced under licence from MBB; total orders by 1984: 123; military orders for approx. 50 helicopters
						1982	(4)	
						1983	(4)	
						1984	(4)	
						1985	(4)	
						(1986)	(4)	
		6	PB-57 Type	PC	1982	(1985)	(1)	In addition to 2 delivered directly; probably 4 for Coast Guard
	Spain	(80)	CN-212	Transport	1976	1981	(3)	100/200-version; total orders by 1984: 185; military orders: approx. 80; customers for military version: Saudi Arabia, Thailand and Indonesia
						1982	(3)	
						1983	(3)	
						1984	(3)	
						1985	(3)	
						(1986)	(3)	
	USA	(28)	Model 412	Hel	1982	(1985)	(1)	More than 100 to be assembled from 1985; military orders by 1984: 28
						(1986)	(12)	
8 Israel	USA		Westwind 1124	Transport	1968	1981	(2)	Production transferred to Israel 1968
						1982	(2)	
						1983	(2)	
						1984	(2)	
						1985	(2)	
		9	Flagstaff-2 Class	Hydrofoil FAC	1981	1983	1	In addition to 1 delivered from USA; remaining 8 may not all be built for financial reasons; arms: 2 Gabriel and 4 Harpoon ShShMs
						1985	1	
10 Korea, South	USA	(68)	F-5E Tiger-2	Fighter	1979	1982	(3)	Incl 36 F-5Es and 32 F-5Fs
						1983	(12)	
						1984	(18)	
						1985	(18)	
						(1986)	(17)	
		(139)	Model 500MD	Hel	1976	1981	(15)	
						1982	(15)	
						1983	(15)	
						1984	(15)	
						1985	(15)	
			M-101-A1 105mm	TH	(1971)	(1981)	(10)	Possibly without US consent

						(1984)	(10)	
						(1985)	(10)	
		. .	M-109-A2 155mm	SPH	1983			
		. .	M-114-A1	TH	(1971)	(1981)	(10)	Possibly without US consent
						(1982)	(10)	
						(1983)	(10)	
						(1984)	(10)	
						(1985)	(10)	
		.	PSMM-5 Type	FAC	(1974)			Produced by US subsidiary Korea Tacoma; first 4 for South Korea; rest built for Indonesia and the Philippines
10	Malaysia	Korea, South	1	Mash Class	OPV	(1983)	(1986)	(1)	Licensed production; in addition to 1 delivered directly from South Korea
14	Mexico	UK	5	Azteca Class	PC	1983			In addition to 31 in service
13	Nigeria	Austria	(200)	Steyr-4K 7FA	APC	(1981)			Various versions to be built; possibly also Cuirassier LT/TD; status uncertain due to financial problems
9	Pakistan	Sweden	. .	Supporter	Trainer	1974	1981	(20)	Assembly of 90 from imported kits began 1976; from 1982 using local raw material only; production transferred to Kamra AMF 1981
							1982	(5)	
							1983	(5)	
							1984	(15)	
							1985	(15)	
							(1986)	(15)	
		UK	1	Amazon Class	Frigate	(1985)			In addition to 2 from UK
15	Peru	Italy	2	Lupo Class	Frigate	1974	1984	1	In addition to 2 delivered directly
							1985	1	
10	Philippines	Germany, FR	. .	Bo-105C	Hel	1974	1981	(2)	44 assembled by 1983; approx. 15 of military version in service with armed forces 1984, incl 5 delivered from FRG
							1982	(1)	
							1983	(1)	
							1984	(1)	
							1985	(1)	
		UK	(100)	BN-2A Islander	Lightplane	1974	1982	(10)	A total of 100 to be produced for civil and military customers in 4-phase programme; last 60 locally manufactured since 1982; approx. 25 in service with armed forces
							(1983)	(10)	
							(1984)	(10)	
							(1985)	(10)	

Region code/ Country	Licenser	No. ordered	Weapon designation	Weapon description	Year of licence	Year of production	No. produced	Comments
10 Singapore	Germany, FR	3	PB-57 Type	PC/FAC	1980			Luerssen design; status unclear
10 Taiwan	Israel	. .	Gabriel-2	ShShM/SShM	(1978)	1981	(75)	Taiwanese designation: Hsiung Feng; arming Lung Chiang Class (PSMM-5) FACs, Hai Ou Class (Dvora) Class FACs and some Gearing/Sumner Class destroyers; also produced in coastal defence version
						1982	(75)	
						1983	(75)	
						1984	(50)	
						1985	(50)	
		. .	Hai Ou Class	FAC	(1979)	1981	(8)	Developed by Sun Yat Sen SRI from Israeli Dvora Class; armed with 2 Hsiung Feng (Gabriel-2) ShShMs; more than 50 planned
						1982	(8)	
						1983	(8)	
						1984	(8)	
						1985	(8)	
	USA	(30)	F-5E Tiger-2	Fighter	1982	1983	(6)	Total cost incl 30 F-5Fs: $620 m.; for delivery 1983-7
						1984	(6)	
						1985	(6)	
		30	F-5F Tiger-2	Jet trainer	1982	1983	(6)	
						1984	(6)	
						1985	(6)	
10 Thailand	France	1	PS-700 Class	LS	1984			To be built by Ital Thai Ltd
	Germany, FR	45	Fantrainer	Trainer	1983	1985	(26)	In addition to 2 delivered directly; local assembly and some component manufacture
						(1986)	(19)	

Appendix 17D. Criteria, values and conventions

I. Selection criteria

The arms trade data cover four categories of 'major weapon': aircraft, armoured vehicles, missiles and warships.

There are two criteria for selection of major weapon items. The first is that of military application. However, some categories have been excluded: such as aerobatic aeroplanes, harbour tugs and icebreakers. The category *armoured vehicles* includes all types of tank, tank destroyer, armoured car, armoured personnel carrier, infantry combat vehicle as well as self-propelled and towed guns and howitzers. Military trucks are not included. The category *missiles* includes only guided missiles and their launch and guidance equipment; unguided rockets are not included.

The second criterion for selection of major weapon items is the identity of the buyer—that is, items either destined for or purchased by the armed forces of the buyer country are included. Weapons for police forces are as a rule not included.

All types of arms transfer are included—that is, direct sales, aid, gifts, loans and grants.

The entry of any arms transfer is made in accordance with the four-category division of major weapons. This means that when, for example, a missile-armed ship or aircraft is purchased, the missiles are entered separately in the arms trade register.

Dates and numbers

Both the order dates and the delivery dates for arms transactions are continuously being revised in the light of new information. The *order date* should be the date on which the sales contract was signed.

In order to enable the reader to follow the development of any given arms transaction, all the *delivery dates* are followed by a column of figures indicating the number of items delivered that year. For reasons of space, only deliveries during the past five years are included.

The exact number of weapons ordered as well as the number of weapons delivered per year may not always be known and may therefore be estimated.

II. The value of the arms trade

The SIPRI system for evaluating the arms trade was designed as a *trend-measuring device*, to enable the measurement of changes in the total flow of major weapons and its geographic pattern. Expressed in monetary terms, both the quantity and the quality of the weapons transferred are reflected. Aggregated values and percentages are based only on *actual deliveries* during the year or years covered in the tables and figures in which they are presented.

SIPRI independently evaluates the arms trade by maintaining a list of comparable prices based on such actual prices as become known and on such criteria as weight, speed and role of the weapon. For weapons for which all price information is lacking, a comparison is made with a known weapon of the same type as regards performance criteria, and the weapon is valued accordingly. Each weapon obtains three separate values: new, second-hand and refurbished. Missiles, however, are valued only as new.

The SIPRI valuation system is not comparable to official economic statistics such as gross domestic product, public expenditure and export/import figures. The monetary values chosen do not correspond to the actual prices paid, which vary considerably

depending on different pricing methods, the length of production runs, and the terms involved in individual transactions—the actual sales price for a given weapon system differs according to the buyer and the coverage of the deal. For instance, a deal may or may not cover spare parts, training, support equipment, compensation and offset arrangements for the local industries in the buying country, and so on.

Furthermore, to use only actual sales prices—assuming that the information were available for all deals, which it is not—military aid and grants would be excluded, and the total flow of arms would therefore not be measured.

Licensed production is included in the aggregated trade statistics and is valued in the same way as the arms trade.

III. Conventions

The following conventions are used in the arms trade registers:

. .	Information not available.
( )	Uncertain data or SIPRI estimate.

Abbreviations and acronyms

AA	Anti-aircraft
AAG	Anti-aircraft gun
AAM	Air-to-air missile
AAV	Anti-aircraft vehicle (gun-armed)
AAV(M)	Anti-aircraft vehicle (missile-armed)
AC	Armoured car
Acc to	According to
ADV	Air defence version
Adv	Advanced
AEW	Airborne early-warning system
AF	Air Force
APC	Armoured personnel carrier
ARM	Anti-radar missile
ARV	Armoured recovery vehicle
AShM	Air-to-ship missile
ASM	Air-to-surface missile
ASSV	Assault vehicle
ASW	Anti-submarine warfare
ATM	Anti-tank missile
AV	Armoured vehicle
BL	Bridge-layer
Bty	Battery
COIN	Counter-insurgency
CPC	Command post carrier
DoD	Department of Defense (USA)
FAC	Fast attack craft (missile/torpedo-armed)
FY	Fiscal year
Grd	Ground
Hel	Helicopter
ICV	Infantry combat vehicle
IDS	Interdictor/strike version
Incl	Including/includes

Landmob	Land-mobile (missile)
LC	Landing craft (<600t displacement)
LS	Landing ship (>600t displacement)
LT	Light tank
LoO	Letter of Offer
MAP	Military Assistance Programme
Mar patrol	Maritime patrol aircraft
MBT	Main battle tank
MG	Machine-gun
MICV	Mechanized infantry combat vehicle
Mk	Mark
MoU	Memorandum of Understanding
MRCA	Multi-role combat aircraft
MRL	Multiple rocket launcher
MSC	Minesweeper, coastal
MSO	Minesweeper, ocean
MT	Medium tank
OPV	Offshore patrol vessel
PC	Patrol craft (gun-armed/unarmed)
PDM	Point defence missile
Port	Portable
RAF	Royal Air Force (UK)
RAAF	Royal Australian Air Force
Recce	Reconnaissance (aircraft/vehicle)
SAM	Surface-to-air missile
SAR	Search and rescue
SC	Scout car
SEK	Swedish crowns
ShAM	Ship-to-air missile
ShShM	Ship-to-ship missile
SLBM	Submarine-launched ballistic missile
SPG	Self-propelled gun
SPH	Self-propelled howitzer
SShM	Surface-to-ship missile
SSM	Surface-to-surface missile
SuShM	Submarine-to-ship missile
TD	Tank destroyer (gun-armed)
TD(M)	Tank destroyer (missile-armed)
TG	Towed gun
TH	Towed howitzer
Trpt	Transport
VIP	Very important person

Region codes

1 USA
2 USSR
3 China
4 NATO, excluding USA
5 WTO, excluding USSR
6 Other Europe, eastern
7 Other Europe, western

8 Middle East
9 South Asia
10 Far East
11 Oceania
12 North Africa
13 Sub-Saharan Africa, excluding South Africa
14 Central America
15 South America
16 South Africa

Part V. Developments in arms control

Chapter 18. The building of confidence and security at the negotiations in Stockholm and Vienna

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18. The building of confidence and security at the negotiations in Stockholm and Vienna

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Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Introduction

Confidence-building measures (CBMs) were first adopted by the Helsinki Conference on Security and Co-operation in Europe (CSCE) in 1975, in a Document on Confidence-Building Measures and Certain Aspects of Security and Disarmament which is part of the Helsinki Final Act.[1] CBMs are also discussed at the Vienna talks on Mutual Reductions of Forces and Armaments and Associated Measures in Central Europe (MURFAAMCE, or MFR) where they are called 'associated measures' and are linked specifically with the verification of troop reductions and ceilings.

Confidence-building is not based on the assumption that the East–West conflict is primarily a result of misperception and misunderstanding. It is consistent with the view that the conflict mainly reflects real incompatibilities of interest. However, it also assumes that anxieties and fears are often exaggerated. Force levels in Europe are incommensurate with the level of political tension in the region. By removing unfounded perceptions of threat, confidence-building measures can, in turn, facilitate force reductions.

Politically, interstate relations in Europe are fairly stable and the norm of peaceful change is strong. Confidence-building presupposes a degree of normality in interstate relations. Hence, CBMs in Europe emerged only after the borders had been recognized and the German issue had been regulated in a more satisfactory manner at the beginning of the 1970s. In the Middle East, where parties question each other's right to exist, CBMs are today inconceivable. In Europe the broader CSCE process, of which CBMs are a part, represents a set of common goals, as well as a code of conduct and a programme of action for achieving them.

The confidence- and security-building measures (CSBMs) discussed at the Stockholm Conference on Confidence- and Security-Building Measures and Disarmament in Europe (CDE)[2] fall into two basic categories: *information* measures and *constraint* measures.[3] They should give 'effect and expression to the duty of States to refrain from the threat or use of force in their mutual relations'.[4] Reaffirmation of the principle of the non-use of force, to amplify and strengthen the obligations of the Helsinki Final Act, is another item on the Stockholm Conference agenda although in the strict sense it is not a CSBM.

The *information* measures initiated at the 1975 Helsinki CSCE meeting touch only the margins of international affairs. They reflect the international situation rather than shape it. For CBMs to become of real military signifi-

cance, provisions for exchange of information must be supplemented by measures constraining military forces. This is a new element at the CDE in Stockholm. The term 'security' refers, *inter alia*, to constraints on military activities and deployments. However, the Stockholm Conference is a modest undertaking: the word 'disarmament' appears only in its title, and the NATO countries remain reluctant to accept constraints. From the outset, the two alliances wanted the CSCE to deal only with matters outside the scope of their own arms control negotiations (i.e., mainly the Vienna MFR talks). In particular, the major powers maintain a restrictive attitude, keeping matters that may interfere with their mutual arrangements outside of these all-European negotiations.

The review of the CSCE process (the Third Follow-up Meeting of the CSCE) commences in Vienna on 4 November 1986. The aim is to finish the first stage of the CDE before then, so that the review meeting can decide on stage two of the conference. If there is no consensus document by that time, the Stockholm negotiations must be adjourned to await the conclusions of the review. In that case, the review meeting could decide that stage one should continue, in Stockholm or somewhere else. The risk would then be that the CDE would lose momentum, to the detriment of the entire CSCE process. The CSCE process is an indispensable part of any policy of détente. For the European countries, sharing a continent with the USSR, the shaping of good relations with that superpower too is an important permanent concern. Therefore, it is important that the Stockholm Conference comes to a successful conclusion in 1986—its meagre content notwithstanding.

The MFR talks in Vienna began in 1973 on Western initiative. The Eastern states agreed to participate in return for Western acceptance of the convocation of the CSCE. NATO's initial objective in proposing the MFR talks was to stem the unilateral Western force reductions that were characteristic of the mid- to late-1960s, or at least to obtain reciprocal Soviet reductions. For the US Government, the immediate concern was to stop the Mansfield resolution, demanding the withdrawal of US troops from Europe, not to stop the Red Army. NATO leaders also hoped to reduce the risk of surprise attack by opening up the Warsaw Treaty Organization (WTO) to regular inspection. The Soviet Union wanted to limit the *Bundeswehr* and to constrain NATO's technologically superior armaments, both nuclear and conventional. Also, with the advent of *Ostpolitik* and the policy of détente, the Federal Republic of Germany and other European states saw the MFR talks as a means of achieving political ends, that is, closer relations between the countries in Central Europe.

In concentrating on manpower as the main unit of account, the MFR talks have become largely divorced from the basic defence concerns in Central Europe, which are about the mobility of forces, their vulnerability, the speed of reinforcements and the risk of pre-emption in a severe crisis. Neither alliance is, moreover, asking for more than symbolic troop reductions in the first phase. Nevertheless, the negotiating parties would be well advised to conclude the MFR talks—within their current framework—as soon as possible, to reap the associated political benefits. However modest the reductions and however high

the force levels that remain, an accord in Vienna might forge agreement between East and West that there is a 'balance of forces' in the reduction area. That would make it more difficult to legitimize further arms buildup, and be a welcome contribution to improved interstate relations in the heavily militarized heart of Europe.

The critical question is whether the major powers are politically prepared to use such terms as 'balance' and 'equivalence' in describing the Central European situation.

II. The positions at the Stockholm Conference[5]

By the end of 1985, the Stockholm Conference had established five informal working groups that were about to become drafting groups. Each group is chaired by a representative of an NNA (neutral and non-aligned) country. The groups are organized according to an understanding of 14 October 1985 which lists the items under negotiation. The list, which may set a framework for the final document, is as follows: (*a*) notification of certain military activities (group chaired by Sweden); (*b*) observation of certain military activities (group chaired by Finland); (*c*) exchange of military information, compliance and verification, and development of means of communication in the context of a notification system comprising a set of mutually complementary CSBMs (group chaired by Switzerland); (*d*) constraining measures such as annual forecasts of certain military activities (group chaired by Switzerland); and (*e*) non-use of force (group chaired by Austria).

The positions of the participating states on these matters are presented below. First, two issues affecting all the drafting groups—the area of application of CSBMs and the degree of commitment to them—are summarized.

Area of application of CSBMs

The Helsinki Final Act distinguished three categories of states: those whose territories are not included in the area of application (Canada and the USA); those whose territories are included only in part (Turkey and the USSR, up to 250 kilometres from the frontiers 'faced or shared' with other European participating states); and European states whose territories are included in their entirety. In 1981, the Soviet Union stated that it was willing to apply CBMs 'to the entire European part of the USSR, provided the Western states, too, extend the confidence zone accordingly'.[6] The statement was made in response to a cardinal demand by France and other Western countries that CBMs should be applicable to all of Europe, from the Atlantic Ocean to the Ural Mountains. The trade-off sought by the USSR was mainly to include sea and ocean areas adjoining Europe, on the grounds that naval and air forces operating in these areas form an important part of the balance of forces in Europe. The Western states preferred a functional approach, including only those naval and air force activities which constitute parts of notifiable activities

on land. The Eastern states wanted to include independent manoeuvres in adjoining ocean areas and airspace as well.

The Concluding Document adopted by the Second CSCE Follow-up Meeting in Madrid in 1983 did not resolve this issue. It states that CSBMs shall apply to activities in the adjoining sea area and airspace 'whenever these activities affect security in Europe as well as constitute a part of activities taking place within the whole of Europe', and that the necessary specifications will be made at the CDE itself.[7] However, by the beginning of 1985 the dominant NATO view remained unchanged—in fact it was the view that the United States expressed in Geneva in July 1975, in a unilateral reservation to the draft of the Helsinki Final Act. The reservation stated that none of the clauses in the section dealing with major military manoeuvres should apply to independent or combined naval and air exercises.[8] The Soviet Union still argues that any change in the balance embodied in the Helsinki document on CBMs requires the specification of a new balance. It maintains that the Western countries must concede to an extension at sea in return for the inclusion of Soviet territory up to the Urals. The NNA states have no common stand on this issue. Their geographical locations and national interests vary so much that it is hard for them to hammer out a joint position. Apart from the major powers, which have always jealously protected their freedom of navigation at sea, the resolution of this matter is also of particular interest to the Nordic countries and the Mediterranean states.

Clearly, the mandate of the CDE presupposes that the area of application will be extended and that a decision will be taken in Stockholm. The view that activities in the adjoining sea area and airspace should be included to a larger extent than hitherto conceded by the West has wide support and, for incorporation at a later stage, sympathy among Western countries as well. The Soviet offer to extend the area of application to the Urals was significant, so the Soviet Government is likely to insist on a *quid pro quo*. In particular, the Soviet Union seems interested in covering activities in the North Atlantic. However, given the multi-purpose nature of its own Northern Fleet—which has important strategic functions *vis-à-vis* the United States and a number of tasks in the Third World—its bargaining flexibility seems heavily circumscribed. The USSR may, furthermore, be somewhat uneasy about all the consequences that might follow from a definition of 'Europe' which covers all territory West of the Urals.

The controversy over the area of application was the principal cause of the prolonged deadlock in Madrid in the early 1980s. It had remained one of the most difficult questions before the Stockholm Conference. General Secretary Gorbachev's statement of 15 January 1986, that it should not be allowed to stand in the way of agreement, probably means that it will be deferred once again.[9]

Degree of commitment to CSBMs

The CSBMs under discussion in Stockholm will be politically binding. The degree of commitment will, therefore, be greater than for the Helsinki CBMs,

which are more or less voluntary—less so in the case of major manoeuvres, more so in the case of smaller manoeuvres and military movements.

Legally binding measures, of course, carry the greatest obligation: only legal norms need be treated as obligatory in international relations. Norms of a political or moral nature do not enjoy the same status. The implementation of politically binding CSBMs is admittedly more open to question than that of legally binding measures.[10] However, the decisive factor is whether the provisions are *perceived* as binding: if they are, their formal status is of less importance. Both NATO and the NNA group, and some WTO states, are on record as perceiving them as mandatory.

The Stockholm Conference faces a trade-off between the area of application for CSBMs and the degree of commitment to them on the one hand, and their military significance on the other. Generally, the wider the area and the stronger the obligation, the less substantive the provisions are likely to be. While the political nature of CSBMs sets the CDE apart from the MFR, where similar ('associated') measures are discussed on a legal basis, it may make it easier to achieve measures of military significance. States are sometimes willing to undertake a political commitment where they would be reluctant to accept a legal obligation.

Notification of military activities

The NATO countries argue that the distinction between manoeuvres and movements leaves a grey area for possible circumvention, and propose that all out-of-garrison activities above a certain level should be notified.[11] They hold that the main threshold should be structural: an activity should be notified whenever one-half or more of the combat units (such as tank and infantry/motorized rifle units) of a division or equivalent formation take part with at least one combat support element (such as helicopters or artillery). Combat and combat support units are the decisive military forces in Europe, so it is the activities of these forces that should be at the core of the confidence- and security-building process.[12]

If an activity merits notification on this criterion, the participation of logistical and service support troops should also be announced. A numerical threshold of 6000 troops, or some (unspecified) number of main battle tanks and armoured carriers, is proposed as augmentation of the structural threshold should that criterion not apply. Furthermore, the NATO countries propose notification of amphibious activities and troop mobilizations above certain levels, and of alert exercises. Alerts should be notified at the time the troops are ordered to carry them out; all other activities should be announced 45 days in advance.

The NATO proposal does not cover *movements* into the zone that are not connected with notifiable *activities* of some kind. Neither does it ask for prior notification of movements out of the zone. Ground forces leaving the zone for a military activity elsewhere would be notified at the start of the movement. Amphibious forces could leave the area without notification.

The Soviet Union and other WTO states propose prior notification of land

manoeuvres, conducted independently or combined with naval and air forces, whenever the total numerical strength exceeds 20 000 troops.[13] This incremental improvement of the Helsinki threshold (25 000 troops) ensures equal treatment. The structural parameter proposed by NATO would establish a higher notification threshold for the West since Western divisions are, on average, considerably larger than those of the East. The WTO proposes that naval manoeuvres should be notified whenever more than 30 combat ships and 100 aircraft are involved; and manoeuvres of air forces whenever more than 200 military aircraft are in the airspace over the notified area at the same time.[14] Military movements should be notified whenever formations of more than 20 000 troops change location—within the area of application as well as into and out of the area. Separate notification of air force movements should be made whenever more than 100 aircraft are flown into the area of application. The Eastern proposals do not cover mobilization and alert activities. All notifications should be made 30 days in advance.

The NNA states propose a combination of (hitherto unspecified) numerical and structural parameters for the notification of manoeuvres. The numerical total(s)—to be defined—would emphasize mobility and firepower. Similarly, in defining the structural parameters—one division or equivalent formation—force components with offensive capabilities are singled out for special attention. In this way, the proposed CSBMs are directly related to threat potentials. The NNA states propose that notification should take place 42 days in advance except for manoeuvres carried out at short notice (such as alert exercises), which should be notified 'at the earliest possible opportunity'.

The NNA states do not ask for notification of troop mobilization activities. They have mobilization-type defences, so advance notification of such activities would simply not be acceptable to all of them.

Observation of military activities

The positions of the three groups of participating states are relatively close on this issue. The NATO and NNA countries would like to invite all participating states to send observers to notified military activities. The WTO, which originally preferred some selectivity, giving priority to neighbouring states, has accommodated to that position. Invitation of observers would be extended simultaneously with the notification of the activity.

The NATO countries propose that observers should be invited to alert exercises whenever the alert has a duration of more than 48 hours, and that observation should be permitted 36 hours after the exercise begins. The NNA states propose the same, but (so far) with no time specification. The German Democratic Republic has proposed a set of measures for observation of air activities, and the Soviet Union has proposed similar measures for naval manoeuvres. A number of practical problems remain unsolved; however, all participants support strengthening the observation provisions of the Helsinki Final Act.

Information, verification and communications

NATO has proposed an annual exchange of information among the participating states about their military command organization—to include the normal locations of headquarters and the composition of forces down to major ground formations/main combat units and land-based air formations, specifying wing, air regiment or equivalent formation. The WTO has rejected the proposal, arguing that it comes close to legalized espionage. This led to a compromise: further discussion of the matter will take place in the context of notifications. The compromise allows the NATO countries to pursue the adoption of such information exchanges as a separate measure. The NNA states have not proposed any exchanges of this kind.

According to the mandate adopted by the Follow-up Meeting in Madrid, the CSBMs to be adopted in Stockholm should be provided with adequate forms of verification which correspond to their content. The WTO states claim that, for the measures under consideration, the observer regime combined with national technical means would suffice. The NNA countries agree that verification should not have the status of a separate measure; it is not an end in itself. They consider that the CSBMs should *include* adequate verification provisions corresponding to their content, such as information exchange, ground rules for observation of notifiable activities, and provisions that can be monitored by national technical means. The NNA states have comparatively limited national technical means at their disposal; on the other hand, most of them would have considerable problems in allowing very intrusive verification because of the character of their national defence organizations.[15]

The NNA states propose that one participating state may request that observers be sent to another—at very short notice—to verify compliance, and that it shall be invited to carry out the observation within 12 hours of receipt of the request. The state which has received the request may, however, decline for reasons of 'supreme national security interests'.

The NATO countries propose that each participating state should be permitted to undertake two on-site inspections per year, from the ground, from the air or both (up to a theoretical maximum of 32 for the Western alliance). Unless otherwise agreed, the inspection team should have one aircraft and two land vehicles at its disposal. Given the geographical extent of many military activities, particular significance is attached to aerial inspection. Aircraft could overfly the entire exercise area within a reasonable period of time to check the size and scope of the activity. The inspection team would be permitted to enter the territory of the receiving state within 'not less than 24 hours nor more than 36 hours' after the inspection request has been issued.

Both NATO and the NNA countries have proposed the establishment of dedicated communications links for handling information related to agreed CSBMs. The NNA states also envisage arrangements for short meetings of all the participating states to discuss the routine implementation of CSBMs as well as, on an *ad hoc* basis, to deal with exceptional situations. So far, the WTO states have shown no great interest in these questions.

Constraining measures

Originally, the Soviet Union proposed an agreement on the reduction of military expenditures and the establishment of a chemical weapon-free zone in Europe. Also, it wanted the CDE to encourage the creation of nuclear weapon-free zones in Europe. These measures would have substantial constraining effects. Other countries—Eastern and non-aligned—have also suggested constraints, both on military deployments and military activities. For instance, the GDR has stressed the timeliness of a nuclear weapon-free corridor in Central Europe, and of a chemical weapon-free zone covering the GDR, the FRG and Czechoslovakia. However, as the Stockholm Conference moved into the drafting stage, only constraints on military activities seemed to have any chance of being adopted. Among the three main groups of countries, it is primarily the NNA states that are pressing for acceptance of such measures.

The NNA countries propose that no individual manoeuvre shall exceed five times the notifiable level nor last for more than 17 days. No more than five manoeuvres, at a size of twice the notifiable level or above, would be permitted each year, and they would have to be included in the annual calendar (see below). This raises the possibility that demonstrations of force for political ends could only be staged at the expense of ordinary military training (see section IV). Once a year, two such manoeuvres may be combined, but they may not exceed a total of seven times the notifiable level. This proposal would put a limit on NATO's large autumn exercises. Only five manoeuvres smaller than twice the notifiable level will be permitted per year, unless they are notified in the annual calendar.

The Soviet Union, Bulgaria and the GDR propose that manoeuvres involving more than 40 000 troops should not be permitted. Participation of amphibious and airborne troops will be included in this total. As early as 1979 the Soviet Union suggested an upper limit of 40 000–50 000 troops, for discussion both at the Vienna MFR talks and within the CSCE: this proposal has each time been rejected by the West. Since NATO comprises more states, including some medium-sized ones, it argues that it needs to exercise larger numbers of troops than the WTO in order to function effectively in a unitary way. The NATO countries state that, in general, they are not against constraints; however, they have tabled no proposal of this kind. The closest NATO has come is to emphasize that an annual forecast of military activities—originally a NATO proposal—would have a constraining effect insofar as it would limit the freedom of action of military planners by freezing essential military activities in a largely foreseeable pattern.[16]

All participating states are now ready to negotiate a standardized format for an annual calendar of military activities. The calendar should contain all plans for military activities at the notifiable level and above to be carried out the following year. The activities could for instance be listed on a monthly or quarterly basis. However, as long as the parties disagree on the area of application (i.e., whether or not to include independent naval and air manoeuvres), it is hard to move from agreement in principle to agreement on

the specifics of such a new practice. If the area issue is deferred, there could be rapid progress.

Non-use of force

The Soviet Union has proposed a treaty which obliges the CSCE states to refrain from the use of military force against each other, covering 'the territories of all parties to the treaty as well as their military and civilian personnel, naval, air and space craft, and other facilities belonging to them, wherever situated'. 'The Treaty could include an obligation to consider, jointly and individually, practical measures to reduce the danger of surprise attack.' The parties to the treaty would also attempt to limit and reduce arms and achieve disarmament based on the principle of equality of rights and equal security. Generally, in giving concrete expression to the principle of the non-use of force, the Eastern states put more weight on the reduction of military forces and activities and less weight on transparency measures than the Western states do. The principal position of the WTO is that 'to reduce the risk of military confrontation in Europe', as the mandate instructs, political measures backed by a 'real effort . . . to reverse the most dangerous trends which have been brought into international relations' are needed. Foremost among these dangers is the danger of nuclear war.[17] However, by the beginning of the drafting stage, the proposal for a politically binding renunciation of the first use of nuclear weapons had been put aside—as had all other nuclear issues.

Provided that agreement is reached on a set of concrete CSBMs, the participating states are likely to reaffirm the principle of non-use of force. It will not be done in the form of a special treaty but incorporated in the final document. The NATO countries see no need for a text on non-use of force from the Stockholm Conference; on the other hand, they are not fundamentally opposed to it. In this connection, it is sometimes recalled that the principle is embodied in bilateral agreements between FR Germany and the WTO states (the '*Ostverträge*' of the early 1970s). The NNA states have tabled a text which states, *inter alia*, that 'no consideration may be invoked to serve to warrant resort to the threat or use of force . . .', and that the participating states 'will refrain from direct or indirect assistance to terrorist activities or to subversive or other activities directed towards the violent overthrow of the regime of another participating State'.

III. The positions at the Vienna MFR talks

At the Vienna MFR talks, the WTO and NATO are trying to negotiate a phased reduction of troops with the agreed objective of reaching parity at equal collective levels of up to 900 000 men, including up to 700 000 ground forces. The talks are concentrating on the specifics of a first-phase or interim agreement.[18]

In 1985, both the WTO and NATO tabled new proposals for a first-phase accord: the WTO on 14 February, and NATO on 5 December.[19] The WTO proposed first-phase troop reductions of the order of 20 000 and 13 000 for East

and West, respectively. NATO proposed reductions of 11 500 for the East and 5 000 for the West. Given that the total number of troops in the reduction area—covering the Netherlands, Belgium and the FRG in the West; Poland and Czechoslovakia and the GDR in the East—is around 2 million, such reductions are cosmetic. Even the agreed final goal—of a common ceiling of 900 000 for armies and air forces combined, and 700 000 for the ground forces on each side—does not match the idea of deep cuts which figures prominently in the declaratory policies for nuclear disarmament. The military significance of such reductions is further diminished by the absence of agreement on the withdrawal of equipment. The East has proposed that the troops to be withdrawn should take with them their organic armaments and combat equipment. The West maintains that, for geographical and other reasons, such removal of heavy equipment from Central Europe is unacceptable. In a first-phase or interim agreement, neither side proposes in any way to restrict the freedom to modernize the forces.

When manpower figures were last exchanged, in June 1980, NATO claimed that the WTO had about 170 000 more troops than it admitted to.[20] The WTO gave equal numbers for the two sides. One of the new features in the most recent NATO proposal is that the West no longer requires prior agreement on data. It has come around to the view that some reductions could be undertaken first and the data dispute resolved later, by verification of residual force levels which would be frozen for a certain number of years (the WTO uses the term freeze; NATO the term no-increase). On this the parties now agree. Also, they have proposed similar measures to monitor the reductions. Verification of the no-increase commitment is another matter. Since the basis for this commitment will be the figures that each side submits for its own forces, and since the WTO is likely to submit an overall figure equal to that for the West, verification of no-increase amounts to verification of the claim to parity. This is the core of the problem.

Alone, mutual recognition of parity in manpower levels does not make much difference—except that it will be more difficult to legitimize further rearmament. However, if it were followed up by a significant withdrawal and reduction of forces in a context of revived East–West détente, it could be a first step towards political rapprochment in the region. Closer relations between Eastern and Western states presuppose a parallel move towards military disengagement, and codification of parity in troop levels might be a convenient starting-point. The politics of the matter are twofold: whereas the states in the reduction area would like to use a first-phase agreement as a stepping stone in this direction, it remains to be seen whether the superpowers can contain such attempts or whether they will eventually go along with them. Also, the political inertia and prestige tied to recurrent Western assertions of imbalance would have to be overcome. Today, there are conflicting interests at work and no clear trend. However, it may be that sustained European initiatives to revive détente will gradually make the superpowers realize that the best way to influence the evolution of East–West relations in Europe is to pursue a policy of détente themselves, and that arms control has to be at the centre of such a policy.[21]

To check each other's figures, the parties will apply national means of verification. In addition, a set of 'associated measures'—including inspections of some sort—are needed. These measures are now the focus of the MFR talks, for they are the tools by which agreed equality in force levels may be forged. While there is a wide body of agreement on other issues, on these measures the positions are far apart.

As of January 1986, the positions at the Vienna talks were as described below.

Area of agreement

In the first phase, only US and Soviet forces will be reduced. Both sides propose to undertake these reductions within one year of the entry into force of the agreement. Ninety per cent would be withdrawn by units, 10 per cent as individuals. The forces are to withdraw behind their national boundaries and not be deployed in a way that reduces the security of any other state participating in the talks, including those with special status. Lists of US and Soviet forces to be withdrawn will be exchanged, and all parties informed about the start of the withdrawals and their completion. Following the period of reductions, there will be a time-limited freeze on remaining forces. The agreement will be legally binding.

To monitor compliance with the agreement, observation points will be established through which Soviet and US forces should pass. Each side will determine the location of these points in its own territory. They will undertake not to interfere with the national means of verification of the other side. Among these means, it is clear that satellite photography does not enable an adequate check on numbers of soldiers, but it can provide data on military equipment and patterns of use around headquarters and military installations. In this way, the presence of combat and combat support units may be ascertained. Air-mounted side-looking radar and infra-red sensors operating along the borders can detect troop activity from a distance, and will certainly be used more widely in the future.

The parties have also agreed, in principle, on a consultative mechanism for expeditious clarification of ambiguities and resolution of disputes concerning compliance and verification.

Area of disagreement

The East accepts the idea of asymmetrical initial reductions, but not the degree of asymmetry proposed by the West (2.3:1 versus 1.5:1). Regarding hardware, the East has consistently argued that arms and equipment should be withdrawn together with the troops employing them. NATO has vacillated on this issue. Initially, it proposed that Soviet troops should take their arms and equipment when departing, while US troops could leave theirs in place to compensate for the geographical advantage enjoyed by the USSR. In December 1975, NATO proposed trading its nuclear weapons for WTO tanks, and in July 1982 it omitted hardware altogether. This has remained the NATO position. According to the NATO proposal of 5 December, each side can decide for

itself how to deal with armaments, that is, there would be no agreed restraint on arms.

The WTO freeze proposal envisages both collective ceilings and national sub-ceilings. The West's view is that there should be a collective no-increase commitment combined with a ceiling on US and Soviet troops, the only troops involved in the initial reduction process. The WTO would not allow any state to contribute more than 50 per cent of its alliance manpower in the reduction area—a provision designed to limit the *Bundeswehr*. NATO has opposed this, in order to allow FR Germany to make up the shortfall of other allies. However, the WTO proposal is attractive to many Western states as well, since it would prevent the USSR from increasing its portion of the WTO total. The Soviet Union currently contributes approximately 50 per cent of WTO forces in the area, and the *Bundeswehr* makes up approximately 50 per cent of NATO forces in the zone. So the WTO proposal implies a codification of the *status quo*.

Regarding the final force ceiling of 900 000, with a sub-ceiling on ground forces of 700 000, the WTO also proposes a sub-ceiling of 200 000 on air force personnel. NATO would permit more than 200 000 air force personnel if ground forces dropped below 700 000.

The focus of the MFR talks is now on associated measures to provide verification of the first-phase reductions; to ensure notification, observation and, eventually, constraints on military activities; and—most important—to help verify the freeze/no-increase commitment. The WTO holds that the reductions can be monitored at three or four exit/entry points. It proposes the same information and constraint measures for military activities in the MFR zone as are proposed for the wider area under consideration at the CDE in Stockholm—no stricter provisions for the inner, Central European zone. For the purpose of verifying the freeze commitment, it envisages the possibility of inspection on challenge in addition to the provisions for observation of manoeuvres and movements and for application of national technical means. However, beyond monitoring at the places of exit and entry, the WTO views on-site inspection in the reduction area as a privilege rather than a right.

The West proposes that the exit/entry points shall be permanently manned so as to monitor all forces entering and leaving the area, not only the troop reductions. Also, it wants prior notification of troop movements into the reduction area in an annual calendar (see below). It has not asked for notification of similar movements out of the area, presumably on the grounds that US forces in Europe may be needed on short notice for contingencies elsewhere. Furthermore, NATO is seeking special permission for the Central Command (Rapid Deployment Force) to use the MFR area as a stopping place, and for large infusions of troops to be permitted for its autumn exercises. The WTO is willing to discuss exemptions, for the freeze period, for troops taking part in exercises.

NATO has proposed prior notification of out-of-garrison activity by one or more division formations within the reduction area, on the territories of the indirect participants in the talks,[18] and in the western military districts of the USSR. The concept of 'division formation' is the same as NATO proposes as a

structural threshold for notification at the CDE. Just as in the Stockholm negotiations, NATO proposes an annual calendar of notifiable activities. If it is not in the calendar, information should be given 30 days in advance (45 days are proposed in Stockholm; these provisions have to be brought into conformity with each other). Observers would be exchanged by the same ground rules that are being drawn up at the Stockholm Conference. In addition, assuming agreement on pre-reduction data the original NATO inspection proposal asked for 18 inspections per year on the territory of the other side—on the ground or by low-flying aircraft that would provide immediate evidence of un-notified out-of-garrison activities or force concentrations exceeding notifiable size.

For some time, US agencies have been developing statistical tools with which to estimate the total number of troops deployed in the reduction area by random inspections of military units.[22] It is this approach which has now been concreted into a monitoring procedure allowing NATO to back off from its insistence on agreed pre-reduction data. The approach requires detailed unit-by-unit information about the composition of the forces: the 5 December proposal asks for such information down to battalion level. In order to verify the information given by the other side (and the provisions regarding out-of-garrison activities), NATO now suggests that each side should have the right to conduct 30 inspections per year, surveying from the ground, from the air, or both. While the first-phase agreement proposed by the East would last for three years, including up to one year for the initial reductions, the West proposes that the reduction period should be followed by a no-increase commitment lasting three years, making a total of four years for the first phase. NATO claims that this is necessary for the inspection system and other monitoring methods to establish with confidence the remaining force levels in the area.

Now that there is no prior-data requirement blocking the way and virtually all differences of principle have been solved, the Vienna MFR negotiations are likely to concentrate on the design of a verification regime that is commensurate with the tasks facing it. Success depends upon greater WTO willingness to submit disaggregated information on its forces. It may be that this would reveal some serious undermanning of units, and expose points of weakness rather than the superiority NATO ascribes to it. If so, disaggregation for the sake of verification is a political consideration, and would not result in their having to make comprehensive reductions and redeployment of troops. On the other hand, NATO may have to accept a lower annual quota of inspections. Also, the demand for information broken down to battalion level may have been motivated by a desire for bargaining flexibility. Previously, NATO asked for disaggregation to division level, while some Western officials are known to have preferred information at the level of regiment.[23]

IV. The functions of CSBMs

One virtue of effective confidence-building measures is that they lead to increased openness. Increased openness is necessary in order to enhance

predictability; predictability is essential for the development of mutual confidence; and mutual confidence is needed to curb the dynamics of the arms buildup and to embark on arms restraint and disarmament. This is, in short, the logic and *raison d'être* of Helsinki-type CBMs, the scope of which the Stockholm Conference is trying to extend.

Information measures

More precisely, information measures serve the following functions:

1. The combination of an annual calendar and a longer notification time will make the pattern of military activity more predictable. Together with an expanded exchange of information on military activities—simultaneous with notifications and through observation—the risk of misperception and miscalculation will be reduced. In particular, the scope for excessive fears will be diminished: what is unknown across a line of military confrontation tends to be perceived as hostile and threatening. For the major powers, information measures can be only minor supplements to intelligence collection; for the smaller states, situated closer to the dividing line and vulnerable even to small variations in East–West affairs, information can do more to alleviate anxieties and fears.

The scope of the information measures pursued at the Stockholm CDE depends, *inter alia*, on the achievement of constraints. If little is achieved in the latter category, there will hardly be very much in the former.

2. Exchange of information can reduce the possibility of using military force for political ends. For example, prior notification of military manoeuvres precludes declaring them at short notice in order to camouflage preparations for an invasion. The longer the notification time, the greater the reassurance that an exercise is neither cover for deployment to war positions nor a show of force to exert political pressure. The value of prior notification does not increase proportionally with increased notification time: but an annual calendar, and a longer notification time than the 21 days agreed in Helsinki—which all parties in Stockholm propose—would be helpful in this respect. A lower notification threshold—also proposed by all participants—would better meet the concerns of small states.

3. A well-elaborated system of notification, observation and exchange of information can provide early warning of attack and, consequently, increase the risks and costs attached to aggression. Violation of the rules would probably be seen as an unambiguous sign of aggressive intent, speeding up alliance decision-making on the other side. NATO in particular would benefit, because it has a greater number of member states and a less monolithic structure than the WTO. Awareness of this may hold the parties back a little longer, improving the chances of crisis management.

4. In a wider context of co-operative undertakings between nations, greater openness about military matters can reduce the role of military factors in international affairs. The CSCE process, linking progress in all the areas that it covers, provides such a context. Greater predictability of military activities, and growing co-operation in other sectors, would amount to balanced progress in

all the main areas of the Helsinki Final Act, making military factors less spectacular in the daily conduct of international affairs. In the absence of such a collaborative framework, expanded communication of military information could do more harm than good: then, military factors and confrontational perspectives might be moved to the forefront. In special circumstances, selective invitation of observers could even be used to enhance the anxiety that military manoeuvres are—occasionally—staged to produce, giving greater political effect to illegitimate displays of force.

To a large extent, the confidence-building effect of military CSBMs therefore presupposes co-operative behaviour in other fields. It can certainly be enhanced by such behaviour. Economic co-operation, human contacts and diplomatic and political acts create a context in which CSBMs can function properly, involving broader segments of European societies in the process. Dissemination of enemy threat perceptions for purposes unrelated to national security is more difficult among peoples who have some understanding of each other. Broader interaction provides improved opportunities for public opinion to counteract tension-producing behaviour. All the main parts of the Final Act are therefore important for eliminating unfounded suspicion and worst-case assumptions, and for fostering mutual assurances of non-aggressive intent.

Constraining measures

If the military alliances ever go to war with each other, it may not be a premeditated attack but the result of an inadvertent escalation. Force postures that put a substantial premium on striking first, in surprise, are particularly dangerous. Simply exchanging information about offensive capabilities that may be used for surprise attack does not help much: information measures can only alleviate the danger of inadvertent escalation at the margin, by reducing the risk of misperception and miscalculation and by improving the chances of successful crisis management. They do not affect the forces that may be moved across the borders. Constraints on force *deployments* can do that—but no such proposal seems negotiable in Stockholm. A few proposals for constraining military *activities*, which would by and large enhance the effects of information measures, are considered here:

1. In a tense situation, big manoeuvres may cause fears that attack is imminent. Notification and observation of them may not suffice for reassurance; but if their size is limited, they may not be big enough to fully exploit the advantages of surprise. Constraints on the size of manoeuvres would facilitate the task of verification: it would be far more difficult to verify the *intentions* behind large military activities than to verify compliance with numerical *constraints* on them.

2. By limiting the number of military manoeuvres of certain sizes, as the NNA states have proposed, the political utility of military exercises may be further constrained. If the numbers are limited to the normal pattern of force training, displays of force for purposes of political intimidation could only be undertaken at the expense of routine military requirements. In the (unlikely) case that numbers were fixed at a lower level, confidence in the effective

functioning of forces would be affected. In some situations, this might reduce the propensity to resort to arms.

3. The more circumscribed military activities are by constraints and information measures, the greater the likelihood that one or other of the provisions would give unambiguous warning of impending danger.

4. Constraints on military activities would help to reduce the role of military factors in the conduct of international affairs—if the contextual preconditions provided by the Final Act are maintained.

Constraining measures are very difficult to agree upon. However, it is important that some such measures are adopted, not only for their own intrinsic merits, but as a building block for the next stage of the CDE.

V. The significance of the Vienna talks

During the 13 years of the Vienna MFR talks, military manpower numbers have changed little. So agreed ceilings at about current levels could make little difference. There is no significant upward trend to be corrected; agreed ceilings could just as well be used to prevent unilateral reductions.

The military changes which have occurred are in the composition, structure and equipment of the NATO and WTO armies and air forces, and in the introduction of new doctrinal concepts for their employment in war. Substantial increases in the mobility, firepower and range of WTO forces have caused concern in the West about short-warning or surprise attack. So have the much emphasized operational manoeuvre groups (OMGs), a new offensive concept for the use of existing formations. In the 1980s, new technologies for deep interdiction have appeared in the West, spurred by its dynamic and innovative industry and culture.[24] At the current very high level of troops, small manpower adjustments are irrelevant.

By and large, the provisions for notification and observation of military activities proposed at the Vienna and Stockholm negotiations are the same, except that for Central Europe they would be legally binding, whereas those for the wider European area would be politically binding. The hope is that they will be perceived as mandatory in both cases. If so, their application will be uniform throughout the region, and the effects similar. It is doubtful whether on-site inspections will be agreed upon at the Stockholm Conference, except perhaps on a challenge basis. At both the Stockholm and Vienna talks, the West argues that the presence of observers at notifiable military activities may not be enough. The main difference between observation and inspection is that in an observation the host country establishes the programme for the observer, while in an inspection the inspectors should be free to check certain aspects of the activity. Observation is a confidence-building routine: inspection deals with the exceptional circumstance.

In Vienna, however, it is clear that some kind of inspection system will be needed to verify the central part of the agreement—the no-increase commitment based on self-declared troop data. Here, the distinction between monitoring and verification comes to the fore. The negotiating task is to agree on forms of monitoring which will provide evidence of whether the submitted

information is or is not correct. Verification itself is the act of weighing the evidence to reach a decision. With military manpower, figures given by the other side need only be within a certain range of estimates in order to be accepted. Individual increases have little military significance unless the men are organized in properly equipped formations: the major concern of every commander is the organized units of the other side, and those are more easily identified.[25] Hence, the West would accept Eastern figures if they fell 'within an acceptable range' of Western estimates: 'five to ten per cent would be a fair way of putting it', although NATO has not yet defined the 'acceptable range'.[26]

The WTO argues that inspection should take place only after the requesting side has aired the reasons for its request, and the other side has had a chance to reply. Only if the matter is not clarified would it envisage inspection. This is different from the type of inspection that NATO wants. However, if the WTO is ready to honour a request for inspection when an initial attempt to resolve the dispute is inconclusive, the qualitative difference boils down to one of timing, that is, how quickly the inspection team could go to work. The West proposes that inspections might begin at six hours' notice.

If a solution to this problem can be found, agreement would then have to be reached on an annual quota of inspections. In this connection, it should be noted that the entire panoply of measures described above—permanent observation at exit/entry points, observation of military activities, prior notification of troop movements, exchange of data, a consultative mechanism, inspections and national technical means—would complement each other with intensifying effect. For instance, even if observation and inspection cannot put a check on all possibilities for significant evasions, they would help focus national technical means on other possible evasion routes. Their synergism reduces the need for big quotas.

In one respect, the verification task being discussed in the Vienna talks is more difficult than that of other arms control arrangements. Usually, the task is to provide adequate verification of compliance with agreed provisions. In Vienna, the task is to create agreement where, at the outset, there is none. Each side would be tempted to use the means of surveillance to prove their claims, by exploiting ambiguities and loopholes in their favour. The provisions for monitoring would have to be accurately formulated—not least to determine their intrusiveness—and strictly applied.

It is an open question whether the stage has been set for more lengthy posturing on the well-known subject of verification, or whether there will be a first-phase agreement along the lines described above. In his statement of 15 January 1986, General Secretary Gorbachev offered a rather favourable assessment of recent developments. He said that 'a framework is emerging for a possible decision' and that 'we [the WTO] are prepared for it'.[27] However, even if agreement is reached and the reductions are successfully implemented, it remains to be seen how the subsequent verification of troop data will proceed. Whether the parties are ready to embark upon it and bring it to a successful conclusion very much depends on their assessment of the international political consequences.

VI. Political and military requirements for effective CSBMs

To establish the relevance to basic security concerns of the measures that may come out of the Stockholm and Vienna negotiations, they must be viewed in relation to the destabilizing features of the current arms buildup in Europe. To assess their net effect, the measures must be weighed against the growth of military capabilities and the evolution of military doctrines. No doubt a more comprehensive set of CSBMs and an agreement on troop levels in Central Europe would have a positive influence on European security. However, in relation to the thrust of destabilizing developments their impact seems modest and, to some extent, irrelevant. Unless they lead to a major revival of political and military détente, they will do little to restrain further increases in destabilizing offensive capabilities.

The arms control establishments involved in the Stockholm and Vienna negotiations are now beginning to look beyond the first stage of the CDE and the MFR, considering approaches for the next phase. In order to enhance their security effects, the new proposals should be more directly addressed to the political and military realities in Europe.

Political considerations

In both negotiations, the political considerations are most important. For instance, at the CDE/CSCE, the Soviet offer to extend the area of application to the Urals may incorporate little additional military activity, but agreement on the area is important in defining the political entity called 'Europe'. It is significant that the offer was first made in the broader CSCE setting: agreement in Stockholm would set a precedent for other regional undertakings. Similarly, inclusion of adjoining sea and ocean areas in the CSBM regime may shape other co-operative ventures accordingly. An agreement to extend the area of application is hard to reach, for in addition to its intrinsic value, it is likely to set an important precedent.

At the Vienna talks, the long-standing Soviet demand for separate national ceilings has probably been opposed for much the same political reasons that motivated it: fear that it would preclude future options for West European defence co-operation, and West German concern about arrangements that may constrain their future role in the European political order. The Soviet interest in provisions that are symmetrical *vis-à-vis* the United States is also of a political rather than military nature. Such provisions might gradually turn the Soviet proximity to Europe into overall political preponderance in the region—if the West European countries do not organize their common interests more effectively. For FR Germany and other states, a strengthening of the European Communities to compensate for reduced US influence in Europe was an important element of the architecture of détente from the very beginning. Greater West European self-confidence is needed, and more flexible application of the principle of equality in superpower relations: substantial force withdrawals could then be compatible with concerns for the political order of the region.

However, it does not suffice to shape *arrangements for confidence-building and arms control* out of regard for the political order. To overcome the division of Europe, it is necessary to keep the political implications of *unilateral military choices* up front as well. Decisions about doctrines, force structures and weapon acquisitions are often made incrementally on the basis of military traditions and cost-efficiency analyses, turning what should ideally have constituted primary considerations into unintended side-effects.[28] On the Eastern side, the multiplicity of choices that combine to strengthen the offensive features of the WTO force posture also combine to push arms control to the periphery and Western Europe into fermented suspicion and opposition. It may be that the weight of political interests in the making of these decisions is sometimes taken for granted when, in effect, other considerations dominate. On the Western side, NATO should want to consider the political implications for the East–West system of making Eastern Europe a zone of destruction in consequence of the fact that the Soviet Union has made it a zone of forward deployment and transit.

Common European interests across the bloc borders cannot be realized to any large extent unless there is a reduction and withdrawal of forces from the forward areas of the confrontation. Similarly, European security cannot be much enhanced unless the offensive capabilities in these areas yield to defensive ones. To achieve this, the objectives of arms reduction and arms control must be given priority in the formulation of coherent policies for defence and security. The challenge lies at the national as well as the international level—in the place accorded to arms reduction and arms control in the national decision-making processes; in the willingness to conduct international negotiations in a serious and constructive fashion; and in the ability to develop a common political perspective within which national and international decisions on military matters can be made. The only such perspective to date is the all-European policy of détente that took shape 15 years ago, of which the CSCE and (to a lesser extent) the MFR were integral parts.

Détente is dormant, not dead. Small and medium-sized states want to revive it. The Soviet Union professes the same.[29] Others believe they would be better off without it. Many European countries—especially those situated close to the East–West border—would find it difficult to go to the Third Follow-up Meeting of the CSCE in Vienna with the dismal record of an unsuccessful human rights meeting in Ottawa, an unsuccessful cultural forum in Budapest, and an unfinished first phase of the CDE. The superpowers may find it less difficult. However, the reference to the Stockholm Conference in the communiqué from the November summit meeting was encouraging, and before the next summit there will be a need for concrete results in the field of arms control.[30] Gorbachev's statement on 15 January 1986 was encouraging, and, in a statement on 21 January, President Reagan said that he had instructed the US delegation to pursue concrete results, and expressed the 'belief that an accord with important implications for the overall East–West relationship can be achieved . . . this year'.[31] Other powers, such as FR Germany, will press ahead together with the smaller states. Therefore, the goal of a Stockholm agreement by autumn 1986

does not seem unrealistic. The Soviet suggestion that, if need be, the question of naval activities might be postponed to the next stage of the CDE underlines this impression. To meet the deadline presented by the Follow-up Meeting, different approaches and proposals may be reduced to common denominators. At the MFR talks, there is less urgency to reach an accord. In bloc-to-bloc negotiations, the interest in military and political détente is less pronounced.

Military considerations

Two different scenarios of how another war may come about are crucial to any discussion of European security. One holds that the main threat comes from states or groups of states which deliberately build up their forces in order to strike at an opportune moment. The legacy of 1939–40, as restructured to fit the bipolar world and directed at the other side of the divided Europe, lingers on. The other scenario holds that the main threat is that nations may stumble into a war they do not want. Political and military circumstances may produce a series of incremental moves towards the brink of war: at some stage of the process, decision-makers will be keen to strike first because the difference between the gains of pre-emption and the losses of being pre-empted appears too big to be left unexploited.

The distinction is fundamental in assessing the realism or futility of efforts at confidence-building, arms control and disarmament. Such measures can succeed only if the parties deem it in their interest to reduce the risk of a war that none of them wants. How keen they actually are on reducing the risk of inadvertent war is in large measure a balancing act between reaping the perceived political benefits of a high and assertive military profile, and keeping the associated danger of human catastrophe within (seemingly) manageable proportions. The former set of considerations is operative at the superpower level. The latter is, in the nature of things, first and foremost a concern for the European nations facing the borders between East and West. They would be the most immediate victims of war, so they can ill afford to play political games on the threshold of armed conflict.

For a decade now, students of security policy have emphasized the danger that Europe may be drawn into war by a process of horizontal escalation beginning in the Third World.[32] When there is high East–West tension and deep distrust, misperception may lead to escalations dragging Europe into war, or one of the parties may choose to open a new front in Europe in accordance with established strategy and military planning. The offensive character of the force postures in Europe may drive decision-makers across the threshold of war. Hence, there is an obvious need for confidence-building and arms control measures to reduce the risk of an inadvertent slide into war. As long as fears of pre-meditated attack remain, the measures should be compatible with policies to deter that kind of threat as well. If not, it may be hard to win acceptance for them.

The propensity to open a new front in Europe may not depend very much on the overall force level in the area. Neither is it closely linked to the notion of a balance between East and West. If an analytical distinction is made between

offensive and defensive capabilities, stability can be said essentially to depend on the relative strength of offence and defence. If both sides have offensive capabilities well in excess of the defensive capabilities of the adversary, the parties may be tempted to strike first in a severe crisis.

To a large extent, that kind of situation already exists in Europe—particularly in Central Europe. There, the Soviet force posture is a constant reminder of the propensity to strike first at a critical stage of conflict, not because of aggressive intent—Soviet military planning can be well explained without resort to such assumptions—but in order to be prepared in case deterrence breaks down. It is impossible for the West, especially for West Europeans, to accept this Soviet concept of military security. In response, NATO tries to blunt the prospect of a successful WTO attack by armament measures of its own; this in turn leads to WTO rearmament to enhance the realism of its strategy. One of the ongoing efforts—to field more effective systems for deep interdiction—encourages the WTO to further strengthen its first-echelon forces. The likely result is a higher ratio of offensive capabilities to defensive ones—on both sides. This ratio is the single most important indicator of crisis instability.

Evolution and reorientation

Except for the Mediterranean dimension of European security, which was recognized by the Helsinki Final Act, CSBMs have been considered almost exclusively within the framework of the East–West confrontation in Europe. No explicit attempt has been made to shape them out of concern for horizontal escalation. Neither do the major powers show much sensitivity to the concerns that non-European countries have about force projection from European territory. The Soviet Union has proposed prior notification of movements out of the CSCE area whenever more than 20 000 troops are involved, but no specific provision is made for notification of amphibious forces. The Western powers have not tabled any proposal for prior notification of movements out of the area, either for ground forces or amphibious forces. The latter need not even be notified when they occur. Correspondingly, in Vienna the West has not proposed prior notification of exits, and seeks exemption for forces in transit. In the Third World, CSBMs designed to enhance the principle of non-use of force in Europe, but which do not interfere with great power interventions in other regions, can only cause resentment. Also for many of the smaller European states, assembly of force projection units constitutes a particularly worrisome warning indicator.

For the future, the participating states of the CDE ought to consider measures that would affect the relationship between Europe and other parts of the world—with the dual aim of reducing Europe's sensitivity to conflicts elsewhere and Third World anxieties about forces that can be projected from or via Europe. Further efforts at confidence-building and arms control must be better focused on main threats. So far, the North–South dimension of European security has to a large extent been neglected.

The CSBMs under discussion in Stockholm have, furthermore, no direct

bearing on present military instabilities in Europe. However, the CDE is supposed to move on to a more ambitious agenda at the next stage: the discussion may then be extended to cover constraints on military capabilities. Constraints on *offensive* capabilities, especially those deployed in forward areas of the East–West confrontation in Europe, would be highly relevant. Normally, constraints do not imply any obligation to disarm although, in practice, force components that are withdrawn may not all be redeployed. Some may be scrapped or mothballed. The mandate of the CDE mentions the possibility of disarmament negotiations at some future stage, but makes no concrete provision for it. The USA was strongly opposed and the USSR concurred, but with some resistance. The major powers may never have been very serious about using the CDE as a disarmament forum.

Neither do the Vienna talks have direct bearing on the military instabilities. They are about manpower, while the central security concerns are about fighting power. The stress on symmetrical constraints—which may be in order for manpower—is misplaced in relation to offensive fighting power. Often, the emphasis on numerical parity in selected weapon systems is counter-productive. At worst, it may encourage arms imitation rather than arms limitation. The most threatening force components on the two sides of a military confrontation are usually different: counting them numerically is then meaningless. A balanced reduction of components causing suspicion and distrust, however asymmetrical, shaped with due respect for the principle of equal security, makes more sense. The uniting objective should preferably be to remove entire categories of military options, notably the possibilities of surprise attack.

Therefore, upon conclusion of a first-phase agreement in Vienna, there is a strong case for rearranging the whole undertaking, charging it with the task of making the force postures less offensive and provocative. That rearrangement ought to be synchronized with the preparations for the second stage of the CDE, since the two ventures address overlapping problems.

Notes and references

[1] The Document is printed in SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1976* (Almqvist & Wiksell: Stockholm, 1976), pp. 359–62.

[2] The Stockholm Conference, which began in January 1984, is the first stage of the Conference on Confidence- and Security-Building Measures and Disarmament in Europe (CDE). There are three groups of CDE/CSCE states: neutral and non-aligned (NNA), Western states, i.e., members of NATO and/or the European Communities (W), and Eastern states, i.e., members of the WTO (E). They are: Austria (NNA), Belgium (W), Bulgaria (E), Canada (W), Cyprus (NNA), Czechoslovakia (E), Denmark (W), Finland (NNA), France (W), German DR (E), FR Germany (W), Greece (W), Holy See, Hungary (E), Iceland (W), Ireland (W), Italy (W), Liechtenstein (NNA), Luxembourg (W), Malta (NNA), Monaco, the Netherlands (W), Norway (W), Poland (E), Portugal (W), Romania (E), San Marino (NNA), Spain (W), Sweden (NNA), Switzerland (NNA), Turkey (W), UK (W), USA (W), USSR (E) and Yugoslavia (NNA). Albania is the only European state that does not participate.

[3] Here, information measures in the broad sense of the word. More specifically, NATO has proposed an exchange of information about peacetime deployment patterns which is also referred to as an information measure.

The Stockholm Conference mainly deals with information measures. Constraints will be achieved only to some small extent, if at all.

[4] From the Concluding Document adopted by the Second CSCE Follow-up Meeting in Madrid on 6 Sep. 1983. For the text, see SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1984* (Taylor & Francis: London, 1984), pp. 570–1.

[5] The NATO proposals are compiled in conference document CSCE/SC.1 of 8 Mar. 1985, and the NNA proposals in CSCE/SC.7 of 15 Nov. 1985. Eastern proposals for notification, constraints and non-use of force were introduced in CSCE/SC/WGA.1 of 7 Feb., (CSCE/SC/)WGB.1,2 and 3 on 20 May, and WGB.4 on 21 June. For Eastern proposals on observation of air and naval activities, see statements by the representatives of the GDR and the USSR in (CSCE/SC/)WGB of 30 May 1985.

The NNA proposals express the national interests of these states. They do not pretend to be compromise suggestions.

[6] Brezhnev, L., speech before the Party Congress on 20 Feb. 1981.

[7] See note 4.

[8] Rotfeld, A. D. (ed.), *From Helsinki to Madrid. CSCE Documents*, Polish Institute of International Affairs (Co-operative Publishers: Warsaw, 1984) p. 34.

[9] *Pravda*, 16 Jan. 1986.

[10] For a listing and discussion of arguments for and against legally and politically binding CSBMs, see Borawski, J., 'Political and legal dimensions of assuring CSBM compliance', *Verification of Disarmament in Europe*, the Swedish National Defence Research Institute, FOA (FOA & the Swedish Armed Forces Educational Center (FLC): Stockholm, 1985), pp. 114–25.

[11] In Soviet terminology, a military manoeuvre usually implies that there are opposing forces fighting each other. However, certain kinds of exercise may be carried out without such opposition. In some environments, exercises may even be staged so that they interact with exercises undertaken by the other side. This is sometimes the case at sea.

[12] Hansen, L. M., 'The political and practical dimensions of verifying confidence- and security-building measures', *Verification of Disarmament in Europe* (note 10), p. 137.

[13] The WTO emphasizes that notification of all out-of-garrison activities is impossible and irrelevant, since troops are also used for such purposes as harvesting and disaster relief.

[14] This is in reference to exercises of air forces, naval aviation and aviation of air defence forces, including those conducted in combination with land and naval forces, in the course of which it is foreseen that more than 200 military aircraft will be in the airspace over the notified area at the same time.

[15] Lundin, L. E., 'The verification of confidence- and security-building measures in Europe', to be published in the Occasional Papers of Institut des Hautes Etudes Internationales, Geneva, Fall 1985.

[16] See, e.g., Mellbin, S. G., 'The Helsinki process: issues of security- and confidence-building', *NATO Review*, vol. 33, no. 4 (Aug. 1985).

[17] Statement by the head of the Polish Delegation to the CDE on 29 Feb. 1984.

[18] There are two categories of participants at the Vienna talks. Direct participants are the 11 countries which have forces in Central Europe: the Benelux countries, Canada, FR Germany, the UK and the USA on the Western side; Czechoslovakia, German DR, Poland and the Soviet Union on the Eastern side. Special or indirect participants are Bulgaria, Hungary and Romania on the WTO's southern tier; and Denmark, Greece, Italy, Norway and Turkey on NATO's flanks.

[19] See transcripts of press briefings of 14 Feb. 1985, by Ambassador Michailov (USSR), and of 5 Dec. 1985 by Ambassador Alexander (UK) and others.

[20] See *Arms Control Reporter*, Dec. 1982, section 401.C. Today, Western estimates indicate that actual WTO forces in the reduction area are about 230 000 persons more than given by official Eastern data.

[21] Holst, J. J., 'On how to achieve progress in nuclear arms control negotiations', *NUPI notat nor. 313(A)*, Norwegian Institute of International Affairs, Oslo, 1985.

[22] Sharp, J., 'Troop reductions in Europe: a status report', *ADIU Report*, vol. 5, no. 5 (Sep./Oct. 1983).

[23] Dean, J., 'Verifying force reductions and confidence-building measures', *Verification of Disarmament in Europe* (note 10), p. 107.

[24] See chapter 10.

[25] Dean, J. (note 23), p. 111.

[26] *The Arms Control Reporter*, May 1984, section 401.B.

[27] See note 9.

[28] Holst, J. J., 'The new conceptual and technological challenges: conventional and chemical weapons', paper presented at the International Conference on Security and Prospects for Disarmament in Europe, UNIDIR and IFRI, Geneva 16–17 Dec. 1985.

[29] General Secretary Gorbachev in *Time Magazine*, 9 Sep. 1985. Here, the importance of

détente in Europe to facilitate economic co-operation and progress is emphasized. In his statement of 15 Jan. 1986 (*Pravda*, 16 Jan.) the commitment to military and political détente is articulated: 'Europe could have a special mission. That mission is erecting a new edifice of detente'.

[30] 'Attaching great importance to the Stockholm conference on confidence- and security-building measures and disarmament in Europe and noting the progress made there, the two sides state their intention to facilitate, together with the other participating states, an early and successful completion of the work of the conference'. Joint Soviet–US statement from the summit meeting in Geneva, 19–21 Nov. 1985.

[31] *Document. Foreign Policy*, United States Information Service, 22 Jan. 1986.

[32] Myrdal, A., *The Game of Disarmament* (Pantheon Books: New York, 1976); and Nincic, M., SIPRI, *How War Might Spread to Europe* (Taylor & Francis: London, 1985).

19. Multilateral arms control efforts

JOZEF GOLDBLAT

Superscript numbers refer to the list of notes and references at the end of the chapter.

The multilateral arms control deliberations held in 1985 at the Conference on Disarmament (CD) and at the United Nations centred on three subjects: (*a*) the suspension of nuclear weapon tests and the conclusion of a treaty banning such tests in all environments—a subject which regained topicality in connection with the commemoration of the 40th anniversary of the use of nuclear weapons in Japan; (*b*) the prohibition of the production and possession of chemical weapons—a measure which has become especially urgent in view of the increased danger of proliferation of such weapons among nations; and (*c*) the prevention of an arms race in outer space—a matter of interest to all countries concerned about the vulnerability of satellites and the survivability of some important arms control agreements related to outer space.

The area of chemical weapons was the only one in which the CD recorded some progress towards an international convention. As regards nuclear tests—a topic on the agenda of arms control forums for more than a quarter of a century—a step backwards was made with the announcement by the United States of its disinterest in a comprehensive ban. Consideration of questions concerning outer space has not progressed beyond the stage of a general exchange of views.

I. A nuclear test ban

The controversy of several years over the mandate of a committee on the cessation of nuclear test explosions to be established by the CD continued in 1985. It was about whether negotiations should be conducted to elaborate a test ban treaty, as the Socialist and non-aligned CD members have been insisting upon, or whether an examination should be made of specific issues related to such a ban 'with a view' to negotiating a treaty, as proposed by the Western countries—mainly the USA. The controversy remained unresolved: no committee was set up and negotiations were not held. Nevertheless, technical aspects of a possible comprehensive test ban were discussed in detail.

Verification

The *Ad Hoc* Group of Scientific Experts, composed of both members and non-members of the CD, set up in 1976 to work out international co-operative measures to detect and identify seismic events, met at two sessions in Geneva and adopted two progress reports.[1] The results of a technical test of international seismic data exchange conducted by this group in October–December 1984 were discussed. Considering the purpose of the test, the USA

complained that seismic signals originating from nuclear explosions that had been reported by participating countries were not processed by the Experimental International Data Centre (EIDC) operated in Moscow by the Soviet Union.[2] (The two other centres were located in Stockholm and Washington.) In this connection, the Netherlands underlined the importance it attached to the idea—which was not shared by all the participants in the test—of a universal, non-selective transmission of seismic data, including data concerning nuclear explosions.[3] Nevertheless, the test was generally regarded as a useful exercise.

Papers concerning verification of a nuclear test ban were also submitted. In a report from a workshop on seismic verification held in Oslo in June 1984, the Norwegian authorities stated that while substantial technical progress had been achieved in the field of seismic verification, it was essential to establish a network of seismological stations which were distributed globally. Such a network should ensure international data exchange based on the most modern technology available. The problems which in the view of Norway still remained to be solved concerned in particular the detection and identification of very low-yield explosions, as well as explosions conducted in an environment that produces very weak seismic signals. Another problem which would need further study was the reduced possibilities for seismic detection immediately after the occurrence of large earthquakes.[4]

A British study on seismic monitoring devoted considerable space to the problem of evasion, that is, deliberately engineered measures intended to significantly degrade the effectiveness of a test ban monitoring system.[5] The evasion scenarios described in the study include conducting multiple explosions, explosion 'masking' and 'decoupling'.

In a multiple explosions scenario, deception would be practised by firing a sequence of explosions with increasing yields in order to produce earthquake-like signals. However, as was pointed out in the study, if suspicions were aroused, detailed seismological examination could show that the signals were not generated by an earthquake.

In another scenario, firing a nuclear explosion shortly after the start of a large earthquake could 'mask' the explosion signal in the tail of the earthquake signal. However, in the view of the authors of the study, such a hide-in earthquake technique cannot be easily undertaken: the explosion would have to be conducted only when an earthquake occurred with a magnitude exceeding a given limit and within a given range of the place of testing.

The technique of 'decoupling' consists of conducting an explosion in a large underground cavity so that the explosion energy is less well transferred to its geological surroundings. According to some British calculations, a fully decoupled 10-kt explosion would generate signals about 100 times smaller than for the same explosion close-coupled in hard rock. This theory had been tested using chemical explosives (up to 1000 kg) and a small nuclear explosion (380-t yield), but there was no experimental proof that decoupling would be equally effective in the case of higher-yield explosions. It was recognized that there would be engineering problems in creating a cavity large enough to decouple such explosions.

In discussing possible motivations for cheating, the same British study put forward two hypotheses: (*a*) that a state might decide to subscribe to a test ban because a ban would put a brake on nuclear developments by others while leaving that state some freedom to continue with its own developments by using techniques which minimized the risk of non-compliance being discovered; and (*b*) that a state which had signed a test ban in good faith might subsequently find that it needed a few nuclear tests, for example, to rectify a previously unsuspected serious fault in its weapon stockpiles, but was unwilling to abrogate its treaty obligations.

The Federal Republic of Germany proposed the establishment of an international monitoring and verification system relating to a comprehensive nuclear test ban pending the conclusion of a test ban treaty. While in operation, the system would be progressively expanded and refined and its capability to detect and identify explosions improved.[6] The improvements proposed would, in the opinion of West German experts, bring the verification capability of the global system to a level of magnitude corresponding to a yield of 5–10 kt in dry unconsolidated rock or to a yield of about 1 kt for explosions in wet hard rock. Moreover, the establishment of internal networks, in particular on the territory of nuclear weapon states, would offer possibilities for detecting and identifying evasion attempts involving yields of 10 kt or more. 'In-country' networks with borehole stations, spaced over distances of 500–1000 km in areas where cavity decoupling is possible, could make it possible to detect and identify evasion attempts involving yields even as low as 1 kt.[7]

Japan suggested that a multilateral verification system should be set up on the basis of the existing and available facilities and equipment, and that verification capabilities should be later improved with a view to reaching the goal of detecting and identifying, with a high degree of confidence, underground nuclear explosions of any kind and at any place.[8] This approach was consonant with the Japanese proposal for an agreement to prohibit nuclear tests above a detectability threshold, which would have to be defined according to the present verification capabilities, along with a commitment to gradually lower the threshold down to zero.[9]

For Sweden, a yield-threshold arrangement would be acceptable only if it were directly linked to a comprehensive test ban treaty effective from an agreed date. During the transition, tests not exceeding a determined yield level (5 kt was mentioned) would be permitted at one test site in each nuclear weapon state adhering to the treaty. Special preparations would have to be made to acquire the capability of exactly estimating the yields. They would include exchange of detailed geological and geophysical information concerning the test sites; establishment of a certain number of local seismological stations close to the sites; and conduct of calibration explosions with known yields. Further development of the verification system should ensure that, at the end of the transitional period (say, no longer than three years), the system would provide monitoring capabilities acceptable to all.[10]

Objecting to the proposal for an international seismic verification system outside a comprehensive test ban treaty, some CD delegations referred to the Final Document of the 1978 UN Special Session on Disarmament, which stated

that the form and the modalities of verification to be provided for in any specific agreement should be determined by the purpose, scope and nature of the agreement. The Socialist states reiterated their position that international exchange of seismic data should be carried out only with the purpose of increasing the confidence of parties to a treaty prohibiting nuclear weapon tests that its provisions are being complied with.

In October 1985, the leaders of six countries—Argentina, Greece, India, Mexico, Sweden and Tanzania—presented a statement on the cessation of nuclear testing to the US and Soviet governments, in which they offered their 'good offices' to facilitate the establishment of effective verification arrangements. This offer was interpreted by certain observers as including readiness to place seismometers on the territories of the nuclear weapon powers in order to detect and identity even very small explosions. In addition, these leaders proposed establishing verification mechanisms on their own territories to assist in monitoring a test ban.[11]

The Soviet moratorium

On 29 July 1985, 'in an endeavour to facilitate the cessation of the dangerous competition in the buildup of nuclear arsenals', the Soviet Union announced a unilateral halt to all its nuclear explosions (both for military and non-military purposes). The moratorium was to start on 6 August, the date of the nuclear destruction of Hiroshima 40 years before, and last until 1 January 1986; it was to continue in effect even beyond that date if the United States were also to refrain from carrying out nuclear explosions. In the opinion of the USSR, a mutual US–Soviet moratorium on all nuclear explosions would serve as a 'good example' for other nuclear weapon states.[12] Responding to Western allegations that it had stopped testing only after completing a planned series of tests so that it did not need to test for a few months, the Soviet Union said that in order to introduce the moratorium it had to break off its testing programme.[13] According to the publicly available data, the total figure for Soviet nuclear explosions in 1985 was considerably lower than that for US explosions and, in fact, the lowest for the USSR since 1964.

The proclamation of the moratorium was welcomed by many countries, in particular the non-aligned countries, which for many years have appealed to the UK, the USA and the USSR to halt nuclear test explosions, as a provisional measure, through a 'trilaterally agreed moratorium or through three unilateral moratoria'. Requests to this effect have been included in resolutions adopted year after year by an overwhelming majority of the UN General Assembly. Some Western nations expressed regret that the moratorium did not address the verification problem. The United States, however, rejected the Soviet proposal without reservation, referring to its need to complete the nuclear weapon programme and to assure the modernization of its deterrent force. The United States moreover expressed doubts that unverifiable, legally not binding moratoriums on nuclear testing could be a sound basis for agreement on verifiable testing limitations, limit further growth in nuclear arsenals or contribute significantly to the stability and confidence that sustain disarmament

negotiations.[14] The United Kingdom argued that 'limited unilateral gestures of this kind' could be no substitute for a genuine and durable framework for arms control with effective verification procedures.[15] This controversy was carried over to the Third Review Conference of the parties to the Non-Proliferation Treaty (NPT), held in the autumn of 1985.

On 15 January 1986, the Soviet Union extended its unilateral moratorium by a further three months, and again stated that it would keep it in effect longer if the United States followed suit. The USSR also expressed the conviction that verification of compliance with the moratorium could be fully ensured by national technical means as well as through international procedures, 'including on-site inspections' whenever necessary.[16]

Peaceful nuclear explosions

In formulating their proposals for a test ban treaty, the Socialist and the non-aligned states seemed to confine the ban to nuclear *weapon* tests, whereas the Western countries envisaged a prohibition on *all* nuclear explosions.

This question had been examined in the course of the British–US–Soviet tripartite talks in the late 1970s. In their 1980 report to the Committee on Disarmament,[17] the negotiating parties agreed that the treaty prohibiting nuclear weapon test explosions in all environments would be accompanied by a protocol on nuclear explosions for peaceful purposes, constituting an integral part of the treaty. In the protocol the parties would establish a moratorium on peaceful nuclear explosions and would commit themselves to refrain from causing, encouraging, permitting or in any way participating in the carrying out of such explosions until arrangements for conducting them were worked out, consistent with the 1963 Partial Test Ban Treaty (PTBT) and the 1968 NPT. The draft test ban treaty submitted by Sweden in 1983 contained a similar provision, making it clear that acquisition of military benefits from peaceful applications of nuclear explosions must be precluded.[18] This requirement, however, is unlikely to be met, because essentially the same technology is used in all nuclear explosions, whatever their purpose. Unless a complete ban were introduced, nuclear weapon states could always use 'peaceful' explosions for testing new warheads or the continued serviceability of stockpiled warheads, while non-nuclear weapon states could use them to develop nuclear explosive technology for weapon purposes.

Nevertheless, certain Third World countries have asserted that a test ban should apply only to nuclear weapons. India has already conducted a nuclear explosion and called it 'peaceful'. Argentina and Brazil claim the right to carry out explosions for peaceful purposes which involve devices similar to those used in nuclear weapons. These three countries are often referred to as the nuclear 'threshold' countries, because they conduct significant nuclear activities and operate unsafeguarded plants (that is, not subject to international controls) which are capable of making nuclear weapon-usable material. All refuse to join the NPT and to formally forgo the acquisition of nuclear weapons. The difference of opinion over peaceful uses of nuclear explosions is very important. It would have to be settled before a multilateral test ban treaty

could be seriously contemplated and concluded. Leaving peaceful nuclear explosions unconstrained would render the treaty ineffective.

Prospects

Contrary to the policy proclaimed during the preceding quarter of a century, the present US Government considers a comprehensive ban on nuclear explosions to be a 'long-term objective' rather than a matter of the 'highest priority', or a matter of 'greatest importance' for the success of efforts to halt and reverse the nuclear arms race, as has been stated in a succession of UN General Assembly resolutions. More specifically, the United States now views a test ban in the context of radical nuclear arms reductions, maintenance of a credible nuclear deterrent, expanded confidence-building measures and improved verification capabilities.[19] In other words, it sees it as part of a large arms control package and not as a separate measure to be carried into effect in conformity with the obligations previously undertaken in international agreements. (The preamble to the PTBT states that the parties are 'seeking to achieve the discontinuance of all test explosions of nuclear weapons for all time' and are 'determined to continue negotiations to this end'; the preamble to the NPT reaffirms this determination. In the 1974 Threshold Test Ban Treaty (TTBT) the parties have undertaken to work towards achieving a solution to the problem of the cessation of 'all' underground nuclear weapon tests.) Consequently, the impediments to a test ban are predominantly of a political nature: they are based on the notion that US security is best served by continued testing. Technical considerations related to verifiability of compliance are no doubt of much lesser concern, protestations to the contrary notwithstanding. The argument of inadequacy of verification appears to many countries as a convenient excuse to avoid a nuclear test ban: many scientists in the USA, the USSR and Western Europe are confident that with the use of seismological and other techniques, such as satellite photography, complemented in the case of suspicious events by on-site inspections (the conduct of which is no longer a matter of contention), nuclear explosions can be detected down to a level of low military significance.[20]

Be that as it may, the US position seems to be firm and there is little chance of achieving the cessation of nuclear tests in the foreseeable future, or at least as long as the US ballistic missile defence (BMD) programme requires the development of a laser powered by a nuclear explosion. There is no way to make a sovereign state conclude an agreement which it does not believe to be in its best interests. There exists, however, a possibility of limiting the size of nuclear explosions, beginning with the formal entry into force of the still unratified 1974 TTBT and 1976 Peaceful Nuclear Explosions Treaty (PNET), both banning nuclear explosions with a yield exceeding 150 kt. The Soviet Union has often appealed to the USA to ratify these treaties, the basic provisions of which are being complied with anyway owing to the pledges unilaterally made by the parties. In recent time, the USA has shown signs of readiness to do so on condition that the verification procedures are tightened to make sure that the 150-kt threshold was actually observed. It is in this vein that

President Reagan, speaking to the UN General Assembly in September 1984, proposed mutual visits of Soviet and US experts to the respective nuclear test sites to measure directly the yields of tests.[21] Developing further this idea in 1985, the USA extended an 'unconditional' invitation to the USSR to send experts to its Nevada test site. The experts would be allowed to bring any equipment they deemed necessary to carry out yield measurements. The US Government said that such a visit would help to establish the basis for the verification of 'effective limits' on underground nuclear testing.[22] Indeed, measuring on the spot could validate the data supplied by the other side and add confidence in the so-called calibration yields, that is, yields of tests conducted for the purpose of calibrating the seismometers.

The Soviet Union declined the US invitation, claiming that it did not serve the goal of a comprehensive test ban. Nevertheless, its December 1985 offer to allow foreign inspectors at its nuclear test sites[23] might ease the way towards the ratification of the 1974 and 1976 treaties limiting the yield of nuclear explosions. This would, of course, be a very modest step: the permitted yield is 10 times higher than that of the Hiroshima bomb. But it could give an impetus to further limitations, through subsequent agreements both on the yield and, even more important, on the number of explosions conducted annually. An attempt could also be made to involve China and France in such undertakings, in addition to the UK, the USA and the USSR, since mere limits on tests would not foreclose the possibility of narrowing the gap between the arsenals of these two states and those of the superpowers—the only justification given so far for the continuation of the French and Chinese tests. However, in any partial underground test ban treaty it would be necessary to obtain a binding commitment from the parties that the goal of a multilateral comprehensive test ban would be vigorously pursued. To have a significant impact on the nuclear arms race and, at the same time, serve as an effective non-proliferation measure, a test ban must be complete and general, that is, universally adhered to.

II. Chemical disarmament

Negotiations for a convention prohibiting the development, production and stockpiling of chemical weapons continued in 1985 in an *Ad Hoc* Committee of the CD. The topics discussed included elimination of stocks of chemical weapons and of the means for their production, verification of compliance, and implementation and operation of the convention. Several working papers were submitted.

Elimination of stocks and production facilities

France proposed that the stocks of chemical weapons should be eliminated in the following way and succession: destruction of munitions (bombs, shells, rockets, mines, etc.) containing phosgene, cyanogen chloride, hydrocyanic acid, and so on; destruction or conversion of lethal toxic chemicals in bulk

(phosgene, etc.); destruction of munitions containing incapacitating agents and yperites; destruction of yperites and incapacitating agents in bulk; destruction of munitions containing nerve agents and key precursors; and destruction of nerve agents in bulk.[24]

The 10-year period said to be necessary for the elimination of stocks should, in the view of France, be divided into subperiods and, to ensure a balanced process, each new stage of destruction should begin only when all the countries had satisfied the requirements of the preceding stage. An inspection team would be present throughout the destruction operation.

As regards production capacity, a distinction would have to be made between development and manufacture. Of the facilities used in developing chemical weapons, only testing grounds would be subject to a very precise declaration indicating the location by geographical co-ordinates. These would be either closed down or converted to other purposes.

Regarding manufacture, a distinction would be made between plants producing toxic substances and workshops for filling these substances into delivery vehicles, as well as those producing bodies or warheads of munitions. The latter workshops are generally part of larger units and their existence is justified only by the existence of the toxic chemical; they would be superfluous once the supply of the chemical was terminated. It is the plants producing toxic chemicals and the workshops for filling them into delivery vehicles that present the greatest risk of circumvention and have, therefore, to be considered for irreversible neutralization. For this operation, the planned period of 10 years is considered to be sufficient. France suggested that the first two years after entry into force of the convention should be devoted to the submission of declarations of production sites (geographical location, production capacity, toxic substances manufactured); to closing the facilities in question and sealing them; to placing them under international control; and to transforming one or more production plants into a destruction plant. The following three years would be devoted to the conversion to other uses of various production units—such as factories for the manufacture of lethal super-toxic substances or incapacitating agents that form part of a military complex, civilian factories which had manufactured key precursors for super-toxic substances, and special-munitions assembly shops or shops preparing munitions for shipment—as well as to the destruction of munitions-filling shops. The final three years would be reserved for the destruction of isolated facilities for the manufacture of lethal super-toxic substances or incapacitating agents, and of isolated facilities for the manufacture of key precursors for super-toxic substances. Thus, the production structure would be completely dismantled by the end of the first eight years. During the remaining two years, any necessary completion of destruction would take place along with definitive verification of facilities taken out of service.

Systematic international verification of initial declarations and of the mothballing or conversion to other uses of production facilities would be mandatory. Sensors would be installed at various key points in facilities and would be monitored periodically: intervals of one year would seem suitable. Also, destruction would have to be effected under systematic international

control. In the event of doubt concerning compliance, a request for inspection might be made to a competent international organ.

In order to ensure a balanced destruction of stocks, it would be essential, in the opinion of France, that the main holders of military stocks be brought to a position of parity half way through the destruction process, that is, by the end of the fifth year, and that an interim, militarily significant stock (to be determined in advance by agreement) be preserved until the eighth year for the countries participating in the munitions-destruction process. This residual capacity, for reprisal in case of an attack, would be destroyed in the course of the last two years of the destruction process.

China has worked out a formula for a balanced order of destruction of chemical weapon stockpiles to prevent any of the parties possessing chemical weapons from gaining military advantage.[25]

Sweden suggested 'a comprehensive approach for elaborating regimes for chemicals in a future chemical weapons convention'. The chemicals were to be arranged in three groups.

Group I would include: super-toxic lethal chemicals developed, produced or stockpiled for chemical weapon purposes, for example, tabun, soman, sarin and VX; super-toxic lethal chemicals which are found to be presumptive chemical weapons, for example, Amiton and skin-penetrating carbamates; other lethal and harmful chemicals developed, produced or stockpiled only for chemical weapon purposes, for example, Adamsite and BZ; key precursors with no or very limited use for permitted purposes; and key components of binary or multicomponent chemical weapons, for example, DF, QL and pinacolylalcohol.

Group II would include: super-toxic lethal chemicals (other than those in Group I) which are at present developed, produced or stockpiled only for permitted purposes, but which warrant special attention to ensure that they are not developed, produced or stockpiled for chemical weapon purposes, for example, Strophantin (a glycocide for heart ailments); and key precursors (other than those in Group I) used for permitted purposes, but which have also been produced for chemical weapon purposes, for example, thiodiglycol.

Group III would include: other lethal chemicals used for permitted purposes, but which have also been produced for chemical weapon purposes, for example, phosgene and hydrogen cyanide; other harmful chemicals used for permitted purposes, but which have also been produced for chemical weapon purposes, for example, phosgeneoxime; and precursors, for example, phosphorus oxychloride and phosphorus trichloride.

For each group a different regime of declaration, elimination, production and verification would be applied, from the most demanding for Group I-chemicals to the least stringent for Group III-chemicals.

The Swedish suggestion was discussed in January 1986 in the CD, where an 'integrated approach for listing relevant chemicals' was worked out, subject to later revision.[26]

Verification

To provide assurances that substances manufactured by the chemical industry for permitted purposes were not diverted or transformed to make chemical weapons, the United Kingdom proposed the use of routine methods of verification, with the understanding that inspection by challenge could be resorted to in case of suspected non-compliance with any aspect of the convention. Drawing as far as possible on the experience with International Atomic Energy Agency (IAEA) safeguards, the UK suggested that the purpose of routine inspections under a chemical weapons convention should be to perform observations, the results of which would be compared with the data submitted by states, as required. Inspection procedures for declared production facilities for high-risk chemicals and precursors, as well as a system for reporting data relating to compounds in the high- and medium-risk categories, were outlined in a special working paper.[27] (It can be noted that a number of CD members, as well as non-members, have already submitted information to the CD on the production of key precursors of super-toxic chemicals in their civilian chemical industries.)

In the view of Australia, procedures for the verification of non-production of chemical warfare agents should include: accountancy of designated chemicals and their precursors (throughout their lifetime); routine, random inspections of the chemical industry; import/export regulations and customs checks; and inspection by challenge to resolve ambiguities.[28]

Regarding on-site inspections, the chairman of a working group of the *Ad Hoc* Committee suggested that a state should have the right to refuse an on-site inspection for reasons relating to an apparent abuse of the request or to a threat to its national security; such a refusal would have to be accompanied by a full explanation of the reasons.[29] This procedure differs from the approach taken by the United States (as put forward in its 1984 draft convention),[30] which required 'special' mandatory inspections to be carried out 'anywhere' without delay, and without giving the challenged state any legal means to refuse the request—a proposal objectionable to many states.

To monitor chemical weapon-related facilities, chemical weapon stockpiles, the process of their elimination, and so on, Japan suggested using the remote continual verification (RECOVER) technology, originally developed in the USA for safeguarding nuclear material. The advanced system now being developed in Japan would permit an economical and reliable transmittal of digital data to a control centre from various sensors appropriately placed.[31] Japan also said that, should suspicion arise concerning the activities of the civil chemical industry, the state concerned must first be given an opportunity to present information and an explanation in order to clarify the situation. Only if doubts persisted would it be advisable to resort to other means of verification, including on-site inspection. Safeguards should be provided for to prevent arbitrary requests for on-site inspection that could create undue difficulties for the industry.[32]

A detailed proposal for the verification of non-production of chemical warfare agents in the civilian chemical industry was made by the Federal

Republic of Germany. Such verification could take the form of systematic international surveillance of specific sectors of the chemical industry, covering a list of selected substances. The scope of on-site inspections, to be carried out on a random basis, would have to be such as to meet the verification requirements of the convention and, at the same time, guarantee respect for the legitimate economic interests of the chemical industry. In other words, inspections would have to be performed without disclosure of secret technological or other industrial information. In addition, there would have to be annual statistical reports on a scale to be agreed.[33]

Expressing the view of the group of Socialist countries, the German Democratic Republic pointed out that concentrating the production of strictly limited quantities of super-toxic lethal chemicals for permitted purposes in a small-scale facility, instead of permitting their unlimited manufacture in several plants, would facilitate effective national and international verification.[34]

Implementation and operation of a convention

The United Kingdom has suggested three organs to constitute an international organization responsible for the implementation of the convention prohibiting chemical weapons: a consultative committee, an executive council and a secretariat.

The consultative committee, the principal organ of the organization, would be empowered to review any questions relevant to the convention or relating to the powers and functions of the organs established under the convention. Meeting in regular and special sessions, the consultative committee, composed of representatives of all parties to the convention, would proceed by consensus where possible. If consensus were not possible, the committee would take its decision by a two-thirds majority on financial matters, on modifications of the convention, and on suspension of a member from the rights and privileges of membership. All other matters would be decided by simple majority.

The executive council would have day-to-day responsibility for the implementation of routine international inspection and for inspection by challenge. It would first comprise 15 members, but upon deposit of the 60th ratification its membership would rise to 30 and would be in two categories: in the first, members would be elected with due regard to equitable geographical representation modelled on UN practice; in the second, the membership would include states (to be designated each year) with the largest industrial chemical base. The council would proceed by consensus where possible; otherwise, it would take its decisions on substantive matters by a two-thirds majority, and by a simple majority on all procedural matters.

The international secretariat, comprising the staff of the organization, would be headed by a director-general. Appointed by the executive council with the approval of the consultative committee, the director-general would be responsible for immediately bringing to the attention of the council any matter calling into question compliance with the convention. The international inspectorate would be part of the secretariat. To enable the organization and its

organs to begin work immediately upon entry into force of the convention, a preparatory commission composed of signatories would come into existence on the first day the convention was opened for signature, and would carry out all the necessary preliminary work before ratification.[35]

Guidelines for a national system for the implementation of a chemical weapons convention were submitted by the German Democratic Republic.[36] The system would comprise laws and regulations forming a legal basis for supervision and control and providing for sanctions in case of non-compliance; a national authority, which could be a specially established body or an institution already in existence; and organizational and operational elements at the facility level.

In addition to its internal functions, the national authority of each state party to the convention would serve as a point of communication with the national authorities of other states and with the consultative committee. It would co-operate with the committee and with other national authorities in solving organizational and technical questions and, in particular, in training national inspectors in standard verification techniques and in the use of relevant equipment. It would also transmit data, as agreed, to the committee (or its subsidiary organ) and evaluate the information received; provide the committee with additional information, expertise and laboratory support, if required; and facilitate and provide support for the inspections conducted by the committee or its subsidiary organ.

Problems and prospects

There exists an agreed structural framework for the chemical weapons convention, but the draft that the CD has so far elaborated contains many alternative formulations as well as gaps which remain to be filled. There are only working definitions of chemical weapons and of key precursors of toxic chemicals to be prohibited. The discussion of how to specify, for the purpose of the convention, what is a chemical weapon production facility has also remained inconclusive. The lack of definitive agreement on these issues has held up the drafting of certain essential interrelated clauses.

Moreover, opinions are not fully concordant on the contents of declarations of chemical weapon stocks and production facilities and of facilities producing chemicals which *can* be used for weapon purposes, as well as on the timing for their submission. Nor has a consensus emerged with regard to the order of elimination of chemical weapon stocks and facilities. Different positions have been maintained on the level and nature of verification of compliance. Equally, agreement is lacking on the functioning of the envisaged international bodies for the supervision and implementation of the convention, including fact-finding and—above all—decision-making.

According to some CD delegations, the process of drafting the convention has been very slow. Many other delegations, however, consider that significant progress was made in 1985. Be that as it may, and considering that the negotiations have been going on for nearly two decades, the goal of chemical disarmament appears to an outside-observer to be still too far away. The US

decision taken in 1985 to start the production of a new generation of chemical weapons, so-called binary munitions, has not made the prospects any brighter:[37] the deployment of binary weapons would erode many of those constraints that have so far prevented chemical weapons from becoming an integral component of the military posture of at least one of the major alliances; it could render the conclusion of a disarmament convention even more complicated.

In January 1986 the situation seemed to improve with General Secretary Gorbachev's statement of Soviet preparedness to make a timely announcement of the location of enterprises producing chemical weapons, to ensure the cessation of their production, to develop procedures for destroying the corresponding industrial base, to proceed, soon after the convention entered into force, to eliminating the stockpiles of nuclear weapons, and to carry out all these measures under strict control, including international on-site inspection.[38] As an interim measure, the achievement of a US–Soviet understanding to prevent proliferation of chemical weapons is a possibility, as indicated in the communiqué from the November 1985 Reagan–Gorbachev summit meeting. (At the beginning of 1986 the USA and the USSR resumed in Geneva their bilateral talks on chemical arms control.)

Non-proliferation of chemical weapons

To halt the further spread of chemical weapons is both important and urgent in view of the alarming reports about new states acquiring chemical weapon capabilities. According to some US sources, more than a dozen states already possess chemical weapons,[39] a development that could be especially threatening in unstable areas of the world. Moreover, continuous complaints are made of the use of chemical weapons in a number of ongoing armed conflicts. It is noteworthy that Iraq, which has used chemical weapons in its war with Iran, had never before been suspected of having a chemical warfare capability. But the prevention of proliferation, which is a relatively modest measure when compared with the ambitious plan for general and complete chemical disarmament, may not be easy to bring about.

To avoid loopholes, a non-proliferation undertaking would have to cover not only chemical weapons but also toxic substances, including precursors. This would require establishing an agreed list of all relevant chemicals, that is, something the CD itself has not yet been in a position to do, but the parties may decide to restrict their commitments to a few of the most dangerous and non-controversial items. To avert circumvention, a ban on transfer of chemical weapons and toxic substances would have to be observed not only by the superpowers, but by all states having a developed chemical industry, and the number of such states is not inconsiderable. Restrictions on exports of chemicals that could be used in the production of warfare agents were imposed by several countries after the incidents in Iran, but they were far from universally applied. To avoid a geographical spread, chemical weapons stationed in the territories of other states would have to be withdrawn; this might require disclosing the presence of such weapons abroad, that is,

providing information which the superpowers and their allies have so far been unwilling to provide. And, finally, to make non-proliferation fully effective, non-chemical weapon states would have to undertake not to manufacture or import the prohibited items and to accept international control of compliance. This last condition, which is crucial, is also the least likely to be met: even countries not intending to acquire a chemical warfare capability may refuse formally to forgo the right to do so and subject themselves to foreign supervision, as long as the chemical weapon powers retain their arsenals of chemical weapons and even plan to modernize them. As distinct from nuclear weapons, chemical weapons can now be relatively easily manufactured by many; and as more countries develop their chemical industries, their potential for producing means of chemical warfare will expand as well.

Regional chemical disarmament

The search for a global ban on chemical weapons has been accompanied in recent years by a search for regional solutions. In its report submitted in 1982, the Independent Commission on Disarmament and Security Issues (the so-called Palme Commission) called for the establishment of a chemical weapon-free zone in Europe.[40] This suggestion was later transformed into an outline of an agreement worked out in 1985 jointly by the ruling East German Socialist Unity Party and the opposition West German Social Democratic Party.

The two parties proposed that, optimally, the European chemical weapon-free zone should initially embrace the region of Central Europe: Belgium, Czechoslovakia, the GDR, the FRG, Luxembourg, the Netherlands and Poland, with the possibility of accession by other states. However, it should comprise at least the GDR, the FRG and Czechoslovakia.

The states making up the zone would pledge themselves to clear their territories of chemical weapons and keep them free of such weapons, to neither manufacture nor acquire them and to forbid other countries to station or manufacture them on their territory or to transport them through it. The states of the zone should call on states which have chemical weapons at their disposal to respect the chemical weapon-free status of the zone and never to use or threaten to use chemical weapons against the area free of such weapons.

Verification of compliance would be carried out through national and international verification procedures in order to ensure the absence of chemical weapons in the zone. Verification powers would be vested in a permanent international commission; all states sharing the obligations relating to the zone would be entitled to membership in this commission and thereby to participation in verification measures. In the event of a suspected violation of the proposed treaty, the commission would be called in. If the grounds for suspicion were not removed within a period to be specified, the commission would carry out on-site inspection.

It is specifically stated in the proposal that the establishment of a zone free of chemical weapons should not affect the membership of the states parties in

their respective political and military alliances. Moreover, the parties would undertake to join a future comprehensive and world-wide agreement banning chemical weapons.[41]

The East German and Czechoslovak governments have formally suggested holding negotiations on the subject of a chemical weapon-free zone with the government of the FRG.[42] The proposal has met with criticism, mainly from Western countries, as expressed by their delegates to the CD as well as through other official spokesmen.[43]

It has been objected that the proposal, if carried into effect, would not enhance security because it would not necessarily reduce the size of the chemical weapon arsenals. Moreover, it was not envisaged to destroy the chemical weapon production facilities that might exist in the potential zone. The zone proposal, however, is not intended to remove completely the threat of use of chemical weapons in Europe, but only to make such use less likely than at present. For the mere absence of these weapons in what is usually considered to be the most likely initial theatre of East–West armed confrontation would help to avoid precipitous recourse to chemical warfare with the purpose of pre-emption or to avoid the destruction or capture of chemical weapon stocks by the enemy. In this sense, the establishment of the zone would be not only a regional disarmament but also an important confidence-building measure.

Another criticism of the zone proposal is that a ban on chemical weapons on a regional scale would aggravate verification problems relating to such weapons. However, verification of a zonal agreement would seem to be less difficult than verification of a global ban, because fewer nations would be involved, the area under surveillance would be relatively small, and control efforts would concentrate on removing chemical weapons, an operation which is relatively easy to monitor.

Further, it has been said that the danger to the region would not disappear, because chemical weapons withdrawn from it might be deployed on its perimeter and could be rapidly re-introduced. It is true that the weapons withdrawn could be brought back, but this is to overlook the fact that, if the zone were sufficiently large, the import of militarily significant quantities of chemical munitions over long distances could hardly escape detection. Ideally, therefore, the zone should encompass the whole of Europe. It would then also be more difficult to reach targets on the Central European battlefield with weapons deployed outside the zone.

Finally, critics have argued that negotiations for a zonal agreement would hinder the efforts to develop a world-wide treaty. It is, however, difficult to see why partial measures of chemical arms control should stand in the way of a comprehensive solution. By analogy, nuclear weapon-free zones, already established in different parts of the world, are universally considered useful in promoting the cause of nuclear arms control because they restrict the geographical spread of these arms. Regional agreements relating to chemical weapons may serve as a testing ground and help remove certain stumbling-blocks in the way of a global agreement. A European agreement might spur similar efforts elsewhere, including the Third World. For example, the

Peruvian Government has suggested that Latin America might be made a chemical weapon-free zone.[44]

Of course, the establishment of the proposed chemical weapon-free zone would not be an easy undertaking. Apart from political obstacles, certain technical problems, such as those relating to definitions or verification, would be the same or similar to those encountered in the negotiation of a universal ban. But they would be less numerous and presumably less difficult to overcome, considering the limited arms control scope of the measure. In any event, the effort seems worth making, because of the expected benefits: the 1925 Geneval Protocol would be strengthened; a European zone enhancing regional security could serve as a model for other areas; and early establishment of the zone might prevent the deployment of binary munitions and a further complication of disarmament efforts which would result from the full integration of chemical weapons into the structure of European forces. All this could precede the general ban on the possession of chemical weapons which is being worked out at the CD.

III. Outer space

In the summer of 1985, an *Ad Hoc* Committee of the CD started consideration of issues related to the prevention of an arms race in outer space. Relevant treaties were examined to identify lacunae in existing international law of outer space, and proposals were made for new agreements.[45]

Existing treaties

Working papers surveying international law relating to arms control and outer space were prepared by Canada[46] and the United Kingdom.[47] From these surveys the following conclusions can be drawn.

1. General international legal norms regarding military activities on earth (for example, the UN Charter) also apply to military activities in outer space, as stipulated in the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty) and the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Treaty).

2. Outer space and celestial bodies are not subject to national appropriation and are free for non-prohibited uses, such as exploration and scientific investigation, by all states, as stipulated in the Outer Space Treaty and the Moon Treaty.

3. States bear international responsibility for their national activities in outer space and on celestial bodies and are to provide information concerning space launches, as stipulated in the Outer Space Treaty, the Moon Treaty, the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue of Astronauts Agreement), the 1972 Convention on International Liability for Damage Caused by Space Objects (Liability Convention) and the 1975 Convention on

Registration of Objects Launched into Outer Space (Registration Convention).

4. Certain military activities in outer space are consistent with international law. These include: (*a*) the use of military personnel in space, as permitted by the Outer Space Treaty; (*b*) the use of military satellites as national technical means of verification of compliance with arms control obligations, as permitted by the US–Soviet Treaty on the Limitation of Anti-Ballistic Missile Systems (ABM Treaty), the 1972 US–Soviet Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms (SALT I Agreement), the 1979 US–Soviet Treaty on the Limitation of Strategic Offensive Arms (SALT II Treaty), the 1974 US–Soviet Treaty on the Limitation of Underground Nuclear Weapon Tests (Threshold Test Ban Treaty) and the 1976 US–Soviet Treaty on Underground Nuclear Explosions for Peaceful Purposes (Peaceful Nuclear Explosions Treaty); and (*c*) the use of space-based communications, early-warning, navigation and meteorological systems, as permitted or required by the 1971 and 1984 US–Soviet agreements on the direct communications link (Hot-Line Agreements), the 1971 US–Soviet Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War (Nuclear Accidents Agreement) and the 1973 US–Soviet Agreement on the Prevention of Nuclear War.

5. Certain military activities in space are inconsistent with international law. These include: (*a*) interference with space-based sensors used to verify compliance with arms control obligations, as prohibited by the ABM Treaty, the SALT I Agreement, the SALT II Treaty, the Threshold Test Ban Treaty and the Peaceful Nuclear Explosions Treaty; (*b*) placement of nuclear weapons and other weapons of mass destruction in orbit around the earth and on celestial bodies or in orbit around them, as prohibited by the Outer Space Treaty, the Moon Treaty and the SALT II Treaty (fractional orbital bombardment systems (FOBS), capable of launching nuclear weapons into an orbital trajectory and bringing them back to earth before the weapons have completed one full revolution, are also prohibited by the SALT II Treaty); (*c*) hostile acts or use of force on celestial bodies and orbits around them, as prohibited by the Moon Treaty; (*d*) establishment of military bases, testing of any type of weapon and conduct of military manoeuvres on celestial bodies, as prohibited by the Outer Space Treaty and the Moon Treaty; (*e*) testing of nuclear weapons in outer space, as prohibited by the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Partial Test Ban Treaty); (*f*) development, testing and deployment of space-based ABM systems or components, as prohibited by the ABM Treaty; and (*g*) military or other hostile use of environmental modification techniques to change the dynamics, composition or structure of outer space, as prohibited by the 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (Environmental Modification Convention).

No internationally agreed definitions exist of such key terms as 'peaceful uses' or 'militarization' of outer space. There are divergent opinions as to where the boundaries between national airspace and outer space lie.

Proposals

China proposed the 'de-weaponization' of outer space, that is, banning the development, testing, production, deployment and use of any space weapons, and the destruction of such weapons. (Limitation and prohibition of military satellites might be left for consideration and resolution at an 'appropriate time in the future'.) Space weapons were defined as devices or installations either space-, land-, sea-, or atmosphere-based, which are designed to attack or damage spacecraft in outer space, or disrupt their normal functioning, or change their orbits; as well as devices or installations based in space (including those based on the moon and other celestial bodies) which are designed to attack or damage objects in the atmosphere, on land or at sea, or to disrupt their normal functioning. In order to create conditions favourable for negotiations, China suggested that all countries with space capabilities should refrain from developing, testing or deploying space weapons.[48]

A group of Socialist states expressed the view that 'strike weapons'—conventional, nuclear, laser, particle-beam or any other kind—whether in manned or unmanned systems, should not be introduced into or stationed in space. Space weapons should not be developed, tested or deployed either for ballistic missile defence, or as anti-satellite (ASAT) systems, or for use against targets on earth or in the air, and such systems which have already been developed should be destroyed. In this connection, reference was made to Soviet proposals for a prohibition on the stationing of weapons of any kind in outer space (1981), for a prohibition on the use of force in outer space and from space against the earth (1983), and for the use of space exclusively for peaceful purposes for the benefit of mankind (1984),[49] as well as to the Soviet unilaterally proclaimed moratorium on the deployment in space of ASAT weapons. The USSR has suggested a reaffirmation, together with the USA, of the commitment to the regime of the ABM Treaty.[50]

Furthermore, the Soviet Union proposed that a world space organization be established for international co-operation in the peaceful exploration and use of outer space 'under conditions of its non-militarization'. Such an organization would be called upon to ensure that all states have access to the results of scientific and technological developments connected with the study and peaceful exploration of outer space; to prepare international projects aimed at concerting efforts and resources for the scientific exploration of outer space and the utilization of space technology; to provide developing countries with assistance in joining in the exploration and use of outer space and in using the practical results of such activities to accelerate their economic and social development; to co-ordinate, on an international scale, the activities of other international organizations in the sphere of the peaceful use of outer space; and to assist, where necessary, in monitoring the observance of agreements already concluded or to be concluded with the view to preventing an arms race in outer space. It was stressed that the establishment of such an organization could start only after agreements had been reached 'effectively ensuring' the non-militarization of outer space.[51]

Some delegations at the CD, including France, suggested that the first

objective should be to prohibit ASAT systems capable of hitting satellites in high orbit, because high-altitude satellites perform a number of stabilizing functions (through timely detection of enemy attacks or war preparations).[52] A view was expressed that an agreement banning such systems (which have not yet been tested, as distinct from low-altitude ASAT devices) would be a step towards more comprehensive agreements to prevent an arms race in outer space. There was a significant body of opinion that those satellites which contribute to the preservation of strategic stability and are instrumental in monitoring arms control and disarmament agreements should be protected. India, however, was opposed to partial solutions, arguing that the only sensible course was to ban *all* kinds of ASAT weapons.[53]

Noting the inadequacy of data furnished under the Registration Convention, some delegations suggested considering an improvement of the implementation of the convention and, if possible, expanding its provisions so that detailed information on the nature and purposes of space activities could be obtained.[54] Others proposed that surveillance and reconnaissance activities by satellites should be entrusted to an international body that could set up data banks from which any country would be able to obtain information relevant to its needs (as suggested by France in the late 1970s). Such a body could also be used to provide advance information on crisis situations and thereby enhance the crisis management role of the United Nations. Yet another approach was put forward by FR Germany, namely, to establish, as a confidence-building measure, a code of conduct with a view to avoiding interference with the operation of space objects and reducing the risks of accidents in outer space.[55]

Prospects

The most pressing problems concerning outer space are those related to ballistic missile defence—in the context of the US Strategic Defense Initiative (SDI)—and to the US–Soviet ABM Treaty, which is in danger of being undermined. These issues must be considered and resolved by the two superpowers which bear chief responsibility for the prevention of an arms race in outer space. On the other hand, since ever more states are becoming involved in space programmes, and since many more benefit from peaceful uses of outer space, the vulnerability of orbiting satellites is a matter of justifiable general concern and calls for an urgent multilateral arms control effort, preferably within the framework of the CD.

A radical measure to ensure the inviolability of satellites would be a prohibition on the development, production and deployment of all kinds of ASAT weapon and the destruction of those which already exist. But this again would require, in the first place, an agreement between the USA and the USSR, so far the only powers possessing such devices, and would therefore be basically a bilateral deal. There exists, moreover, an opposition, at least on the part of one of the superpowers, to any role being played in this regard by third countries. On the other hand, banning the use of force to destroy or damage satellites, or to interfere in any other way with their functioning, could and should be an international multilateral undertaking. Such a 'no-use-of-force'

commitment would complement international law, which accords protection to certain important objects in armed conflicts. However, reaching this commitment would require dealing with complications caused by the overlap between civilian and military, as well as between stabilizing and destabilizing, uses of satellites; resistance might be expected to a blanket ban, which in any event could not be completely credible because of the importance of satellites in modern warfare. Nevertheless, a no-use agreement would be a reasonable prelude to a process of controlling ASAT activities.

Notes and references

[1] Conference on Disarmament documents CD/583 and CD/616.
[2] Conference on Disarmament document CD/PV. 306.
[3] Conference on Disarmament document CD/PV. 309.
[4] Conference on Disarmament document CD/PV. 309.
[5] Conference on Disarmament document CD/610.
[6] Conference on Disarmament document CD/612.
[7] Conference on Disarmament document CD/624.
[8] Conference on Disarmament document CD/626.
[9] Conference on Disarmament document CD/PV. 291.
[10] Conference on Disarmament document CD/PV. 297.
[11] United Nations documents A/40/825; S/17596.
[12] Conference on Disarmament document CD/625.
[13] Conference on Disarmament document CD/638.
[14] Conference on Disarmament document CD/PV. 326.
[15] *Financial Times*, 1 Aug. 1985.
[16] *Pravda*, 16 Jan. 1986.
[17] Committee on Disarmament document CD/130.
[18] Committee on Disarmament document CD/381.
[19] Conference on Disarmament document CD/642.
[20] See, for example, 'Militarily significant nuclear explosive yields', *FAS Public Interest Report*, Washington, DC, vol. 38, no. 7 (Sep. 1985).
[21] *Weekly Compilation of Presidential Documents*, Washington, DC, vol. 20, no. 39 (1 Oct. 1984), p. 1358.
[22] Conference on Disarmament document CD/PV. 290.
[23] *Washington Post*, 24 Dec. 1985.
[24] Conference on Disarmament documents CD/630 and CD/PV. 327.
[25] Conference on Disarmament document CD/613.
[26] Conference on Disarmament documents CD/632, CD/PV. 324 and CD/651.
[27] Conference on Disarmament documents CD/575 and CD/CW/WP. 100.
[28] Conference on Disarmament document CD/PV. 309.
[29] Conference on Disarmament document CD/CW/WP. 106.
[30] Conference on Disarmament document CD/500.
[31] Conference on Disarmament documents CD/619 and CD/PV. 324.
[32] Conference on Disarmament document CD/PV. 307.
[33] Conference on Disarmament documents CD/627 and CD/PV. 328.
[34] Conference on Disarmament document CD/PV. 309.
[35] Conference on Disarmament document CD/589.
[36] Conference on Disarmament documents CD/620, CD/CW/WP. 119 and CD/PV. 324.
[37] Conference on Disarmament document CD/615.
[38] *Statement by M. Gorbachev, General Secretary of the CPSU Central Committee*, 15 Jan. 1986 (Novosti Press Publishing House: Moscow, 1986).
[39] Conference on Disarmament document CD/PV. 303.
[40] *Common Security: A Programme for Disarmament*, The Report of the Independent Commission on Disarmament and Security Issues (Pan Books: London, 1982).
[41] *For a Zone Free of Chemical Weapons in Europe*, joint political initiative by the Socialist Unity Party of Germany and the Social Democratic Party of Germany (Verlag Zeit im Bild: Dresden, 1985).

[42] Conference on Disarmament document CD/643.
[43] For example, statement by the FRG at the CD: Conference on Disarmament document CD/PV.315; FRG Chancellor's letter of 27 Sep. 1985: Conference on Disarmament document CD/644; the US White House statement of 11 Sep. 1985, in *International Herald Tribune*, 13 Dec. 1985.
[44] Conference on Disarmament document CD/PV. 315.
[45] Conference on Disarmament document CD/584.
[46] Conference on Disarmament documents CD/618 and CD/OS/WP. 6.
[47] Conference on Disarmament document CD/637.
[48] Conference on Disarmament documents CD/579 and CD/PV. 302.
[49] Conference on Disarmament documents CD/607 and CD/OS/WP. 3.
[50] Conference on Disarmament document CD/611.
[51] Conference on Disarmament documents CD/639 and CD/PV. 332.
[52] Conference on Disarmament document CD/PV. 303.
[53] Conference on Disarmament document CD/PV. 333.
[54] For example, statement by the Netherlands in Conference on Disarmament document CD/PV. 330, or the Swedish working paper in Conference on Disarmament document CD/OS/WP. 8.
[55] Conference on Disarmament document CD/PV. 318.

20. The third review of the Non-Proliferation Treaty

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Superscript numbers refer to the list of notes and references at the end of the chapter.

I. General assessment

The parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) met on 27 August–21 September 1985 at a conference in Geneva to review the operation of the NPT and to ensure that its purposes and provisions were being realized. Preceded by three preparatory committee sessions, this Review Conference, the third since the NPT entered into force, was attended by 86 of the 130 states parties and by 2 signatories which have not yet ratified the treaty.[1]

In view of the fact that the second NPT Review Conference, held in 1980, had not been able to adopt a common declaration, the chances for a successful outcome of the third Review Conference, in an international situation hardly any better than five years earlier, were rated rather low. Many observers expected sharp polemics between the USA and the USSR on nuclear arms control issues, as well as harsh criticism by Third World countries of the superpowers' failure to start the process of nuclear disarmament. All this seemed to rule out an agreement on the future course of action with respect to the implementation of the NPT, and to make the breakdown of the conference inevitable, with all the negative consequences this could entail for the continued operation of the treaty.

In the event, none of these predictions came true. The USA and the USSR expounded their well-known positions, but without directly assailing each other. This is further evidence that the NPT continues to be one of those rare areas of international politics in which the superpowers see eye to eye. Nor was there a wholesale attack by the non-aligned states on the policies of both superpowers, as had happened on previous occasions. Only the USA was explicitly criticized, especially for its refusal to enter into negotiations on the cessation of nuclear weapon tests.

The Soviet Union escaped censure, owing mainly to the moratorium which it had proclaimed on nuclear weapon tests one month earlier and which received wide support at the conference, and also owing to its suspension of anti-satellite (ASAT) weapon testing and advocacy of other measures to prevent an arms race in outer space. Equally useful in this respect was the voluntary submission, almost on the eve of the conference, of a few Soviet nuclear reactors to international inspection, following the example set by the other nuclear weapon parties to the NPT several years before. In fact, the sharpest controversies threatening the consensus of the conference erupted between

Iran and Iraq, both Third World countries, on issues only indirectly related to the NPT.

At no point during the four weeks of hard bargaining did any of the parties threaten to withdraw from the NPT. On the contrary, there was a general recognition that the treaty is essential to international peace and security, that it has helped to keep the number of nuclear weapon states constant and that it has served thereby the interests of all nations, nuclear and non-nuclear alike. The fact that the NPT has managed to attract more adherents than any other arms control agreement clearly carries political weight.

Another important reason for the relatively calm and, on the whole, businesslike atmosphere of the conference was the imminent US–Soviet summit meeting, which was expected to open new avenues for progress in nuclear arms control negotiations. Moreover, because of the general slow-down in nuclear power generation, coupled with a world-wide economic depression and the enormous indebtedness of the developing countries, the latter's expected complaints about inadequate assistance in the peaceful application of nuclear energy turned out to be much milder than at the previous Review Conferences. Many delegates seemed to consider that the UN Conference for the Promotion of International Co-operation in the Peaceful Uses of Nuclear Energy, planned for 1987, would be a better forum for airing such grievances than the NPT Review Conference. And, last but not least, states holding out from the NPT have considerably softened their international campaign against the treaty, partly as a result of internal political changes.

Consequently, and to the surprise of many, the conference succeeded in working out a final declaration[2] (see appendix 20A) and in adopting it by consensus. One could argue that a failure might have produced more pressure on the major nuclear powers—both directly and through the effect on public opinion—to proceed to qualitative and quantitative limitations of nuclear arsenals, and to deliver thereby the unfulfilled part of the NPT bargain. However, it is more likely—and this was the view of most participants—that, rather than stimulate nuclear disarmament, a demonstrated inability of the Review Conference to produce a common document, or recourse to the voting procedure, would have had a disruptive impact on the treaty, to the detriment of both nuclear and non-nuclear weapon states. This does not mean that the final declaration resolved all differences of opinion: a short meeting could hardly achieve that much, nor was it the purpose of the Review Conference. It means rather that the parties were in agreement on basic issues of non-proliferation and that they decided therefore unanimously both to reaffirm the validity of the NPT and their commitment to its purposes and provisions and to consider the specific proposals made at the conference to strengthen the authority of the treaty. It also means that they 'agreed to disagree' on certain specific issues more or less directly related to the treaty. It is important to note, however, that the balance of agreements and disagreements tips heavily in the direction of the former, as will be seen from the following analysis of the final declaration of the conference and of the discussions which preceded its adoption.

II. Areas of agreement

1. The conference acknowledged the declarations by the parties that the central non-proliferation undertakings (NPT Articles I and II)—that of the nuclear weapon powers not to transfer nuclear weapons, and that of the non-nuclear weapon states not to acquire such weapons—have been fulfilled. It also expressed the opinion that any further detonation of a nuclear explosive device by a non-nuclear weapon state would be a 'most serious breach of the non-proliferation objective'. [Since the signing of the treaty only one such detonation has been carried out, namely, by India in 1974.][3]

2. The conference expressed the conviction that nuclear safeguards (NPT Article III) administered by the International Atomic Energy Agency (IAEA) have played a key role in preventing nuclear weapon proliferation by providing assurance that states have been complying with their undertakings. The parties noted with satisfaction that the IAEA had not detected any diversion of safeguarded material to the production of nuclear explosive devices, but they stated that unsafeguarded nuclear activities in certain non-nuclear weapon states pose serious proliferation dangers. [This was a reference to facilities in Argentina, India, Israel, Pakistan and South Africa—all non-parties to the NPT—which are capable of producing nuclear weapon material but are not subject to international control.]

3. The conference noted that IAEA safeguards had not hampered the economic, scientific or technological development of the parties to the NPT, or international co-operation in peaceful nuclear activities. On the contrary, it was pointed out in the debate that the NPT verification system provides a service to states wishing to demonstrate their compliance with non-proliferation obligations, and thereby actually facilitates nuclear trade.

4. The conference called on all states that had not done so to adhere to the 1980 Convention on the Physical Protection of Nuclear Material at the earliest possible date. [This convention obliges the parties to ensure that, during international transport across their territory or on ships or aeroplanes under their jurisdiction, nuclear material for peaceful purposes is protected at an agreed level.]

5. In the field of the applications of nuclear energy for peaceful purposes (NPT Article IV), the conference confirmed the need for assurances of long-term supplies of nuclear items and agreed that modification of agreements in the nuclear field, if required, should be made only 'by mutual consent of the parties concerned'. [This was an obvious allusion to the 1978 US Nuclear Non-Proliferation Act, which by calling for the re-negotiation of existing nuclear fuel supply contracts provoked hostile reactions from both industrialized and Third World countries.] There was a common view that preferential treatment should be given to the non-nuclear weapon parties to the NPT over non-parties for access to or supply of nuclear material, equipment and services, as well as for transfer of scientific and technological information in the peaceful uses of nuclear energy. Taking into account the interests of developing countries, the conference voiced support for the IAEA study on small and medium power reactors, which are better suited than large ones to the needs of

such countries. In addition to technical assistance, the IAEA was asked to provide, upon request, assistance in securing financing from outside sources for nuclear power projects, especially in the least developed countries.

6. The conference agreed that the 'potential' benefits of peaceful applications of nuclear explosions, which (under NPT Article V) are to be made available by the nuclear weapon parties to non-nuclear weapon parties, had not been demonstrated. It was also noted that no request for such services had been received. [This statement amounted to a common understanding that the practical implementation of the relevant provision of the NPT continued to be kept in abeyance.]

7. The conference gave much attention to the question of an armed attack on a safeguarded nuclear facility, or the threat of such attack. It expressed the view that in such a case consideration should be given to all appropriate measures to be taken by the UN Security Council, including those under Chapter VII of the UN Charter, which provides for sanctions. In this connection, reference was made in the final declaration to the 1981 Israeli attack on nuclear installations in Iraq, which had been condemned by the Security Council.

In the course of the debate Iran complained that its nuclear facilities had been destroyed by the Iraqi Air Force and insisted that this be explicitly stated in the declaration, or included in a special resolution. Iran's allegation was rejected by Iraq, and it was this controversy that held up agreement on a conference document until the early hours of 21 September. As a compromise it was then decided that the statements made on the subject by the representatives of Iran and Iraq would form part of the final document. [It should be noted that the events discussed above, although often characterized as undermining the IAEA safeguards regime and thereby the NPT itself, have in fact only an indirect relationship to the treaty. In peacetime, an attack on a foreign facility, whether nuclear or not, and whether or not covered by international safeguards, qualifies as an aggression to be dealt with by the United Nations according to its Charter; in time of war, restrictions on the use of force must be observed in accordance with the existing rules of humanitarian law of armed conflict. In particular, the 1977 Protocol relating to the protection of victims of international armed conflicts stipulates (in Article 56) that 'nuclear electrical generating stations shall not be made the object of attack . . . if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population'. However, since many states hold that a considerably stricter legal norm is needed, the problem is being examined at the Geneva Conference on Disarmament (CD) within the framework of measures to prevent radiological warfare, rather than within the framework of NPT nuclear safeguards.]

8. The conference agreed to take note of concerns expressed about the nuclear weapon capability of South Africa and Israel, and of calls for the prohibition on transfer of 'all nuclear facilities, resources or devices' to these two countries and for stopping all exploitation of Namibian uranium until the attainment of Namibian independence. [On the other hand, no concern was formally expressed with regard to the nuclear activities of India, which had already demonstrated a nuclear weapon capability by exploding a nuclear device

constructed from unsafeguarded nuclear material, or those of Argentina and Pakistan, countries which technologically may be as close to the production of a nuclear bomb as South Africa. The reasons for singling out Israel and South Africa thus appear to have less to do with concerns over proliferation than with preoccupations about the apartheid policies of the latter and the Middle East conflict in the case of the former.]

9. The conference noted 'with regret' the continuing development and deployment of nuclear weapon systems. It called upon the nuclear weapon parties to intensify their efforts to reach agreements on measures relating to the cessation of the arms race and on nuclear disarmament, and agreed that the implementation of the relevant provisions (NPT Article VI) was 'essential' to the maintenance and strengthening of the treaty.

10. The conference emphasized the importance of nuclear weapon-free zone arrangements for the cause of achieving a world free of nuclear weapons. It mentioned in this context the successful operation of the 1967 treaty prohibiting nuclear weapons in Latin America (Treaty of Tlatelolco), welcomed the endorsement in 1985 by the South-Pacific Forum of the South Pacific Nuclear-Free Zone Treaty, and urged the implementation of the proposal to establish a nuclear weapon-free zone in the region of the Middle East. South Africa was claimed to have frustrated the implementation of the UN declaration on the denuclearization of Africa by developing a nuclear weapon capability. [No mention was made, however, of the calls repeatedly made by the UN General Assembly to establish a nuclear weapon-free zone in South Asia, a proposition which has been consistently frustrated by Indian opposition.]

11. In recognizing the need to assure the non-nuclear weapon states against the use or threat of use of nuclear weapons, the conference agreed that negotiations should continue at the CD with a view to elaborating an approach to these so-called negative security assurances, which would be acceptable to all and which could be included in a binding international instrument.

12. The conference urged all non-nuclear weapon states not party to the treaty to make an international and legally binding commitment not to acquire nuclear weapons or other nuclear explosive devices and to accept IAEA safeguards on all their peaceful nuclear activities (both current and future) in order to verify that commitment. Simultaneously, to ensure the universality of the NPT, the conference appealed to all states, particularly the nuclear weapon states not party (that is, China and France) and other non-party states advanced in nuclear technology, to join the treaty at the earliest possible date.

13. Finally, it was agreed to convene the fourth NPT Review Conference in 1990.

III. Areas of disagreement

1. The Review Conference, with the exception of the USA and the UK (quite obviously referred to anonymously in the declaration as 'certain states'), deeply regretted that a comprehensive nuclear test ban treaty (CTBT) had not been concluded. It called on the nuclear weapon parties to the NPT to resume

trilateral negotiations in 1985, and called on all nuclear weapon states to participate in multilateral negotiations and the conclusion of such a treaty 'as a matter of the highest priority' in the Conference on Disarmament.

The two dissenting nuclear powers did not deny their commitment to the goal of an 'effectively verifiable' CTBT, but considered deep and verifiable reductions in existing arsenals of nuclear weapons as the highest priority in the process of pursuing the disarmament objectives of the NPT.

The dispute which arose on the subject of nuclear testing could have brought about the collapse of the conference. Particularly insistent on the immediate resumption of negotiations for a CTBT were the non-aligned states, which recalled the NPT preamble reiterating the determination of the parties to the 1963 Partial Test Ban Treaty 'to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end'. In view of the existing differences between the USA and the UK on the one hand, and most, if not all, of the other participants in the conference on the other, the group of non-aligned and neutral states prepared, at the initiative of Mexico, three draft resolutions: one urging the depositary states of the NPT (the UK, the USA and the USSR) to undertake negotiations during 1985 for the 'elaboration and adoption' of a comprehensive nuclear test ban treaty; another calling upon the same states to institute as a provisional measure 'an immediate moratorium' on all nuclear weapon tests; and yet another calling for a freeze on the 'testing, production and deployment of all nuclear weapons and their delivery vehicles'. The possibility of having to take a vote on these resolutions remained until the last day of the conference. Eventually, however, mainly because the USA threatened to withdraw its support for the final declaration and because most participants were reluctant to depart from the consensus rule observed on similar occasions and provoke thereby a breakdown of the conference, the resolutions were not voted upon.

As a matter of fact, the proponents of a vote were never sure of getting the required majority, certainly not on the 'freeze' resolution. Even with regard to nuclear testing it was not certain that in a public showdown the Western countries would unequivocally align themselves with the critics of current US policies. Indicative in this respect was the attitude of some of the Western protagonists of a total ban on nuclear tests: they welcomed the US invitation to the Soviet Union to send observers to measure the yield of a US nuclear explosion, although this offer related merely to possible limitations on underground testing.

2. Another dispute developed around the application of nuclear safeguards. Whereas non-nuclear weapon parties to the NPT are subject to full-scope safeguards covering all of their peaceful nuclear activities, the nuclear activities of non-parties are only partially covered by safeguards (of the pre-NPT order), which means that only imported items—individual installations or material—are placed under IAEA control, while part of the nuclear fuel cycle may remain unsafeguarded.

Many suppliers party to the NPT already require full-scope safeguards to apply to all existing and future nuclear activities as a condition of nuclear supplies to non-parties. Those suppliers opposing the imposition of such a require-

ment, ostensibly on the grounds that it could compel non-parties to embark on a course leading to uncontrolled self-sufficiency in the nuclear field and thus prove to be counter-productive, include Switzerland, the Federal Republic of Germany and Belgium. [A great number of present proliferation problems are in fact traceable to supplies from these countries and from France.] Again, a rather convoluted wording was found to avoid a rift: all states were urged in their international nuclear co-operation and in their nuclear export policies to take effective steps towards achieving a commitment to non-proliferation and acceptance of full-scope safeguards as a 'necessary basis' for the transfer of relevant nuclear supplies to non-nuclear weapon states not party to the NPT. [This does not mean that the parties have undertaken to provide *all* requested equipment, material and technological information once comprehensive safeguards are applied to the recipients' nuclear activities. Most suppliers continue to insist that nuclear supplies must be subordinated to non-proliferation goals, that is, they must not facilitate the acquisition of nuclear weapons.]

IV. Proposals of the conference

The conference recommended the continued pursuit of the principle of universal application of IAEA safeguards to all peaceful nuclear activities in all states. To this end, it proposed an evaluation of the economic and practical possibility of extending the application of safeguards to additional civil facilities in the nuclear weapon states and consideration of the separation of civil and military facilities in these states.

In a related move, the conference favoured the taking of commitments by nuclear weapon states that nuclear supplies received by them for peaceful uses would not be used for nuclear weapons or other nuclear explosive devices. It was suggested that safeguards agreements of nuclear weapon states with the IAEA could verify observance of such commitments.

V. Conclusion

In spite of the inequality of rights and obligations inherent in the concept of non-proliferation, the NPT has attracted well over three-fourths of the independent states of the world, including almost all of the highly industrialized and militarily significant ones. Several important countries, however, still remain outside the treaty.

Of the nine main hold-outs, China and France are nuclear weapon powers. On a purely practical level, the absence of these states' signatures to the treaty may not be a matter of particular concern, as long as they exercise a policy of non-proliferation by refraining from assisting other countries to acquire nuclear weapons. At the same time, since neither of these states stands to gain in any way from a wider spread of nuclear weapons, their expressed opposition to the treaty, although probably rooted in their early aspirations for great-power status—and in the case of France, also in previous tensions with the USA over nuclear matters—does not today appear to have a rational basis.

The nuclear 'threshold' countries include most of the developing countries that are leaders in the use of nuclear technology. Some of them are highly populous and influential nations, and a few are situated in areas of acute political tension or even armed conflict. None has accepted full-scope safeguards.

Acting on the presumption of the political value of nuclear weapons, the threshold states have so far sought to derive advantages from a deliberately cultivated ambiguity as to their intentions or capabilities (or both). Of these, India and Pakistan, which are busily engaged in building up a nuclear weapon potential, are considered by some as the most likely countries to proceed to overt proliferation and to join thereby the 'club' of recognized nuclear weapon powers. Indeed, both produce unsafeguarded plutonium and, in the case of Pakistan, also unsafeguarded enriched uranium, and both possess aircraft which could be adapted to carry first-generation fission bombs. Influential Indian spokesmen have claimed that without nuclear weapons the country is not able to defend itself against its powerful neighbours. They have also contended that the economic costs of a nuclear weapon programme would not be prohibitive for a country already possessing fissile-material production facilities and that, in any event, the costs should be subordinated to considerations of national security. The neighbours alluded to are China and Pakistan, but India's official rationale for rejecting non-proliferation obligations rests less on the threat posed by China (which has pledged itself not to use or threaten to use nuclear weapons against non-nuclear weapon states under any circumstances) than on the fear of the nascent nuclear weapon potential of Pakistan.

Similarly, Pakistan's unwillingness to join the NPT has less to do with threats to its national security from an actual nuclear weapon power than with the fear of India, especially after the 1974 Indian nuclear explosion.

Considering Pakistan's sympathetic attitude in the late 1960s towards international efforts to check the proliferation of nuclear weapons, as well as its subsequent repeatedly declared readiness to forgo these weapons on the basis of reciprocity with India, or within the framework of a South Asian nuclear weapon-free zone, its present position with regard to the NPT can be regarded as a reflection of that of India.

Nevertheless, India and Pakistan appear to be interlocked in a relationship which may deter either side from crossing the nuclear threshold by testing a nuclear device (for the second time in the case of India): a competition in arms, as distinct from a competition in capabilities, would not only endanger the security of both countries but could also prove economically ruinous (among other reasons, because of the almost certain withdrawal of much foreign assistance) and threaten thereby their internal stability as well. Indeed, it is difficult to see what interest either of these states could have in demonstrating the possession of a nuclear weapon. It is, therefore, likely that India and Pakistan will continue to declare a policy of not aiming at the acquisition of nuclear weapons, although a drastic deterioration in their mutual relations, leading to a large-scale armed conflict, might induce one side or another to cross the nuclear Rubicon.

South Africa, another 'threshold' country, is under no threat of aggression from abroad. There is, of course, a constant danger of a general uprising against the apartheid regime, but nuclear weapons would be useless in dealing with such a danger. It appears, however, to be the South African government's policy to capitalize on the country's present position in respect of nuclear know-how, especially its uranium enrichment capacity, and to use it as a bargaining chip to alleviate the international boycotts and embargoes imposed by the UN, other international organizations and individual states. Since these goals are clearly not achievable as long as the apartheid regime is maintained, and since the South African government seems to assume that accession to the NPT would do little to improve the country's image in the world, it will probably persist in refusing to join the treaty. However, the risk of being subjected to severe sanctions by the UN Security Council may deter South Africa from moving further towards a nuclear weapon potential.

The situation of Israel is different, because the very existence of this state has been under constant threat and because the nuclear weapon which Israel is widely believed to have may be considered by its leaders to be decisive for national survival. In any event, having sown ambiguity regarding its nuclear capability, Israel appears ill-disposed to remove it, for it is precisely by maintaining a state of uncertainty that it hopes to deter its enemies and to extract concessions from its friends. By the same token it is highly unlikely that Israel will proceed to nuclear testing, for this could provoke a response on the part of the neighbouring states, or the powers allied with them, which would nullify the advantages of the present Israeli monopoly in the region. In all likelihood, therefore, any nuclear weapons Israel may possess will remain untested.

Of the Latin American countries, Argentina has the most significant nuclear activities with a plutonium reprocessing and uranium enrichment capacity. But its policy of acquiring all the elements of a nuclear weapon programme has borne no fruit: it has not improved the security of the state, its international standing, the cohesion of the nation or the material conditions of the people. Moreover, the precise targets of possible Argentine nuclear weapons have always been obscure. Also Brazil's anti-NPT posture has proved futile: the grandiose nuclear energy projects, entirely unwarranted by the country's natural resources, have had to be abandoned. In any event, Argentina and Brazil are at present in economic straits that ought to rule out nuclear weapon programmes. On the other hand, both countries may consider gaining international esteem by ratifying the Treaty of Tlatelolco (in the case of Argentina) or waiving the requirements for its entry into force (in the case of Brazil). Such actions would be the practical equivalent of NPT adherence.

And finally, as regards Spain, yet another hold-out from the NPT, there appears to be no risk of nuclear weapon proliferation there. Spain's entry into the European Communities entails an obligation formally to accept full-scope safeguards, which precludes a nuclear weapon programme. If, in spite of this, Spain continues to withhold accession to the NPT, it will probably do so for some bargaining purposes unrelated to nuclear matters.

Besides the 'threshold' countries there are over 30 non-NPT non-nuclear

weapon states that have no nuclear facilities, and two parties to the NPT—Iraq and Libya—whose commitment to the treaty has been publicly questioned even though their nuclear activities are safeguarded. However, Iraq and Libya are at a very early stage of nuclear development and lack the industrial infrastructure to support a significant indigenous programme.

For the foreseeable future accession to the NPT—the centrepiece of the non-proliferation regime— by those most critical states is doubtful. The chief priority, therefore, is to reinforce another pillar of the regime by making IAEA nuclear safeguards as nearly universal as possible through the application of full-scope international controls even without accession to the NPT or the Treaty of Tlatelolco. It is disturbing that unsafeguarded plants that can make nuclear weapon-usable material are now in operation in at least five countries (see appendix 20B). Nevertheless, there appears to be no imminent danger of an overt expansion of the nuclear club; the nuclear incentives are still considerably weaker than the disincentives, which means that the status quo will probably be maintained for some time.

VI. Prospects and recommendations

Unlike many other multilateral arms control agreements, the NPT is not of permanent duration. In 1995, 25 years after its entry into force, a conference is to be convened to determine its future: the parties will decide whether the treaty should continue in force indefinitely, or be extended for an additional period or periods of time. It may then be a question of the treaty's survival. In this respect the nuclear weapon powers carry major responsibilities. As long as these powers act as if nuclear weapons were politically and militarily useful, some non-nuclear weapon countries may feel that they too must obtain these advantages. It is because of this danger of 'proliferation by contagion' that primary importance must be given to measures of nuclear arms control.

One measure generally considered to be a long-overdue first step in the direction of the qualitative limitation of nuclear arms is a comprehensive nuclear test ban. The development of new designs of nuclear weapons by the nuclear weapon powers would be rendered practically impossible without tests, while the modification of existing weapon designs would be seriously constrained. The importance of such a ban for non-proliferation would also lie in the practical obstacles it would create for would-be proliferators, inasmuch as governments may hesitate to build a significant stock of untested weapons. Moreover, since a CTB would apply to both nuclear and non-nuclear weapon states, it would partly obliterate the politically sensitive aspect of the NPT—its implication that one group of states is permitted to develop and test nuclear weapons while another is not.

Another arms control measure directly connected to non-proliferation would be a cessation of the production of fissionable material for weapon purposes. Such a cut-off, intended to set a limit on the availability of fissionable material, would in time contribute to curbing the 'vertical' proliferation of nuclear weapons possessed by the nuclear weapon states and would impede the 'horizontal' spread of these weapons to other states.

Even after the shutdown of facilities dedicated to the production of material for nuclear weapons, the nuclear powers would still maintain in their civilian nuclear activities facilities capable of producing significant quantities of fissionable material for weapons. Therefore, there would have to be arrangements to ensure that civilian facilities were not serving military purposes. Thus, separation of civil and military nuclear sectors in nuclear weapon countries and placing under IAEA safeguards *all* installations and materials in the civil nuclear fuel cycles of these countries would help to prepare the ground for verifying the implementation of a cut-off.

It would also be useful if restraint were exercised with regard to exports to non-nuclear weapon states of dual-purpose weapon systems, that is, those capable of delivering both conventional and nuclear bombs and warheads. This would complement the restraints on supplies of nuclear material and equipment.

Moreover, uniform and unconditional assurances of the non-use of nuclear weapons must be given to non-nuclear weapon states by the nuclear weapon powers. Failing this, the qualified assurances already provided by these powers could be incorporated in a formal international document, for example, in a resolution of the UN Security Council.

To improve further the functioning of the non-proliferation regime, the authority of the IAEA must be strengthened. The Agency's Board of Governors should develop rapid-action responses to acts in defiance of safeguards agreements. Better material accountancy and reporting from safeguarded countries are needed, and the designation of IAEA inspectors must be free from the political constraints imposed by a number of states.

To diminish the risks of abuse of nuclear exports, no nuclear material or equipment should be supplied to those non-nuclear weapon states that refuse to accept full-scope IAEA safeguards. The 'threshold' countries (with the exception of India which can build its own power reactors) would thus be offered a choice between a fully safeguarded nuclear power programme or nuclear explosive capability without nuclear power. Supplies to NPT parties of 'sensitive' equipment, that is, equipment destined for peaceful uses but capable of producing weapon-usable material, must be justified by economic necessity and the stage of development of the nuclear industry of the prospective importer. For example, there can be no excuse for supplies of plutonium reprocessing facilities to countries with an embryonic nuclear industry, even if all their nuclear activities are subject to comprehensive international control. In any event, in view of the risks involved in stockpiling plutonium and the apparent lack of economic justification of spent fuel reprocessing, it seems advisable to recommend the so-called once-through fuel cycle in which the fuel elements, when discharged from the reactors, are disposed of without being reprocessed, that is, without separating the plutonium from the waste products. (Although plutonium derived from the spent fuel rods of nuclear power reactors normally has a higher content of undesired plutonium isotopes than weapon-grade plutonium produced in facilities committed to military use, it can still be used to manufacture nuclear explosive devices.)

Regional arrangements for nuclear supplies should be encouraged, and the

idea of establishing international nuclear fuel cycle centres could be revived if the demand for sensitive dual-purpose material were to increase.

Above all, however, it is only by de-emphasizing the role of nuclear weapons in foreign policy through a sustained process of dismantling the nuclear arsenals that the imperative of non-proliferation can become entrenched among the norms of international behaviour.

Notes and references

[1] Participants of the third Review Conference of the NPT were: Afghanistan, Australia, Austria, Bangladesh, Belgium, Bhutan, Bolivia, Brunei, Bulgaria, Burundi, Cameroon, Canada, Colombia (has signed but not ratified the NPT), Cyprus, Czechoslovakia, Denmark, Ecuador, Egypt, Ethiopia, Finland, German Democratic Republic, Federal Republic of Germany, Ghana, Greece, Guatemala, Holy See, Honduras, Hungary, Iceland, Indonesia, Iran, Iraq, Ireland, Italy, Ivory Coast, Japan, Jordan, Kenya, Republic of Korea, Lebanon, Libya, Liechtenstein, Luxembourg, Malaysia, Maldives, Malta, Mauritius, Mexico, Mongolia, Morocco, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Panama, Papua New Guinea, Peru, Philippines, Poland, Portugal, Romania, Rwanda, San Marino, Senegal, Seychelles, Somalia, Sri Lanka, Sudan, Sweden, Switzerland, Syria, Thailand, Tunisia, Turkey, Uganda, UK, USA, USSR, Uruguay, Venezuela, Viet Nam, Yemen Arab Republic (has signed but not ratified the NPT), People's Democratic Republic of Yemen, Yugoslavia and Zaire.

[2] Third Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Final Document NPT/CONF.III/61, 21 September 1985.

[3] Comments in square brackets are those of the author, as distinct from statements of the Review Conference.

Appendix 20A. Final declaration of the third Review Conference of the NPT

THE STATES PARTY TO THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS WHICH MET IN GENEVA FROM 27 AUGUST TO 21 SEPTEMBER 1985 TO REVIEW THE OPERATION OF THE TREATY SOLEMNLY DECLARE:

— their conviction that the Treaty is essential to international peace and security,
— their continued support for the objectives of the Treaty which are:
  —the prevention of proliferation of nuclear weapons or other nuclear explosive devices;
  —the cessation of the nuclear arms race, nuclear disarmament and a Treaty on general and complete disarmament;
  —the promotion of co-operation between States Parties in the field of the peaceful uses of nuclear energy,
— the reaffirmation of their firm commitment to the purposes of the Preamble and the provisions of the Treaty,
— their determination to enhance the implementation of the Treaty and to further strengthen its authority.

Review of the Operation of the Treaty and Recommendations

Articles I and II and preambular paragraphs 1–3

The Conference noted the concerns and convictions expressed in preambular paragraphs 1 to 3 and agreed that they remain valid. The States Party to the Treaty remain resolved in their belief in the need to avoid the devastation that a nuclear war would bring. The Conference remains convinced that any proliferation of nuclear weapons would seriously increase the danger of a nuclear war.

The Conference agreed that the strict observance of the terms of Articles I and II remains central to achieving the shared objectives of preventing under any circumstances the further proliferation of nuclear weapons and preserving the Treaty's vital contribution to peace and security, including to the peace and security of non-Parties.

The Conference acknowledged the declarations by nuclear-weapons States Party to the Treaty that they had fulfilled their obligations under Article I. The Conference further acknowledged the declarations that non-nuclear-weapons States Party to the Treaty had fulfilled their obligations under Article II. The Conference was of the view therefore that one of the primary objectives of the Treaty had been achieved in the period under review.

The Conference also expressed deep concern that the national nuclear programmes of some States non-Party to the Treaty may lead them to obtain a nuclear weapon capability. States Party to the Treaty stated that any further detonation of a nuclear explosive device by any non-nuclear-weapon State would constitute a most serious breach of the non-proliferation objective.

The Conference noted the great and serious concerns expressed about the nuclear capability of South Africa and Israel. The Conference further noted the calls on all States for the total and complete prohibition of the transfer of all nuclear facilities, resources or devices to South Africa and Israel and to stop all exploitation of Namibian uranium, natural or enriched, until the attainment of Namibian independence.

Article III and preambular paragraphs 4 and 5

1. The Conference affirms its determination to strengthen further the barriers against the proliferation of nuclear weapons and other nuclear explosive devices to additional States. The spread of nuclear explosive capabilities would add immeasurably to regional and international tensions and suspicions. It would increase the risk of nuclear war and lessen the security of all States. The Parties remain convinced that universal adherence to the Non-Proliferation Treaty is the best way to strengthen the barriers against proliferation and they urge all States not party to the Treaty to accede to it. The Treaty and the régime of non-proliferation it supports play a central role in promoting regional and international peace and security, *inter alia*, by helping to prevent the spread of nuclear explosives. The non-proliferation and safeguards commitments in the Treaty are essential also for peaceful nuclear commerce and co-operation.
2. The Conference expresses the conviction that IAEA safeguards provide assurance that States are complying with their undertakings and assist States in demonstrating this compliance. They thereby promote further confidence among States and, being a fundamental element of the Treaty, help to strengthen their collective security. IAEA safeguards play a key role in preventing the proliferation of nuclear weapons and other nuclear explosive devices. Unsafeguarded nuclear activities in non-nuclear-weapon States pose serious proliferation dangers.
3. The Conference declares that the commitment to non-proliferation by nuclear-weapon States Party to the Treaty pursuant to Article I, by non-nuclear-weapon States Party to the Treaty pursuant to Article II, and by the acceptance of IAEA safeguards on all peaceful nuclear activities within non-nuclear-weapon States Party to the Treaty pursuant to Article III is a major contribution by those States to regional and international security. The Conference notes with satisfaction that the commitments in Articles I–III have been met and have greatly helped prevent the spread of nuclear explosives.
4. The Conference therefore specifically urges all non-nuclear-weapon States not party to the Treaty to make an international legally-binding commitment not to acquire nuclear weapons or other nuclear explosive devices and to accept IAEA safeguards on all their peaceful nuclear activities, both current and future, to verify that commitment. The Conference further urges all States in their international nuclear co-operation and in their nuclear export policies and, specifically as a necessary basis for the transfer of relevant nuclear supplies to non-nuclear-weapon States, to take effective steps towards achieving such a commitment to non-proliferation and acceptance of such safeguards by those States. The Conference expresses its view that accession to the Non-Proliferation Treaty is the best way to achieve that objective.
5. The Conference expresses its satisfaction that four of the five nuclear-weapon States have voluntarily concluded safeguards agreements with the IAEA, covering all or part of their peaceful nuclear activities. The Conference regards those agreements as further strengthening the non-proliferation régime and increasing the authority of IAEA and the effectiveness of its safeguards system. The Conference calls on the nuclear-weapon States to continue to co-operate fully with the IAEA in the implementation of these agreements and calls on IAEA to take full advantage of this co-operation. The

Conference urges the People's Republic of China similarly to conclude a safeguards agreement with IAEA. The Conference recommends the continued pursuit of the principle of universal application of IAEA safeguards to all peaceful nuclear activities in all States. To this end, the Conference recognizes the value of voluntary offers and recommends further evaluation of the economic and practical possibility of extending application of safeguards to additional civil facilities in the nuclear-weapon States as and when IAEA resources permit and consideration of separation of the civil and military facilities in the nuclear-weapon States. Such an extending of safeguards will enable the further development and application of an effective régime in both nuclear-weapon States and non-nuclear-weapon States.

6. The Conference also affirms the great value to the non-proliferation régime of commitments by the nuclear-weapon States that nuclear supplies provided for peaceful use will not be used for nuclear weapons or other nuclear explosive purposes. Safeguards in nuclear-weapon States pursuant to their safeguards agreements with IAEA can verify observance of those commitments.

7. The Conference notes with satisfaction the adherence of further Parties to the Treaty and the conclusion of further safeguards agreements in compliance with the undertaking of the Treaty and recommends that:

(a) The non-nuclear-weapon States Party to the Treaty that have not concluded the agreements required under Article III (4) conclude such agreements with IAEA as soon as possible;

(b) The Director-General of IAEA intensify his initiative of submitting to States concerned draft agreements to facilitate the conclusion of corresponding safeguards agreements, and that Parties to the Treaty, in particular Depositary Parties, should actively support these initiatives;

(c) All States Party to the Treaty make strenuous individual and collective efforts to make the Treaty truly universal.

8. The Conference notes with satisfaction that IAEA in carrying out its safeguards activities has not detected any diversion of a significant amount of safeguarded material to the production of nuclear weapons, other nuclear explosive devices or to purposes unknown.

9. The Conference notes that IAEA safeguards activities have not hampered the economic, scientific or technological development of the Parties to the Treaty, or international co-operation in peaceful nuclear activities and it urges that this situation be maintained.

10. The Conference commends IAEA on its implementation of safeguards pursuant to this Treaty and urges it to continue to ensure the maximum technical and cost effectiveness and efficiency of its operations, while maintaining consistency with the economic and safe conduct of nuclear activities.

11. The Conference notes with satisfaction the improvement of IAEA safeguards which has enabled it to continue to apply safeguards effectively during a period of rapid growth in the number of safeguarded facilities. It also notes that IAEA safeguards approaches are capable of adequately dealing with facilities under safeguards. In this regard, the recent conclusion of the project to design a safeguards régime for centrifuge enrichment plants and its implementation is welcomed. This project allows the application of an effective régime to all plants of this type in the territories both of nuclear-weapon States and non-nuclear-weapon States Parties to the Treaty.

12. The Conference emphasizes the importance of continued improvements in the effectiveness and efficiency of IAEA safeguards, for example, but not limited to:

(a) Uniform and non-discriminatory implementation of safeguards;

(b) The expeditious implementation of new instruments and techniques;

(c) The further development of methods for evaluation of safeguards effectiveness in combination with safeguards information;
(d) Continued increases in the efficiency of the use of human and financial resources and of equipment.
13. The Conference believes that further improvement of the list of materials and equipment which, in accordance with Article III (2) of the Treaty, calls for the application of IAEA safeguards should take account of advances in technology.
14. The Conference recommends that IAEA establish an internationally agreed effective system of international plutonium storage in accordance with Article XII(A)5 of its statute.
15. The Conference welcomes the significant contributions made by States Parties in facilitating the application of IAEA safeguards and in supporting research, development and other supports to further the application of effective and efficient safeguards. The Conference urges that such co-operation and support be continued and that other States Parties provide similar support.
16. The Conference calls upon all States to take IAEA safeguards requirements fully into account while planning, designing and constructing new nuclear fuel cycle facilities and while modifying existing nuclear fuel cycle facilities.
17. The Conference also calls on States Parties to the Treaty to assist IAEA in applying its safeguards, *inter alia*, through the efficient operation of State systems of accounting for and control of nuclear material, and including compliance with all notification requirements in accordance with safeguards agreements.
18. The Conference welcomes the Agency's endeavours to recruit and train staff of the highest professional standards for safeguards implementation with due regard to the widest possible geographical distribution, in accordance with Article VII D of the IAEA Statute. It calls upon States to exercise their right regarding proposals of designation of IAEA inspectors in such a way as to facilitate the most effective use of safeguards manpower.
19. The Conference also commends to all States Parties the merits of establishment of international fuel cycle facilities, including multination participation, as a positive contribution to reassurance of the peaceful use and non-diversion of nuclear materials. While primarily a national responsibility, the Conference sees advantages in international co-operation concerning spent fuel storage and nuclear waste storage.
20. The Conference calls upon States Parties to continue their political, technical and financial support of the IAEA safeguards system.
21. The Conference underlines the need for IAEA to be provided with the necessary financial and human resources to ensure that the Agency is able to continue to meet effectively its safeguards responsibilities.
22. The Conference urges all States that have not done so to adhere to the Convention on the physical protection of nuclear material at the earliest possible date.

Article IV and preambular paragraphs 6 and 7

1. The Conference affirms that the NPT fosters the world-wide peaceful use of nuclear energy and reaffirms that nothing in the Treaty shall be interpreted as affecting the inalienable right of any Party to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II.
2. The Conference reaffirms the undertaking by all Parties to the Treaty, in accordance with Article IV and preambular paragraphs 6 and 7, to facilitate the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy and the right of all Parties to the Treaty to participate in

such exchange. In this context, the Conference recognizes the importance of services. This can contribute to progress in general and to the elimination of technological and economic gaps between the developed and developing countries.

3. The Conference reaffirms the undertaking of the Parties to the Treaty in a position to do so to co-operate in contributing, alone or together with other States or international organizations, to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of the non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world. In this context the Conference recognizes the particular needs of the least developed countries.

4. The Conference requests that States Parties consider possible bilateral co-operation measures to further improve the implementation of Article IV. To this end, States Parties are requested to give in written form their experiences in this area in the form of national contributions to be presented in a report to the next Review Conference.

5. The Conference recognizes the need for more predictable long-term supply assurances with effective assurances of non-proliferation.

6. The Conference commends the recent progress which the IAEA's Committee on Assurances of Supply (CAS) has made towards agreeing a set of principles related to this matter, and expresses the hope that the Committee will complete this work soon. The Conference further notes with satisfaction the measures which CAS has recommended to the IAEA Board of Governors for alleviating technical and administrative problems in international shipments of nuclear items, emergency and back-up mechanisms, and mechanisms for the revision of international nuclear co-operation agreements and calls for the early completion of the work of CAS and the implementation of its recommendations.

7. The Conference reaffirms that in accordance with international law and applicable treaty obligations, States should fulfil their obligations under agreements in the nuclear field, and any modification of such agreements, if required, should be made only by mutual consent of the parties concerned.

8. The Conference confirms that each country's choices and decisions in the field of peaceful uses of nuclear energy should be respected without jeopardizing their respective fuel cycle policies. International co-operation in this area, including international transfer and subsequent operations should be governed by effective assurances of non-proliferation and predictable long-term supply assurances. The issuance of related licences and authorization involved should take place in a timely fashion.

9. While recognizing that the operation and management of the back-end of the fuel cycle including nuclear waste storage are primarily a national responsibility, the Conference acknowledges the importance for the peaceful uses of nuclear energy of international and multilateral collaboration for arrangements in this area.

10. The Conference expresses its profound concern about the Israeli military attack on Iraq's safeguarded nuclear reactor on 7 June 1981. The Conference recalls Security Council Resolution 487 of 1981, strongly condemning the military attack by Israel which was unanimously adopted by the Council and which considered that the said attack constituted a serious threat to the entire IAEA safeguards régime which is the foundation of the Non-Proliferation Treaty. The Conference also takes note of the decisions and resolutions adopted by the United Nations General Assembly and the International Atomic Energy Agency on this attack, including Resolution 425 of 1984 adopted by the General Conference of the IAEA.

11. The Conference recognizes that an armed attack on a safeguarded nuclear facility, or threat of attack, would create a situation in which the Security Council would have to

act immediately in accordance with provisions of the United Nations Charter. The Conference further emphasizes the responsibilities of the Depositaries of NPT in their capacity as permanent members of the Security Council to endeavour, in consultation with the other members of the Security Council, to give full consideration to all appropriate measures to be undertaken by the Security Council to deal with the situation, including measures under Chapter VII of the United Nations Charter.

12. The Conference encourages Parties to be ready to provide immediate peaceful assistance in accordance with international law to any Party to the NPT, if it so requests, whose safeguarded nuclear facilities have been subject to an armed attack, and calls upon all States to abide by any decisions taken by the Security Council in accordance with the United Nations Charter in relation to the attacking State.

13. The Conference considers that such attacks could involve grave dangers due to the release of radioactivity and that such attacks or threats of attack jeopardize the development of the peaceful uses of nuclear energy. The Conference also acknowledges that the matter is under consideration by the Conference on Disarmament and urges co-operation of all States for its speedy conclusion.

14. The Conference acknowledges the importance of the work of the International Atomic Energy Agency (IAEA) as the principal agent for technology transfer amongst the international organizations referred to in Article IV (2) and welcomes the successful operation of the Agency's technical assistance and co-operation programmes. The Conference records with appreciation that projects supported from these programmes covered a wide spectrum of applications, related both to power and non-power uses of nuclear energy notably in agriculture, medicine, industry and hydrology. The Conference notes that the Agency's assistance to the developing States Party to the Treaty has been chiefly in the non-power uses of nuclear energy.

15. The Conference welcomes the establishment by the IAEA, following a recommendation of the First Review Conference of the Parties to the Treaty, of a mechanism to permit the channelling of extra-budgetary funds to projects additional to those financed from the IAEA Technical Assistance and Co-operation Fund. The Conference notes that this channel has been used to make additional resources available for a wide variety of projects in developing States Party to the Treaty.

16. In this context, the Conference proposes the following measures for consideration by the IAEA:

(i) IAEA assistance to developing countries in siting, construction, operation and safety of nuclear power projects and the associated trained manpower provision to be strengthened.

(ii) To provide, upon request, assistance in securing financing from outside sources for nuclear power projects in developing countries, and in particular the least developed countries.

(iii) IAEA assistance in nuclear planning systems for developing countries to be strengthened in order to help such countries draw up their own nuclear development plans.

(iv) IAEA assistance on country-specific nuclear development strategies to be further developed, with a view to identifying the application of nuclear technology that can be expected to contribute most to the development both of individual sectors and developing economies as a whole.

(v) Greater support for regional co-operative agreements, promoting regional projects based on regionally agreed priorities and using inputs from regional countries.

(vi) Exploration of the scope for multi-year, multi-donor projects financed from the extra-budgetary resources of the IAEA.

(vii) The IAEA's technical co-operation evaluation activity to be further developed, so as to enhance the Agency's effectiveness in providing technical assistance.

17. The Conference underlines the need for the provision to the IAEA of the necessary financial and human resources to ensure that the Agency is able to continue to meet effectively its responsibilities.

18. The Conference notes the appreciable level of bilateral co-operation in the peaceful uses of nuclear energy, and urges that States in a position to do so should continue and where possible increase the level of their co-operation in these fields.

19. The Conference urges that preferential treatment should be given to the non-nuclear-weapon States Party to the Treaty in access to or transfer of equipment, materials, services and scientific and technological information for the peaceful uses of nuclear energy, taking particularly into account needs of developing countries.

20. Great and serious concerns were expressed at the Conference about the nuclear capability of South Africa and Israel and that the development of such a capability by South Africa and Israel would undermine the credibility and stability of the non-proliferation Treaty régime. The Conference noted the demands made on all States to suspend any co-operation which would contribute to the nuclear programme of South Africa and Israel. The Conference further noted the demands made on South Africa and Israel to accede to the NPT, to accept IAEA safeguards on all their nuclear facilities and to pledge themselves not to manufacture or acquire nuclear weapons or other nuclear explosive devices.

21. The Conference recognizes the growing nuclear energy needs of the developing countries as well as the difficulties which the developing countries face in this regard, particularly with respect to financing their nuclear power programmes. The Conference calls upon States Party to the Treaty to promote the establishment of favourable conditions in national, regional and international financial institutions for financing of nuclear energy projects including nuclear power programmes in developing countries. Furthermore, the Conference calls upon the IAEA to initiate and the Parties to the Treaty to support the work of an expert group study on mechanisms to assist developing countries in the promotion of their nuclear power programmes, including the establishment of a Financial Assistance Fund.

22. The Conference recognizes that further IAEA assistance in the preparation of feasibility studies and infrastructure development might enhance the prospects for developing countries for obtaining finance, and recommends such countries as are members of the Agency to apply for such help under the Agency's technical assistance and co-operation programmes. The Conference also acknowledges that further support for the IAEA's Small and Medium Power Reactor (SMPR) Study could help the development of nuclear reactors more suited to the needs of some of the developing countries.

23. The Conference expresses its satisfaction at the progress in the preparations for the United Nations Conference for the Promotion of International Co-operation in the Peaceful Uses of Nuclear Energy (UNCPICPUNE) and its conviction that UNCPICPUNE will fully realize its goals in accordance with the objectives of resolution 32/50 and relevant subsequent resolutions of the General Assembly for the development of national programmes of peaceful uses of nuclear energy for economic and social development, especially in the developing countries.

24. The Conference considers that all proposals related to the promotion and strengthening of international co-operation in the peaceful uses of nuclear energy which have been produced by the Third Review Conference of the NPT, be transmitted to the Preparatory Committee of the UNCPICPUNE.

Article V

1. The Conference reaffirms the obligation of Parties to the Treaty to take appropriate measures to ensure that potential benefits from any peaceful applications of nuclear explosions are made available to non-nuclear weapon States Party to the Treaty in full accordance with the provisions of article V and other applicable international obligations, that such services should be provided to non-nuclear weapon States Party to the Treaty on a non-discriminatory basis and that the charge to such Parties for the explosive devices used should be as low as possible and exclude any charge for research and development.
2. The Conference confirms that the IAEA would be the appropriate international body through which any potential benefits of the peaceful applications of nuclear explosions could be made available to non-nuclear weapon States under the terms of article V of the Treaty.
3. The Conference notes that the potential benefits of the peaceful applications of nuclear explosions have not been demonstrated and that no requests for services related to the peaceful applications of nuclear explosions have been received by the IAEA since the Second NPT Review Conference.

Article VI and preambular paragraphs 8–12

A.

1. The Conference recalled that under the provisions of article VI all parties have undertaken to pursue negotiations in good faith:

—on effective measures relating to cessation of the nuclear arms race at an early date;
—on effective measures relating to nuclear disarmament;
—on a Treaty on general and complete disarmament under strict and effective international control.

2. The Conference undertook an evaluation of the achievements in respect of each aspect of the article in the period under review, and paragraphs 8 to 12 of the preamble, and in particular with regard to the goals set out in preambular paragraph 10 which recalls the determination expressed by the parties to the Partial Test Ban Treaty to:

—continue negotiations to achieve the discontinuance of all test explosions of nuclear weapons for all time.

3. The Conference recalled the declared intention of the parties to the Treaty to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament and their urging made to all States parties to co-operate in the attainment of this objective. The Conference also recalled the determination expressed by the parties to the 1963 Treaty banning nuclear weapons tests in the atmosphere, in outer space and under water in its preamble to seek to achieve the discontinuance of all test explosions on nuclear weapons for all time and the desire to further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery.
4. The Conference notes that the Tenth Special Session of the General Assembly of the United Nations concluded, in paragraph 50 of its Final Document, that the achievement of nuclear disarmament will require urgent negotiations of agreements at appropriate stages and with adequate measures of verification satisfactory to the States concerned for:

(a) Cessation of the qualitative improvement and development of nuclear-weapon systems;
(b) Cessation of the production of all types of nuclear weapons and their means of delivery, and of the production of fissionable material for weapons purposes;
(c) A comprehensive, phased programme with agreed time-tables whenever feasible, for progressive and balanced reduction of stockpiles of nuclear weapons and their means of delivery, leading to their ultimate and complete elimination at the earliest possible time.

5. The Conference also recalled that in the Final Declaration of the First Review Conference, the parties expressed the view that the conclusion of a treaty banning all nuclear-weapon tests was one of the most important measures to halt the nuclear arms race and expressed the hope that the nuclear-weapon States party to the Treaty would take the lead in reaching an early solution of the technical and political difficulties of this issue.

6. The Conference examined developments relating to the cessation of the nuclear arms race, in the period under review and noted in particular that the destructive potentials of the nuclear arsenals of nuclear-weapon States parties, were undergoing continuing development, including a growing research and development component in military spending, continued nuclear testing, development of new delivery systems and their deployment.

7. The Conference noted the concerns expressed regarding developments with far reaching implications and the potential of a new environment, space, being drawn into the arms race. In that regard the Conference also noted the fact that the United States of America and the Union of Soviet Socialist Republics are pursuing bilateral negotiations on a broad complex of questions concerning space and nuclear arms, with a view to achieving effective agreements aimed at preventing an arms race in space and terminating it on Earth.

8. The Conference noted with regret that the development and deployment of nuclear weapon systems had continued during the period of review.

9. The Conference also took note of numerous proposals and actions, multilateral and unilateral, advanced during the period under review by many States with the aim of making progress towards the cessation of the nuclear arms race and nuclear disarmament.

10. The Conference examined the existing situation in the light of the undertaking assumed by the parties in Article VI to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament. The Conference recalled that a stage of negotiations on the Strategic Arms Limitations Talks (SALT II) had been concluded in 1979, by the signing of the Treaty which had remained unratified. The Conference noted that both the Union of Soviet Socialist Republics and the United States of America have declared that they are abiding by the provisions of SALT II.

11. The Conference recalled that the bilateral negotiations between the Union of Soviet Socialist Republics and the United States of America which were held between 1981 and 1983 were discontinued without any concrete results.

12. The Conference noted that bilateral negotiations between the Union of Soviet Socialist Republics and the United States of America had been held in 1985 to consider questions concerning space and nuclear arms, both strategic and intermediate-range, with all the questions considered and resolved in their interrelationship. No agreement has emerged so far. These negotiations are continuing.

13. The Conference evaluated the progress made in multilateral nuclear disarmament negotiations in the period of the Review.

14. The Conference recalled that the trilateral negotiations on a comprehensive test ban treaty, begun in 1977 between the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, had not continued after 1980, that the Committee on Disarmament and later the Conference on Disarmament had been called upon by the General Assembly of the United Nations in successive years to begin negotiations on such a Treaty, and noted that such negotiations had not been initiated, despite the submission of draft treaties and different proposals to the Conference on Disarmament in this regard.
15. The Conference noted the lack of progress on relevant items of the agenda of the Conference on Disarmament, in particular those relating to the cessation of the nuclear arms race and nuclear disarmament, the prevention of nuclear war including all related matters and effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.
16. The Conference noted that two Review Conferences had taken place since 1980, one on the Sea-bed Treaty and one on the Environmental Modification Treaty and three General Conferences of the Agency for the Prohibition of Nuclear Weapons in Latin America. In 1982, a Special United Nations General Assembly Session on Disarmament took place without any results in matters directly linked to nuclear disarmament.
17. The Conference also noted the last five years had thus not given any results concerning negotiations on effective measures relating to cessation of the nuclear arms race and to nuclear disarmament.

B.

1. The Conference concluded that, since no agreements had been reached in the period under review on effective measures relating to the cessation of an arms race at an early date, on nuclear disarmament and on a Treaty on general and complete disarmament under strict and effective international control, the aspirations contained in preambular paragraphs 8 to 12 had still not been met, and the objectives under Article VI had not yet been achieved.
2. The Conference reiterated that the implementation of Article VI is essential to the maintenance and strengthening of the Treaty, reaffirmed the commitment of all States Parties to the implementation of this Article and called upon the States Parties to intensify their efforts to achieve fully the objectives of the Article. The Conference addressed a call to the nuclear-weapon States Parties in particular to demonstrate this commitment.
3. The Conference welcomes the fact that the United States of America and the Union of Soviet Socialist Republics are conducting bilateral negotiations on a complex of questions concerning space and nuclear arms—both strategic and intermediate-range—with all these questions considered and resolved in their interrelationship. It hopes that these negotiations will lead to early and effective agreements aimed at preventing an arms race in space and terminating it on Earth, at limiting and reducing nuclear arms, and at strengthening strategic stability. Such agreements will complement and ensure the positive outcome of multilateral negotiations on disarmament, and would lead to the reduction of international tensions and the promotion of international peace and security. The Conference recalls that the two sides believe that ultimately the bilateral negotiations, just as efforts in general to limit and reduce arms, should lead to the complete elimination of nuclear arms everywhere.
4. The Conference urges the Conference on Disarmament, as appropriate, to proceed to early multilateral negotiations on nuclear disarmament in pursuance of paragraph 50

of the Final Document of the First Special Session of the General Assembly of the United Nations devoted to disarmament.

5. The Conference reaffirms the determination expressed in the preamble of the 1963 Partial Test Ban Treaty, confirmed in Article I (b) of the said Treaty and reiterated in preambular paragraph 10 of the Non-Proliferation Treaty, to achieve the discontinuance of all test explosions of nuclear weapons for all time.

6. The Conference also recalls that in the Final Document of the First Review Conference, the Parties expressed the view that the conclusion of a Treaty banning all nuclear weapons tests was one of the most important measures to halt the nuclear arms race. The Conference stresses the important contribution that such a treaty would make toward strengthening and extending the international barriers against the proliferation of nuclear weapons; it further stresses that adherence to such a treaty by all States would contribute substantially to the full achievement of the non-proliferation objective.

7. The Conference also took note of the appeals contained in five successive United Nations General Assembly resolutions since 1981 for a moratorium on nuclear weapons testing pending the conclusion of a comprehensive test ban Treaty, and of similar calls made at this Conference. It also took note of the measure announced by the Union of Soviet Socialist Republics for a unilateral moratorium on all nuclear explosions from 6 August 1985 until 1 January 1986, which would continue beyond that date if the United States of America, for its part, refrained from carrying out nuclear explosions. The Union of Soviet Socialist Republics suggested that this would provide an example for other nuclear-weapon States and would create favourable conditions for the conclusion of a Comprehensive Test Ban Treaty and the promotion of the fuller implementation of the Non-Proliferation Treaty.

8. The Conference took note of the unconditional invitation extended by the United States of America to the Union of Soviet Socialist Republics to send observers, who may bring any equipment they deem necessary, to measure a United States of America nuclear test in order to begin a process which in the view of the United States of America would help to ensure effective verification of limitations on under-ground nuclear testing.

9. The Conference also took note of the appeals contained in five United Nations General Assembly resolutions since 1982 for a freeze on all nuclear weapons in quantitative and qualitative terms, which should be taken by all nuclear-weapon States or, in the first instance and simultaneously, by the Union of Soviet Socialist Republics and the United States of America on the understanding that the other nuclear-weapon States would follow their example, and of similar calls made at this Conference.

10. The Conference took note of proposals by the Union of Soviet Socialist Republics and the United States of America for the reduction of nuclear weapons.

11. The Conference took note of proposals submitted by States Parties on a number of related issues relevant to achieving the purposes of Article VI and set out in Annex I to this document and in the statements made in the General Debate of the Conference.

12. The Conference reiterated its conviction that the objectives of Article VI remained unfulfilled and concluded that the nuclear-weapon States should make greater efforts to ensure effective measures for the cessation of the nuclear arms race at an early date, for nuclear disarmament and for a Treaty on general and complete disarmament under strict and effective international control.

The Conference expressed the hope for rapid progress in the United States–USSR bilateral negotiations.

The Conference except for certain States whose views are reflected in the following subparagraph deeply regretted that a comprehensive multilateral Nuclear Test Ban Treaty banning all nuclear tests by all States in all environments for all time had not been

concluded so far and, therefore, called on the nuclear weapon States Party to the Treaty to resume trilateral negotiations in 1985 and called on all the nuclear-weapon States to participate in the urgent negotiation and conclusion of such a Treaty as a matter of the highest priority in the Conference on Disarmament.

At the same time, the Conference noted that certain States Party to the Treaty, while committed to the goal of an effectively verifiable comprehensive Nuclear Test Ban Treaty, considered deep and verifiable reductions in existing arsenals of nuclear weapons as the highest priority in the process of pursuing the objectives of Article VI.

The Conference also noted the statement of the USSR, as one of the nuclear weapon States Party to the Treaty, recalling its repeatedly expressed readiness to proceed forthwith to negotiations, trilateral and multilateral, with the aim of concluding a comprehensive Nuclear Test Ban Treaty and the submission by it of a draft Treaty proposal to this end.

Article VII and the Security of Non-Nuclear-Weapon States

1. The Conference observes the growing interest in utilizing the provisions of Article VII of the Non-Proliferation Treaty, which recognizes the right of any group of States to conclude regional treaties in order to assure the absence of nuclear weapons in their respective territories.
2. The Conference considers that the establishment of nuclear-weapon-free zones on the basis of arrangements freely arrived at among the States of the region concerned constitutes an important disarmament measure and therefore the process of establishing such zones in different parts of the world should be encouraged with the ultimate objective of achieving a world entirely free of nuclear weapons. In the process of establishing such zones, the characteristics of each region should be taken into account.
3. The Conference emphasizes the importance of concluding nuclear-weapon-free zone arrangements in harmony with internationally recognized principles, as stated in the Final Document of the First Special Session of the United Nations devoted to disarmament.
4. The Conference holds the view that, under appropriate conditions, progress towards the establishment of nuclear-weapon-free zones will create conditions more conducive to the establishment of zones of peace in certain regions of the world.
5. The Conference expresses its belief that concrete measures of nuclear disarmament would significantly contribute to creating favourable conditions for the establishment of nuclear-weapon-free zones.
6. The Conference expresses its satisfaction at the continued successful operation of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco). It reaffirms the repeated exhortations of the General Assembly to France, which is already a signatory of Additional Protocol I, to ratify it, and calls upon the Latin American States that are eligible to become parties to the treaty to do so. The Conference welcomes the signature and ratification of Additional Protocol II to this Treaty by all nuclear-weapon States.
7. The Conference also notes the continued existence of the Antarctic Treaty.
8. The Conference notes the endorsement of the South Pacific Nuclear Free Zone Treaty by the South-Pacific Forum on 6 August 1985 at Rarotonga and welcomes this achievement as consistent with Article VII of the Non-Proliferation Treaty. The Conference also takes note of the draft Protocols to the South Pacific Nuclear Free Zone Treaty and further notes the agreement at the South Pacific Forum that consultations on the Protocols should be held between members of the Forum and the nuclear-weapon States eligible to sign them.

9. The Conference takes note of the existing proposals and the ongoing regional efforts to achieve nuclear-weapon-free zones in different areas of the world.

10. The Conference recognizes that for the maximum effectiveness of any treaty arrangements for establishing a nuclear-weapon-free zone the co-operation of the nuclear-weapon States is necessary. In this connection, the nuclear-weapon States are invited to assist the efforts of States to create nuclear-weapon-free zones, and to enter into binding undertakings to respect strictly the status of such a zone and to refrain from the use or threat of use of nuclear weapons against the States of the zone.

11. The Conference welcomes the consensus reached by the United Nations General Assembly at its thirty-fifth session that the establishment of a nuclear-weapon-free zone in the region of the Middle East would greatly enhance international peace and security, and urges all parties directly concerned to consider seriously taking the practical and urgent steps required for the implementation of the proposal to establish a nuclear-weapon-free zone in the region of the Middle East.

12. The Conference also invites the nuclear-weapon States and all other States to render their assistance in the establishment of the zone and at the same time to refrain from any action that runs counter to the letter and spirit of United Nations General Assembly resolution 39/54.

13. The Conference considers that acceding to the Non-Proliferation Treaty and acceptance of IAEA safeguards by all States in the region of the Middle East will greatly facilitate the creation of a nuclear-weapon-free zone in the region and will enhance the credibility of the Treaty.

14. The Conference considers that the development of a nuclear weapon capability by South Africa at any time frustrates the implementation of the Declaration on the Denuclearization of Africa and that collaboration with South Africa in this area would undermine the credibility and the stability of the Non-Proliferation Treaty régime. South Africa is called upon to submit all its nuclear installations and facilities to IAEA safeguards and to accede to the Non-Proliferation Treaty. All States Parties directly concerned are urged to consider seriously taking the practical and urgent steps required for the implementation of the proposal to establish a nuclear-weapon-free zone in Africa. The nuclear weapon States are invited to assist the efforts of States to create a nuclear-weapon-free zone in Africa, and to enter into binding undertakings to respect strictly the status of such a zone and to refrain from the use or threat of use of nuclear weapons against the States of the zone.

15. The Conference considers that the most effective guarantee against the possible use of nuclear weapons and the danger of nuclear war is nuclear disarmament and the complete elimination of nuclear weapons. Pending the achievement of this goal on a universal basis and recognizing the need for all States to ensure their independence, territorial integrity and sovereignty, the Conference reaffirms the particular importance of assuring and strengthening the security of non-nuclear-weapon States Parties which have renounced the acquisition of nuclear weapons. The Conference recognizes that different approaches may be required to strengthen the security of non-nuclear-weapon States Parties to the Treaty.

16. The Conference underlines again the importance of adherence to the Treaty by non-nuclear-weapon States as the best means of reassuring one another of their renunciation of nuclear weapons and as one of the effective means of strengthening their mutual security.

17. The Conference takes note of the continued determination of the Depositary States to honour their statements, which were welcomed by the United Nations Security Council in resolution 255 (1968), that, to ensure the security of the non-nuclear-weapon States Parties to the Treaty, they will provide or support immediate assistance, in

accordance with the Charter, to any non-nuclear-weapon State Party to the Treaty which is a victim of an act or an object of a threat of aggression in which nuclear weapons are used.

18. The Conference reiterates its conviction that, in the interest of promoting the objectives of the Treaty, including the strengthening of the security of non-nuclear-weapon States Parties, all States, both nuclear-weapon and non-nuclear-weapon States, should refrain, in accordance with the Charter of the United Nations, from the threat or the use of force in relations between States, involving either nuclear or non-nuclear weapons.

19. The Conference recalls that the Tenth Special Session of the General Assembly in paragraph 59 of the Final Document took note of the declarations made by the nuclear-weapon States regarding the assurance of non-nuclear-weapon States against the use or threat of use of nuclear weapons and urged them to pursue efforts to conclude, as appropriate, effective arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons.

20. Being aware of the consultations and negotiations on effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons, which have been under way in the Conference on Disarmament for several years, the Conference regrets that the search for a common approach which could be included in an international legally binding instrument, has been unsuccessful. The Conference takes note of the repeatedly expressed intention of the Conference on Disarmament to continue to explore ways and means to overcome the difficulties encountered in its work and to carry out negotiations on the question of effective international arrangements to assure non-nuclear-weapon States against the use or threat of use of nuclear weapons. In this connection, the Conference calls upon all States, particularly the nuclear-weapon States, to continue the negotiations in the Conference on Disarmament devoted to the search for a common approach acceptable to all, which could be included in an international instrument of a legally binding character.

Article VIII

The States Party to the Treaty participating in the Conference propose to the Depositary Governments that a fourth Conference to review the operation of the Treaty be convened in 1990.

The Conference accordingly invites States Party to the Treaty which are Members of the United Nations to request the Secretary-General of the United Nations to include the following item in the provisional agenda of the forty-third session of the General Assembly:

> 'Implementation of the conclusions of the third Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons and establishment of a Preparatory Committee for the fourth Conference.'

Article IX

The Conference, having expressed great satisfaction that the overwhelming majority of States have acceded to the Treaty on the Non-Proliferation of Nuclear Weapons and having recognized the urgent need for further ensuring the universality of the Treaty, appeals to all States, particularly the nuclear-weapon States and other States advanced in nuclear technology, which have not yet done so, to adhere to the Treaty at the earliest possible date.

Source: *Final Document*, Review Conference of the Parties to the Treaty on the non-proliferation of nuclear weapons, NPT/CONF.III/64/I, Annex I.

Appendix 20B. Nuclear plants under construction or operating in the developing countries outside Europe (power and research reactors and significant fuel facilities)

Unsafeguarded plants are in italics. HWR = heavy water reactor; LWR = light water reactor.

Argentina	3 HWR power reactors 6 small research reactors[2] 3 fuel fabrication plants 2 heavy water production plants (*1 unsafeguarded*) 1 pilot reprocessing plant (under safeguards when, as today, reprocessing safeguarded fuel) *1 pilot enrichment plant*[3] 1 uranium oxide conversion plant (possibly a second *unsafeguarded plant*) *1 UF_6 plant*
Brazil	3 LWR power reactors 3 small research reactors 1 pilot reprocessing plant (construction status not clear) 1 pilot enrichment plant 1 fuel fabrication plant 1 uranium oxide conversion plant *1 UF_6 plant*
Cuba	2 LWR power reactors[4] 1 small LWR research reactor[4]
India	10 power reactors (8 HWRs and 2 LWRs, *6 HWRs unsafeguarded*) *6 research reactors* (including 1 large HWR)[5] *3 reprocessing plants*[5] (1 under safeguards while reprocessing safeguarded fuel) 2 fuel fabrication plants (*1 unsafeguarded*) *7 heavy water production plants* 3 uranium oxide conversion plants (*2 unsafeguarded*) *1 thorium oxide fuel fabrication plant* *1 fast breeder fuel fabrication plant*
Israel	2 research reactors (*including 1 large HWR*)[5] *1 reprocessing plant*[5] *1 heavy water production plant* *1 fuel fabrication plant*

Korea, South	9 power reactors (8 LWRs and 1 HWR) 3 small research reactors 2 fuel fabrication plants (1 pilot) 1 uranium oxide conversion plant
Mexico	1 LWR power reactor (construction of second power reactor reportedly suspended) 2 small research reactors
Pakistan	1 HWR power reactor 1 small research reactor *2 reprocessing plants (possibly 3 including 2 pilot reprocessing plants)* *1 pilot enrichment plant*[6] *1 fuel fabrication plant* *2 heavy water production plants* *1 UF_6 plant*
Philippines	1 LWR power reactor 1 small research reactor
South Africa[7]	2 LWR power reactors 1 large LWR research reactor 2 enrichment plants (*1 pilot plant in operation*,[5] 1 commercial plant under construction) *1 fuel fabrication plant* *2 uranium oxide conversion plants* *1 UF_6 plant* (also extensive uranium mining, milling and processing)
Taiwan	6 LWR power reactors 6 research reactors (including 1 large HWR) 1 fuel fabrication plant 1 uranium oxide conversion plant

The nuclear plant in each of the following developing countries is confined essentially to a single small research reactor, usually an LWR using enriched US or Soviet fuel:

Colombia	Peru (building a second)
Egypt	Thailand
Iran	Uruguay
Iraq[8]	Venezuela
Libya[9]	Viet Nam
Malaysia	Zaire

A further four developing countries each have two research reactors:[10]

Chile	Korea, North
Indonesia	Turkey

Notes

[1] Other than uranium mills producing U_3O_8.

[2] 'Small' indicates less than 5 MW(th). The fuel content of such reactors is normally well below a 'significant quantity', i.e., the amount needed to make a single nuclear explosive.

[3] Producing unsafeguarded enriched uranium.

[4] All supplied by the USSR and using Soviet low-enriched fuel.

[5] Producing unsafeguarded plutonium.

[6] Believed to be nearing completion.

[7] Although not usually classified as a developing country, South Africa is included in this list as one of the non-nuclear weapon states that produce unsafeguarded nuclear weapon material.

[8] The Tamuz 1 reactor was destroyed.

[9] There are unconfirmed reports that Libya is also obtaining a power reactor (LWR) from the USSR.

[10] Among the industrial countries, Greece, Portugal and Norway each operate a single small research reactor while Denmark has two (none has or is building a power reactor).

Sources: Fischer, D. and Szasz, P., edited by J. Goldblat, SIPRI, *Safeguarding the Atom: A Critical Appraisal* (Taylor & Francis: London, 1985), appendix VIII; and Goldblat, J. (ed.), SIPRI, *Non-Proliferation: The Why and the Wherefore* (Taylor & Francis: London, 1985).

21. The South Pacific nuclear-free zone

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Superscript numbers refer to the list of references at the end of the chapter.

I. Introduction

In August 1985 the South Pacific became the second populated region, after Latin America, to establish a nuclear weapon-free zone. This was achieved by an international treaty which was opened for signature in Rarotonga in the Cook Islands during a meeting of the South Pacific Forum, the organization comprising all of the independent states of the region.[1] Leaders of eight South Pacific countries signed the treaty before they left Rarotonga; another four promised to sign the document later. The treaty will enter into force when eight countries have ratified the agreement.

II. The political exercise

The Treaty of Rarotonga, as it is now called, was the culmination of two years of negotiations among South Pacific governments (for the text of the treaty, see appendix 21A). Throughout this period, discussions focused on a proposal first put forward by the new Australian Labor Government in mid 1983.[2] It was not a formula, however, which evoked an initial enthusiastic response from other governments. For some, such as Papua New Guinea, the Solomon Islands and Vanuatu, it did not go far enough. They indicated a preference for a zone that prohibited all nuclear weapons and weapon-related activity. For others, such as Fiji, Tonga and Samoa, there were concerns that such a zone might affect existing security arrangements, particularly placing restrictions on the United States' options in some future contingency.[3]

These variations in opinion first surfaced at the August 1983 South Pacific Forum meeting in Canberra. At the end of this meeting it was clear that it would be a formidable political task to move other South Pacific countries from their preferred positions to one of accepting the middle-ground position embodied in the Australian formula.[4] In the event, several developments assisted this process. One was the element of time. South Pacific leaders had only been given short notice of Australia's intention to introduce its proposals at the 1983 Forum meeting; this contributed to their lack of enthusiasm at that meeting. In the 12 months following the Canberra Forum, however, there was time to explain the proposal's provisions and implications.

A second development of significance was the change of government in New Zealand in July 1984. This not only removed one of the influential critics of the scheme, former Prime Minister Robert Muldoon; it also introduced a government that strongly supported moves to create a nuclear weapon-free

zone. However, in view of the New Zealand Labour Government's preferred position of establishing a zone in which all nuclear weapon activity was prohibited, this could have proved to be an obstacle to gaining agreement on the less ambitious Australian formula. Prime Minister David Lange, however, chose the pragmatic course of supporting the Australian proposal, recognizing that a more radical initiative would not obtain the same degree of support.[5] New Zealand's influence was not only important in lending general support to the concept; it was also important in making sure that Australia's proposal would be put in treaty form rather than remaining as a 'political concept'. Further, New Zealand lobbied for quick movement towards that goal. On both counts it was successful. By the conclusion of the 1984 Forum meeting held in Tuvalu in August, there was unanimous agreement that a draft treaty should be drawn up.[6]

From this point the pace was swift. A working group of officials met five times in 1985 to flesh out a draft treaty based on the principles agreed at the Tuvalu Forum. It was this document that was put before the Prime Ministers at Rarotonga. As the Rarotonga meeting approached, however, there were indications that several countries were having second thoughts.[7] It was expected that divisions might occur on the by now familiar lines: Melanesian countries, to the west (Papua New Guinea, the Solomon Islands and Vanuatu), wanting a more radical zone treaty; and Fiji and some of the Polynesian states, to the east (Samoa, Tonga, the Cook Islands, Niue and Fiji), wanting to exercise caution even in relation to this modest treaty. This, however, did not happen. On the day, the President of Vanuatu, Father Walter Lini, was the only leader who felt he could not put his signature on the document.

Although Australia and New Zealand were pushing for a treaty at this particular time and in this particular form, the outcome should not be seen as representing a forceful Australia and New Zealand pushing reluctant Pacific Island countries into signing something that they did not want. There is a longstanding anti-nuclear sentiment throughout the South Pacific Islands: all of these countries actively oppose French nuclear testing and Japan's proposals to dump radioactive wastes in the Pacific,[8] and in 1975 they went as far as supporting a New Zealand-inspired proposal for a South Pacific nuclear-free zone.[9] The existence of this anti-nuclear sentiment provided a base on which the Australian proposal could build.

The success in obtaining near unanimous agreement was also helped by a number of favourable strategic conditions in the South Pacific. Unlike many other regions, there are no serious tensions between countries or between South Pacific states and countries outside the area, at least none that would prompt a South Pacific state to want to keep open the option to 'go nuclear'. There is also a long record of regional co-operation, and the South Pacific Forum, in particular, provided a useful vehicle for the promotion of such an agreement. Even more important, the region is already nuclear-free in the sense provided for in the treaty, except for the nuclear weapon testing in French Polynesia. This restricted the debate about possible consequences of the treaty to future contingencies. The task was not one of disengaging deployed weapons of superpowers, as in Europe, or of dismantling existing

bases. All of these factors, together with the strategic isolation of the region, meant that there was at least a basis on which a political exercise could be mounted.

At bottom, the debate within the region turned on the question of whether, and to what extent, US nuclear involvement should be allowed. In particular, it focused on the issue of visits of US nuclear ships to regional ports. The outcome was a treaty that was written so as not to upset this involvement. It does not place a regional ban on the visits of nuclear-armed ships but leaves the decision of whether to do so to national policies.

The document also represents a political exercise within Australia. The issue was essentially the same—the degree to which US nuclear involvement should be controlled. The Labor Government came to office with commitments to both the security relationship with the United States—the 1951 ANZUS Pact treaty between Australia, New Zealand and the USA—and to a nuclear-free Pacific.[10] Its subsequent partial nuclear-free zone initiative was an attempt to balance these two contradictory objectives. To reflect the majority view in the party and the electorate, the Australian proposal had to leave out of the regional initiative any prohibition on US nuclear activity that would have been seen by Washington or the Australian electorate as constituting the dismantling of the security pact with the United States. A nuclear-free ANZUS was not an option.

III. Nuclear prohibitions

Although the Rarotonga Treaty purports to be a 'nuclear-free zone' treaty, it does not establish, or even seek to establish, a zone in which all nuclear activities are prohibited. It is primarily an arms control agreement, although it also contains one non-weapon prohibition—a ban on the dumping of radioactive wastes.[11] All other parts of the nuclear fuel cycle are unaffected. The energy, bio-medical and research uses of nuclear technology, for example, are not banned.

While some political opportunity may have been seen in inflating what was a more modest exercise, there is an understandable reason for the use of the misleading 'nuclear-free' title. The Australian Government had initially contemplated the use of the narrower, and more apt, 'nuclear weapon-free zone'.[12] During the negotiation of the treaty, however, it became clear that the South Pacific states wanted a non-weapon provision included: a ban on the dumping of radioactive wastes. As this meant that the agreement was now to go beyond arms control objectives, the 'nuclear *weapon*-free zone' label was dropped in favour of the broader 'nuclear-free zone'.

Specifically, then, what are the prohibitions on nuclear weapons? Each signatory undertakes: (*a*) not to manufacture, or otherwise acquire, possess or have control over, any nuclear explosive device inside or outside the zone, or to seek or receive assistance with such activity, or to give assistance to other states engaged in this activity;[13] (*b*) to prevent the stationing of any nuclear explosive device in its territory, stationing being defined specifically as 'emplantation, emplacement, transportation on land or inland waters, stockpiling, storage,

installation and deployment';[14] and (*c*) to prevent on its territory the testing of any nuclear explosive device and not to assist in the testing activity of any other state.[15] In relation to the latter two undertakings, 'territory' refers to 'internal waters, territorial sea and archipelagic waters, the seabed and subsoil beneath, the land territory and the airspace above them'.[16]

What this amounts to, then, is a prohibition of the presence of nuclear weapons, or of their manufacture or testing, anywhere within the territories of South Pacific states, up to the 12-mile sea limit. There is one very significant qualification to this general prohibition. The treaty specifically allows each state to make an exception for nuclear weapons that may be aboard ships that are visiting its ports or navigating its territorial sea or archipelagic waters, and for weapons that may be aboard aircraft that are visiting its airfields or which are transiting its airspace.[17] It should be noted that the treaty does not compel signatories to allow such involvement. It leaves the decision to the state concerned.

There is no attempt to control nuclear weapons on ships outside the 12-mile territorial limits of the South Pacific states or to control weapons on aircraft flying in international airspace. Both are beyond the legal jurisdiction of the South Pacific states and are, in any case, activities which are protected by international law. This is enforced by a specific reference in the treaty to the fact that none of its provisions seeks to contravene 'international law with regard to freedom of the seas'.[18] Nor does the treaty seek to control missile testing. The definition of a 'nuclear explosive device' is such that it excludes the delivery system (the missile) if it is not an indivisible part of the weapon.[19] Thus the ban on nuclear weapon testing only refers to explosive devices. The treaty's definition of a nuclear weapon also excludes the communications and surveillance facilities which are an integral part of nuclear weapon systems.

In its attempt to ban direct nuclear weapon presence on land while not prohibiting weapon-related activity or the transit of nuclear-armed ships or aircraft, the Treaty of Rarotonga resembles the Tlatelolco Treaty. However, the South Pacific treaty goes beyond the Tlatelolco Treaty in two important respects: it bans so-called 'peaceful nuclear explosions' as well as explosions concerned with weapon testing; and it bans the dumping of radioactive wastes. On the other hand, the Tlatelolco Treaty appears to achieve a more complete geographical coverage of its region. This is because nearly all the Latin American region is land, which consequently falls within the jurisdiction of zonal states. In the South Pacific most of the region is ocean, therefore falling outside the control of the treaty signatories. (See also appendix 21B.)

IV. Geographical scope

The scope of the treaty in geographical terms is defined by membership of the South Pacific Forum, the regional organization comprising the independent states of the region. The nuclear prohibitions will therefore almost certainly apply in Australia (and its territories), the Cook Islands, Fiji, Kiribati, Nauru, New Zealand (and its territories), Niue, Papua New Guinea, the Solomon Islands, Tonga, Tuvalu and Samoa. In addition, there is provision for

Britain, France and the United States to sign on behalf of their South Pacific territories.[20]

Although the actual area of application of the nuclear prohibitions is confined to the territory of the Forum countries, and of the dependencies for which administering powers sign, the treaty defines the geographical scope of the South Pacific nuclear-free zone in a much broader fashion.[21] The boundaries stretch from the border of the Latin American nuclear weapon-free zone in the east, to the west coast of Australia in the west, and from the border of the Antarctic zone in the south to the equator—with some extension into the northern hemisphere to include Kiribati—in the north (see the map of the zone in Annex 1 to the treaty, appendix 21A).

This zone includes a vast area of ocean over which the treaty signatories do not have jurisdiction and in relation to which the treaty does not seek to apply any nuclear prohibitions. It also includes the French territories which will fall outside the jurisdiction of the treaty unless France signs. This concept of region, then, termed a 'picture frame' approach, represents an intended area of application. It is really a political concept. The fact that French Polynesia is included within it does not mean that nuclear testing will cease there. French Polynesia's inclusion facilitates one of the political objectives of the treaty, which is to demonstrate that France is the only country involved in the area which is not prepared to support the anti-nuclear sentiment of the region. In addition, the 'picture frame' approach is used to make clear that the South Pacific zone is building on to existing zones in Latin America and Antarctica. The extension of the frame to include high seas over which the treaty has no legal jurisdiction in order that the zone might abut these existing zones is essentially a political exercise.

V. Verification and compliance

Verification of the treaty obligations is provided by the application of International Atomic Energy Agency (IAEA) safeguards to peaceful nuclear activities; and by giving a controlling body, the Consultative Committee, the power to direct a special inspection team to investigate any suspected violation on the territory of a member state. The verification process is assisted by a complaints procedure which allows any signatory to the treaty to raise any suspicions of violation with the Consultative Committee.[22]

Any attempt by a South Pacific state to acquire nuclear weapons itself should be picked up by the IAEA inspections. The stationing of foreign nuclear forces would quickly become common knowledge, although there could be difficulties in knowing when substantial transiting of ships or aircraft becomes 'deployment' or 'home-basing'. Nuclear weapon testing could be detected by the seismic monitoring network in Australia and New Zealand. Thus, in terms of what is being prohibited, the verification procedures would seem more than adequate.

There are no sanctions against non-compliance provided for in the treaty. As in the case with most arms control agreements, the ultimate sanction is the breakdown of the agreement itself.[23] This is generally regarded as an effective

sanction when an arms control agreement is based on the mutual interests of the members in upholding a regime. There is also a broader sanction. To violate this particular treaty is to contribute to the breakdown of the basis of the arms control system generally, and even more broadly, the system of international law. That is, even though a state may want to violate a particular treaty, it will have to weigh this action against the effect it will have on the whole system of arms control agreements, the existence of which, in its totality, it will view as being in its interests to uphold.

There are also other sanctions involved in a regional treaty of this kind. If a state does not comply with its obligations under a regional arms control treaty, this may jeopardize the achievement of other objectives it wishes to pursue in the region. In the South Pacific case, there is close co-operation and shared security, and economic and political concerns among the member states. This puts an added obstacle in the way of a state violating its treaty commitments.

VI. Attitude of the nuclear weapon powers

Now that the treaty has been signed by several of the South Pacific countries, the immediate issue is whether it can gain support from beyond the region, and particularly from the five nuclear weapon powers. They will be asked to sign two protocols attached to the treaty in which they would pledge not to contribute to any violation of its provisions, and not to use or threaten to use nuclear weapons against members of the zone. These signatures are not required for the treaty to enter into force. This will be achieved when eight South Pacific states have ratified the agreement. Nor can the nuclear weapon states legally stop the signatories from prohibiting the nuclear weapon activity outlawed in the treaty. The zonal states have full jurisdiction over the territory to which their undertakings apply.

While not critical for the treaty's effective operation, the support of the nuclear weapon powers is nevertheless desirable. The South Pacific nuclear-free zone treaty is not, however, the arms control arrangement preferred by any of the nuclear weapon powers, with the possible exception of China. France is clearly opposed to it. The Soviet Union would like to see a more comprehensive zone banning visits by US ships to regional ports and US communications/surveillance facilities in Australia. The United States and Britain would rather the initiative had not been taken. Only China has indicated support for the development of such a treaty.[24] This does not mean, however, that these countries will necessarily withhold their support. It may still be the case that all, except France, will see their interests best served by endorsing the treaty.

The main question for the United States is whether the treaty is to be seen as an anti-American expression and as a development which could encourage further anti-nuclear sentiment within the region or in other regions under US influence; or whether it legitimizes US involvement in the area and will act to contain any move to a more radical nuclear-free zone. Clearly, existing US involvement is not threatened by the treaty. Its concern is more with the symbolism of the initiative, particularly in the wake of the ANZUS crisis.

Although Secretary of State George Shultz cautioned against the treaty before it was signed,[25] now that it is a *fait accompli*, the USA is more likely to conclude that it is better tactics to be supportive rather than draw attention to what it sees as an undesirable development within its nuclear alliance.

Despite Prime Minister Margaret Thatcher's initial negative remarks about the zone, Britain could adopt similar reasoning and therefore be in a position to sign the protocols. For both countries, however, there is the additional consideration of their relations with France. They may not wish to be associated with a treaty which is clearly aimed at putting political pressure on France to cease its nuclear testing programme at Mururoa Atoll.

The Soviet Union will be weighing the question of whether the treaty is to be seen as one which legitimizes US nuclear involvement in the South Pacific or whether it might encourage further developments which would move the region closer to the Soviet Union's preferred option. In the event, the Soviet Union may be influenced by its general policy of supporting nuclear-free zones. Even if it has some concerns about lending legitimacy to a concept that is clearly consistent with continued US nuclear involvement, it may decide that it cannot be seen as opposing efforts to create nuclear-free zones. Another question mark hangs over the specific question of whether the Soviet Union will be able to sign a protocol that includes a pledge not to threaten or use nuclear weapons against signatories to the treaty. In view of the strategic significance of the Pine Gap, Nurrungar and North West Cape facilities in Australia, the Soviet Union may choose to make a political issue of this undertaking.

VII. Value as an arms control mechanism

From the time the Australian proposal for a nuclear-free zone was first mooted in mid-1983 it came under attack from the peace movement, on the one hand, and the conservative parties on the other, for being an 'empty concept'. Both Left and Right on the disarmament issue have argued that the zone is a cynical political exercise which does not actually achieve anything in arms control terms. It has been variously described as a 'Mickey Mouse zone', a 'joke', a 'farce' and a 'folly'.[26] The starting point for such an assessment is the observation that the list of nuclear prohibitions contained in the treaty does not add up to a nuclear-free zone or even a nuclear weapon-free zone.

But the argument goes beyond saying that the treaty falls well short of what its 'nuclear-free' title appears to claim. It says that the zone does not in fact achieve anything at all in arms control terms. This part of the argument is based on the observation that the treaty will not change any existing weapon involvement either because it is left outside the purview of the treaty or because, in the case of nuclear testing, France will simply ignore the ban. Therefore, it is concluded, there is no arms control value in the concept.

Clearly these critics are correct in pointing out that the treaty falls short of what is implied in its title. But the next stage of the argument is more difficult to accept. The assertion that it has no value at all in arms control terms is based on a false premise: that because it changes nothing, it is therefore an 'empty

concept'. It is true to say that it changes no existing involvement; but this is to miss a very important objective of arms control. It can have an important role as a braking mechanism.

In the South Pacific case, the preventive role of an arms control mechanism is particularly important because the existing situation is one in which there are no nuclear weapons on any territory in the region and no country wants to acquire or develop nuclear weapons. Nor are the nuclear forces of the Soviet Union or the United States stationed in the region. While the region is effectively nuclear weapon-free in this sense, an international agreement in which governments agree to keep it that way and to enter obligations to that effect, backed up by verification procedures, means that that existing favourable situation can be entrenched. This does have value. The idea is to prohibit weapon involvement before it happens and to base that prohibition on the mutual interests of the nuclear weapon powers in containing the geographical spread of their arms competition.

The prohibition on the stationing of foreign nuclear forces on the territory of South Pacific countries is of particular importance in this regard. This extends beyond the obligations that these countries have entered into under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). It is a significant move to effectively ban home-basing in the South Pacific for the nuclear-armed ships or aircraft of either superpower. This puts an obstacle in the way of competitive base development in the South Pacific.

The prohibition on a signatory of the Treaty of Rarotonga acquiring or manufacturing nuclear weapons itself may be thought to have no arms control value because all of the signatories of the regional agreement have already entered into such an obligation under the NPT. This, however, overlooks the importance of the difference in contexts in which such undertakings are made, and in particular, the difference in the sanctions which might ensure compliance in a regional, as against a global, regime. The regional sanctions could complement the global sanctions to make it less likely that a state breaks out of the non-proliferation regime. Regional sanctions may not only complement global ones but they may also be stronger. A state may be pursuing a number of important political and economic objectives regionally which it would not want to put at risk by abrogating the non-proliferation provisions of a regional treaty entered into with the same states.

In the South Pacific case, this is mainly applicable to Australia as the only potential nuclear weapon power in the region.[27] It is of some value to have Australia saying to its region as well as to the NPT membership that it will not be acquiring nuclear weapons and is willing to undergo verification of that undertaking. It is also a political signal to countries outside the South Pacific zone which may have to take Australia's actions into account. It constitutes an extra assurance to Indonesia, for example, that Australia is not intending to introduce nuclear weapons into the security equation in the region. Indonesia will know that Australia, having initiated this regime in the South Pacific, could not lightly take a decision that would go against its undertaking.

If Indonesia, already a signatory of the NPT, made similar undertakings to its region—something it has already indicated it is willing to do by its promotion

of a South-East Asian nuclear weapon-free zone—this would be a valuable contribution to a nuclear non-proliferation regime in the area. While Australia and Indonesia would be making their undertakings in relation to two different, though adjacent, regions, they would also be signalling to each other their intention to defuse any nuclear competition that could otherwise arise between them. The signals would be backed by the assurance that it would be difficult for each to go against a regional treaty that they had signed unless there were exceptional circumstances that outweighed the diplomatic costs of abrogation. This would seem to be of considerable potential value in constraining a regional nuclear competition. The Rarotonga Treaty is the first step in this process.

Not only would the South Pacific treaty work well alongside a South-East Asian treaty, but it may be that the existence of the Rarotonga Treaty will encourage South-East Asian developments. There are already some signs that this is the case. Indonesia, which along with Malaysia, is promoting the concept in South-East Asia, has welcomed the Rarotonga Treaty.[28] Officials of the Association of South East Asian Nations (ASEAN)[29] have also been studying the South Pacific initiative.[30]

Notes and references

[1] The 13 member states of the South Pacific Forum are Australia, the Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Niue, Papua New Guinea, the Solomon Islands, Tonga, Tuvalu, Vanuatu and Samoa.

[2] See Beard, P., 'Paris snub prompts Hayden to seek Pacific nuclear-free zone', *The Australian*, 13 May 1983, p. 4; and 'Speech by the Australian Prime Minister, the Hon. R. J. Hawke, AC, MP to the Washington Press Club, Washington, 15 June 1983', paragraph 53, reported in Australian Department of Foreign Affairs, *Backgrounder*, 22 June 1983, Annex 1.

[3] For a more detailed explanation of the positions of Pacific Island countries, see Fry, G. E., 'Australia, New Zealand and arms control in the Pacific region', in D. Ball (ed.), *The ANZAC Connection* (George Allen & Unwin: Sydney, 1985), pp. 106–8.

[4] See, for example, Davis, T., 'Forum rejects nuclear-free zone proposal', *The Age*, 31 Aug. 1983, p. 1; and Brammall, C., 'Melanesian alliance begins to flex its political muscle', *Canberra Times*, 6 Sep. 1983, p. 2.

[5] 'Lange allows nuclear transit', *Dominion*, 3 June 1983; transcript of interview between Mr Lange and Mr Tanaka of Asahi Shimbun, 22 Aug. 1984; and Clark, H. (M.P.), 'Establishing a nuclear-free zone in the South Pacific', Address to the Twentieth Foreign Policy School, Otago University, 18 May 1985, pp. 6–7.

[6] Communique of the Fifteenth South Pacific Forum, Funafuti, Tuvalu, 27–8 Aug. 1984, Canberra, Department of Foreign Affairs, *News Release*, 29 Aug. 1984.

[7] See Malone, P., 'Reservations on N-free zone', *Canberra Times*, 3 Aug. 1985, p. 9; Cockburn, M., 'Nearly ready for a nuclear-free Pacific', *Sydney Morning Herald*, 7 Aug. 1985, p. 1; and 'Nuclear ships row on boil at ASEAN', *Sydney Morning Herald*, 11 July 1985, p. 1.

[8] See, for example, South Pacific Forum Communiques 1971–85, reported in *Australian Foreign Affairs' Record*, Canberra, 1971–85.

[9] 'Sixth South Pacific Forum: press communique', Nuku'alofa, Tonga, July 1975, p. 3; and Alley, R., *Nuclear-Weapon-Free Zones: The South Pacific Proposal* (The Stanley Foundation: Muscatine, IA, 1977), pp. 27–36.

[10] Australian Labor Party, *1982 Platform, Constitution and Rules*, Canberra, pp. 70, 81; and Hamel-Green, M., *Future for the South Pacific: Nuclear Free*, Peace Dossier 8 (Victorian Association for Peace Studies: Melbourne, Dec. 1983), pp. 6–7.

[11] South Pacific Nuclear Free Zone Treaty, Article 7.

[12] Brammall, C., 'Now it's "nuclear weaponry free"', *Canberra Times*, 31 Aug. 1983, p. 1.

[13] South Pacific Nuclear Free Zone Treaty, Article 3.

[14] South Pacific Nuclear Free Zone Treaty, Articles 1, 5.

[15] South Pacific Nuclear Free Zone Treaty, Article 6.

[16] South Pacific Nuclear Free Zone Treaty, Article 1.

[17] South Pacific Nuclear Free Zone Treaty, Article 5.
[18] South Pacific Nuclear Free Zone Treaty, Article 2.
[19] South Pacific Nuclear Free Zone Treaty, Article 1.
[20] South Pacific Nuclear Free Zone Treaty, Protocol 1.
[21] South Pacific Nuclear Free Zone Treaty, Annex 1.
[22] South Pacific Nuclear Free Zone Treaty, Articles 8, 9.
[23] Bull, H., *The Control of the Arms Race: Disarmament and Arms Control in the Missile Age*, 2nd ed. (Praeger: New York, 1965), appendix: 'The problem of sanctions', pp. 215–35.
[24] Hu Yaobang, Address to the National Press Club, Canberra, 16 Apr. 1985.
[25] Cockburn, M. and Buckely, A., 'Pacific treaty has US worried', *Sydney Morning Herald*, 8 Aug. 1985, p. 1; and Grattan, M., 'Hawke courts Kudos for N-free treaty', *The Age*, 7 Aug. 1985, p. 1.
[26] 'Vallentine, Peacock condemn agreement', *The Australian*, 8 Aug. 1985, p. 5; and Conkey, H., 'Opposition criticised on nuclear-free zone views', *Canberra Times*, 16 May 1985, p. 11.
[27] See, Ball, D., 'Australia and nuclear policy', in D. Ball (ed.), *Strategy and Defence: Australian Essays* (George Allen & Unwin: London, 1982), pp. 320–7.
[28] See Peter Hastings' interview with the Indonesian Foreign Minister, Dr Mochtar Kusumaatmadja, *Sydney Morning Herald*, 16 Aug. 1985, p. 11.
[29] ASEAN comprises Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand, and was formed in 1967.
[30] Clad, J., 'No nukes maybe', *Far Eastern Economic Review*, 28 Mar. 1985, p. 42.

Appendix 21A. The South Pacific Nuclear Free Zone Treaty

Preamble

The Parties to this Treaty,

United in their commitment to a world at peace;

Gravely concerned that the continuing nuclear arms race presents the risk of nuclear war which would have devastating consequences for all people;

Convinced that all countries have an obligation to make every effort to achieve the goal of eliminating nuclear weapons, the terror which they hold for humankind and the threat which they pose to life on earth;

Believing that regional arms control measures can contribute to global efforts to reverse the nuclear arms race and promote the national security of each country in the region and the common security of all;

Determined to ensure, so far as lies within their power, that the bounty and beauty of the land and sea in their region shall remain the heritage of their peoples and their descendants in perpetuity to be enjoyed by all in peace;

Reaffirming the importance of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in preventing the proliferation of nuclear weapons and in contributing to world security;

Noting, in particular, that Article VII of the NPT recognizes the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories;

Noting that the prohibitions of emplantation and emplacement of nuclear weapons on the seabed and the ocean floor and in the subsoil thereof contained in the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof apply in the South Pacific;

Noting also that the prohibition of testing of nuclear weapons in the atmosphere or under water, including territorial waters or high seas, contained in the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water applies in the South Pacific;

Determined to keep the region free of environmental pollution by radioactive wastes and other radioactive matter;

Guided by the decision of the Fifteenth South Pacific Forum at Tuvalu that a nuclear free zone should be established in the region at the earliest possible opportunity in accordance with the principles set out in the communiqué of that meeting;

Have agreed as follows:

Article 1

Usage of terms

For the purposes of this Treaty and its Protocols:

(a) 'South Pacific Nuclear Free Zone' means the areas described in Annex 1 as illustrated by the map attached to that Annex;

(b) 'territory' means internal waters, territorial sea and archipelagic waters, the seabed and subsoil beneath, the land territory and the airspace above them;

(c) 'nuclear explosive device' means any nuclear weapon or other explosive device

capable of releasing nuclear energy, irrespective of the purpose for which it could be used. The term includes such a weapon or device in unassembled and partly assembled forms, but does not include the means of transport or delivery of such a weapon or device if separable from and not an indivisible part of it;

(d) 'stationing' means emplantation, emplacement, transportation on land or inland waters, stockpiling, storage, installation and deployment.

Article 2

Application of the Treaty

1. Except where otherwise specified, this Treaty and its Protocols shall apply to territory within the South Pacific Nuclear Free Zone.
2. Nothing in this Treaty shall prejudice or in any way affect the rights, or the exercise of the rights, of any State under international law with regard to freedom of the seas.

Article 3

Renunciation of nuclear explosive devices

Each Party undertakes:

(a) not to manufacture or otherwise acquire, possess or have control over any nuclear explosive device by any means anywhere inside or outside the South Pacific Nuclear Free Zone;

(b) not to seek or receive any assistance in the manufacture or acquisition of any nuclear explosive device;

(c) not to take any action to assist or encourage the manufacture or acquisition of any nuclear explosive device by any State.

Article 4

Peaceful nuclear activities

Each Party undertakes:

(a) not to provide source or special fissionable material, or equipment or material especially designed or prepared for the processing, use or production of special fissionable material for peaceful purposes to:

(i) any non-nuclear-weapon State unless subject to the safeguards required by Article III.1 of the NPT, or

(ii) any nuclear-weapon State unless subject to applicable safeguards agreements with the International Atomic Energy Agency (IAEA).

Any such provisions shall be in accordance with strict non-proliferation measures to provide assurance of exclusively peaceful non-explosive use;

(b) to support the continued effectiveness of the international non-proliferation system based on the NPT and IAEA safeguards system.

Article 5

Prevention of stationing of nuclear explosive devices

1. Each Party undertakes to prevent in its territory the stationing of any nuclear explosive device.
2. Each Party in the exercise of its sovereign rights remains free to decide for itself whether to allow visits by foreign ships and aircraft to its ports and airfields, transit of its airspace by foreign aircraft, and navigation by foreign ships in its territorial sea or

archipelagic waters in a manner not covered by the rights of innocent passage, archipelagic sea lane passage or transit passage of straits.

Article 6

Prevention of testing of nuclear explosive devices

Each Party undertakes:

(a) to prevent in its territory the testing of any nuclear explosive device;

(b) not to take any action to assist or encourage the testing of any nuclear explosive device by any State.

Article 7

Prevention of dumping

1. Each Party undertakes:

(a) not to dump radioactive wastes and other radioactive matter at sea anywhere within the South Pacific Nuclear Free Zone;

(b) to prevent the dumping of radioactive wastes and other radioactive matter by anyone in its territorial sea;

(c) not to take any action to assist or encourage the dumping by anyone of radioactive wastes and other radioactive matter at sea anywhere within the South Pacific Nuclear Free Zone;

(d) to support the conclusion as soon as possible of the proposed Convention relating to the protection of the natural resources and environment of the South Pacific region and its Protocol for the prevention of pollution of the South Pacific region by dumping, with the aim of precluding dumping at sea of radioactive wastes and other radioactive matter by anyone anywhere in the region.

2. Paragraphs 1(a) and 1(b) of this Article shall not apply to areas of the South Pacific Nuclear Free Zone in respect of which such a Convention and Protocol have entered into force.

Article 8

Control system

1. The Parties hereby establish a control system for the purpose of verifying compliance with their obligations under this Treaty.

2. The control system shall comprise:

(a) reports and exchange of information as provided for in Article 9;

(b) consultations as provided for in Article 10 and Annex 4(1);

(c) the application to peaceful nuclear activities of safeguards by the IAEA as provided for in Annex 2;

(d) a complaints procedure as provided for in Annex 4.

Article 9

Reports and exchanges of information

1. Each Party shall report to the Director of the South Pacific Bureau for Economic Co-operation (the Director) as soon as possible any significant event within its jurisdiction affecting the implementation of this Treaty. The Director shall circulate such reports promptly to all Parties.

2. The Parties shall endeavour to keep each other informed on matters arising under or

in relation to this Treaty. They may exchange information by communicating it to the Director, who shall circulate it to all Parties.
3. The Director shall report annually to the South Pacific Forum on the status of this Treaty and matters arising under or in relation to it, incorporating reports and communications made under paragraphs 1 and 2 of this Article and matters arising under Articles 8(2)(d) and 10 and Annex 2(4).

Article 10

Consultations and review

Without prejudice to the conduct of consultations among Parties by other means, the Director, at the request of any Party, shall convene a meeting of the Consultative Committee established by Annex 3 for consultation and co-operation on any matter arising in relation to this Treaty or for reviewing its operation.

Article 11

Amendment

The Consultative Committee shall consider proposals for amendment of the provisions of this Treaty proposed by any Party and circulated by the Director to all Parties not less than three months prior to the convening of the Consultative Committee for this purpose. Any proposal agreed upon by consensus by the Consultative Committee shall be communicated to the Director who shall circulate it for acceptance to all Parties. An amendment shall enter into force thirty days after receipt by the depositary of acceptances from all Parties.

Article 12

Signature and ratification

1. This Treaty shall be open for signature by any Member of the South Pacific Forum.
2. This Treaty shall be subject to ratification. Instruments of ratification shall be deposited with the Director who is hereby designated depositary of this Treaty and its Protocols.
3. If a Member of the South Pacific Forum whose territory is outside the South Pacific Nuclear Free Zone becomes a Party to this Treaty, Annex 1 shall be deemed to be amended so far as is required to enclose at least the territory of that Party within the boundaries of the South Pacific Nuclear Free Zone. The delineation of any area added pursuant to this paragraph shall be approved by the South Pacific Forum.

Article 13

Withdrawal

1. This Treaty is of a permanent nature and shall remain in force indefinitely, provided that in the event of a violation by any Party of a provision of this Treaty essential to the achievement of the objectives of the Treaty or of the spirit of the Treaty, every other Party shall have the right to withdraw from the Treaty.
2. Withdrawal shall be effected by giving notice twelve months in advance to the Director who shall circulate such notice to all other Parties.

Article 14

Reservations

This Treaty shall not be subject to reservations.

Article 15

Entry into force

1. This Treaty shall enter into force on the date of deposit of the eighth instrument of ratification.
2. For a signatory which ratifies this Treaty after the date of deposit of the eighth instrument of ratification, the Treaty shall enter into force on the date of deposit of its instrument of ratification.

Article 16

Depositary functions

The depositary shall register this Treaty and its Protocols pursuant to Article 102 of the Charter of the United Nations and shall transmit certified copies of the Treaty and its Protocols to all Members of the South Pacific Forum and all States eligible to become Party to the Protocols to the Treaty and shall notify them of signatures and ratifications of the Treaty and its Protocols.

IN WITNESS WHEREOF the undersigned, being duly authorized by their Governments, have signed this Treaty.

DONE at Rarotonga, this sixth day of August, One thousand nine hundred and eighty five, in a single original in the English language.

Annex 1 South Pacific Nuclear Free Zone

A. The area bounded by a line:
   (1) commencing at the point of intersection of the Equator by the maritime boundary between Indonesia and Papua New Guinea;
   (2) running thence northerly along that maritime boundary to its intersection by the outer limit of the exclusive economic zone of Papua New Guinea;
   (3) thence generally north-easterly, easterly and south-easterly along that outer limit to its intersection by the Equator;
   (4) thence east along the Equator to its intersection by the meridian of Longitude 163 degrees East;
   (5) thence north along that meridian to its intersection by the parallel of Latitude 3 degrees North;
   (6) thence east along that parallel to its intersection by the meridian of Longitude 171 degrees East;
   (7) thence north along that meridian to its intersection by the parallel of Latitude 4 degrees North;
   (8) thence east along that parallel to its intersection by the meridian of Longitude 180 degrees East;
   (9) thence south along that meridian to its intersection by the Equator;
   (10) thence east along the Equator to its intersection by the meridian of Longitude 165 degrees West;

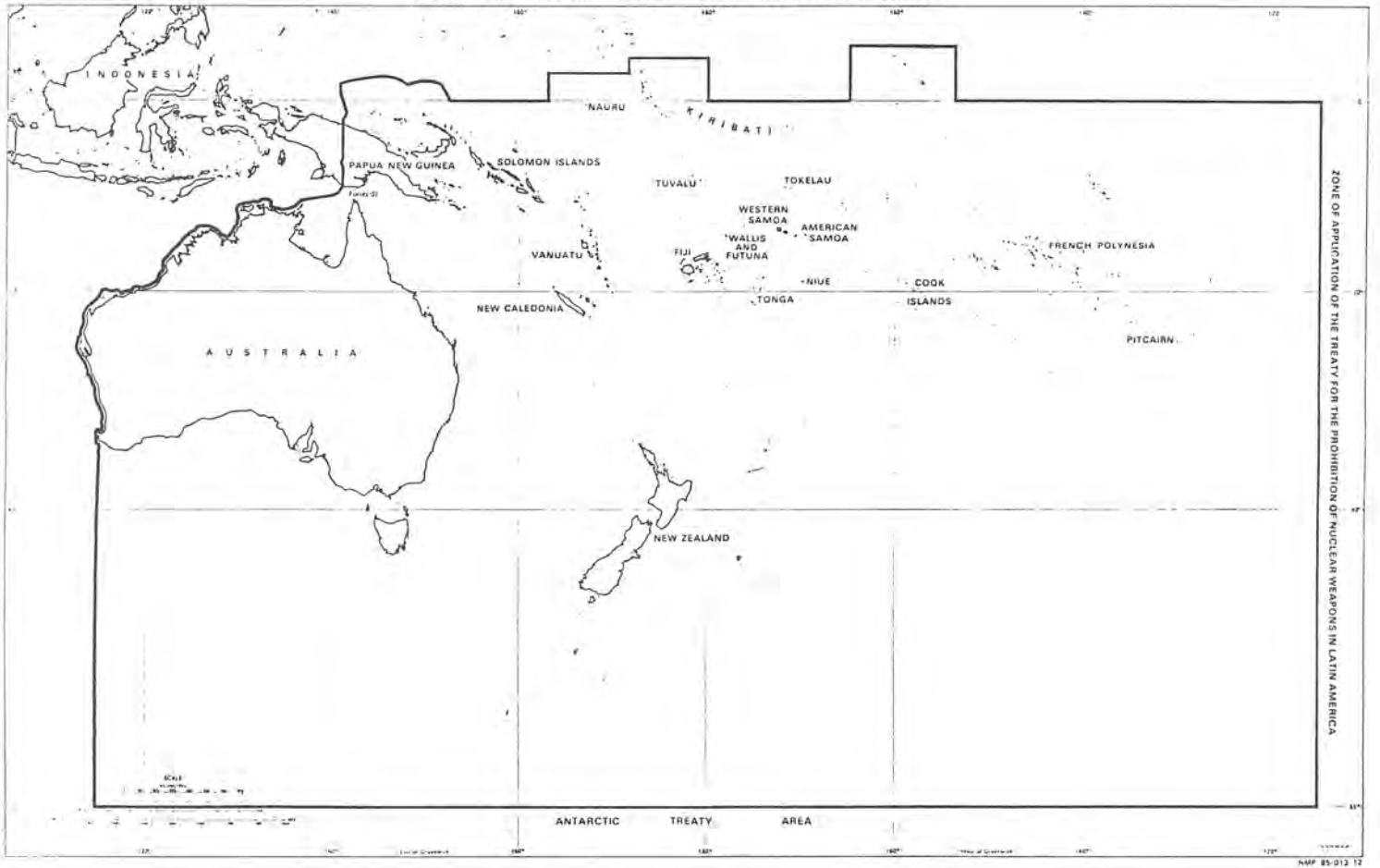
(11) thence north along that meridian to its intersection by the parallel of Latitude 5 degrees 30 minutes North;
(12) thence east along that parallel to its intersection by the meridian of Longitude 154 degrees West;
(13) thence south along that meridian to its intersection by the Equator;
(14) thence east along the Equator to its intersection by the meridian of Longitude 115 degrees West;
(15) thence south along that meridian to its intersection by the parallel of Latitude 60 degrees South;
(16) thence west along that parallel to its intersection by the meridian of Longitude 115 degrees East;
(17) thence north along that meridian to its southermost intersection by the outer limit of the territorial sea of Australia;
(18) thence generally northerly and easterly along the outer limit of the territorial sea of Australia to its intersection by the meridian of Longitude 136 degrees 45 minutes East;
(19) thence north-easterly along the geodesic to the point of Latitude 10 degrees 50 minutes South, Longitude 139 degrees 12 minutes East;
(20) thence north-easterly along the maritime boundary between Indonesia and Papua New Guinea to where it joins the land border between those two countries;
(21) thence generally northerly along that land border to where it joins the maritime boundary between Indonesia and Papua New Guinea, on the northern coastline of Papua New Guinea; and
(22) thence generally northerly along that boundary to the point of commencement.

B. The areas within the outer limits of the territorial seas of all Australian islands lying westward of the area described in paragraph A and north of Latitude 60 degrees South, provided that any such areas shall cease to be part of the South Pacific Nuclear Free Zone upon receipt by the depositary of written notice from the Government of Australia stating that the areas have become subject to another treaty having an object and purpose substantially the same as that of this Treaty.

Annex 2 IAEA Safeguards

1. The safeguards referred to in Article 8 shall in respect of each Party be applied by the IAEA as set forth in an agreement negotiated and concluded with the IAEA on all source or special fissionable material in all peaceful nuclear activities within the territory of the Party, under its jurisdiction or carried out under its control anywhere.
2. The agreement referred to in paragraph 1 shall be, or shall be equivalent in its scope and effect to, an agreement required in connection with the NPT on the basis of the material reproduced in document INFCIRC/153 (Corrected) of the IAEA. Each Party shall take all appropriate steps to ensure that such an agreement is in force for it not later than 18 months after the date of entry into force for that Party of this Treaty.
3. For the purposes of this Treaty, the safeguards referred to in paragraph 1 shall have as their purpose the verification of the non-diversion of nuclear material from peaceful nuclear activities to nuclear explosive devices.
4. Each Party agrees upon the request of any other Party to transmit to that Party and to the Director for the information of all Parties a copy of the overall conclusions of the most recent report by the IAEA on its inspection activities in the territory of the Party concerned, and to advise the Director promptly of any subsequent findings of the Board

ATTACHMENT TO ANNEX 1 TO THE SOUTH PACIFIC NUCLEAR FREE ZONE TREATY:—
ILLUSTRATIVE MAP
(Australian islands in the Indian Ocean, which are also part of the South Pacific Nuclear Free Zone, are not shown)



of Governors of the IAEA in relation to those conclusions for the information of all Parties.

Annex 3 Consultative Committee

1. There is hereby established a Consultative Committee which shall be convened by the Director from time to time pursuant to Articles 10 and 11 and Annex 4(2). The Consultative Committee shall be constituted of representatives of the Parties, each Party being entitled to appoint one representative who may be accompanied by advisers. Unless otherwise agreed, the Consultative Committee shall be chaired at any given meeting by the representative of the Party which last hosted the meeting of Heads of Government of Members of the South Pacific Forum. A quorum shall be constituted by representatives of half the Parties. Subject to the provisions of Article 11, decisions of the Consultative Committee shall be taken by consensus or, failing consensus, by a two-thirds majority of those present and voting. The Consultative Committee shall adopt such other rules of procedure as it sees fit.
2. The costs of the Consultative Committee, including the costs of special inspections pursuant to Annex 4, shall be borne by the South Pacific Bureau for Economic Co-operation. It may seek special funding should this be required.

Annex 4 Complaints Procedure

1. A Party which considers that there are grounds for a complaint that another Party is in breach of its obligations under this Treaty shall, before bringing such a complaint to the Director, bring the subject matter of the complaint to the attention of the Party complained of and shall allow the latter reasonable opportunity to provide it with an explanation and to resolve the matter.
2. If the matter is not so resolved, the complainant Party may bring the complaint to the Director with a request that the Consultative Committee be convened to consider it. Complaints shall be supported by an account of evidence of breach of obligations known to the complainant Party. Upon receipt of a complaint the Director shall convene the Consultative Committee as quickly as possible to consider it.
3. The Consultative Committee, taking account of efforts made under paragraph 1, shall afford the Party complained of a reasonable opportunity to provide it with an explanation of the matter.
4. If, after considering any explanation given to it by the representatives of the Party complained of, the Consultative Committee decides that there is sufficient substance in the complaint to warrant a special inspection in the territory of that Party or elsewhere, the Consultative Committee shall direct that such special inspection be made as quickly as possible by a special inspection team of three suitably qualified special inspectors appointed by the Consultative Committee in consultation with the complained of and complainant Parties, provided that no national of either Party shall serve on the special inspection team. If so requested by the Party complained of, the special inspection team shall be accompanied by representatives of that Party. Neither the right of consultation on the appointment of special inspectors, nor the right to accompany special inspectors, shall delay the work of the special inspection team.
5. In making a special inspection, special inspectors shall be subject to the direction only of the Consultative Committee and shall comply with such directives concerning tasks, objectives, confidentiality and procedures as may be decided upon by it. Directives shall take account of the legitimate interests of the Party complained of in complying with its other international obligations and commitments and shall not duplicate safeguards

procedures to be undertaken by the IAEA pursuant to agreements referred to in Annex 2(1). The special inspectors shall discharge their duties with due respect for the laws of the Party complained of.

6. Each Party shall give to special inspectors full and free access to all information and places within its territory which may be relevant to enable the special inspectors to implement the directives given to them by the Consultative Committee.

7. The Party complained of shall take all appropriate steps to facilitate the special inspection, and shall grant to special inspectors privileges and immunities necessary for the performance of their functions, including inviolability for all papers and documents and immunity from arrest, detention and legal process for acts done and words spoken and written, for the purpose of the special inspection.

8. The special inspectors shall report in writing as quickly as possible to the Consultative Committee, outlining their activities, setting out relevant facts and information as ascertained by them, with supporting evidence and documentation as appropriate, and stating their conclusions. The Consultative Committee shall report fully to all Members of the South Pacific Forum, giving its decision as to whether the Party complained of is in breach of its obligations under this Treaty.

9. If the Consultative Committee has decided that the Party complained of is in breach of its obligations under this Treaty, or that the above provisions have not been complied with, or at any time at the request of either the complainant or complained of Party, the Parties shall meet promptly at a meeting of the South Pacific Forum.

Protocol 1

The Parties to this Protocol,

Noting the South Pacific Nuclear Free Zone Treaty (the Treaty)

Have Agreed as follows:

Article 1

Each Party undertakes to apply, in respect of the territories for which it is internationally responsible situated within the South Pacific Nuclear Free Zone, the prohibitions contained in Articles 3, 5 and 6, in so far as they relate to the manufacture, stationing and testing of any nuclear explosive device within those territories, and the safeguards specified in Article 8(2)(c) and Annex 2 of the Treaty.

Article 2

Each Party may, by written notification to the depositary, indicate its acceptance from the date of such notification of any alteration to its obligations under this Protocol brought about by the entry into force of an amendment to the Treaty pursuant to Article 11 of the Treaty.

Article 3

This Protocol shall be open for signature by France, the United Kingdom of Great Britain and Northern Ireland and the United States of America.

Article 4

This Protocol shall be subject to ratification.

Article 5

This Protocol shall enter into force for each State on the date of its deposit with the depositary of its instrument of ratification.

IN WITNESS WHEREOF the undersigned, being duly authorized by their Governments, have signed this Protocol.

DONE at , this day of , One thousand nine hundred and eighty- , in a single original in the English language.

Protocol 2

The Parties to this Protocol

Noting the South Pacific Nuclear Free Zone Treaty (the Treaty)

Have Agreed as follows:

Article 1

Each Party undertakes not to contribute to any act which constitutes a violation of the Treaty or its Protocols by Parties to them.

Article 2

Each Party further undertakes not to use or threaten to use any nuclear explosive device against:

(a) Parties to the Treaty; or

(b) any territory within the South Pacific Nuclear Free Zone for which a State that has become a Party to Protocol 1 is internationally responsible.

Article 3

Each Party may, by written notification to the depositary, indicate its acceptance from the date of such notification of any alteration to its obligations under this Protocol brought about by the entry into force of an amendment to the Treaty pursuant to Article 11 of the Treaty or by the extension of the South Pacific Nuclear Free Zone pursuant to Article 12(3) of the Treaty.

Article 4

This Protocol shall be open for signature by France, the People's Republic of China, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America.

Article 5

This Protocol shall be subject to ratification.

Article 6

This Protocol shall enter into force for each State on the date of its deposit with the depositary of its instrument of ratification.

IN WITNESS WHEREOF the undersigned, being duly authorized by their Governments, have signed this Protocol.

DONE at , this day of , One thousand nine hundred and eighty- , in a single original in the English language.

Protocol 3

The Parties to this Protocol

Noting the South Pacific Nuclear Free Zone Treaty (the Treaty)

Have Agreed as follows:

Article 1

Each Party undertakes not to test any nuclear explosive device anywhere within the South Pacific Nuclear Free Zone.

Article 2

Each Party may, by written notification to the depositary, indicate its acceptance from the date of such notification of any alteration to its obligation under this Protocol brought about by the entry into force of an amendment to the Treaty pursuant to Article 11 of the Treaty or by the extension of the South Pacific Nuclear Free Zone pursuant to Article 12(3) of the Treaty.

Article 3

This Protocol shall be open for signature by France, the People's Republic of China, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America.

Article 4

This Protocol shall be subject to ratification.

Article 5

This Protocol shall enter into force for each State on the date of its deposit with the depositary of its instrument of ratification.

IN WITNESS WHEREOF the undersigned, being duly authorized by their Governments, have signed this Protocol.

DONE at , this day of , One thousand nine hundred and eighty- , in a single original in the English language.

Source: Conference on Disarmament document CD/633, 16 Aug. 1985.

Appendix 21B. Comparison of arms control commitments in the Treaty of Rarotonga and the Treaty of Tlatelolco

JOZEF GOLDBLAT and SVERRE LODGAARD

The 1985 Treaty of Rarotonga establishing a nuclear-free zone in the South Pacific is modelled on the 1967 Treaty of Tlatelolco proscribing nuclear weapons in Latin America. A comparison between these two treaties, as has been made to some extent in the analysis in chapter 21, is therefore useful and instructive. The comments which follow are intended to complement this exercise.

In some ways, the scope of the Treaty of Rarotonga seems to be broader than that of the Treaty of Tlatelolco: the latter allows explosions of nuclear devices for peaceful purposes, while the former prohibits the testing of *any* nuclear explosive device. However, the conditions attached to the relevant clause in the Treaty of Tlatelolco are interpreted by most countries as prohibiting the very manufacture of nuclear explosive devices for peaceful purposes unless or until nuclear devices are developed which cannot be used as weapons—a condition which is not likely ever to be fulfilled.

Unlike the Treaty of Tlatelolco, the Treaty of Rarotonga prohibits the dumping of radioactive wastes and other radioactive material at sea; this measure, however, belongs to the body of law for the protection of the environment rather than to arms control.

On the other hand, the geographical extent of the Latin American zone is considerably larger than that of the South Pacific zone. Although it claims to have set up a nuclear-free zone stretching to the border of the Latin American nuclear weapon-free zone in the east, and to the border of the Antarctic demilitarized zone in the south, the Treaty of Rarotonga bans the presence of nuclear weapons only within the territories of South Pacific states, up to the 12-mile territorial sea limit. It does not even seek, through an additional protocol or otherwise, to have nuclear weapon prohibitions applied to the larger ocean area. The zone of application of the Treaty of Tlatelolco, however, would, upon fulfilment of certain requirements, include large areas in the Atlantic and the Pacific Oceans, hundreds of kilometres off the coasts of Latin America, in addition to the territories of the countries concerned. The requirements, most of which have already been met, are: adherence to the treaty by all states in the region; adherence to additional protocols by all states to which they are open for signature; and the conclusion of safeguards agreements with the International Atomic Energy Agency (IAEA). International law regarding the freedom of the seas did not stand in the way of banning nuclear weapons from the high seas under the Treaty of Tlatelolco. There seems to be no reason why it should have obstructed introducing a similar restriction into the Treaty of Rarontonga or at least asking nuclear weapon powers to accept the restriction voluntarily in a separate document.

Any arms control commitment undertaken by sovereign states involves some agreed limitations on freedoms otherwise exercised by those states, and the sea environment is no exception. Indeed, all nuclear weapon powers have assumed an obligation to respect the statute of denuclearization of Latin America as 'delimited' in the treaty, that is, covering the designated portions of the high seas. Further, the 1971 treaty prohibiting the placement of nuclear weapons on the sea-bed and ocean floor under the high

seas (Sea-Bed Treaty) has been ratified by all the major nuclear weapon powers.

Both treaties provide, in an additional protocol, for an undertaking to be contracted by the nuclear weapon states not to use or threaten to use nuclear weapons against the parties. This requirement was fully warranted in the Treaty of Tlatelolco, signed more than 19 years ago. It seems, however, redundant in the Treaty of Rarotonga, because in the meantime all the nuclear weapon states have unilaterally, but formally, made non-use pledges. China undertook 'unconditionally' not to use or threaten to use nuclear weapons against non-nuclear countries and nuclear-free zones. Also the Soviet Union gave assurances of never using nuclear weapons against states which had renounced the production and acquisition of such weapons and did not have them on their territories. The Western nuclear weapon powers—the USA, the UK and France—which undertook not to use nuclear weapons against non-nuclear weapon states internationally committed not to acquire such weapons, attached a condition that nuclear weapon-free countries should not participate in an aggression against them or their allies in association with another nuclear weapon power. This condition, however, should not pose a problem for the South Pacific states, considering the political status of these states. Nonetheless, to ask the nuclear weapon powers to reiterate their pledges in an international multilateral legal instrument, rather than to refer to the already existing, voluntarily assumed obligations, could turn out to be counter-productive. In particular, the Soviet Union might hesitate to sign a protocol to the treaty which legalizes the presence in the Pacific area of communications and surveillance facilities serving US nuclear strategic systems, and which permits visits of nuclear-armed aircraft and naval units; all the more so, since the frequency and duration of such visits have not been limited.

It is true that the parties to the Treaty of Tlatelolco, too, consider it to be their prerogative to grant or deny permission for transit of nuclear weapons. However, in ratifying the relevant protocol to this treaty, the Soviet Union made a statement (equivalent to a reservation) that authorizing the transit of nuclear weapons in *any form* would be incompatible with the non-nuclear weapon status of the parties. It is unlikely that the USSR would take a different position with regard to the Pacific region, which is of greater strategic importance to it than the Latin American region precisely because of the increasing US nuclear presence there.

These qualifications do not detract from the value of the Treaty of Rarotonga as a measure intended to prevent further nuclearization of the South Pacific region and to strengthen thereby the global nuclear non-proliferation regime.

22. The Central American crisis and the Contadora search for regional security

JOZEF GOLDBLAT and VICTOR MILLÁN

Superscript numbers refer to the list of notes and references at the end of the chapter.

I. Background

Since the late 1970s, Central America—a region in continuous crisis—has become an area of particular concern in the western hemisphere. Such dramatic events as the revolution in Nicaragua, the civil wars in El Salvador and Guatemala, Panama's assertion of national sovereignty over the Canal Zone and the transition towards civilian rule in Honduras and Guatemala have all marked progress by the Central Americans in shaping their own destiny. Recently, however, the situation in the region has become exceedingly complex owing to the increased interference by the United States, the Soviet Union and Cuba in the internal and interstate conflicts.

Cuba has become involved in the conflicts by providing material and political help as well as military advice to revolutionary movements in Central America. The USSR has become a major actor because of its military presence in Cuba and the economic and military assistance it gives to Nicaragua. The USA felt provoked not only by Nicaragua's close relationship with 'enemy' states—Cuba and the Soviet Union—but also by the support which these states provide to insurgents in El Salvador and to similar groups in neighbouring states.

The United States is clearly afraid that the emergence of new unfriendly regimes in the region would further weaken its position, already shaken by the revolutionary changes in Cuba and Nicaragua. This may explain why, for the first time since the USA withdrew from Nicaragua some 50 years ago, US Marines have established themselves in Central America for extended, massive military exercises in the vicinity of Nicaragua. The country has been to some extent isolated from Western aid, and attempts have been made to cut it off from the rest of the world by, among other means, mining its harbours. Material and political assistance is given to the forces which are seeking to overthrow the country's Sandinista Government or bring about its capitulation. When Nicaragua complained to the International Court of Justice (ICJ) that the United States was acting in violation of international law, the Court ordered on 10 May 1984 that, pending its final decision, the USA should cease and refrain from any action 'restricting, blocking or endangering access to or from Nicaraguan ports, and, in particular, the laying of mines'. The ICJ also indicated that the right of Nicaragua to sovereignty and political independence should not 'in any way' be jeopardized by military and paramilitary activities, and appealed to both parties not to take any action which might aggravate or extend the dispute.[1] In response to the ICJ order, the

USA first announced that it would not participate in the case brought against it by Nicaragua and subsequently, on 7 October 1985, decided to withdraw its recognition of the Court's compulsory jurisdiction in *all* legal disputes.[2]

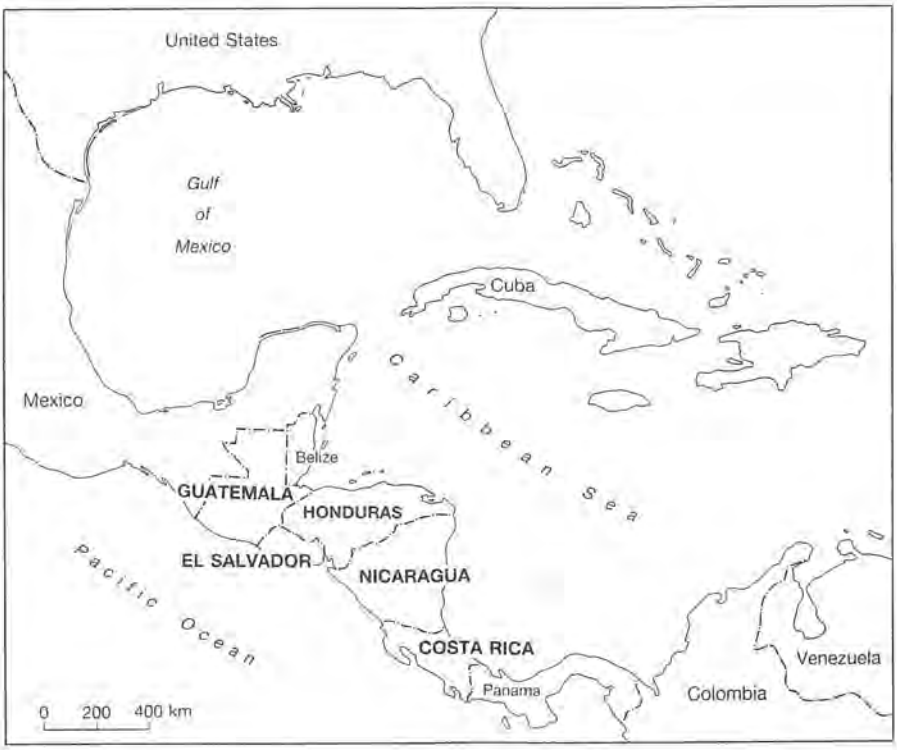
The US Administration has also set as one of its objectives a 'favourable' outcome of the civil war in El Salvador. This is consistent with the conclusion of a US national bipartisan commission, set up in 1983, that 'the future of Central America will depend in large part on what happens in El Salvador'.[3] Nevertheless, despite the withdrawal of the military from the government, direct presidential elections, and the dialogue between a government commission and guerrilla representatives, the war in El Salvador continues.

The situation is not likely to improve as long as the US Administration regards Central America as just one of the fronts in the general confrontation between East and West, rather than a region in which domestic issues, mainly poverty, social injustice and lack of democratic political structures, generate internal struggle. This has been well understood by the so-called Contadora Group of Latin American states—Colombia, Mexico, Panama and Venezuela—states which have the closest geographical, political and diplomatic ties with Central America, and which since the 1983 meeting on the Panamanian island of Contadora have been making strenuous efforts outside the inter-American security system to bring peace to this troubled region through a negotiated agreement. The joint effort of these four countries reflects a considered view that current policies might lead to a full-scale interstate war, destabilizing the whole region and threatening thereby the relatively feeble political orders of the Contadora countries as well. The mediation efforts of the Contadora Group enjoy wide international sympathy. In particular, the governments of Argentina, Brazil, Peru and Uruguay decided in Lima, in July 1985, to form a Group of Support for the Contadora efforts. In addition, the foreign ministers of the non-aligned countries, meeting in September 1985 in Luanda, expressed their conviction that the Contadora Group represented an authentic regional initiative to solve the Central American crisis by political means. And, above all, the United Nations has repeatedly appealed to all states to co-operate in bringing to a conclusion the Contadora negotiating process.

The five Central American Isthmus countries whose approval is indispensable for any negotiated agreement are Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua. Some of them view US policy towards the region as unreliable, if not erratic, even though they need US support; others may be resentful of the excessive interest of the Contadora Four in their internal affairs. However, all want to avoid a generalized conflict.

In December 1985, Nicaragua requested that the Contadora process be suspended for six months. Subsequently, on 14 January 1986, it agreed to sign, together with the other four Isthmus countries, the so-called Guatemala declaration, which opened the possibility of resuming the negotiations earlier. The declaration actually endorsed the resolution adopted a few days before in Venezuela by the Contadora Group together with the Group of Support on new actions to be taken in the pursuit of peace in Central America. The first such action was the creation in February 1986 of a 'permanent' force charged

Figure 22.1. The Central American Isthmus and neighbouring countries



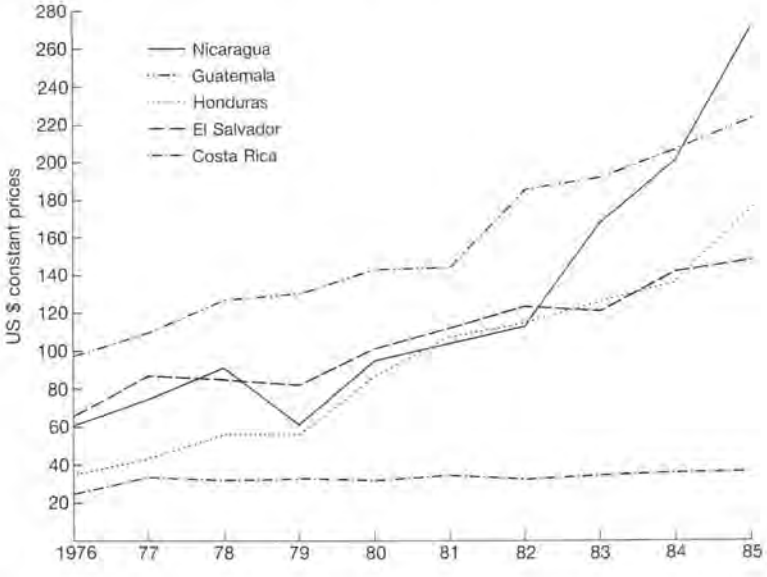
with keeping peace along the border between Costa Rica and Nicaragua.

The purpose of this study is, first, to describe the military situation on the Central American Isthmus and to indicate the magnitude of the indigenous forces that might become involved in a regional war; and, second, to summarize and briefly evaluate the proposals put forward by the Contadora Group to prevent such a war. Particular emphasis will therefore be placed on security aspects, including arms control.

II. Militarization of the Central American Isthmus

The civil war in El Salvador, sporadic flare-ups of violence in Guatemala, border clashes between Honduras and Nicaragua, continual incidents in the frontier area between Nicaragua and Costa Rica, as well as US policy towards Nicaragua, as described above, have triggered an unprecedented arms buildup in Central America and, at the same time, deepened the polarization of political forces within the states concerned. The indicators of this militarization process are examined below.[4] They include military spending, military personnel, insurgency forces, foreign military presence and military hardware. The figures are approximate but give an idea of the military situation in the region.

Figure 22.2. Military expenditure trends, 1976–85



Military expenditure

Poor economic growth and balance-of-payments deficits have not affected the trends of military spending in Central America.[5] The average annual rate of growth of military expenditures from 1981 to 1985 for all the countries of the Central American Isthmus was as high as 14 per cent, while for the previous four-year period it was 9.5 per cent. All these countries, with the exception of Costa Rica, devoted more than 20 per cent of their national budgets to military preparedness, while Nicaragua, which since the end of 1982 has been running a 'war economy', was reported in 1985 to be diverting over 38 per cent of the national budget and 60 per cent of public investment to military objectives.[6] With the exception of Costa Rica, which during the past decade has held its military spending under 1 per cent of the gross domestic product (GDP), all the other states have been steadily increasing their share.

Since the latter part of the 1970s, the Central American countries have been

Table 22.1. Military expenditures as percentage of GDP, 1976–84

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984
Costa Rica	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	(0.8)
El Salvador	1.7	2.0	2.1	(2.0)	2.8	3.7	4.4	4.4	(4.9)
Guatemala	1.5	1.5	1.7	1.7	1.8	1.9	[2.4]	(2.6)	(2.9)
Honduras	1.8	1.9	2.3	2.3	3.5	4.5	[5.0]	[5.7]	(6.0)
Nicaragua	2.1	2.5	3.2	[3.1]	4.4	[5.0]	(5.9)	(9.6)	[11.7]

Conventions
( ) Uncertain data; [ ] Estimate with a high degree of uncertainty.

in the grip of an economic crisis, as a result of which real per capita income in Costa Rica and Guatemala was in 1984 barely at the 1972 level; in Honduras, at the 1979 level; in Nicaragua, at the 1965 level; and in El Salvador, at the 1960 level. Military spending, however, has not suffered a decline. On the contrary, in 1984 Costa Rica's military spending was 180 per cent and Guatemala's 200 per cent greater than in 1972, while Honduras increased its military spending by 630 per cent above the 1970 level; Nicaragua, by 890 per cent above the 1965 level; and El Salvador, 680 per cent above the 1960 level.

Two other sources in addition to domestic spending—foreign borrowing and foreign security aid—have enabled these countries to maintain a high level of military activity. Thus, while in 1983 the domestic military budgets of Costa Rica, Guatemala, Honduras and El Salvador, combined, amounted to an estimated $530 million, US security assistance to these countries was approximately $550 million, with El Salvador being the largest recipient in Latin America (followed by Honduras).[7] Indeed, US military assistance to El Salvador in 1983 was equivalent to 55 per cent of this country's national budget and 15 per cent of its GDP. US security aid to all the four Isthmus countries from 1980 to 1985 exceeded $1 billion (US aid to Nicaragua was terminated in mid-1981).[8]

The Soviet Union is the main donor of military aid to the Sandinista regime of Nicaragua. According to US data, Soviet military aid to Nicaragua, from 1979 to 1982, totalled $125 million.[9] In 1983 alone, military deliveries from the Warsaw Treaty Organization (WTO) countries are said to have reached $115 million, and in 1984 about $250 million, bringing the cumulative amount from 1979 to 1984 to around $500 million.[10] According to national Nicaraguan sources, military aid received by Nicaragua from the Socialist countries during 1980–4 amounted to $350 million.[11]

Western military and military-related aid to Nicaragua has been given mainly by France and the Netherlands. France provided the Sandinistas with a $15 million credit to purchase two coastal patrol boats, two Alouette helicopters, 45 troop-transport vehicles, 100 missile launchers and 7000 anti-tank missiles, and most of these items were delivered in 1982 and 1983.[12] The Netherlands has provided a $5.5 million credit to help with port defence improvements at the Nicaraguan port of Corinto.[13] No figures are available for military deliveries from Libya and Algeria, the two other non-WTO countries providing assistance to Nicaragua.

Armed forces

The armed forces of the Central American Isthmus countries (combined) grew from 1979 to 1985 by 23 per cent a year, while the average annual growth of their populations for the same period was only 3 per cent. In the past decade, the total strength of the military personnel in these nations increased almost fourfold. In El Salvador, Guatemala, Honduras and Nicaragua there is compulsory military service for all male citizens between the ages of 18 and around 60, while in Costa Rica recruitment to the Guards is voluntary.[14]

Striking increases in manpower have occurred in the paramilitary forces of

Table 22.2 The size and growth of armed forces, 1979–85[a] (in thousands)

	1979	1980	1981	1982	1983	1984	1985	Increase of armed forces 1979–85 (%)	Average annual growth of armed forces 1979–85 (%)	Average annual growth of population 1979–85 (%)
Costa Rica[b]	3.0	4.0	5.0	6.0	7.0	9.5	12.6	*320*	*27.0*	*2.7*
El Salvador	11.0	12.0	15.9	25.0	30.0	37.5	43.0	*291*	*25.5*	*3.0*
Guatemala	14.0	16.0	19.0	22.0	25.0	30.0	40.0	*186*	*19.0*	*2.9*
Honduras	12.0	14.0	15.0	16.0	23.0	25.0	30.0	*150*	*16.0*	*3.5*
Nicaragua	13.0	15.0	20.0	25.0	35.0	45.0	60.0	*362*	*29.0*	*3.3*
Total	**53.0**	**61.0**	**75.0**	**94.0**	**120.0**	**147.0**	**186.0**	***260***	***23.3***	***3.0***

[a] Figures do not include paramilitary forces in El Salvador, Guatemala, Honduras and Nicaragua which in 1985 rose to more than 100 000 men and women in the four countries combined.

[b] According to the constitution, Costa Rica has no armed forces but civil guards.

Sources: *World Military Expenditures and Arms Transfers 1972–1982* (US Arms Control and Disarmament Agency: Washington, DC, Apr. 1984); *The Military Balance 1983–84* (IISS: London, 1983); *The Military Balance 1984–85* (IISS: London, 1984); English, A. J., *Armed Forces of Latin America* (Jane's: London, 1984); *Boletín Demográfico*, Centro Latinoamericano de Demografía (CELADE), Santiago de Chile, vol. 18, no. 35 (Jan. 1985), p. 2; SIPRI data.

El Salvador, Guatemala, Honduras and Nicaragua. Their numbers have grown by 820 per cent from 1979 to 1985, owing to the increased needs of the governments in power to sustain internal security and to suppress internal opposition.[15]

In Nicaragua, the National Guard, disbanded after the downfall of Somoza, was replaced by Border Guards (some 3000), the Sandinista Popular Militia performing internal security functions and serving as a reserve for the Army (40 000–60 000) and the Ministry of Interior Troops (some 2000). Given the constant external threat, Nicaragua, a country practically under siege, has built up an armed force, military and paramilitary, that is by far the largest in the region in terms of manpower.

There exist also non-governmental but often government-supported paramilitary forces in Central America, such as the death squads in Guatemala and El Salvador or the rural vigilant organization 'Orden' in El Salvador. Even Costa Rica has experienced a proliferation of right-wing paramilitary organizations, such as the 'Free Costa Rica Movement' and the 'Patriotic Union', the two groups (some 4000 members) which are responsible for several attacks inside the country on both governmental and non-governmental institutions and organizations.[16]

Insurgency forces

In the early 1960s, following the example of Fidel Castro in Cuba, the opposition in El Salvador, Guatemala, Honduras and Nicaragua were already forming some guerrilla units to fight the regimes in power. But economic development, though modest, fostered by the Alliance for Progress (initiated by the USA) and the Central American Common Market, along with some 'democratic opening' and the rise of middle-class political parties, dampened the guerrilla efforts. In the 1970s, however, widespread disillusion with the political processes (which involved repression), coupled with a sharp regional economic downturn, provided a climate favouring radical approaches. In the

Table 22.3. The insurgency forces, 1979–85 (in thousands)

Country	1979	1985	Growth (%)	Comments
El Salvador	3.0	>10.0	*>230*	
Guatemala	8.0	2.0	*–75*	
Honduras	c. 0.1	>0.2	insignificant	Not particularly active
Nicaragua	4–6	10–15	*150*	Operating from Honduras and Costa Rica

Sources: 'Organization and evolution of the Salvadoran insurgent movement', *Department of State Bulletin*, vol. 82 (May 1982); *Anti-Sandinista Insurgent Organizations* (US Defense Intelligence Agency: July 1982); Hopkins, J. W. (ed.), *Latin America and the Caribbean Contemporary Record* (Holmes and Meier: New York/London, 1983 and 1984), vol. 1: 1981–1982, Part Two, and vol. 2: 1982–1983, Part Two; *The Military Balance*, several issues (International Institute for Strategic Studies: London, 1979–85); SIPRI data.

Note: For details about the structure of the insurgency forces, see *The Jacobsen Report: Soviet Attitudes Towards Aid to and Contacts with Central American Revolutionaries*, released by the US State Department in Autumn 1984.

first half of the 1970s, important guerrilla groups emerged in El Salvador, Guatemala and Nicaragua, and in the late 1970s also in Honduras. After the 1979 triumph of the Sandinista Front of National Liberation (FSLN) in Nicaragua, insurgency activities have intensified in El Salvador, Guatemala and Honduras, while Nicaraguan exiles of all political shades, including ex-Somoza National Guardsmen and former Sandinistas, started using Honduran and Costa Rican territories as bases to launch armed attacks on Nicaragua.

Of all the insurgency forces in the region, the smallest, a few hundred, are those operating in Honduras. Until 1985 they have harassed US military advisers and installations, foreign embassies and government institutions, but without presenting a major threat to the Honduran military forces.[17]

The insurgency groups in Guatemala pursue the goal of overthrowing the existing social, economic and political structures and creating in their place a 'popular, democratic and revolutionary government'.[18] The Guatemalan insurgency forces are the only ones in the region whose numbers have decreased, mainly due to the counter-insurgency campaign started by the government in 1983.

The heaviest fighting in Central America is in El Salvador, where US-backed government forces and right-wing death squads have been fighting some 10 000 guerrillas, primarily the Farabundo Marti National Liberation Front (FMLN). The guerrillas control about 25 per cent of El Salvador's territory. The death toll since 1979 has exceeded 50 000 people, and the cost to the economy is estimated at $1200 million. The Salvadorean insurgency forces are well trained and armed with weapons from external sources and weapons captured from government troops.[19] They are led by people who were previously in high positions in labour and peasant unions or teachers' organizations, or who even occupied ministerial or army posts. Another distinctive feature of the Salvadorean situation is that in 1984, four years after the civil war started, the Salvadorean government officials formally met the leaders of the insurgency forces to find a political solution to the conflict. The Salvadorean opposition is grouped in two organizations: the politico-military organization—the FMLN mentioned above—and a federation of political and trade union movements —the FDR (Democratic Revolutionary Front). Since the end of 1980 all public statements from the opposition have been issued in the name of FMLN–FDR.

In Nicaragua, the counter-revolutionary bodies, the so-called contras fighting the Sandinista Government, are an amalgam of disparate forces unified only by opposition to the country's current rulers. There are 12 000–15 000 contras divided into three main guerrilla groups, all financed and equipped mainly by the US Administration and trained by the CIA. In February 1986, the Reagan Aministration requested from Congress an authorization for $100 million in aid, both military ($70 million) and non-military (or rather 'non-lethal'), to the Nicaraguan contras. The largest group, most closely linked to the USA, is the Nicaraguan Democratic Force (FDN), having its headquarters in Miami. It is composed mostly of former Somoza National Guardsmen, but it also includes conservative civilians, many of whom opposed Somoza during his

last year in power. The FDN forces operate from bases in Honduras along the Nicaraguan border, but since 1984 have been fighting also inside Nicaragua for longer periods than before. They use a wide range of weapons and equipment of US and Israeli origin, including light aircraft, transport aircraft, 60-mm mortars, 40-mm grenade launchers, light anti-tank weapons (bazookas), machine-guns, rifles and other small arms, field radios and other communications equipment, as well as anti-aircraft missiles of Soviet origin.[20]

The second group, the Democratic Revolutionary Alliance (ARDE)—less strong than the FDN and based mainly in Costa Rica—was originally an amalgam of the Sandino Revolutionary Front (founded by the disenchanted former Sandinista commander Eden Pastora), other veterans of the Nicaraguan revolution, and the Indian organization Misurasata (led by Brooklyn Rivera). ARDE troops constituted an effective fighting force until 1984, when a bomb exploded at a Pastora press conference in the jungles of Nicaragua near the Costa Rican border, wounding Pastora and disrupting ARDE's military leadership. During the summer of 1984, ARDE split, with several of its component groupings—most importantly the one led by another leader of the 1979 Nicaraguan revolution, Alfonso Robelo—allying with the FDN. Pastora still commands the loyalty of 2000–3000 fighters, but lack of funds and internal divisions have seriously hindered their effectiveness.[21]

The third group, based mainly in Honduras, is the Misura, a movement of Miskito Indians, who resent the Sandinista efforts to change their traditional way of life and are fighting for the recovery of their land and self-determination. They are heavily armed and pose a threat to the government troops stationed on the Atlantic coast.[22]

In addition, a group called United Nicaraguan Opposition (UNO) was set up in 1985, with the support of the USA, for the first time to co-ordinate political and military actions against the Nicaraguan Government.

The overall strength of the contras at the end of 1985 was pretended by their leaders to be 17 000. It was also claimed that their forces would reach 30 000 people under arms by mid-1986—'the strength we need to march on Managua'.[23] However, Sandinista intelligence sources and Honduran Army officers estimate the active fighting forces of the contras at just over 10 000. Nevertheless, since the war had already cost Nicaragua over 12 000 victims—killed, wounded or kidnapped (it was later stated by the Nicaraguan Minister of Defence that in 1985 as many as 6000 people were killed on both sides)—and since the country had suffered material losses amounting to some $1300 million (not counting the loss in trade income because of the US embargo), the Sandinista Government announced in August 1985 a mobilization to expand its regular and militia forces to 200 000 by early 1986.[24]

Foreign military presence

Since the beginning of the 1980s there has been a rapid escalation of third-party military involvement in Central American conflicts. In particular, the numbers of foreign military personnel stationed in the countries of the Isthmus have

Table 22.4. Foreign military presence, 1980–5

Country	1980	1985	Growth (%)	Comments
Costa Rica	0	24–40	–	Since 1982—some 10 Israeli military advisers; the rest from the USA
El Salvador	40	>100	*150*	In 1981 the USA imposed a limit of 55 advisers
Guatemala	50	320	*550*	Mainly from Israel and Taiwan
Honduras	20–26	1 800	*770*	Permanent US military personnel
Nicaragua	200	>800	*300*	Nicaraguan figures (mainly Cuban, Soviet and East German advisers)
	800	2 500–3 500	*213–330*	US figures (mainly Cubans)

Sources: *The Soviet–Cuban Connection in Central America and the Caribbean*, US Department of State and Department of Defense (US Government Printing Office: Washington, DC, Mar. 1985); *Report of the National Bipartisan Commission on Central America* (National Bipartisan Commission on Central America: Washington, DC, 11 Jan. 1984); Arnson, C., *Background Information on Honduras and El Salvador and US Military Assistance to Central America*, Update No. 5 (Institute for Policy Studies: Washington, DC, Aug. 1981); *Jane's Defence Weekly*, vol. 3, no. 19 (May 1985); Felton, J., 'Reports detail military buildup: U.S. troops expanding role in region's wars', *Congressional Quarterly Weekly Report*, vol. 42, no. 21 (26 May 1984), pp. 1238–9; SIPRI data.

increased, and international military manoeuvres, with an overwhelming US component, have become more frequent and of ever longer duration.

Honduras has become the centre of US military activities, while military advisers from Cuba, the Soviet Union and East European countries have been active in Nicaragua.

From 1983 to 1985 the United States carried out five large-scale war games and at least 25 smaller military manoeuvres in Honduras, obviously with the aim of exerting pressure on Nicaragua.[25] In one of the joint US–Honduran manoeuvres in 1985, special tactical and logistical troops participated from different bases in the USA and Panama, in addition to 850 US military engineers working on the installation of a new military base in San Lorenzo, 130 km north of the Honduran capital, and on the construction of a 27-km highway for military use.[26] The 1986 manoeuvres started in January and are expected to last until June; some 5000 US and 150 Honduran men are to participate. The manoeuvres have provided training for tens of thousands of US and Honduran troops, including practice in paratroop drops, mining and amphibious landing. The exercises have also been used to expand or build airfields strategically located in different parts of Honduras, radar stations, weapons and fuel storage, roads, bridges and other facilities which could be used in wartime. Since the summer of 1983, the number of US troops in Honduras has never dropped below 800 and has often reached 6000.[27] Until 1985 the USA maintained a regional military and security training centre in Honduras, in which, among others, Salvadorean soldiers were trained (to the dissatisfaction of the Honduran military, who consider El Salvador to be an enemy state).

The number of military and security advisers in Nicaragua has been a controversial issue. According to the US Administration, the number of

Cubans directly assigned to military or security positions in Nicaragua in 1985 was between 2500 and 3500, while the Soviet Union was reported to have 140 military advisers and technicians there. The Sandinista sources put the numbers of foreign military advisers in Nicaragua considerably lower. In March 1985, at a press conference in Rio de Janeiro, President Ortega acknowledged the presence of 786 Cuban military advisers in his country.[28] Other advisers, about 60 according to the US Administration, are from the German Democratic Republic, Bulgaria and other East European countries and provide internal-security services. In addition, about 50 pilots and mechanics from Libya and the Palestine Liberation Organization (PLO) are said to provide assistance to the Sandinista Air Force.[29] The US Administration also estimates the number of Cuban military-related personnel in Nicaragua at 10 000, including a vast variety of technicians, teachers, physicians and construction workers.[30]

Military hardware

Most of the modern conventional weapons in use in Central America are suitable mainly for police and counter-insurgency (COIN) operations. With the exception of Guatemala, which in 1983 started manufacturing ammunition and assembling the Galil rifle under Israeli licence, no country in the region produces arms; almost all weapons there are of foreign origin. (Plans, however, have been announced for the assembly of armoured vehicles in El Salvador.)[31]

Until the mid-1970s the arsenals of the five Isthmus countries were supplied nearly exclusively with major and light weapons from the United States, which included COIN, trainer, support and transport aircraft, helicopters, coastal patrol boats, armoured vehicles, howitzers, air-defence artillery, mortars, machine-guns, rifles and ammunition. In 1975, Israel became a major supplier, providing STOL (short-take-off and landing) transport and COIN aircraft, as well as fighter-bombers, helicopters, rifles and ammunition to Guatemala and Honduras, armoured vehicles and missiles to Honduras, various other weapons, such as sub-machineguns, machine-guns, rifles and rockets to El Salvador, Honduras and Guatemala and, until the fall of the Somoza regime, also to Nicaragua.[32] Other suppliers included FR Germany (rifles), France (light tanks with 75-mm cannons), Brazil (land and maritime patrol aircraft), the United Kingdom (light tanks and armoured vehicles), Spain (aircraft) and Argentina (rifles and ammunition).[33]

After 1979 the countries in the region embarked on an accelerated arms buildup. The United States has been a major force behind this buildup in El Salvador, Guatemala, Honduras and Costa Rica, while the Soviet Union, Cuba and East European countries have contributed to the militarization of Nicaragua.

Costa Rica, receiving supplies mainly from the United States under the military assistance programme, has since 1982 modernized its security forces to such an extent that they resemble a professional army more than a civil guard. Transfers of US weapons in fiscal year (FY) 1984 and FY 1985 include M-16

Table 22.5. Weapon arsenals in 1985

Weapon category	Costa Rica[a]		El Salvador[b]		Guatemala[c]		Honduras[d]		Nicaragua[e]	
	No.	Weapon designation	No.	Weapon designation	No.	Weapon designation	No.	Weapon designation	No.	Weapon designation
Fighter aircraft (COIN/ground attack)	—		>42	Ouragan, A-37B, Super Mystère, AC-47, Magister	>22	A-37B, PC-7	>48	Super Mystère B-2, Sabre F-86K, A-37B, EMB-312 Tucano	17	AT-33A, T-28D, Cessna 337
Transport and light planes (recce, training, support)	10	Cessna U-17A, Piper T-33	>40	D-2, C-47, DC-62, Arava, 0-2 Skymaster	34	DC-6B, C-47, Arava, T-33A, T-37C, T-41	>32	C-47B, C-101, T-28A, Arava, T-41A, Tucano, C-130, etc.	14	C-212A, Arava, C-47, AN-2, AN-26
Helicopters	8	Hughes-500, -269, UH-1B, FH-1100, S-58ET	>40	UH-1H, Hughes-500MD	47	UD-1D, 212, 412, 206B, 206L-1	32	S-76, UH-1H, UH-1B, Hughes-500, etc.	>26	Alouette, Mi-2, Mi-8, Mi-24
Coastal patrol craft	>9	105-ft, 65-ft, Swift ships	20	Camcraft, Sewart, Swift ships	13	(+ some 30 small armed boats)	>9	Swift ships	18	Dabur, Shuk, Singhung, etc.
Landing and transport naval craft	—		—		15	LCM, Zodiac assault boats	1	LCM	7	LCM, K-8
Tanks	—		12	AMX-13	>23	AMX-13, M-41A3, M-3A1	20	Scorpion	120	T-54/55
Armoured vehicles including personnel carriers	. .	UR-416, M-113, V-100	45	AML-90, M-113, M-3A1, UR-416	37	M-8, RBY-1, M-3A1, M-113, V-150	50	Saladin, Spartan, RBY-1, M-3A1	200	PT-76, BRDM-2, BTR-60, BTR-152
Howitzers			56	M-101, M-102, M-56, 105-mm, M-114 105-mm	>48	M-116 76-mm, M-109 105-mm	>36	M-101/102 105-mm	250	D-30 122-mm, D-20 152-mm, 105-mm, 122-mm

Anti-tank weapons	—		430	M-67, 90-mm RCL	..		..	106-mm	100	Zis 57-mm
Air defence artillery	..		24	20-mm, 40-mm	12	M-1A1 40-mm	..	40-mm	180	ZPU-1/2/4 14.5-mm, ZU-23 23-mm, S-60
Mortars	..	81-mm, 90-mm RL, P1-203 GL	120	81-mm, 120-mm	>30	M-1 81-mm, M-30 107-mm, EC1A 120-mm	80	M-1 81-mm, M-65 120-mm, M-2A1	>35	M-43 120-mm
Missiles	—		..	Sidewinder AAM	..	Shafrir AAM	..	Sidewinder AAM	..	SAM-7

[a] Almost all weapons in Costa Rica are of US origin: light planes are exclusively of US origin and suitable only for COIN purposes; US helicopters are mainly for transport.

[b] Aircraft are of French, Israeli and US origin; helicopters are almost exclusively of US origin; light tanks are French; armoured vehicles and artillery are from the USA.

[c] Ground-attack fighter aircraft and helicopters are of US origin; light aircraft are of US and Israeli origin; light tanks are from France and the USA; armoured vehicles and artillery are of US origin; missiles are from Israel.

[d] Fighter aircraft are Israeli- and US-supplied; transport and light planes are from Brazil, Israel, Spain and the USA. Except for British light tanks and some Israeli and British armoured vehicles, all other weapons are of US origin or US-supplied.

[e] Except for obsolete aircraft (lacking spare-parts) from the USA, transport aircraft from Israel and Spain, and two French helicopters, all weapons are Soviet- or East European-supplied.

Abbreviations: APC: armoured personnel carrier; RL: rocket launcher; RCL: recoilless launcher; GL: grenade launcher; COIN: counter-insurgency; LCM: landing craft medium; AAM: air-to-air missile; SAM: surface-to-air missile; . .: unknown number; —: none.

Sources: *The Military Balance 1985–1986* (International Institute for Strategic Studies: London, Autumn 1985); Cirincione, J., 'Latin America: regional threats to Western security', in B. M. Blechman and E. N. Luttwar (eds), *International Security Yearbook 1984/85* (Westview Press: Boulder and London, 1985), pp. 183–210; Aguilera, G., *Datos sobre las Fuerzas Armadas de Guatemala* (CRIES: Managua, Nicaragua, 1985); *Honduras: Cambios y Contradicciones en las Fuerzas Armadas de Honduras* (INSEH: Documento Especial, Aug. 1985, Mexico, 1985); *Jane's Armour and Artillery 1984–85*, 5th edition (Jane's: London, 1984); *Invasion: A Guide to the US Military Presence in Central America* (Narmic: Philadelphia, May 1985); Goose, S. D., 'Into the fray: facts on the US military in Central America', *Defense Monitor*, vol. 13, no. 3 (Center for Defense Information: Washington, DC, 1984); Bermúdez, L. and Castillo, A., *Estrategia de Reagan hacia la Revolución Centro Americana* (Editorial Nuestro Tiempo, S.A.: Mexico, 1982); Bermúdez, L. and Córdova, R., *America Central: La Estrategia Militar Norteamericana y el Proceso de Militarización* (Centro de Investigación y Acción Social, Cuaderno de Trabajo no. 4, Jan. 1985, Mexico, 1985); 'El Salvador: funding incremental steps in a new war effort', *Update*, vol. 10, no. 1 (Jan./Feb. 1985) (Washington Office on Latin America, WOLA: Washington, DC); *Defensa*, Madrid, vol. 7, no. 86, p. 103; *New York Times*, 18 July 1985, p. 1; *International Herald Tribune*, 6 Nov. 1985, p. 5; Landabury, F. G. C., 'Fuerzas en Centroamerica', *Tecnología Militar*, vol. 6, no. 5 (July 1985), pp. 76–88; Marthoz, J-P., Schmitz, M. *et al.*, 'Enjeux stratégiques en Amérique Centrale', *GRIP Informations*, no. 5 (July 1985), pp. 3–24; SIPRI data register.

rifles, M-60 machine-guns, 81-mm mortars, 20-mm recoilless rifles, helicopters, transport aircraft, ammunition and transport vehicles.[34]

El Salvador is the largest recipient of US weapons and training in the region. Its armed forces have been modernized with US aircraft and other military equipment, vehicles and communications equipment. The Salvadorean Air Force, the most powerful in Central America, has more than 40 Hughes UH-1 combat helicopters, including Hughes-500 helicopters equipped with rapid-fire 'miniguns' of a type used in Viet Nam; C-47 aircraft converted to gunships, which can fire 1500 rounds per minute, with night-vision equipment; reconnaissance aircraft; as well as a fleet of at least 10 A-37B jet ground target fighter aircraft.[35] During 1985, in its counter-insurgency operations, the Air Force dropped an average of sixty 500-pound bombs and seventy-five 750-pound bombs a month, while the number of 2.75-inch rockets fired reached about 975 a month.[36]

In Honduras, despite the relative calm on the domestic front, weapon arsenals have been growing rapidly owing to US supplies. The Honduran Air Force, which even before 1980 was strong by Central American standards, has been further reinforced with more than two dozen US helicopters (UH-1H, UH-1B and Hughes-500) and tens of A-37B counter-insurgency aircraft, 12 Israeli-modernized French Super-Mystère fighter-bombers (roughly equivalent to the Soviet MiG-21s), as well as US reconnaissance, Spanish transport and Brazilian trainer aircraft.[37] The Honduran Air Force is thus capable of reaching any capital city in Central America. The army now uses only modern M-16 rifles; it has also acquired modern radio and communications equipment and has improved troop mobility due to the acquisition of US armoured vehicles and trucks.[38]

Guatemala's primary suppliers of weapons and military training have been the USA and Israel. A ban was introduced in 1977 by the USA on new arms sales and aid to Guatemala, because of its unsatisfactory human rights record, but the Departments of Defense and Commerce, as well as private US companies, sold military equipment to Guatemala for at least $11.1 million during FYs 1978–83. In addition, Guatemala purchased about $25 million worth of 'civilian' helicopters, many of which were subsequently fitted with machine-guns and other weapons.[39] In 1983 the US Administration partially lifted the ban.

Nicaragua's military buildup has to a large extent been a response to specific threats and hostile acts. In 1979, the Sandinista Army was an undisciplined mix of forces, with extremely disparate military experience, equipped with a diverse array of US vehicles, US M-16 rifles, Belgian FAL and Israeli Galil rifles—mostly without stocks of ammunition. Some US inventory was left by Somoza's National Guard—M-4 tanks, scout cars, howitzers and aircraft from World War II or of Korean War vintage. Until late 1980, military aid to Nicaragua from Cuba, the Soviet Union and Eastern Europe was not substantial, but it included Soviet ZPU light anti-aircraft guns, SAM-7 surface-to-air missiles, RPG-7 anti-tank grenades and trucks.[40] According to US figures, the arms deliveries to Nicaragua from the Soviet Union and its allies have steadily increased: from 850 tons in 1980 to 900 in 1981, to 6700 in 1982, to 14 000 in 1983, and to 18 000 in 1984.[41]

The Air Force of Nicaragua is weak compared to those of its neighbours. The expected introduction of Soviet MiGs has not taken place so far, presumably because of a threat of US military retaliation, although Nicaraguan pilots have reportedly been trained in Eastern Europe. Instead, Nicaragua is said to be looking for the Czech-built L39 Albatross subsonic trainers, which can be converted for use in counter-insurgency operations and have a performance roughly comparable to US-made A-37 aircraft widely used in El Salvador and Honduras. In late 1984, Nicaragua obtained 12 Soviet Mi-24 Hind helicopters in addition to some Mi-8 helicopters it already possessed. In early December 1985, an Mi-8 Nicaraguan helicopter was shot down by a SAM-7 missile fired by the contras, and 14 soldiers were killed. According to US officials, the helicopter was piloted by Cubans.[42]

Large transfers of weapons from mid-1981 led to a US claim that Nicaragua had acquired an offensive capability. In this context, reference was made to an estimated 120 Soviet-made T-54/55 tanks which, indeed, are the first heavy tanks in Central America. However, the rugged topography of the region and logistical problems severely constrain their offensive potential.[43]

III. The Contadora Act and commitments to be undertaken

Proposals for stopping and reversing the militarization of the Central American Isthmus have been put forward in the draft Contadora Act on Peace and Co-operation in Central America. The draft is a detailed elaboration, in treaty language, of the Document of Objectives and of the Norms for its Implementation, adopted by all the governments concerned in September 1983 and January 1984, respectively. (For a resumé of these documents, see *SIPRI Yearbook 1984*, pp. 537–40.) The text had to undergo several changes before the latest version could be delivered by the four Contadora Foreign Ministers to their five Central American Isthmus counterparts at a meeting held in Cartagena, Colombia, on 12 and 13 September 1985.[44] Some unresolved questions of substance, as well as several questions of an operational nature, were left for discussion by the plenipotentiaries of the nine countries vested with powers to contract commitments on behalf of their governments, and the signing was to take place in November 1985 at a specially convened joint conference of the Ministers of Foreign Affairs. This deadline was not met, chiefly because of renewed tensions between the governments of the USA and Nicaragua—the latter's insistence that the United States should first pledge to end its support for Nicaraguan rebels based in Honduras, and the former's refusal to continue bilateral talks to normalize relations between the two countries. (The unilateral interruption of these talks by the USA at Manzanillo, Mexico, was also deplored by the non-aligned countries' movement.)[45]

The declared purpose of the Contadora Act, as stated succinctly in its preamble, is 'to strengthen peace, co-operation, confidence, democracy and economic and social development among the peoples of the region'. The preamble recognizes that the security and stability of the region are endangered by the pursuit of military superiority; the presence of foreign

miltary advisers; the holding of international military manoeuvres; the existence of foreign military bases, schools and installations; the presence of irregular forces; and the traffic in arms. Concrete commitments to be assumed by the parties are contained in Part I of the Act. Commitments concerning regional détente and confidence-building, national reconciliation, human rights, electoral processes and parliamentary co-operation, economic and social matters, as well as the situation of refugees are specified in chapters II and IV of Part I, while those regarding security matters are dealt with in chapter III. It is the latter commitments, which form the most elaborate part of the Act and which are the most controversial, that are summarized here, with due account being taken of the definitions agreed upon in an annex to the Act.

Military manoeuvres

The parties are required to provide notification, at least 30 days in advance, of national military manoeuvres held in areas less than 30 km from the territory of another state. The notification should give information about the name, purpose, area, programme and timetable of the manoeuvre, as well as about the participating forces and the equipment and weapons to be used. Observers from neighbouring states parties would have to be invited.

Provisions relating to international military manoeuvres, that is, those involving the armed forces of two or more countries on the territory of one country or in an international area, are much stricter: they are to be reduced with the aim of eventually prohibiting them altogether once the maximum limits for armaments and troop strength agreed upon have been reached. Until then, the parties must ensure that these manoeuvres do not involve any form of intimidation against a Central American state or any other state, and that at least 90 days' prior notification is given with the same type of information as in the case of national manoeuvres.

Additional constraints include a ban on holding international military manoeuvres within a zone less than 50 km from the territory of a state that is not participating, without that state's express consent; limitation of international manoeuvres to only one manoeuvre a year, with a duration not longer than 15 days; as well as limitation of the total number of participating troops to 3000, with a proviso that 'under no circumstances' shall the number of troops of other states exceed the number of participating nationals. As in the case of national manoeuvres, observers of the parties would have to be invited.

Armaments and troop strength

Control and reduction of the inventory of weapons and of the number of troops would take place in two stages.

In the first stage, pending the establishment of the maximum limits for military development, the parties would undertake not to acquire any military material with the exception of supplies needed to keep existing *matériel* in operation, and not to increase their military forces. They would also submit to the Verification and Control Commission (VCC), a body established by the Act, simultaneously and within 15 days of the signing of the Act, their current

inventories of weapons, military installations and troops. The inventories would have to be drawn up in accordance with the criteria specified in the annex to the Act. Within 60 days of the signing of the Act, the VCC would suggest to the parties (without prejudice to any negotiations that they might initiate themselves) maximum limits for their military development, as well as timetables for reduction and dismantlement, as the case may be. The actual establishment of these limits and timetables would have to be agreed in the second stage. If the parties failed to reach such agreement within a specified period, the suggestions made by the VCC would apply provisionally and the VCC would then assist the parties in continuing their negotiations with a view to concluding an agreement.

A separate clause describes the basic criteria to be observed in establishing limits for military development in Central America, so as to avoid 'hegemony' of one state's armed forces over those of other states. These criteria, of potential application also in other regions, are as follows: internal and external security needs of the state; area; population; nation-wide distribution of economic resources, infrastructure and population; extent and characteristics of land and sea boundaries; military expenditure in relation to GDP; military budget in relation to public expenditure and in comparison with social indicators; and level of advanced military technology suited to the region.[46]

The prohibitions, which would apply to all parties, would include bans on the introduction of new weapon systems altering the quality and quantity of current inventories of *matériel*, as well as on the introduction, possession or use of lethal chemical weapons or biological, radiological or other weapons which are excessively injurious or have indiscriminate effects.[47]

Foreign military bases, schools or installations

Within 15 days of the signing of the Act, the parties would submit simultaneously to the VCC a list of foreign military establishments for the teaching, instruction and training of military personnel, of foreign military bases (defined by taking into account such elements as the administration and control, the sources of financing, the percentage ratio of local and foreign personnel, bilateral agreements, the geographical location and area, transfer of part of the territory to another state, and the number of personnel) and of temporary or permanent foreign military installations (built for use by foreign units for the purposes of manoeuvres, training or other military objectives).

All such schools, bases or installations would have to be closed down within 180 days of the signing of the Act, and the parties would undertake not to authorize their establishment in the respective territories.

Foreign military advisers

Within 15 days of the signing of the Act, the parties would submit a list of foreign military advisers, defined as foreign military and civilian personnel performing technical, training or advisory functions, or other foreign elements participating in military, paramilitary and security activities in their territories. Data must include numbers, the immigration status, the specialty, nationality

and duration of stay in the country, as well as the terms of the relevant agreements or contracts. Subsequently, within a period of no more than 180 days, the foreign advisers and foreign elements 'likely' to participate in military, paramilitary and security activities would have to be withdrawn. As regards advisers performing technical functions related to the installation and maintenance of military equipment, a control register would have to be maintained, and 'reasonable' limits on their numbers would be proposed by the VCC.

The traffic in arms

The parties would undertake to stop all illegal flow of arms, meaning transfer by governments, individuals or regional or extra-regional groups of weapons intended for groups, irregular forces or armed bands that are seeking to destabilize governments in the region. The passage of such traffic through the territory of a third state, destined for the above-mentioned groups, would also be prohibited. For that purpose control mechanisms would be established at airports, landing strips, harbours, terminals and border crossings, on roads, air routes, sea-lanes and waterways, and at any other point or in any other area likely to be used for the traffic in arms.

The prohibition on support for irregular forces

The parties would be obligated to refrain from giving any support to individuals, groups, irregular forces or armed bands advocating the overthrow or destabilization of other governments, and to prevent, by all means at their disposal, the use of their territory for attacks on another state or for the organization of attacks, acts of sabotage, kidnappings or criminal activities in the territory of another state. They would also undertake to deny the use of and dismantle installations, equipment and facilities used for acts against neighbouring governments. Any group or irregular force identified as being responsible for acts against a neighbouring state would have to be disarmed and removed from the border area.

Terrorism, subversion or sabotage

The parties would assume an obligation to refrain from giving any support to acts of subversion, terrorism or sabotage intended to destabilize or overthrow governments in the region, and to abide by international treaties aimed at the suppression of terrorism. To prevent in their respective territories the planning or commission of criminal acts against other states or the nationals of such states by terrorist groups or organizations, the parties would strengthen co-operation between their competent migration offices and police departments and between the corresponding civilian authorities.

Direct communications systems

With a view to preventing incidents, a regional communications system would be established guaranteeing timely liaison between the competent govern-

ment, civilian and military authorities, and with the VCC. Joint security commissions would help settling disputes between neighbouring states.

Implementation and follow-up

Special mechanisms are provided for in Part II of the Contadora Act which contains commitments with regard to the implementation and the follow-up of the Act. These mechanisms include two *ad hoc* committees, one for political and refugee matters and another for economic and social matters, while security matters are to be dealt with by the VCC. The latter body would be composed of four commissioners representing four states known to be impartial and genuinely interested in helping to resolve the Central American crisis, and of a Latin American executive secretary responsible for the operation of the VCC. All VCC members would be proposed by the Contadora Group and would have to be acceptable to the parties.

The VCC would have an international corps of inspectors provided by its member states and co-ordinated by a director of operations. It would also have an advisory body consisting of one representative of each Central American state. Representatives of the UN Secretary-General and of the Secretary-General of the Organization of American States (OAS) might be invited to participate in the VCC meetings as observers.

The function of the VCC would be to verify the observance of the commitments concerning military manoeuvres, military forces and *matériel*, military bases and advisers, the flow of arms, the presence of irregular forces and the commission of acts of terrorism, subversion or sabotage. Especially elaborate are the verification tasks aimed at preventing illegal transfer of arms, as distinct from commercial transfers or donations within the framework of assistance agreements among governments.

The VCC would receive any 'duly substantiated' report concerning violations of the security commitments, communicate it to the parties involved and initiate investigations. It would also be empowered to carry out investigations on its own initiative. Investigations could include on-site inspections, and the parties would have to accord every facility and prompt full co-operation to the Commission in the performance of its functions. VCC reports and recommendations would be transmitted to the states parties and to the governments of the Contadora Group on a confidential basis. They might be made public, if the Commission considered that that would contribute to full compliance with the commitments under the Act.

The VCC would be established at the time of the Act's signature and would draw up its rules of procedure in consultation with the parties. The commissioners would have an initial mandate of two years, extendable by common agreement among the parties and the states participating in the Commission. The VCC and other mechanisms set up by the Act would be financed through a Fund for Peace in Central America, which would draw its resources from equal contributions by the states parties, as well as from contributions of other states, international organizations or other sources, and would be managed by the Central American states in collaboration with the Contadora Group.

Final clauses

According to the provisions contained in Part III, the Act would enter into force eight days after the date on which the fifth instrument of ratification was deposited, but the verification mechanism would provisionally enter into force upon the signing of the Act.

Possible disputes concerning the interpretation or application of the Act, which could not be settled through the machinery established by the Act, would be referred to the Foreign Ministers of the parties for consideration and 'unanimous' decision. Should the dispute continue, the Foreign Ministers of the Contadora Group would, at the request of any party, use their good offices. After this, they might, if necessary, suggest another peaceful means of settling the dispute, in accordance with the UN Charter and the Charter of the OAS. If after 30 days there were still no agreement between the parties on the use of the suggested procedure, any of them might make public the findings, reports or recommendations relating to the dispute. Five years after the entry into force of the Act, the parties and the Contadora Group would meet to evaluate it and to take the steps deemed necessary.

Additional protocols

To ensure the widest possible support for the Act, and to reinforce it thereby, four additional protocols, containing pledges of co-operation in achieving its objectives, have been drawn up to be signed by states other than the parties: Protocol I, by the Contadora Group of states; Protocol II, by states of the 'American continent'; Protocol IV, by states participating in the implementation and follow-up machinery; and Protocol III, by any other state. All protocols form an integral part of the Act.

IV. The Nicaraguan objections

As distinct from the previous version of the Contadora Act, the September 1985 version does not seem to be objectionable to the USA. Of the parties directly concerned only Nicaragua has opposed it; its main criticism centres on security matters and could be summarized as follows.[48]

As long as Nicaragua is facing the danger of US military intervention, it needs means of defence to safeguard its independence. Its security situation would have to improve considerably before it could safely assume commitments regarding arms limitation. This would require a formal obligation on the part of the USA to stop all forms of aggression against Nicaragua, including overt and covert aid to forces labelled as mercenaries of a foreign power, engaged in terrorist activities.

More specific objections along with proposals for modifications are addressed to those provisions of the Act which deal with international military manoeuvres, armaments and troops, foreign military advisers, as well as the duration of the Act and the procedure for its denunciation.

Thus, regarding international manoeuvres, Nicaragua has pointed out that

the Act fails to prohibit them simultaneously with the freeze on the procurement of weapons, as was envisaged in a previous draft which met with US disapproval; instead, the prohibition is to be postponed to a subsequent stage. Nicaragua, however, considers an immediate and absolute ban on all such manoeuvres to be an indispensable condition for peace in the region.

Nicaragua deems it also unacceptable that the VCC should have the power to establish limits for armaments and troops and the timetables for their reduction, to be applied provisionally should the parties prove unable to reach agreement. The imposition of such a measure without the consent of the parties would, in the opinion of Nicaragua, be contrary to the principle of state sovereignty. Moreover, the Act should expressly prohibit the Central American Isthmus countries from allowing their territories to be used by foreign troops, for such a practice could affect the balance of forces (a position also held by Guatemala).

As regards foreign military advisers, Nicaragua proposes that all such advisers must be withdrawn, without distinction; no allowance should be made, as it is in the Act, for those performing technical functions related to the installation and maintenance of military equipment. Nicaragua is also of the opinion that the notion of foreign elements 'likely' to participate in military activities is ambiguous, because any foreign civilian who is not physically disabled could fall under this category.

And, finally, Nicaragua proposes that, instead of being of indefinite duration, the Contadora Act should be valid for no more than five years, with the possibility of extension if all the parties so desired. A system of denunciation would also have to be established.

V. Conclusions

The Contadora Act is the most comprehensive multilateral regional arms control agreement ever submitted for international consideration, without excluding the possibility of bilateral arrangements between the countries concerned. It could, of course, be improved and rendered more effective if some further-reaching measures were to be taken at the very outset of the envisaged arms control programme. Thus, for instance, it would be desirable to prohibit earlier than provided for in the Act all international military manoeuvres—a matter of particular concern to Nicaragua, which considers these manoeuvres to be practice for a possible invasion of its territory. A similar consideration would apply to the earliest possible withdrawal of all foreign military advisers and certain other 'foreign elements'—a matter of particular concern to the USA, which resents the presence of thousands of Cuban, Soviet and East European personnel in an area considered sensitive for US security.

Nevertheless, with all its deficiencies, the Contadora document has a potential for drastically reducing the possibility of military confrontation between Nicaragua and its immediate neighbours, as well as the likelihood of direct US intervention feared by Nicaragua. In compliance with the requirements of the Act, the anti-Sandinista forces stationed in Honduras

Table 22.6. Criteria to be followed in establishing maximum limits for military development in Central America according to the Contadora Act

Criteria	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Area (km)	50 900	20 935	108 889	112 088	139 000
Total population (thousands 1985)	2 600	5 552	7 963	4 372	3 272
Urban population as % of total (1984)	48.7	40.8	32.7	39.0	56.6
Length of land boundaries (km)	586	413	1 393	1 418	1 232
Length of sea boundaries (km)	370	297	240	864	1 264
Economic sectors as % of GDP (1984)[a]:					
Agriculture	21.2	29.5	27.6	29.0	21.9
Mining / Manufacturing	17.6	0.2 / 16.1	0.4 / 17.7	2.2 / 13.9	1.0 / 25.5
Electricity	3.4	3.2	1.3	2.3	2.1
Transport and communications	2.6	6.0	4.4	7.8	6.5
Military expenditures as % of GDP (1984)	(0.8)	(4.9)	(2.9)	(6.0)	[11.7]
Percentage share in national budget of:					
Military expenditures (1984)	4.9	25.2	21.7	23.9	38.4 (1985)
Education (1983)	25.2	16.6	12.3	15.0	16.0
Health (1983)	3.0	8.4	6.7	11.0	9.8
Internal security needs (armed opposition)	Low	Very high	Low	Low	High
External security needs (border disputes and/or incidents)	High	Low	Low	High	Very high
Level of military technology	Very low	Sophisticated	Sophisticated	Sophisticated	Relatively high but less sophisticated

[a] The Nicaraguan data are for 1983.

Conventions

( ) Uncertain data; [ ] Estimate with a high degree of uncertainty.

would have to be removed from the areas bordering on Nicaragua, where they have become a source of concern and embarrassment even to the Honduran military. At the same time, the control mechanisms to be established by the Act could prevent clandestine transfers of arms, in particular transfers to the guerrilla forces in El Salvador, for which Nicaragua has been alleged to be responsible.

It is true that the actual levels of armaments and armed forces to be retained by the parties and the timetables for their reduction would still remain to be determined, and Nicaragua is reluctant to leave such an important decision to an international body, even for a transitional period. However, the composition of the VCC should be such as to guarantee impartiality in the application of the agreed criteria for limiting military development in Central America. And the criteria especially pertinent in the case of Nicaragua are those relating to the size of its territory (the largest among the countries of the Isthmus), the extent of its boundaries, in particular sea boundaries (the longest), and its present external security needs (the most acute).

It is also of importance that limitation of armaments to be carried into effect under international control, along with constraints on military activities and the removal of foreign military personnel, would be coupled with a series of confidence-building undertakings, including exchange of information and establishment of direct communications and other forms of co-operation between the authorities of the states party to the Act. These measures are bound to create a propitious climate for the maintenance of peace among the parties. They could be further reinforced with the support of states called upon to sign the relevant protocols annexed to the Act. On the other hand, recent attempts by Nicaragua to re-submit for consideration its 1983 draft general treaty on peace and security in the region, which had already been rejected by all those concerned, could not serve a useful purpose.

The Contadora Act, a regionally conceived instrument, with its carefully balanced security guarantees, constitutes an equitable basis for a peaceful settlement of the Central American problems. However, its conclusion and implementation require a firm resolution by the parties, as well as those non-parties which are directly or indirectly implicated in the conflicts, not to engage in interstate ideological warfare unrelated to actual national security needs. It is the USA, the most powerful nation in the world, rather than the small and underdeveloped country of Nicaragua, that carries primary responsibility for such an accommodation. In other words, it is necessary for different political and social regimes in the western hemisphere to learn to live with one another.

Notes and references

[1] UN document S/16564, 16 May 1984.

[2] *US Congressional Quarterly, Weekly Report*, vol. 43, no. 41 (12 Oct. 1985), p. 2079.

[3] Report of the National Bipartisan Commission on Central America, Washington, DC, 11 Feb. 1984, p. 109.

[4] The term 'militarization', as here used, denotes a steady growth in military potential which reinforces the role of military institutions in national affairs, including the economic, social and political spheres.

[5] For an overview of the economic situation, see *Central America: Bases for reactivation and development*, UN, ECLAC document LC/L.31 (Sem22/5), 15 Apr. 1985, Santiago, Chile. Also the *Inter-American Development Bank Economic and Social Progress in Latin America 1985 Report* (IDB: Washington, DC, 1985).

[6] 'Response to aggression: the economic battlefield', *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 154 (4 Apr. 1985), p. 6.

[7] Brzoska, M. *et al.*, 'World military expenditure and arms production', in SIPRI, *World Armaments and Disarmament: SIPRI Yearbook 1985* (Taylor & Francis: London, 1985), chapter 7.

[8] For a more detailed account of the security assistance programmes, see Tullberg, R. and Millán, V., 'Security assistance: the case of Central America', in SIPRI, *World Armaments and Disarmament, SIPRI Yearbook 1986* (Oxford University Press: Oxford, 1986), chapter 16.

[9] *Current Policy*, US Department of State, Bureau of Public Affairs, no. 476 (Apr. 1983).

[10] *US Support for the Democratic Resistance Movement in Nicaragua* (The White House: Washington, DC, 10 Apr. 1985) in *Department of Defense Appropriations for 1986*, Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives, 99th Congress, First Session, Subcommittee on the Department of Defense (US Government Printing Office: Washington, DC, 1985), p. 1032. Also in *Press Release*, USUN 193–(85), United States Mission to the United Nations, 10 Dec. 1985, p. 4.

[11] *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 169 (1 Aug. 1985), p. 15.

[12] *New York Times*, 27 Apr. 1983; *Enjeux Stratégiques et Amérique Centrale* (GRIP Informations No. 5, Brussels, July 1985), p. 21.

[13] *Central America Report*, Guatemala City, 19 Aug. 1983.

[14] The 1949 constitution of Costa Rica states in article 12 that 'the army is prohibited as a permanent institution'. The army was therefore replaced by security forces, the so-called Civil Guard; in addition, a Rural Assistance Guard was created.

[15] *The Military Balance 1978–1979* and *1985–86* (IISS: London, 1978 and 1985); *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 164 (27 June 1985), pp. 6–7; English, A. J., *Armed Forces of Latin America* (Jane's: London, 1984); Aguilera Peralta, G., 'The militarization of the Guatemalan state', in L. F. Johnathan *et al.* (eds), *Guatemala in Rebellion* (Grove Press: New York, 1983).

[16] *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 164 (27 June 1985), p. 7.

[17] Pearson, N. J., 'Honduras', in J. W. Hopkins (ed.), *Latin America and the Caribbean Contemporary Record* (Holmers and Meir: New York/London, 1983), vol. 1: 1981–1982, pp. 439–54.

[18] Peterson, R. L., 'Guatemala', in Hopkins (note 17), vol. 1: 1981–1982 and vol. 2: 1982–1983, pp. 426–38 and 497–520.

[19] Goose, S. D., 'Into the fray: facts on the US military in Central America', in *Defense Monitor*, vol. 13, no. 3, 1984 (Center for Defense Information: Washington, DC, 1984), p. 9. The guerrillas claimed to have captured military equipment valued at up to 20 per cent of US military aid provided to the Salvadorean Government in 1983 (*ibid.*, p. 9); *International Herald Tribune*, 17 May 1985.

[20] The leaders of the FDN have referred to military supplies from Israeli arsenals of 5000 Galil-3 automatic rifles, AK-47 assault rifles, and rocket-propelled grenade launchers and mortars. Israel has consistently denied that it was supplying the contras. However, the minutes of a July 1983 US National Security Council meeting stated that Israel was one of the parties asked to provide arms to Nicaragua's adversaries. *Latin America Weekly Report*, London, 22 Nov. 1985, WR-85-46, p. 10; *International Herald Tribune*, 9 Aug. 1985, p. 2; *Boston Globe*, 30 Aug. 1985, p. 1; *El Pais*, Madrid, 15 Dec. 1985, p. 7.

[21] Goose (note 19), pp. 14–15; Cirincione, J., 'Latin America: regional threats to Western security', in B. M. Blechman and E. N. Luttwak (eds), *International Security Yearbook 1984/85* (Westview Press: Boulder/London, 1985), pp. 183–7; Colburn F. D., 'Nicaragua under siege', in *Current History*, vol. 84, no. 500 (Mar. 1985), pp. 105–8.

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[23] Preston, J., Globe Staff, *Boston Globe*, 30 Aug. 1985, p. 1.

[24] See note 23; *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 175 (12 Sep. 1985), p. 16; *Svenska Dagbladet*, Stockholm, 2 Jan. 1986.

[25] *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 170 (8 Aug. 1985), p. 7; and vol. 7, no. 148 (14 Feb. 1985), pp. 1–11.

[26] *Barricada Internacional* (International Weekly), Managua, vol. 5, no. 170 (8 Aug. 1985), p. 7; *Boletín Informative*, Centro Documentacion de Honduras (CEDOH), no. 57 (Jan. 1986), p. 3.

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[28] *New York Times*, 21 Mar. 1985; and *Miami Herald*, 20 Mar. 1985.

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[37] 'Sandinista foreign policy: strategies for survival', in *Report on the Americas-NACLA*, New York, vol. 19, no. 3, (May/June 1985), p. 49.

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[40] Goldblat and Millán (note 31), p. 531.

[41] Statement of Nestor D. Sanchez, Deputy Assistant Secretary of Defense for Inter-American Affairs: *Soviet Posture in the Western Hemisphere*, Hearings before the Subcommittee on Western Hemisphere Affairs of the Committee on Foreign Affairs, House of Representatives, 99th Congress, First Session, 28 Feb. 1985 (US Government Printing Office: Washington, DC, 1985), pp. 22–3; also in *NACLA* (see note 37), pp. 50–1; and in *Defensa*, Madrid, vol. 7, no. 86 (June 1985), p. 103.

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[43] Goldblat and Millán (note 31), pp. 531–2; and also testimony by Carl G. Jacobsen, 'Moscow in Central America', in *Soviet Posture in the Western Hemisphere* (note 41), p. 51.

[44] UN document A/40/737, 9 Oct. 1985.

[45] UN document S/17610, 7 Nov. 1985.

[46] It will be noted that under the 1923 Convention on the limitation of armaments in Central America, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua agreed not to maintain standing armies or national guards in excess of the numbers which were fixed in the convention and which were based on such considerations as the population, area and extent of frontiers. The limits set for the number of military aircraft were equal for all, while the acquisition of war vessels, except for armed coast guard boats was not allowed. See, Goldblat, J. SIPRI, *Agreements for Arms Control* (Taylor & Francis: London, 1982), p. 134.

[47] It will also be noted that the signatories to the 1923 Central American Convention obligated themselves not to use in war asphyxiating gases, poisons or similar substances, as well as analogous liquids, materials or devices (see note 46).

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23. Arms control agreements

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For the full texts of the arms control agreements, see Goldblat, J., SIPRI, *Agreements for Arms Control: A Critical Survey* (Taylor & Francis: London, 1982). Both members and non-members of the United Nations are parties to the arms control agreements; UN member states are listed in appendix 23B.

I. Bilateral agreements: summaries

Agreements on the establishment of a direct communications link between the USA and the USSR ('Hot Line' Agreements)

A Memorandum of Understanding signed on 20 June 1963, and in force since then, establishes a direct communications link between the two governments for use in time of emergency. An annex attached to the Memorandum provides for two circuits, a duplex wire telegraph circuit and a duplex radio telegraph circuit, as well as two terminal points with telegraph-teleprinter equipment between which communications are to be exchanged.

An agreement signed on 30 September 1971 has improved the reliability of the US–Soviet Hot Line by providing for the establishment of two satellite communications circuits between the two countries, with a system of multiple terminals in each country.

On 17 July 1984 the USA and the USSR agreed to add a facsimile transmission capability to the Hot Line. This improvement will enable the parties to exchange messages more rapidly and to send graphic material such as maps, charts or drawings.

(Direct communications links have also been established between France and the USSR, as well as between the UK and the USSR, following the agreements concluded in 1966 and 1967, respectively.)

Treaty between the USA and the USSR on the limitation of anti-ballistic missile systems (ABM Treaty)

Signed at Moscow on 26 May 1972; entered into force on 3 October 1972.

Prohibits the deployment of ABM systems (or their components) for the defence of the whole territory of the USA and the USSR (or the creation of a base for such defence) or of an individual region, except as expressly permitted. Permitted ABM deployments are limited to two areas in each country—one for the defence of the national capital, and the other for the defence of an intercontinental ballistic missile (ICBM) complex. No more than 100 ABM launchers and 100 ABM interceptor missiles may be deployed in each ABM deployment area. ABM radars should not exceed specified numbers and are subject to qualitative restrictions. In particular, it is forbidden to deploy radars for early warning of strategic ballistic missile attack, including large phased-array radars, except at locations along the periphery of the national territory of each party and on condition that they be oriented outward. An agreed interpretation, accompanying the Treaty, permits deployment of large phased-array radars for tracking objects in outer space or for use as national technical means of verification to provide assurance of compliance with the provisions of the Treaty.

In addition, the parties undertake not to develop, test or deploy ABM systems or components which are sea-, air-, space- or mobile land-based, nor to give missiles, launchers or radars, other than ABM interceptor missiles, launchers or radars, capabilities to counter strategic ballistic missiles, nor to test them in an ABM mode. According to another agreed interpretation, development, testing or deployment of ABM interceptor missiles for the delivery by each missile of more than one independently guided warhead are prohibited. The parties also agreed that in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, launchers or radars are created in the future, specific limitations on such systems and their components would be subject to discussion and agreement. The use of deliberate concealment measures impeding verification is prohibited. A Standing Consultative Commission is established to promote the objectives and implementation of the Treaty. The ABM Treaty is of unlimited duration.

Protocol to the US–Soviet ABM Treaty

Signed at Moscow on 3 July 1974; entered into force on 25 May 1976.

Provides that each party shall be limited to a single area for deployment of anti-ballistic missile systems or their components instead of two such areas as allowed by the ABM Treaty. Each party will have the right to dismantle or destroy its ABM system and the components thereof in the area where they were deployed at the time of the signing of the Protocol and to deploy an ABM system or its components in the alternative area permitted by the ABM Treaty, provided that, before starting construction, notification is given during the year beginning on 3 October 1977 and ending on 2 October 1978, or during any year which commences at five-year intervals thereafter, those being the years for periodic review of the ABM Treaty. This right may be exercised only once. The deployment of an ABM system within the area selected shall remain limited by the levels and other requirements established by the ABM Treaty.

Interim Agreement between the USA and the USSR on certain measures with respect to the limitation of strategic offensive arms (SALT I Agreement)

Signed at Moscow on 26 May 1972; entered into force on 3 October 1972.
In September 1977 the USA and the USSR stated that, although the Interim Agreement was to expire on 3 October 1977, they intended to refrain from any actions incompatible with its provisions or with the goals of the ongoing talks on a new agreement.

Provides for a freeze for a period of five years of the aggregate number of fixed land-based intercontinental ballistic missile (ICBM) launchers (i.e., launchers of missiles capable of a range in excess of 5500 km) and ballistic missile launchers on modern submarines. The parties are free to choose the mix, except that conversion of land-based launchers for light ICBMs, or for ICBMs of older types, into land-based launchers for modern heavy ICBMs is prohibited. National technical means of verification are to be used to provide assurance of compliance with the provisions of the Agreement, and the parties undertake not to use deliberate concealment measures impeding verification.

A *protocol*, which is an integral part of the Interim Agreement, specifies that the USA may have not more than 710 ballistic missile launchers on submarines and 44 modern ballistic missile submarines, while the USSR may have not more than 950 ballistic missile launchers on submarines and 62 modern ballistic missile submarines. Up

to those levels, additional ballistic missile launchers—in the USA over 656 launchers on nuclear-powered submarines and in the USSR over 740 launchers on nuclear-powered submarines, operational and under construction—may become operational as replacements for equal numbers of ballistic missile launchers of types deployed before 1964, or of ballistic missile launchers on older submarines.

Treaty between the USA and the USSR on the limitation of underground nuclear weapon tests (Threshold Test Ban Treaty—TTBT)

Signed at Moscow on 3 July 1974; not in force by 1 January 1986. The parties stated that they would observe the limitation during the pre-ratification period.

Prohibits from 31 March 1976 the carrying out of any underground nuclear weapon test having a yield exceeding 150 kt. Each party undertakes to limit the number of its underground nuclear weapon tests to a minimum. The parties have agreed, in a separate understanding, that one or two 'slight, unintended' breaches per year would not be considered a violation of the Treaty, because of the technical uncertainties associated with predicting the precise yield of nuclear weapon tests. National technical means of verification are to be used to provide assurance of compliance, and a *protocol* to the Treaty specifies the data that have to be exchanged between the parties to ensure such verification.

Treaty between the USA and the USSR on underground nuclear explosions for peaceful purposes (Peaceful Nuclear Explosions Treaty—PNET)

Signed at Moscow and Washington on 28 May 1976; to be ratified simultaneously with the TTBT.

Prohibits the carrying out of any individual underground nuclear explosion for peaceful purposes, having a yield exceeding 150 kt, or any group explosion (consisting of two or more individual explosions) with an aggregate yield exceeding 1500 kt. The Treaty governs all nuclear explosions carried out outside the weapon test sites after 31 March 1976. The question of carrying out individual explosions with a yield exceeding 150 kt will be considered at an appropriate time to be agreed. In addition to the use of national technical means of verification, the Treaty provides for access to sites of explosions in certain specified cases. A *protocol* to the Treaty sets forth operational arrangements for ensuring that no weapon-related benefits precluded by the TTBT are derived from peaceful nuclear explosions.

Treaty between the USA and the USSR on the limitation of strategic offensive arms (SALT II Treaty)

Signed at Vienna on 18 June 1979; not ratified.
Although the Treaty did not enter into force, the signatories stated that they would refrain from actions contrary to its provisions and would observe the numerical limits established therein.

Sets, for both parties, an initial ceiling of 2400 on the number of intercontinental ballistic missile (ICBM) launchers, submarine-launched ballistic missile (SLBM) launchers,

heavy bombers, and air-to-surface ballistic missiles (ASBMs) capable of a range in excess of 600 km. This ceiling will be lowered to 2250 and the lowering must begin on 1 January 1981, while the dismantling or destruction of systems which exceed that number must be completed by 31 December 1981. A sublimit of 1320 is imposed upon each party for the combined number of launchers of ICBMs and SLBMs equipped with multiple independently targetable re-entry vehicles (MIRVs), ASBMs equipped with MIRVs, and aeroplanes equipped for long-range (over 600 km) cruise missiles. Moreover, each party is limited to a total of 1200 launchers of MIRVed ICBMs, SLBMs and ASBMs, and of this number no more than 820 may be launchers of MIRVed ICBMs. A freeze is introduced on the number of re-entry vehicles on current types of ICBMs, with a limit of 10 re-entry vehicles on the one new type of ICBM allowed each side, a limit of 14 re-entry vehicles on SLBMs and a limit of 10 re-entry vehicles on ASBMs. An average of 28 long-range air-launched cruise missiles (ALCMs) per heavy bomber is allowed, while current heavy bombers may carry no more than 20 ALCMs each. Ceilings are established on the throw-weight and launch-weight of light and heavy ICBMs.

There is a ban on the flight-testing or deployment of new types of ICBMs, except for one new type of light ICBM. The term 'new' refers to any ICBM differing in the number of stages and (in excess of 5 per cent) in the length, diameter, launch-weight or throw-weight, from those ICBMs flight-tested as of 1 May 1979, as well as differing with respect to the type of propellant (liquid or solid) of any of the missile stages. No ICBM of an existing type, equipped with a single re-entry vehicle, may be flight-tested or deployed with a re-entry vehicle the weight of which is less than 50 per cent of the throw-weight of that ICBM. The parties are not allowed to convert land-based launchers of ballistic missiles which are not ICBMs into launchers for ICBMs, and not to test them for this purpose. In this connection, the Soviet Union undertakes not to produce, test or deploy ICBMs known as SS-16; neither will it produce the third stage and the re-entry vehicle of that missile, or the appropriate device for targeting the re-entry vehicle. In the case of ICBM launchers undergoing structural changes after entry into force of the Treaty, launchers of MIRVed missiles are to be made distinguishable from launchers of missiles not equipped with MIRVs. Furthermore, there are prohibitions: on building additional fixed ICBM launchers; on converting fixed light ICBM launchers into heavy ICBM launchers; on heavy mobile ICBMs, heavy SLBMs and heavy ASBMs; on surface-ship ballistic missile launchers; on systems to launch missiles from the sea-bed or the beds of internal waters; as well as on systems for delivery of nuclear weapons from Earth orbit, including fractional orbital missiles.

National technical means will be used to verify compliance. Any interference with such means of verification, or any deliberate concealment measures which impede verification, are prohibited. In particular, neither party shall engage in denial of telemetric information (radio signals sent from a missile to ground monitors during a flight test), such as through the use of telemetry encryption, whenever such denial impedes verification. In addition, each party undertakes not to circumvent the provisions of the Treaty through any other state or states, or in any other manner, nor to assume international obligations conflicting with the Treaty. To consider questions concerning compliance, the parties are to use the Standing Consultative Commission established in 1972. The envisaged duration of the Treaty is until 31 December 1985.

Prior to the signing of the Treaty, on 16 June 1979, the USSR informed the USA that the Soviet Tu-22M aircraft, called 'Backfire', is a medium-range bomber, and that the Soviet Union does not intend to give this bomber an intercontinental capability and will not increase its radius of action to enable it to strike targets on US territory. The USSR also pledged to limit the production of Backfire aircraft to the 1979 rate.

Protocol to the SALT II Treaty

Signed at Vienna on 18 June 1979; not ratified.

Bans until 31 December 1981: the deployment of mobile ICBM launchers or the flight-testing of ICBMs from such launchers; the deployment (but not the flight-testing) of long-range (over 600 km) cruise missiles on sea-based or land-based launchers; the flight-testing of long-range cruise missiles with multiple warheads from sea-based or land-based launchers; and the flight-testing or deployment of ASBMs. The Protocol is an integral part of the Treaty.

In a *Memorandum of Understanding* the parties agreed on the numbers of strategic offensive arms in each of the 10 categories limited by the Treaty, as of 1 November 1978. In separate statements of data, each party declared that it possessed the stated number of strategic offensive arms subject to the Treaty limitations as of the date of signature of the Treaty.

II. Multilateral agreements: summaries and the status of implementation as of 1 January 1986

Protocol for the prohibition of the use in war of asphyxiating, poisonous or other gases, and of bacteriological methods of warfare (Geneva Protocol)

Signed at Geneva on 17 June 1925; entered into force on 8 February 1928. Parties: see appendix 23A.

Declares that the parties agree to be bound by the above prohibition, which should be universally accepted as part of international law, binding alike the conscience and the practice of nations. (Reservations made by a number of states have limited the applicability of the Protocol to nations party to it and to first use only.)

Convention on the prevention and punishment of the crime of genocide (Genocide Convention)

Adopted at Paris by the UN General Assembly on 9 December 1948; entered into force on 12 January 1951.

Declares genocide, defined as the commission of acts intended to destroy, in whole or in part, a national, ethnic, racial or religious group, as such, to be a punishable crime.

Parties: Afghanistan, Albania, Algeria, Argentina, Australia, Austria, Bahamas, Barbados, Belgium, Brazil, Bulgaria, Burkina Faso, Burma, Byelorussia, Canada, Chile, China, Colombia, Costa Rica, Cuba, Cyprus, Czechoslovakia, Denmark, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Finland, France, Gabon, Gambia, German Democratic Republic, FR Germany, Ghana, Greece, Guatemala, Haiti, Honduras, Hungary, Iceland, India, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Jordan, Kampuchea, Republic of Korea (South), Lao People's Democratic Rep., Lebanon, Lesotho, Liberia, Luxembourg, Maldives, Mali, Mexico, Monaco, Mongolia, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Poland, Romania, Rwanda, Saint Vincent, Saudi Arabia, Senegal, Spain, Sri Lanka, Sweden, Syria, Taiwan, Tanzania, Togo, Tonga, Tunisia, Turkey, UK, Ukraine, USA (1986), USSR, Uruguay, Venezuela, Viet Nam, Yugoslavia, Zaire

Conventions for the protection of war victims (Geneva Conventions)

Signed at Geneva on 12 August 1949; entered into force on 21 October 1950.

Convention I provides for the amelioration of the condition of the wounded and sick in armed forces in the field.

Convention II provides for the amelioration of the condition of the wounded, sick and shipwrecked members of armed forces at sea.

Convention III relates to the treatment of prisoners of war.

Convention IV relates to the protection of civilian persons in time of war.

Parties: Afghanistan, Albania, Algeria, Angola, Argentina, Australia, Austria, Bahamas, Bahrain, Bangladesh, Barbados, Belgium, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Byelorussia, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Cuba, Cyprus, Czechoslovakia, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Finland, France, Gabon, Gambia, German Democratic Republic, FR Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Holy See, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kampuchea, Kenya, Democratic People's Republic of Korea (North), Republic of Korea (South), Kuwait, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Monaco, Mongolia, Morocco, Mozambique, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Rwanda, Saint Lucia, Saint Vincent, Samoa, San Marino, Sao Tomé and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syria, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Tuvalu, Uganda, UK, Ukraine, United Arab Emirates, Uruguay, USA, USSR, Vanuatu, Venezuela, Viet Nam, Yemen Arab Republic, People's Democratic Republic of Yemen, Yugoslavia, Zaire, Zambia, Zimbabwe

Antarctic Treaty

Signed at Washington on 1 December 1959; entered into force on 23 June 1961. Parties: see appendix 23A.

Declares the Antarctic an area to be used exclusively for peaceful purposes. Prohibits any measure of a military nature in the Antarctic, such as the establishment of military bases and fortifications, and the carrying out of military manoeuvres or the testing of any type of weapon. Bans any nuclear explosion as well as the disposal of radioactive waste material in Antarctica, subject to possible future international agreements on these subjects.

Representatives of the contracting parties meet at regular intervals to exchange information and consult each other on matters of common interest pertaining to Antarctica, as well as to recommend to their governments measures in furtherance of the principles and objectives of the Treaty.

Treaty banning nuclear weapon tests in the atmosphere, in outer space and under water (Partial Test Ban Treaty—PTBT)

Signed at Moscow on 5 August 1963; entered into force on 10 October 1963. Parties: see appendix 23A.

Prohibits the carrying out of any nuclear weapon test explosion or any other nuclear explosion: (*a*) in the atmosphere, beyond its limits, including outer space, or under water, including territorial waters or high seas; or (*b*) in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the state under whose jurisdiction or control the explosion is conducted.

Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies (Outer Space Treaty)

Signed at London, Moscow and Washington on 27 January 1967; entered into force on 10 October 1967. Parties: see appendix 23A.

Prohibits the placing in orbit around the earth of any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, the installation of such weapons on celestial bodies, or the stationing of them in outer space in any other manner. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies are also forbidden.

Treaty for the prohibition of nuclear weapons in Latin America (Treaty of Tlatelolco)

Signed at Mexico City on 14 February 1967; entered into force on 22 April 1968. Parties: see appendix 23A.

Prohibits the testing, use, manufacture, production or acquisition by any means, as well as the receipt, storage, installation, deployment and any form of possession of any nuclear weapons by Latin American countries.

The parties should conclude agreements with the IAEA for the application of safeguards to their nuclear activities.

Under *Additional Protocol I* the extra-continental or continental states which, *de jure* or *de facto*, are internationally responsible for territories lying within the limits of the geographical zone established by the Treaty (France, the Netherlands, the UK and the USA), undertake to apply the statute of military denuclearization, as defined in the Treaty, to such territories.

Under *Additional Protocol II* the nuclear weapon states undertake to respect the statute of military denuclearization of Latin America, as defined and delimited in the Treaty, and not to contribute to acts involving a violation of the Treaty, nor to use or threaten to use nuclear weapons against the parties to the Treaty.

UN Security Council Resolution on security assurances to non-nuclear weapon states

Adopted on 19 June 1968. The Security Council approved this resolution by a vote of 10 to 0, with 5 abstentions. It was supported by Canada, Republic of China (Taiwan), Denmark, Ethiopia, Hungary, Paraguay, Senegal, UK, USA and USSR. Abstentions: Algeria, Brazil, France, India and Pakistan.

Provides for immediate assistance by the UK, the USA and the USSR, in conformity with the UN Charter, to be given to any non-nuclear weapon state party to the NPT which is a victim of an act or an object of a threat of aggression in which nuclear weapons are used.

Treaty on the non-proliferation of nuclear weapons (NPT)

Signed at London, Moscow and Washington on 1 July 1968; entered into force on 5 March 1970. Parties: see appendix 23A.

Prohibits the transfer by nuclear weapon states, to any recipient whatsoever, of nuclear weapons or other nuclear explosive devices or of control over them, as well as the assistance, encouragement or inducement of any non-nuclear weapon state to manufacture or otherwise acquire such weapons or devices. Prohibits the receipt by non-nuclear weapon states from any transferor whatsoever, as well as the manufacture or other acquisition by those states of nuclear weapons or other nuclear explosive devices.

Non-nuclear weapon states undertake to conclude safeguards agreements with the International Atomic Energy Agency (IAEA) with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices.

The parties undertake to facilitate the exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy and to ensure that potential benefits from peaceful applications of nuclear explosions will be made available to non-nuclear weapon parties to the Treaty. They also undertake to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament.

Treaty on the prohibition of the emplacement of nuclear weapons and other weapons of mass destruction on the sea-bed and the ocean floor and in the subsoil thereof (Sea-Bed Treaty)

Signed at London, Moscow and Washington on 11 February 1971; entered into force on 18 May 1972. Parties: see appendix 23A.

Prohibits emplanting or emplacing on the sea-bed and the ocean floor and in the subsoil thereof beyond the outer limit of a sea-bed zone (coterminous with the 12-mile outer limit of the zone referred to in the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone) any nuclear weapons or any other types of weapons of mass destruction as well as structures, launching installations or any other facilities specifically designed for storing, testing or using such weapons.

Convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction (BW Convention)

Signed at London, Moscow and Washington on 10 April 1972; entered into force on 26 March 1975. Parties: see appendix 23A.

Prohibits the development, production, stockpiling or acquisition by other means or retention of microbial or other biological agents or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes, as well as weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict. The destruction of the agents, toxins, weapons, equipment and means of delivery in the possession of the parties, or their diversion to peaceful purposes, should be effected not later than nine months after the entry into force of the Convention.

Document on confidence-building measures and certain aspects of security and disarmament, included in the Final Act of the Conference on Security and Co-operation in Europe (CSCE)

Signed at Helsinki on 1 August 1975.

Provides for notification of major military manoeuvres in Europe to be given at least 21 days in advance or, in the case of a manoeuvre arranged at shorter notice, at the earliest possible opportunity prior to its starting date. The term 'major' means that at least 25 000 troops are involved. The following information is to be provided for each major manoeuvre: designation (code-name), if any; general purpose; states involved; types and numerical strength of the forces engaged; area; and estimated time-frame. States may give additional information and may invite observers to attend the manoeuvres.

Signatories of Final Act: Austria, Belgium, Bulgaria, Canada, Cyprus, Czechoslovakia, Denmark, Finland, France, German Democratic Republic, FR Germany, Greece, Holy See, Hungary, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Romania, San Marino, Spain, Sweden, Switzerland, Turkey, UK, USA, USSR, Yugoslavia

Convention on the prohibition of military or any other hostile use of environmental modification techniques (Enmod Convention)

Signed at Geneva on 18 May 1977; entered into force on 5 October 1978. Parties: see appendix 23A.

Prohibits military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to states party to the Convention. The term 'environmental modification techniques' refers to any technique for changing—through the deliberate manipulation of natural processes—the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space.

The understandings reached during the negotiations, but not written into the Convention, define the terms 'widespread', 'long-lasting' and 'severe'.

Protocol (I) Additional to the 1949 Geneva Conventions

Signed at Bern on 12 December 1977; entered into force on 7 December 1978.

Relates to the protection of victims of international armed conflicts.

Reiterates the rule of international law that the right of the parties to an armed conflict to choose methods or means of warfare is not unlimited, and that it is prohibited to use weapons and methods of war that cause superfluous injury or unnecessary suffering. Expands the existing prohibition against indiscriminate attacks to cover attacks by bombardment of cities or other areas containing a similar concentration of civilians or civilian objects. Dams, dykes and nuclear electric power generating stations are placed under special protection. There is also a prohibition on attacking, by any means, localities declared as non-defended, or to extend military operations to zones on which the parties conferred by agreement the status of demilitarized zone. Reprisals against the civilian population are forbidden. Guerrilla fighters are accorded the right to prisoner-of-war status if they belong to organized units subject to an internal disciplinary system and under a command responsible to the party concerned.

Protocol (II) Additional to the 1949 Geneva Conventions

Signed at Bern on 12 December 1977; entered into force on 7 December 1978.

Relates to the protection of victims of non-international conflicts.

Prescribes humane treatment of all the persons involved in such conflicts, care for the wounded, sick and shipwrecked, as well as protection of civilians against the dangers arising from military operations.

Parties: Angola, Austria, Bangladesh, Bahamas, Belize, Bolivia, Botswana, Cameroon, Comoros, Central African Republic, China, Congo, Costa Rica, Cuba (Protocol I), Cyprus (Protocol I), Denmark, Ecuador, El Salvador, Finland, France (Protocol II), Gabon, Ghana, Guinea, Holy See, Jordan, Republic of Korea (South), Kuwait, Lao People's Democratic Republic, Libya, Mauritania, Mauritius, Mexico (Protocol I), Mozambique (Protocol I), Namibia, Niger, Norway, Oman, Rwanda, Saint Lucia, Saint Vincent, Samoa, Senegal, Seychelles, Suriname, Sweden, Switzerland, Syria (Protocol I), Tanzania, Togo, Tunisia, United Arab Emirates, Uruguay, Vanuatu, Viet Nam (Protocol I), Yugoslavia, Zaire (Protocol I)

Agreement governing the activities of states on the moon and other celestial bodies (Moon Treaty)

Opened for signature at New York on 18 December 1979; entered into force on 11 July 1984.

Declares that the moon shall be used exclusively for peaceful purposes. Prohibits any threat or use of force or any other hostile act or threat of hostile act on the moon. It is likewise prohibited to use the moon in order to commit any such act or to engage in any such threat in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man-made space objects. The parties shall not place in orbit around the moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon. The moon and its natural resources are the common heritage of mankind.

Parties: Austria, Chile, Netherlands, Philippines, Uruguay

Convention on the physical protection of nuclear material

Signed at Vienna and New York on 3 March 1980; not in force by 1 January 1986.

Obliges the parties to ensure that, during international transport across their territory or on ships or planes under their jurisdiction, nuclear material for peaceful purposes as categorized in a special annex is protected at the agreed level. Storage of such material, incidental to international transport, must be within an area under constant surveillance. Robbery and embezzlement or extortion in relation to nuclear material, and acts without lawful authority involving nuclear material, are to be treated as punishable offences. 'International nuclear transport' is defined as the carriage of a consignment of nuclear material by any means of transport intended to go beyond the territory of the state where the shipment originates.

Ratifications: Brazil, Bulgaria, Czechoslovakia, German Democratic Republic, Guatemala, Hungary, Republic of Korea (South), Norway, Paraguay, Philippines, Poland, Sweden, Turkey, USA, USSR

Convention on the prohibitions or restrictions on the use of certain conventional weapons which may be deemed to be excessively injurious or to have indiscriminate effects ('Inhumane Weapons' Convention)

Signed at New York on 10 April 1981; entered into force on 2 December 1983. Parties: see appendix 23A.

The Convention is an 'umbrella treaty', under which specific agreements can be concluded in the form of protocols.

Protocol I prohibits the use of weapons intended to injure by fragments which are not detectable in the human body by X-rays.

Protocol II prohibits or restricts the use of mines, booby-traps and similar devices.

Protocol III prohibits or restricts the use of incendiary weapons.

South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga)

Signed at Rarotonga, Cook Islands, on 6 August 1985; not in force by 1 January 1986.

Prohibits the manufacture or acquisition by other means of any nuclear explosive device, as well as possession or control over such device by the parties anywhere inside or outside the zone area described in an annex. The parties also undertake not to supply nuclear material or equipment unless subject to IAEA safeguards; and to prevent in their territories the stationing of as well as the testing of any nuclear explosive device. (However, each party remains free to allow visits, as well as transit, by foreign ships and aircraft.)

Under Protocol 1, France, the UK and the USA would undertake to apply the treaty prohibitions relating to the manufacture, stationing and testing of nuclear explosive devices in the territories situated within the zone, for which they are internationally responsible.

Under Protocol 2, China, France, the UK, the USA and the USSR would undertake not to use or threaten to use a nuclear explosive device against the parties to the treaty.

Under Protocol 3, China, France, the UK, the USA and the USSR would undertake not to test any nuclear explosive device anywhere within the zone.

Signatories: Australia, Cook Islands, Fiji, Kiribati, New Zealand, Niue, Papua New Guinea, Tuvalu, Samoa
Ratifications: Cook Islands, Fiji, Tuvalu

Appendix 23A. Status of the implementation of the major multilateral arms control agreements, as of 1 January 1986

Number of parties

1925 Geneva Protocol	108
Antarctic Treaty	32
Partial Test Ban Treaty	115
Outer Space Treaty	85
Treaty of Tlatelolco	23
Additional Protocol I	3
Additional Protocol II	5
Non-Proliferation Treaty	132
NPT safeguards agreements	78
Sea-Bed Treaty	76
BW Convention	103
Enmod Convention	48
'Inhumane Weapons' Convention	25

Notes

1. The table records year of ratification, accession and succession.

2. The Partial Test Ban Treaty, the Outer Space Treaty, the Non-Proliferation Treaty, the Sea-Bed Treaty and the Biological Weapons Convention provide for three depositaries—the governments of the UK, the USA and the USSR. The dates given for these agreements are the earliest dates on which countries deposited their instruments of ratification, accession or succession—whether in London, Washington or Moscow. The dates given for the other agreements, for which there is only one depositary, are the dates of the deposit of the instruments of ratification, accession or succession with the depositary in question.

3. Key to abbreviations used in the table:
S: Signature without further action
PI: Additional Protocol I to the Treaty of Tlatelolco
PII: Additional Protocol II to the Treaty of Tlatelolco
SA: Nuclear safeguards agreement in force with the International Atomic Energy Agency as required by the Non-Proliferation Treaty or the Treaty of Tlatelolco, or concluded by nuclear weapon states on a voluntary basis.

4. The footnotes are listed at the end of the table and are grouped separately under the heading for each agreement. The texts of the statements contained in the footnotes have been abridged, but the wording is close to the original version.

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Afghanistan			1964	S		1970 SA	1971	1975	1985	S
Algeria			S							
Antigua and Barbuda					1983[2]	1985[1]				
Argentina	1969	1961	S	1969	S[1]		1983[1]	1979		S
Australia	1930[1]	1961	1963	1967		1973 SA	1973	1977	1984	1983
Austria	1928		1964	1968		1969 SA	1972	1973[1]		1983
Bahamas			1976[1]	1976[1]	1977[2]	1976[1]				
Bangladesh			1985			1979 SA		1985	1979	
Barbados	1976[2]			1968	1969[2]	1980		1973		
Belgium	1928[1]	1960	1966	1973		1975 SA	1972	1979	1982	S
Belize						1985[1]				
Benin			1964			1972	S	1975	S	

Bhutan	1978		1978			1985		1978		
Bolivia	1985		1965	S	1969[2]	1970	S	1975	S	
Botswana			1968[1]	S		1969	1972	S		
Brazil	1970	1975	1964	1969[2]	1968[3]		S[2]	1973	1984	
Brunei Darussalam						1985				
Bulgaria	1934[1]	1978	1963	1967		1969 SA	1971	1972	1978	1982
Burkina Faso (formerly Upper Volta)	1971		S	1968		1970				
Burma			1963	1970			S	S		
Burundi			S	S		1971	S	S		
Byelorussia	1970[3]		1963[3]	1967[3]			1971	1975	1978	1982
Cameroon			S[2]	S		1969	S			
Canada	1930[1]		1964	1967		1969 SA	1972[3]	1972	1981	S

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Cape Verde			1979			1979	1979	1977	1979	
Central African Republic	1970		1964	S		1970	1981	S		
Chad			1965			1971				
Chile	1935[1]	1961	1965	1981	1974[4]			1980		
China	1929[4]	1983		1983	PII: 1974[5]			1984[2]		1982[1]
Colombia			1985	S	1972[2] SA	S	S	1983		
Congo						1978	1978	1978		
Costa Rica			1967		1969[2] SA[16]	1970 SA	S	1973		
Cuba	1966	1984		1977[4]			1977[4]	1976	1978	S
Cyprus	1966[2]		1965	1972		1970 SA	1971	1973	1978	
Czechoslovakia	1938[5]	1962	1963	1967		1969 SA	1972	1973	1978	1982

Denmark	1930	1965	1964	1967		1969 SA	1971	1973	1978	1982
Dominica						1984[1]				
Dominican Republic	1970		1964	1968	1968[2] SA[16]	1971 SA	1972	1973		
Ecuador	1970		1964	1969	1969[2] SA[16]	1969 SA		1975		1982
Egypt	1928		1964	1967		1981[2] SA		S	1982	S
El Salvador	S		1964	1969	1968[2] SA[16]	1972 SA		S		
Equatorial Guinea						1984	S			
Ethiopia	1935		S	S		1970 SA	1977	1975	S	
Fiji	1973[1,2]		1972[1]	1972[1]		1972[1] SA		1973		
Finland	1929	1984	1964	1967		1969 SA	1971	1974	1978	1982
France	1926[1]	1960		1970	PI: S[6] PII: 1974[7]	SA[3]		1984		S[2]

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Gabon			1964			1974		S		
Gambia	1966[2]		1965[1]	S		1975 SA	S	S		
German Dem. Republic	1929	1974[1]	1963	1967		1969 SA	1971	1972	1978	1982
FR Germany	1929	1979[2]	1964[4]	1971[5]		1975[4] SA	1975[5]	1983[3]	1983[1]	S
Ghana	1967		1963	S		1970 SA	1972	1975	1978	
Greece	1931		1963	1971		1970 SA	1985	1975	1983	S
Grenada					1975[2]	1975[1]				
Guatemala	1983		1964[2]		1970[2] SA[16]	1970 SA	S	1973		1983
Guinea						1985	S			
Guinea-Bissau			1976	1976		1976	1976	1976		
Guyana				S				S		

Haiti			S	S	1969[2]	1970		S		
Holy See (Vatican City)	1966			S		1971[5] SA			S	
Honduras			1964	S	1968[2] SA[16]	1973 SA	S	1979		
Hungary	1952	1984	1963	1967		1969 SA	1971	1972	1978	1982
Iceland	1967		1964	1968		1969 SA	1972	1973	S	S
India	1930[1]	1983	1963	1982			1973[6]	1974[4]	1978	1984
Indonesia	1971[2]		1964	S		1979[6] SA		S		
Iran	1929		1964	S		1970 SA	1971	1973	S	
Iraq	1931[1]		1964	1968		1969 SA	1972[4]	S	S	
Ireland	1930[6]		1963	1968		1968 SA	1971	1972[5]	1982	S
Israel	1969[7]		1964	1977						

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Italy	1928	1981	1964	1972		1975[7] SA	1974[7]	1975	1981	S[3]
Ivory Coast	1970		1965			1973 SA	1972	S		
Jamaica	1970[2]		S	1970	1969[2] SA[16]	1970 SA	S	1975		
Japan	1970	1960	1964	1967		1976[8] SA	1971	1982	1982	1982
Jordan	1977[8]		1964	S		1970 SA	1971	1975		
Kampuchea	1983[9]					1972	S	1983		
Kenya	1970		1965			1970		1976		
Kiribati						1985[1]				
Korea, Democratic People's Republic						1985			1984	
Korea, Republic of			1964[2]	1967[4]		1975[9,10] SA	S[4]	S[6]		

Kuwait	1971[10]	1965[5]	1972[6]	S		1972[7]	1980[2]	
Lao People's Dem. Republic		1965	1972	1970	1971	1973	1978	1983
Lebanon	1969	1965	1969	1970 SA	S	1975	S	
Lesotho	1972[2]		S	1970 SA	1973	1977		
Liberia	1927	1964		1970	S	S	S	
Libya	1971[11]	1968	1968	1975 SA		1982		
Liechtenstein				1978[11] SA				S
Luxembourg	1936	1965	S	1975 SA	1982	1976	S	S
Madagascar	1967	1965	1968[7]	1970 SA	S	S		
Malawi	1970	1964[1]				S	1978	
Malaysia	1970	1964	S	1970 SA	1972	S		

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Maldives	1966[2]					1970 SA				
Mali			S	1968		1970	S	S		
Malta	1970[2]		1964[1]			1970	1971	1975		
Mauritania			1964							
Mauritius	1970[2]		1969[1]	1969[1]		1969 SA	1971	1972		
Mexico	1932		1963	1968	1967[2,8] SA	1969[12] SA	1984[8]	1974[8]		1982
Monaco	1967									
Mongolia	1968[12]		1963	1967		1969 SA	1971	1972	1978	1982
Morocco	1970		1966	1967		1970 SA	1971	S	S	S
Nauru						1982 SA				

Nepal	1969		1964	1967		1970 SA	1971	S		
Netherlands	1930[13]	1967	1964	1969	PI: 1971[9]	1975 SA	1976	1981	1983[3]	S
New Zealand	1930[1]	1960	1963	1968		1969 SA	1972	1972	1984[4]	S
Nicaragua	S		1965	S	1968[2,10] SA[16]	1973 SA	1973	1975	S	S
Niger	1967[2]		1964	1967			1971	1972		
Nigeria	1968[1]		1967	1967		1968		1973		S
Norway	1932	1960	1963	1969		1969 SA	1971	1973	1979	1983
Pakistan	1960[2]		S	1968				1974		1985
Panama	1970		1966	S	1971[2] SA	1977	1974	1974		
Papua New Guinea	1981[1]	1981	1980[1]	1980[1]		1982 SA		1980	1980	
Paraguay	1933[14]		S		1969[2] SA[16]	1970 SA	S	1976		

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Peru	1985	1981	1964	1979	1969[2] SA	1970 SA		1985		
Philippines	1973		1965[2]	S		1972 SA		1973		S
Poland	1929	1961	1963	1968		1969 SA	1971	1973	1978	1983
Portugal	1930[1]		S			1977 SA	1975	1975	S	S
Qatar	1976						1974	1975		
Romania	1929[1]	1971[3]	1963	1968		1970 SA	1972	1979	1983	S[4]
Rwanda	1964[2]		1963	S		1975	1975	1975		
Saint Lucia						1979[1]				
Saint Vincent and the Grenadines						1984[1]				
Samoa			1965			1975 SA				

San Marino			1964	1968		1970[9]		1975		
Sao Tome and Principe						1983	1979	1979	1979	
Saudi Arabia	1971			1976			1972	1972		
Senegal	1977		1964			1970 SA	S	1975		
Seychelles			1985	1978		1985	1985	1979		
Sierra Leone	1967		1964	1967		1975	S	1976	S	S
Singapore			1968[1]	1976		1976 SA	1976	1975		
Solomon Islands						1981[1]	1981	1981[9]	1981[5]	
Somalia			S	S		1970		S		
South Africa	1930[1]	1960	1963	1968			1973	1975		
Spain	1929[15]	1982	1964	1968				1979	1978	S
Sri Lanka	1954		1964	S		1979 SA		S	1978.	

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Sudan	1980		1966			1973 SA	S			S
Suriname					1977[2] SA[16]	1976[1] SA				
Swaziland			1969			1969 SA	1971			
Sweden	1930	1984	1963	1967		1970 SA	1972	1976	1984	1982
Switzerland	1932		1964	1969		1977[11] SA	1976	1976[10]		1982
Syria	1968[16]		1964	1968[8]		1969[9]		S	S	
Taiwan	[17]		1964	1970[9]		1970	1972[9]	1973[11]		
Tanzania	1963		1964				S	S		
Thailand	1931		1963	1968		1972 SA		1975		
Togo	1971		1964	S		1970	1971	1976		S
Tonga	1971		1971[1]	1971[1]		1971[1]		1976		

Trinidad and Tobago	1970[2]		1964	S	1970[2]	S				
Tunisia	1967		1965	1968		1970	1971	1973	1978	
Turkey	1929		1965	1968		1980[13] SA	1972	1974	S[6]	S
Tuvalu						1979[1]				
Uganda	1965		1964	1968		1982			S	
UK	1930[1]	1960	1963[6]	1967	PI: 1969[11] PII: 1969[11]	1968[14] SA[15]	1972[10]	1975[12]	1978	S
Ukraine			1963[3]	1967[3]	.		1971	1975	1978	1982
United Arab Emirates								S		
Uruguay	1977	1980[4]	1969	1970	1968[2] SA[16]	1970	S	1981		
USA	1975[18]	1960	1963	1967	PI: 1981[12] PII: 1971[13]	1970 SA[16]	1972	1975	1980	S[5]
USSR	1928[19]	1960	1963	1967	PII: 1979[14]	1970 SA[17]	1972	1975	1978	1982

State	Geneva Protocol	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty	Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention	Enmod Convention	'Inhumane Weapons' Convention
Venezuela	1928		1965	1970	1970[2,15] SA[16]	1975 SA		1978		
Viet Nam	1980[1]			1980		1982	1980[11]	1980	1980	S
Yemen Arab Republic	1971		S			S	S	S	1977	
Yemen, People's Dem. Republic of			1979	1979		1979	1979	1979	1979	
Yugoslavia	1929[20]		1964	S		1970[18] SA	1973[12]	1973		1983
Zaire			1965	S		1970 SA		1977	S	
Zambia			1965[1]	1973			1972			

The 1925 Geneva Protocol

[1] The Protocol is binding on this state only as regards states which have signed and ratified or acceded to it. The Protocol will cease to be binding on this state in regard to any enemy state whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

[2] Notification of succession. (In notifying its succession to the obligations contracted in 1930 by the United Kingdom, Barbados stated that as far as it was concerned the reservation made by the UK was to be considered as withdrawn.)

[3] In a note of 2 Mar. 1970, submitted at the United Nations, Byelorussia stated that 'it recognizes itself to be a party' to the Protocol.

[4] On 13 July 1952 the People's Republic of China issued a statement recognizing as binding upon it the accession to the Protocol in the name of China. China considers itself bound by the Protocol on condition of reciprocity on the part of all the other contracting and acceding powers.

[5] Czechoslovakia shall cease to be bound by this Protocol towards any state whose armed forces, or the armed forces of whose allies, fail to respect the prohibitions laid down in the Protocol.

[6] The government of Ireland does not intend to assume, by this accession, any obligation except towards the states having signed and ratified this Protocol or which shall have finally acceded thereto, and should the armed forces or the allies of an enemy state fail to respect the Protocol, the government of Ireland would cease to be bound by the said Protocol in regard to such state. In Feb. 1972, Ireland declared that it had decided to withdraw the above reservations made at the time of accession to the Protocol.

[7] The Protocol is binding on Israel only as regards states which have signed and ratified or acceded to it. The Protocol shall cease to be binding on Israel as regards any enemy state whose armed forces, or the armed forces of whose allies, or the regular or irregular forces, or groups or individuals operating from its territory, fail to respect the prohibitions which are the object of the Protocol.

[8] The accession by Jordan to the Protocol does not in any way imply recognition of Israel. Jordan undertakes to respect the obligations contained in the Protocol with regard to states which have undertaken similar commitments. It is not bound by the Protocol as regards states whose armed forces, regular or irregular, do not respect the provisions of the Protocol.

[9] The accession was made on behalf of the coalition government of Democratic Kampuchea (the government in exile), with a statement that the Protocol will cease to be binding on it in regard to any enemy state whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol. The French Government declared that as a party to the Geneva Protocol (but not as the depositary) it considers this accession to have no effect. A similar statement was made by the governments of Australia, Bulgaria, Cuba, Czechoslovakia, GDR, Hungary, Mauritius, Netherlands, Poland, Romania, USSR and Viet Nam, which do not recognize the coalition government of Kampuchea.

[10] The accession of Kuwait to the Protocol does not in any way imply recognition of Israel or the establishment of relations with the latter on the basis of the present Protocol. In case of breach of the prohibition laid down in this Protocol by any of the parties, Kuwait will not be bound, with regard to the party committing the breach, to apply the provisions of this Protocol.

[11] The accession to the Protocol does not imply recognition of Israel. The Protocol is binding on Libya only as regards states which are effectively bound by it and will cease to be binding on Libya as regards states whose armed forces, or the armed forces of whose allies, fail to respect the prohibitions which are the object of this Protocol.

[12] In the case of violation of this prohibition by any state in relation to Mongolia or its allies, the government of Mongolia shall not consider itself bound by the obligations of the Protocol towards that state.

[13] As regards the use in war of asphyxiating, poisonous or other gases and of all analogous liquids, materials or devices, this Protocol shall cease to be binding on the Netherlands with regard to any enemy state whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

[14] This is the date of receipt of Paraguay's instrument of accession. The date of the notification by the depositary government 'for the purpose of regularization' is 1969.

[15] Spain declared the Protocol as binding *ipso facto*, without special agreement with respect to any other member or state accepting and observing the same obligation, that is, on condition of reciprocity.

[16] The accession by Syria to the Protocol does not in any case imply recognition of Israel or lead to the establishment of relations with the latter concerning the provisions laid down in the Protocol.

[17] The Protocol, signed in 1929 in the name of China, is valid for Taiwan which is part of China.

[18] The Protocol shall cease to be binding on the USA with respect to the use in war of asphyxiating poisonous or other gases, and of all analogous liquids, materials, or devices, in regard to an enemy state if such state or any of its allies fail to respect the prohibitions laid down in the Protocol.

[19] The Protocol only binds the USSR in relation to the states which have signed and ratified or which have definitely acceded to the Protocol. The Protocol shall cease to be binding on the USSR in regard to any enemy state whose armed forces or whose allies *de jure* or in fact do not respect the prohibitions which are the object of this Protocol.

[20] The Protocol shall cease to be binding on Yugoslavia in regard to any enemy state whose armed forces or whose allies fail to respect the prohibitions which are the object of the Protocol.

The Antarctic Treaty

[1] The German Democratic Republic stated that in its view Article XIII, paragraph 1 of the Treaty was inconsistent with the principle that all states whose policies are guided by the purposes and principles of the UN Charter have a right to become parties to treaties which affect the interests of all states.

[2] The Federal Republic of Germany stated that the Treaty applies also to Berlin (West).

[3] Romania stated that the provisions of Article XIII, paragraph 1 of the Treaty were not in accordance with the principle according to which multilateral treaties whose object and purposes concern the international community, as a whole, should be open for universal participation.

[4] In acceding to the Treaty, Uruguay proposed the establishment of a general and definitive statute on Antarctica in which the interests of all states involved and of the international community as a whole would be considered equitably. It also declared that it reserved its rights in Antarctica in accordance with international law.

The Partial Test Ban Treaty

[1] Notification of succession.

[2] With a statement that this does not imply the recognition of any territory or regime not recognized by this state.

[3] The United States considers that Byelorussia and Ukraine are already covered by the signature and ratification by the Soviet Union.

[4] The Federal Republic of Germany stated that the Treaty applies also to Berlin (West).

[5] Kuwait stated that its signature and ratification of the Treaty do not in any way imply its recognition of Israel nor oblige it to apply the provisions of the Treaty in respect of the said country.

[6] The United Kingdom stated its view that if a regime is not recognized as the government of a state, neither signature nor the deposit of any instrument by it, nor notification of any of those acts, will bring about recognition of that regime by any other state.

The Outer Space Treaty

[1] Notification of succession.

[2] The Brazilian Government interprets Article X of the Treaty as a specific recognition that the granting of tracking facilities by the parties of the Treaty shall be subject to agreement between the states concerned.

[3] The United States considers that Byelorussia and Ukraine are already covered by the signature and ratification by the Soviet Union.

[4] With a statement that this does not imply the recognition of any territory or regime not recognized by this state.

[5] The Federal Republic of Germany stated that the Treaty applies also to Berlin (West).

[6] Kuwait acceded to the Treaty with the understanding that this does not in any way imply its recognition of Israel and does not oblige it to apply the provisions of the Treaty in respect of the said country.

[7] Madagascar acceded to the Treaty with the understanding that under Article X of the Treaty the state shall retain its freedom of decision with respect to the possible installation of foreign observation bases in its territory and shall continue to possess the right to fix, in each case, the conditions for such installation.

[8] Syria acceded to the Treaty with the understanding that this should not mean in any way the recognition of Israel, nor should it lead to any relationship with Israel that could arise from the Treaty.

[9] The People's Republic of China declared as illegal and null and void the signature and ratification of the Outer Space Treaty by the Taiwan authorities.

The Treaty of Tlatelolco

[1] Argentina stated that it understands Article 18 as recognizing the rights of parties to carry out, by their own means or in association with third parties, explosions of nuclear devices for peaceful purposes, including explosions which involve devices similar to those used in nuclear weapons.

[2] The Treaty is in force for this country due to a declaration, annexed to the instrument of ratification in accordance with Article 28, paragraph 2, which waived the requirements for the entry into force of the Treaty, specified in paragraph 1 of that Article: namely, that all states in the region deposit the instruments of ratification; that Protocol I and Protocol II be signed and ratified by those states to which they apply; and that agreements on safeguards be concluded with the IAEA. (Colombia made this declaration subsequent to the deposit of ratification, as did Nicaragua and Trinidad and Tobago.)

[3] On signing the Treaty, Brazil stated that, according to its interpretation, Article 18 of the Treaty gives the signatories the right to carry out, by their own means or in association with third parties, nuclear explosions for peaceful purposes, including explosions which involve devices similar to those used in nuclear weapons. This statement was reiterated at the ratification. Brazil also stated that it did not waive the requirements for the entry into force of the Treaty laid down in Article 28. The Treaty is therefore not yet in force for Brazil.

[4] Chile has not waived the requirements for the entry into force of the Treaty laid down in Article 28. The Treaty is therefore not yet in force for Chile.

[5] On signing Protocol II, China stated, *inter alia*: China will never use or threaten to use nuclear weapons against non-nuclear Latin American countries and the Latin American nuclear weapon-free zone; nor will China test, manufacture, produce, stockpile, install or deploy nuclear weapons in these countries or in this zone, or send its means of transportation and delivery carrying nuclear weapons to cross the territory, territorial sea or airspace of Latin American countries. The signing of the Protocol does not imply any change whatsoever in China's stand on the disarmament and nuclear weapons issue and, in particular, does not affect the Chinese Government's stand against the Non-Proliferation Treaty and the Partial Test Ban Treaty.

The Chinese Government holds that, in order that Latin America may truly become a nuclear weapon-free

zone, all nuclear countries, and particularly the superpowers, must undertake not to use or threaten to use nuclear weapons against the Latin American countries and the Latin American nuclear weapon-free zone, and implement the following undertakings: (1) dismantle all foreign military bases in Latin America and refrain from establishing new bases there, and (2) prohibit the passage of any means of transportation and delivery carrying nuclear weapons through Latin American territory, territorial sea or airspace.

[6] On signing Protocol I, France made the following reservations and interpretative statements: the Protocol, as well as the provisions of the Treaty to which it refers, will not affect the right of self-defence under Article 51 of the UN Charter; the application of the legislation referred to in Article 3 of the Treaty relates to legislation which is consistent with international law; the obligations under the Protocol shall not apply to transit across the territories of the French Republic situated in the zone of the Treaty, and destined to other territories of the French Republic; the Protocol shall not limit, in any way, the participation of the populations of the French territories in the activities mentioned in Article 1 of the Treaty, and in efforts connected with the national defence of France; the provisions of Articles 1 and 2 of the Protocol apply to the text of the Treaty as it stands at the time when the Protocol is signed by France, and consequently no amendment to the Treaty that might come into force under Article 29 thereof would be binding on the government of France without the latter's express consent.

[7] On signing Protocol II, France stated that it interprets the undertaking contained in Article 3 of the Protocol to mean that it presents no obstacle to the full exercise of the right of self-defence enshrined in Article 51 of the United Nations Charter; it takes note of the interpretation of the Treaty given by the Preparatory Commission for the Denuclearization of Latin America and reproduced in the Final Act, according to which the Treaty does not apply to transit, the granting or denying of which lies within the exclusive competence of each state party in accordance with the pertinent principles and rules of international law; it considers that the application of the legislation referred to in Article 3 of the Treaty relates to legislation which is consistent with international law. The provisions of Articles 1 and 2 of the Protocol apply to the text of the Treaty as it stands at the time when the Protocol is signed by France. Consequently, no amendment to the Treaty that might come into force under the provision of Article 29 would be binding on the government of France without the latter's express consent. If this declaration of interpretation is contested in part or in whole by one or more contracting parties to the Treaty or to Protocol II, these instruments would be null and void as far as relations between the French Republic and the contesting state or states are concerned. On depositing its instrument of ratification of Protocol II, France stated that it did so subject to the statement made on signing the Protocol. On 15 Apr. 1974, France made a supplementary statement to the effect that it was prepared to consider its obligations under Protocol II as applying not only to the signatories of the Treaty, but also to the territories for which the statute of denuclearization was in force in conformity with Article 1 of Protocol I.

[8] On signing the Treaty, Mexico said that if technological progress makes it possible to differentiate between nuclear weapons and nuclear devices for peaceful purposes, it will be necessary to amend the relevant provisions of the Treaty, according to the procedures established therein.

[9] The Netherlands stated that Protocol I shall not be interpreted as prejudicing the position of the Netherlands as regards its recognition or non-recognition of the rights or of claims to sovereignty of the parties to the Treaty, or of the grounds on which such claims are made.

[10] Nicaragua stated that it reserved the right to use nuclear energy for peaceful purposes such as the removal of earth for the construction of canals, irrigation works, power plants, and so on, as well as to allow the transit of atomic material through its territory.

[11] When signing and ratifying Protocol I and Protocol II, the United Kingdom made the following declarations of understanding:

In connection with Article 3 of the Treaty, defining the term 'territory' as including the territorial sea, airspace and any other space over which the state exercises sovereignty in accordance with 'its own legislation', the UK does not regard its signing or ratification of the Protocols as implying recognition of any legislation which does not, in its view, comply with the relevant rules of international law.

The Treaty does not permit the parties to carry out explosions of nuclear devices for peaceful purposes unless and until advances in technology have made possible the development of devices for such explosions which are not capable of being used for weapon purposes.

The signing and ratification by the UK could not be regarded as affecting in any way the legal status of any territory for the international relations of which the UK is responsible, lying within the limits of the geographical zone established by the Treaty.

Should a party to the Treaty carry out any act of aggression with the support of a nuclear weapon state, the UK would be free to reconsider the extent to which it could be regarded as committed by the provisions of Protocol II.

In addition, the UK declared that its undertaking under Article 3 of Protocol II not to use or threaten to use nuclear weapons against the parties to the Treaty extends also to territories in respect of which the undertaking under Article I of Protocol I becomes effective.

[12] The United States ratified Protocol I with the following understandings: The provisions of the Treaty made applicable by this Protocol do not affect the exclusive power and legal competence under international law of a state adhering to this Protocol to grant or deny transit and transport privileges to its own or any other vessels or aircraft irrespective of cargo or armaments; the provisions of the Treaty made applicable by this Protocol do not affect rights under international law of a state adhering to this Protocol regarding the exercise of the freedom of the seas, or regarding passage through or over waters subject to the sovereignty of a state, and the declarations attached by the United States to its ratification of Protocol II apply also to its ratification of Protocol I.

[13] The United States signed and ratified Protocol II with the following declarations and understandings:

In connection with Article 3 of the Treaty, defining the term 'territory' as including the territorial sea, airspace and any other space over which the state exercises sovereignty in accordance with 'its own legislation', the US ratification of the Protocol could not be regarded as implying recognition of any legislation which did not, in its view, comply with the relevant rules of international law.

Each of the parties retains exclusive power and legal competence, unaffected by the terms of the Treaty, to grant or deny non-parties transit and transport privileges.

As regards the undertaking not to use or threaten to use nuclear weapons against the parties, the United States would consider that an armed attack by a party, in which it was assisted by a nuclear weapon state, would be incompatible with the party's obligations under Article 1 of the Treaty.

The definition contained in Article 5 of the Treaty is understood as encompassing all nuclear explosive devices; Articles 1 and 5 of the Treaty restrict accordingly the activities of the parties under paragraph 1 of Article 18.

Article 18, paragraph 4 permits, and US adherence to Protocol II will not prevent, collaboration by the USA with the parties to the Treaty for the purpose of carrying out explosions of nuclear devices for peaceful purposes in a manner consistent with a policy of not contributing to the proliferation of nuclear weapon capabilities.

The United States will act with respect to such territories of Protocol I adherents, as are within the geographical area defined in Article 4, paragraph 2 of the Treaty, in the same manner as Protocol II requires it to act with respect to the territories of the parties.

[14] The Soviet Union signed and ratified Protocol II with the following statement:

The Soviet Union proceeds from the assumption that the effect of Article 1 of the Treaty extends, as specified in Article 5 of the Treaty, to any nuclear explosive device and that, accordingly, the carrying out by any party to the Treaty of explosions of nuclear devices for peaceful purposes would be a violation of its obligations under Article 1 and would be incompatible with its non-nuclear status. For states parties to the Treaty, a solution to the problem of peaceful nuclear explosions can be found in accordance with the provisions of Article V of the Non-Proliferation Treaty and within the framework of the international procedures of the IAEA. The signing of the Protocol by the Soviet Union does not in any way signify recognition of the possibility of the force of the Treaty being extended beyond the territories of the states parties to the Treaty, including airspace and territorial waters as defined in accordance with international law. With regard to the reference in Article 3 of the Treaty to 'its own legislation' in connection with the territorial waters, airspace and any other space over which the states parties to the Treaty exercise sovereignty, the signing of the Protocol by the Soviet Union does not signify recognition of their claims to the exercise of sovereignty which are contrary to generally accepted standards of international law. The Soviet Union takes note of the interpretation of the Treaty given in the Final Act of the Preparatory Commission for the Denuclearization of Latin America to the effect that the transport of nuclear weapons by the parties to the Treaty is covered by the prohibitions in Article 1 of the Treaty. The Soviet Union reaffirms its position that authorizing the transit of nuclear weapons in any form would be contrary to the objectives of the Treaty, according to which, as specially mentioned in the preamble, Latin America must be completely free from nuclear weapons, and that it would be incompatible with the non-nuclear status of the states parties to the Treaty and with their obligations as laid down in Article 1 thereof.

Any actions undertaken by a state or states parties to the Treaty which are not compatible with their non-nuclear status, and also the commission by one or more states parties to the Treaty of an act of aggression with the support of a state which is in possession of nuclear weapons or together with such a state, will be regarded by the Soviet Union as incompatible with the obligations of those countries under the Treaty. In such cases the Soviet Union reserves the right to reconsider its obligations under Protocol II. It further reserves the right to reconsider its attitude to this Protocol in the event of any actions on the part of other states possessing nuclear weapons which are incompatible with their obligations under the said Protocol. The provisions of the articles of Protocol II are applicable to the text of the Treaty for the Prohibition of Nuclear Weapons in Latin America in the wording of the Treaty at the time of the signing of the Protocol by the Soviet Union, due account being taken of the position of the Soviet Union as set out in the present statement. Any amendment to the Treaty entering into force in accordance with the provisions of Articles 29 and 6 of the Treaty without the clearly expressed approval of the Soviet Union shall have no force as far as the Soviet Union is concerned.

In addition, the Soviet Union proceeds from the assumption that the obligations under Protocol II also apply to the territories for which the status of the denuclearized zone is in force in conformity with Protocol I of the Treaty.

[15] Venezuela stated that in view of the existing controversy between Venezuela on the one hand and the United Kingdom and Guyana on the other, Article 25, paragraph 2 of the Treaty should apply to Guyana. This paragraph provides that no political entity should be admitted, part or all of whose territory is the subject of a dispute or claim between an extra-continental country and one or more Latin American states, so long as the dispute has not been settled by peaceful means.

[16] Safeguards under the Non-Proliferation Treaty cover the Treaty of Tlatelolco.

The Non-Proliferation Treaty

[1] Notification of succession.

[2] On the occasion of the deposit of the instrument of ratification, Egypt stated that since it was embarking on the construction of nuclear power reactors, it expected assistance and support from industrialized nations with a developed nuclear industry. It called upon nuclear weapon states to promote research and development of peaceful applications of nuclear explosions in order to overcome all the difficulties at present involved therein. Egypt also appealed to these states to exert their efforts to conclude an agreement prohibiting the use or threat of use of nuclear weapons against any state, and expressed the view that the Middle East should remain completely free of nuclear weapons.

[3] France, not party to the Treaty, declared that it would behave like a state adhering to the Treaty and that it would follow a policy of strengthening appropriate safeguards relating to nuclear equipment, material and technology. On 12 Sep. 1981 an agreement between France, the European Atomic Energy Community (Euratom) and the IAEA for the application of safeguards in France entered into force. The agreement covers nuclear material and facilities notified to the IAEA by France.

[4] On depositing the instrument of ratification, the Federal Republic of Germany reiterated the declaration

made at the time of signing: it reaffirmed its expectation that the nuclear weapon states would intensify their efforts in accordance with the undertakings under Article VI of the Treaty, as well as its understanding that the security of FR Germany continued to be ensured by NATO; it stated that no provision of the Treaty may be interpreted in such a way as to hamper further development of European unification; that research, development and use of nuclear energy for peaceful purposes, as well as international and multinational co-operation in this field, must not be prejudiced by the Treaty; that the application of the Treaty, including the implementation of safeguards, must not lead to discrimination of the nuclear industry of FR Germany in international competition; and that it attached vital importance to the undertaking given by the United States and the United Kingdom concerning the application of safeguards to their peaceful nuclear facilities, hoping that other nuclear weapon states would assume similar obligations.

In a separate note, FR Germany declared that the Treaty will also apply to Berlin (West) without affecting Allied rights and responsibilities, including those relating to demilitarization. In notes of 24 July, 19 Aug. and 25 Nov. 1975, respectively, addressed to the US Department of State, Czechoslovakia, the Soviet Union and the German Democratic Republic stated that this declaration by FR Germany had no legal effect.

[5] On acceding to the Treaty, the Holy See stated, *inter alia*, that the Treaty will attain in full the objectives of security and peace and justify the limitations to which the states party to the Treaty submit, only if it is fully executed in every clause and with all its implications. This concerns not only the obligations to be applied immediately but also those which envisage a process of ulterior commitments. Among the latter, the Holy See considers it suitable to point out the following:

(*a*) The adoption of appropriate measures to ensure, on a basis of equality, that all non-nuclear weapon states party to the Treaty will have available to them the benefits deriving from peaceful applications of nuclear technology.

(*b*) The pursuit of negotiations in good faith of effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective control.

[6] On signing the Treaty, Indonesia stated, *inter alia*, that the government of Indonesia attaches great importance to the declarations of the United States, the United Kingdom and the Soviet Union affirming their intention to provide immediate assistance to any non-nuclear weapon state party to the Treaty that is a victim of an act of aggression in which nuclear weapons are used. Of utmost importance, however, is not the action *after* a nuclear attack has been committed but the guarantees to prevent such an attack. The Indonesian Government trusts that the nuclear weapon states will study further this question of effective measures to ensure the security of the non-nuclear weapon states. On depositing the instrument of ratification, Indonesia expressed the hope that the nuclear countries would be prepared to co-operate with non-nuclear countries in the use of nuclear energy for peaceful purposes and implement the provisions of Article IV of the Treaty without discrimination. It also stated the view that the nuclear weapon states should observe the provisions of Article VI of the Treaty relating to the cessation of the nuclear arms race.

[7] Italy stated that in its belief nothing in the Treaty was an obstacle to the unification of the countries of western Europe; it noted full compatibility of the Treaty with the existing security agreements; it noted further that when technological progress would allow the development of peaceful explosive devices different from nuclear weapons, the prohibition relating to their manufacture and use shall no longer apply; it interpreted the provisions of Article IX, paragraph 3 of the Treaty, concerning the definition of a military nuclear state, in the sense that it referred exclusively to the five countries which had manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 Jan. 1967, and stressed that under no circumstance would a claim of pertaining to such category be recognized by the Italian Government for any other state.

[8] On depositing the instrument of ratification, Japan expressed the hope that France and China would accede to the Treaty; it urged a reduction of nuclear armaments and a comprehensive ban on nuclear testing; appealed to all states to refrain from the threat or use of force involving either nuclear or non-nuclear weapons; expressed the view that peaceful nuclear activities in non-nuclear weapon states party to the Treaty should not be hampered and that Japan should not be discriminated against in favour of other parties in any aspect of such activities. It also urged all nuclear weapon states to accept IAEA safeguards on their peaceful nuclear activities.

[9] A statement was made containing a disclaimer regarding the recognition of states party to the Treaty.

[10] On depositing the instrument of ratification, the Republic of Korea took note of the fact that the depositary governments of the three nuclear weapon states had made declarations in June 1968 to take immediate and effective measures to safeguard any non-nuclear weapon state which is a victim of an act or an object of a threat of aggression in which nuclear weapons are used. It recalled that the UN Security Council adopted a resolution to the same effect on 19 June 1968.

[11] On depositing the instruments of accession and ratification, Liechtenstein and Switzerland stated that activities not prohibited under Articles I and II of the Treaty include, in particular, the whole field of energy production and related operations, research and technology concerning future generations of nuclear reactors based on fission or fusion, as well as production of isotopes. Liechtenstein and Switzerland define the term 'source or special fissionable material' in Article III of the Treaty as being in accordance with Article XX of the IAEA Statute, and a modification of this interpretation requires their formal consent; they will accept only such interpretations and definitions of the terms 'equipment or material especially designed or prepared for the processing, use or production of special fissionable material', as mentioned in Article III of the Treaty, that they will expressly approve; and they understand that the application of the Treaty, especially of the control measures, will not lead to discrimination of their industry in international competition.

[12] On signing the Treaty, Mexico stated, *inter alia*, that none of the provisions of the Treaty shall be interpreted as affecting in any way whatsoever the rights and obligations of Mexico as a state party to the Treaty of Tlatelolco.

It is the understanding of Mexico that at the present time any nuclear explosive device is capable of being used as a nuclear weapon and that there is no indication that in the near future it will be possible to manufacture

nuclear explosive devices that are not potentially nuclear weapons. However, if technological advances modify this situation, it will be necessary to amend the relevant provisions of the Treaty in accordance with the procedure established therein.

[13] The ratification was accompanied by a statement in which Turkey underlined the non-proliferation obligations of the nuclear weapon states, adding that measures must be taken to meet adequately the security requirements of non-nuclear weapon states. Turkey also stated that measures developed or to be developed at national and international levels to ensure the non-proliferation of nuclear weapons should in no case restrict the non-nuclear weapon states in their option for the application of nuclear energy for peaceful purposes.

[14] The United Kingdom recalled its view that if a regime is not recognized as the government of a state, neither signature nor the deposit of any instrument by it, nor notification of any of those acts, will bring about recognition of that regime by any other state.

[15] This agreement, signed by the United Kingdom, Euratom and the IAEA, provides for the submission of British non-military nuclear installations to safeguards under IAEA supervision.

[16] This agreement provides for safeguards on fissionable material in all facilities within the USA, excluding those associated with activities of direct national security significance.

[17] The agreement provides for the application of IAEA safeguards in Soviet peaceful nuclear facilities designated by the Soviet Union.

[18] In connection with the ratification of the Treaty, Yugoslavia stated, *inter alia*, that it considered a ban on the development, manufacture and use of nuclear weapons and the destruction of all stockpiles of these weapons to be indispensable for the maintenance of a stable peace and international security; it held the view that the chief responsibility for progress in this direction rested with the nuclear weapon powers, and expected these powers to undertake not to use nuclear weapons against the countries which have renounced them as well as against non-nuclear weapon states in general, and to refrain from the threat to use them. It also emphasized the significance it attached to the universality of the efforts relating to the realization of the Non-Proliferation Treaty.

The Sea-Bed Treaty

[1] On signing and ratifying the Treaty, Argentina stated that it interprets the references to the freedom of the high seas as in no way implying a pronouncement of judgement on the different positions relating to questions connected with international maritime law. It understands that the reference to the rights of exploration and exploitation by coastal states over their continental shelves was included solely because those could be the rights most frequently affected by verification procedures. Argentina precludes any possibility of strengthening, through this Treaty, certain positions concerning continental shelves to the detriment of others based on different criteria.

[2] On signing the Treaty, Brazil stated that nothing in the Treaty shall be interpreted as prejudicing in any way the sovereign rights of Brazil in the area of the sea, the sea-bed and the subsoil thereof adjacent to its coasts. It is the understanding of the Brazilian Government that the word 'observation', as it appears in paragraph 1 of Article III of the Treaty, refers only to observation that is incidental to the normal course of navigation in accordance with international law.

[3] In depositing the instrument of ratification, Canada declared: Article I, paragraph 1, cannot be interpreted as indicating that any state has a right to implant or emplace any weapons not prohibited under Article I, paragraph 1, on the sea-bed and ocean floor, and in the subsoil thereof, beyond the limits of national jurisdiction, or as constituting any limitation on the principle that this area of the sea-bed and ocean floor and the subsoil thereof shall be reserved for exclusively peaceful purposes. Articles I, II and III cannot be interpreted as indicating that any state but the coastal state has any right to implant or emplace any weapon not prohibited under Article I, paragraph 1 on the continental shelf, or the subsoil thereof, appertaining to that coastal state, beyond the outer limit of the sea-bed zone referred to in Article I and defined in Article II. Article III cannot be interpreted as indicating any restrictions or limitation upon the rights of the coastal state, consistent with its exclusive sovereign rights with respect to the continental shelf, to verify, inspect or effect the removal of any weapon, structure, installation, facility or device implanted or emplaced on the continental shelf, or the subsoil thereof, appertaining to that coastal state, beyond the outer limit of the sea-bed zone referred to in Article I and defined in Article II. On 12 Apr. 1976, the Federal Republic of Germany stated that the declaration by Canada is not of a nature to confer on the government of this country more far-reaching rights than those to which it is entitled under current international law, and that all rights existing under current international law which are not covered by the prohibitions are left intact by the Treaty.

[4] A statement was made containing a disclaimer regarding recognition of states party to the Treaty.

[5] On ratifying the Treaty, the Federal Republic of Germany declared that the Treaty will apply to Berlin (West).

[6] On the occasion of its accession to the Treaty, the government of India stated that as a coastal state, India has, and always has had, full and exclusive rights over the continental shelf adjoining its territory and beyond its territorial waters and the subsoil thereof. It is the considered view of India that other countries cannot use its continental shelf for military purposes. There cannot, therefore, be any restriction on, or limitation of, the sovereign right of India as a coastal state to verify, inspect, remove or destroy any weapon, device, structure, installation or facility, which might be implanted or emplaced on or beneath its continental shelf by any other country, or to take such other steps as may be considered necessary to safeguard its security. The accession by the government of India to the Treaty is based on this position. In response to the Indian statement, the US Government expressed the view that, under existing international law, the rights of coastal states over their continental shelves are exclusive only for the purposes of exploration and exploitation of natural resources, and are otherwise limited by the 1958 Convention on the Continental Shelf and other principles of international law. On 12 Apr. 1976, the Federal Republic of Germany stated that the declaration by India is not of a nature to confer

on the government of this country more far-reaching rights than those to which it is entitled under current international law, and that all rights existing under current law which are not covered by the prohibitions are left intact by the Treaty.

[7] On signing the Treaty, Italy stated, *inter alia*, that in the case of agreements on further measures in the field of disarmament to prevent an arms race on the sea-bed and ocean floor and in their subsoil, the question of the delimitation of the area within which these measures would find application shall have to be examined and solved in each instance in accordance with the nature of the measures to be adopted. The statement was repeated at the time of ratification.

[8] Mexico declared that in its view no provision of the Treaty can be interpreted to mean that a state has the right to emplace nuclear weapons or other weapons of mass destruction, or arms or military equipment of any type, on the continental shelf of Mexico. It reserves the right to verify, inspect, remove or destroy any weapon, structure, installation, device or equipment placed on its continental shelf, including nuclear weapons or other weapons of mass destruction.

[9] Ratification of the Treaty by Taiwan is considered by Romania as null and void.

[10] The United Kingdom recalled its view that if a regime is not recognized as the government of a state neither signature nor the deposit of any instrument by it, nor notification of any of those acts, will bring about recognition of that regime by any other state.

[11] Viet Nam stated that no provision of the Treaty should be interpreted in a way that would contradict the rights of the coastal states with regard to their continental shelf, including the right to take measures to ensure their security.

[12] On 25 Feb. 1974, the Ambassador of Yugoslavia transmitted to the US Secretary of State a note stating that in the view of the Yugoslav Government, Article III, paragraph 1, of the Treaty should be interpreted in such a way that a state exercising its right under this Article shall be obliged to notify in advance the coastal state, in so far as its observations are to be carried out 'within the stretch of the sea extending above the continental shelf of the said state'. On 16 Jan. 1975 the US Secretary of State presented the view of the United States concerning the Yugoslav note, as follows: In so far as the note is intended to be interpretative of the Treaty, the United States cannot accept it as a valid interpretation. In addition, the United States does not consider that it can have any effect on the existing law of the sea. In so far as the note was intended to be a reservation to the Treaty, the United States placed on record its formal objection to it on the grounds that it was incompatible with the object and purpose of the Treaty. The United States also drew attention to the fact that the note was submitted too late to be legally effective as a reservation. A similar exchange of notes took place between Yugoslavia and the United Kingdom. On 12 Apr. 1976, the Federal Republic of Germany stated that the declaration by Yugoslavia is not of a nature to confer on the government of this country more far-reaching rights than those to which it is entitled under current international law, and that all rights existing under current international law which are not covered by the prohibitions are left intact by the Treaty.

The BW Convention

[1] Considering the obligations resulting from its status as a permanently neutral state, Austria declares a reservation to the effect that its co-operation within the framework of this Convention cannot exceed the limits determined by the status of permanent neutrality and membership with the United Nations.

[2] China stated that the BW Convention has the following defects: it fails explicitly to prohibit the use of biological weapons; it does not provide for 'concrete and effective' measures of supervision and verification; and it lacks measures of sanctions in case of violation of the Convention. The Chinese Government hopes that these defects will be corrected at an appropriate time, and also that a convention for complete prohibition of chemical weapons will soon be concluded. The signature and ratification of the Convention by the Taiwan authorities in the name of China are considered illegal and null and void.

[3] On depositing its instrument of ratification, the Federal Republic of Germany stated that a major shortcoming of the BW Convention is that it does not contain any provisions for verifying compliance with its essential obligations. The Federal Government considers the right to lodge a complaint with the UN Security Council to be an inadequate arrangement. It would welcome the establishment of an independent international committee of experts able to carry out impartial investigations when doubts arise as to whether the Convention is being complied with.

[4] In a statement made on the occasion of the signature of the Convention, India reiterated its understanding that the objective of the Convention is to eliminate biological and toxin weapons, thereby excluding completely the possibility of their use, and that the exemption with regard to biological agents or toxins, which would be permitted for prophylactic, protective or other peaceful purposes, would not in any way create a loophole in regard to the production or retention of biological and toxin weapons. Also any assistance which might be furnished under the terms of the Convention would be of a medical or humanitarian nature and in conformity with the UN Charter. The statement was repeated at the time of the deposit of the instrument of ratification.

[5] Ireland considers that the Convention could be undermined if the reservations made by the parties to the 1925 Geneva Protocol were allowed to stand, as the prohibition of possession is incompatible with the right to retaliate, and that there should be an absolute and universal prohibition of the use of the weapons in question. Ireland notified the depositary government for the Geneva Protocol of the withdrawal of its reservations to the Protocol, made at the time of accession in 1930. The withdrawal applies to chemical as well as to bacteriological (biological) and toxin agents of warfare.

[6] The Republic of Korea stated that the signing of the Convention does not in any way mean or imply the recognition of any territory or regime which has not been recognized by the Republic of Korea as a state or government.

[7] In the understanding of Kuwait, its ratification of the Convention does not in any way imply its recognition of Israel, nor does it oblige it to apply the provisions of the Conventions in respect of the said country.

[8] Mexico considers that the Convention is only a first step towards an agreement prohibiting also the development, production and stockpiling of all chemical weapons, and notes the fact that the Convention contains an express commitment to continue negotiations in good faith with the aim of arriving at such an agreement.

[9] Notification of succession.

[10] The ratification by Switzerland contains the following reservations:

1. Owing to the fact that the Convention also applies to weapons, equipment or means of delivery designed to use biological agents or toxins, the delimitation of its scope of application can cause difficulties since there are scarcely any weapons, equipment or means of delivery peculiar to such use; therefore, Switzerland reserves the right to decide for itself what auxiliary means fall within that definition.

2. By reason of the obligations resulting from its status as a perpetually neutral state, Switzerland is bound to make the general reservation that its collaboration within the framework of this Convention cannot go beyond the terms prescribed by that status. This reservation refers especially to Article VII of the Convention as well as to any similar clause that could replace or supplement that provision of the Convention.

In a note of 18 Aug. 1976, addressed to the Swiss Ambassador, the US Secretary of State stated the following view of the US Government with regard to the first reservation: The prohibition would apply only to (*a*) weapons, equipment and means of delivery, the design of which indicated that they could have no other use than that specified, and (*b*) weapons, equipment and means of delivery, the design of which indicated that they were specifically intended to be capable of the use specified. The government of the United States shares the view of the government of Switzerland that there are few weapons, equipment or means of delivery peculiar to the uses referred to. It does not, however, believe that it would be appropriate, on this ground alone, for states to reserve unilaterally the right to decide which weapons, equipment or means of delivery fell within the definition. Therefore, while acknowledging the entry into force of the Convention between itself and the government of Switzerland, the US Government enters its objection to this reservation.

[11] The deposit of the instrument of ratification by Taiwan is considered by the Soviet Union as an illegal act because the government of the People's Republic of China is regarded by the Soviet Union as the sole representative of China.

[12] The United Kingdom recalled its view that if a regime is not recognized as the government of a state, neither signature nor the deposit of any instrument by it nor notification of any of those acts will bring about recognition of that regime by any other state.

The Enmod Convention

[1] The Federal Republic of Germany declared that the Convention applies also to Berlin (West). The Soviet Union objected to this and stated that the declaration was 'illegal'. Also the German Democratic Republic considers that the West German declaration has no legal effect.

[2] Kuwait made the following reservation and understanding: This Convention binds Kuwait only towards states parties thereto; its obligatory character shall *ipso facto* terminate with respect to any hostile state which does not abide by the prohibition contained therein. It is understood that accession to this Convention does not mean in any way recognition of Israel by Kuwait; furthermore, no treaty relation will arise between Kuwait and Israel.

On 23 June 1980, the UN Secretary-General, the depositary of the Convention, received from the government of Israel a communication stating that Israel would adopt towards Kuwait an attitude of complete reciprocity.

[3] The Netherlands accepts the obligation laid down in Article I of the Enmod Convention as extending to states which are not party to the Convention and which act in conformity with Article I of this Convention.

[4] New Zealand declared that, in its interpretation, nothing in the Convention detracts from or limits the obligations of states to refrain from military or any other hostile use of environmental modification techniques which are contrary to international law.

[5] Notification of succession.

[6] On signing the Convention, Turkey declared that the terms 'widespread', 'long-lasting' and 'severe effects' contained in the Convention need to be more clearly defined, and that so long as this clarification was not made, Turkey would be compelled to interpret for itself the terms in question and, consequently, reserved the right to do so as and when required. Turkey also stated its belief that the difference between 'military or any other hostile purposes' and 'peaceful purposes' should be more clearly defined so as to prevent subjective evaluations.

The 'Inhumane Weapons' Convention

[1] Upon signature, China stated that the Convention fails to provide for supervision or verification of any violation of its clauses, thus weakening its binding force. The Protocol on mines, booby traps and other devices fails to lay down strict restrictions on the use of such weapons by the aggressor on the territory of the victim and to provide adequately for the right of a state victim of an aggression to defend itself by all necessary means. The Protocol on incendiary weapons does not stipulate restrictions on the use of such weapons against combat personnel.

[2] France stated that it regretted that it had not been possible to reach agreement on the provisions concerning the verification of facts which might be alleged and which might constitute violations of the undertakings subscribed to. It therefore reserved the right to submit, possibly in association with other states, proposals aimed at filling that gap at the first conference to be held pursuant to Article 8 of the Convention and to utilize, as appropriate, procedures that would make it possible to bring before the international community facts and

information which, if verified, could constitute violations of the provisions of the Convention and the protocols annexed thereto.

Not being bound by the 1977 Additional Protocol I to the Geneva Conventions of 1949, France considers that the fourth paragraph of the preamble to the Convention on prohibitions or restrictions on the use of certain conventional weapons, which reproduces the provisions of Article 35, paragraph 3, of Additional Protocol I, applies only to states parties to that Protocol. France will apply the provisions of the Convention and its three Protocols to all the armed conflicts referred to in Articles 2 and 3 common to the Geneva Convention of 1949.

[3] Italy stated its regret that no agreement had been reached on provisions that would ensure respect for the obligations under the Convention. Italy intends to undertake efforts to ensure that the problem of the establishment of a mechanism that would make it possible to fill this gap in the Convention is taken up again at the earliest opportunity in every competent forum.

[4] Romania stated that the provisions of the Convention and its Protocols have a restricted character and do not ensure adequate protection either to the civilian population or to the combatants as the fundamental principles of international humanitarian law require.

[5] The United States stated that it had strongly supported proposals by other countries to include special procedures for dealing with compliance matters, and reserved the right to propose at a later date additional procedures and remedies, should this prove necessary, to deal with such problems.

Appendix 23B. UN member states and year of membership

In the following list of names of the 159 UN member states, the countries marked with an asterisk are also members of the Geneva-based Conference on Disarmament (CD).

Afghanistan, 1946
Albania, 1955
*Algeria, 1962
Angola, 1976
Antigua and Barbuda, 1981
*Argentina, 1945
*Australia, 1945
Austria, 1955
Bahamas, 1973
Bahrain, 1971
Bangladesh, 1974
Barbados, 1966
*Belgium, 1945
Belize, 1981
Benin, 1960
Bhutan, 1971
Bolivia, 1945
Botswana, 1966
*Brazil, 1945
Brunei Darussalam, 1984
*Bulgaria, 1955
Burkina Faso (formerly Upper Volta), 1960
*Burma, 1948
Burundi, 1962
Byelorussia, 1945
Cameroon, 1960
*Canada, 1945
Cape Verde, 1975
Central African Republic, 1960
Chad, 1960
Chile, 1945
*China, 1945
Colombia, 1945
Comoros, 1975
Congo, 1960
Costa Rica, 1945
*Cuba, 1945
Cyprus, 1960
*Czechoslovakia, 1945
Denmark, 1945
Djibouti, 1977
Dominica, 1978
Dominican Republic, 1945
Ecuador, 1945
*Egypt, 1945
El Salvador, 1945
Equatorial Guinea, 1968
*Ethiopia, 1945
Fiji, 1970
Finland, 1955
*France, 1945
Gabon, 1960
Gambia, 1965
*German Democratic Republic, 1973
*FR Germany, 1973
Ghana, 1957
Greece, 1945
Grenada, 1974
Guatemala, 1945
Guinea, 1958
Guinea-Bissau, 1974
Guyana, 1966
Haiti, 1945
Honduras, 1945
*Hungary, 1955
Iceland, 1946
*India, 1945
*Indonesia, 1950
*Iran, 1945
Iraq, 1945
Ireland, 1955
Israel, 1949
*Italy, 1955
Ivory Coast, 1960
Jamaica, 1962
*Japan, 1956
Jordan, 1955
Kampuchea, 1955
*Kenya, 1963
Kuwait, 1963
Lao People's Democratic Republic, 1955
Lebanon, 1945
Lesotho, 1966
Liberia, 1945
Libya, 1955
Luxembourg, 1945
Madagascar, 1960
Malawi, 1964
Malaysia, 1957
Maldives, 1965
Mali, 1960
Malta, 1964
Mauritania, 1961
Mauritius, 1968
*Mexico, 1945

*Mongolia, 1961
*Morocco, 1956
Mozambique, 1975
Nepal, 1955
*Netherlands, 1945
New Zealand, 1945
Nicaragua, 1945
Niger, 1960
*Nigeria, 1960
Norway, 1945
Oman, 1971
*Pakistan, 1947
Panama, 1945
Papua New Guinea, 1975
Paraguay, 1945
*Peru, 1945
Philippines, 1945
*Poland, 1945
Portugal, 1955
Qatar, 1971
*Romania, 1955
Rwanda, 1962
Saint Christopher and Nevis, 1983
Saint Lucia, 1979
Saint Vincent and the Grenadines, 1980
Samoa, 1976
Sao Tome and Principe, 1975
Saudi Arabia, 1945
Senegal, 1960
Seychelles, 1976
Sierra Leone, 1961
Singapore, 1965
Solomon Islands, 1978
Somalia, 1960
South Africa, 1945
Spain, 1955
*Sri Lanka, 1955
Sudan, 1956
Suriname, 1975
Swaziland, 1968
*Sweden, 1946
Syria, 1945
Tanzania, 1961
Thailand, 1946
Togo, 1960
Trinidad and Tobago, 1962
Tunisia, 1956
Turkey, 1945
Uganda, 1962
*UK, 1945
Ukraine, 1945
United Arab Emirates, 1971
Uruguay, 1945
*USA, 1945
*USSR, 1945
Vanuatu, 1981
*Venezuela, 1945
Viet Nam, 1977
Yemen Arab Republic, 1947
Yemen, People's Democratic Republic of, 1967
*Yugoslavia, 1945
*Zaire, 1960
Zambia, 1964
Zimbabwe, 1980

24. Chronology

JOZEF GOLDBLAT and RAGNHILD FERM

January–December 1985

8 January In a joint statement issued in Geneva, the Soviet and US governments agree to negotiate agreements aimed at preventing an arms race in space and terminating it on earth, limiting and reducing nuclear arms, and strengthening strategic stability. All these questions are to be considered and resolved in their interrelationship.

28 January In a joint declaration issued in Delhi, the heads of state or government of Argentina, Greece, India, Mexico, Sweden and Tanzania call for a prohibition on the development, testing, production, deployment and use of all space weapons, as well as for an immediate halt to the testing of all kinds of nuclear weapon and the conclusion, at an early date, of a treaty on a nuclear weapon test ban.

28 January New Zealand's Prime Minister says that the request for a US warship to visit New Zealand will be accepted only if it is determined that the ship is not nuclear-armed.

31 January New Zealand's Prime Minister says that the ship nominated by the USA will not be allowed to visit New Zealand.

1 February President Reagan transmits to the US Congress his report on alleged Soviet non-compliance with the following agreements: the Biological Weapons Convention, the Partial Test Ban Treaty, the Threshold Test Ban Treaty, the Final Act of the Conference on Security and Co-operation in Europe, the ABM Treaty and the SALT agreements.

4 February A US State Department spokesman says that his government is reviewing defence co-operation with New Zealand following the latter's rejection of a naval port visit.

14 February At the Vienna talks on mutual force reductions, the WTO side tables basic provisions of an agreement which would remove from Central Europe, within one year, 20 000 Soviet and 13 000 US troops together with their armaments. To monitor the withdrawal, observation points would be established on each side. Negotiations are to continue for further reductions—down to 900 000 troops on each side.

21 February The Soviet Union and the International Atomic Energy Agency (IAEA) sign an agreement for the application of safeguards in peaceful nuclear facilities to be designated by the Soviet Union.

12 March US–Soviet talks on nuclear and space arms begin in Geneva.

15 March The Belgian Government confirms its decision to deploy US ground-launched cruise missiles in the country.

27 March The NATO Nuclear Planning Group meeting in ministerial session in Luxembourg issues a communiqué in which it reports on the consultations held on political and strategic implications of the US Strategic Defense Initiative. It expresses support for US research on technologies, the aim of which is to enhance stability and deterrence at reduced levels of offensive nuclear forces, and states that such research conducted within the terms of the ABM Treaty should continue.

7 April General Secretary Gorbachev announces a moratorium on the deployment of Soviet intermediate-range missiles in the European zone until November 1985.

10 April Communist Party Chairman Hu Yaobang says that China and the United States have agreed that US Navy ships will not be carrying nuclear weapons when they make a port call in China.

19 April Communist Party Chairman Hu Yaobang announces that one million men will be cut from China's armed forces during the next two years.

20 April The WTO Committee of Foreign Ministers meeting in Budapest demands the cessation of the deployment of US intermediate-range nuclear missiles in Western Europe, and declares that if a decision is taken to withdraw the missiles already deployed, simultaneous measures will be taken to 'withdraw the countersteps' of the WTO as well.

25 April In a statement made by its president, the UN Security Council strongly condemns the renewed use of chemical weapons against Iranian soldiers in the Iran–Iraq conflict.

2 May The foreign ministers of Argentina and Chile exchange instruments of ratification for the treaty ending their countries' dispute over the Beagle Channel.

23 May The Parliament of Iceland adopts a resolution reiterating the ban on stationing nuclear weapons in the country.

7 June In a communiqué issued by the North Atlantic Council meeting in ministerial session in Lisbon, the allies concerned state their willingness to modify, halt, reverse or dispense with longer-range INF deployment as part of an equitable and verifiable arms control agreement.

10 June President Reagan says that the United States will continue to refrain from 'undercutting' existing strategic arms agreements to the extent that the Soviet Union exercises comparable restraint and actively pursues arms reduction agreements in the nuclear and space arms talks in Geneva.

10 July *Rainbow Warrior*, the ship owned by the environmental organization Greenpeace and bound for the French nuclear weapon testing zone in the

South Pacific to protest against nuclear tests, is sunk following a criminal explosion in Auckland, New Zealand.

25 July The US Congress approves the production of binary chemical weapons under certain conditions.

29 July General Secretary Gorbachev announces the Soviet Government's decision to unilaterally cease conducting all nuclear explosions as from 6 August 1985 and to continue this moratorium through 1 January 1986. He urges the United States to follow this example.

29 July The US Secretary of State rejects the Soviet proposal for a moratorium on nuclear explosions, saying that the moratorium would be difficult to verify and that the USSR violated a similar agreement in the past.

29 July The US Secretary of State rejects the Soviet proposal for a moratorium on nuclear explosions, saying that the moratorium would be difficult to verify and that the USSR violated a similar agreement in the past.

30 July Representatives of 35 states meet in Helsinki to commemorate the adoption in 1975 of the Final Act of the Conference on Security and Co-operation in Europe.

6 August The treaty setting up the South Pacific nuclear-free zone is signed at Rarotonga, Cook Islands.

6 August Reacting to the US invitation to visit a nuclear test site (see *29 July*), the Soviet representative to the Geneva Conference on Disarmament says that 'one should stop nuclear explosions and not extend invitations to observe how they are conducted'.

27 August–21 September A conference of the parties to the Treaty on the Non-Proliferation of Nuclear Weapons takes place in Geneva to review the operation of the treaty.

12–13 September In a meeting held in Cartagena, Colombia, the foreign ministers of Colombia, Mexico, Panama and Venezuela (the Contadora group) deliver to their counterparts from Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua the draft Contadora Act on Peace and Co-operation in Central America.

13 September In formal letters addressed to the Government of the Federal Republic of Germany, the governments of Czechoslovakia and the German Democratic Republic propose that negotiations be held on the establishment of a zone free of chemical weapons in Europe.

15 September Responding to allegations that the French nuclear weapon tests have caused environmental damage, President Mitterrand invites the leaders of the South Pacific Forum to visit Mururoa and see that the allegations are not true. He adds that France will continue testing as long as it considers that the experiments are useful for its defence.

22 September The French Prime Minister admits that in Auckland, New

Zealand, French intelligence agents, acting under orders, blew up the *Rainbow Warrior* (see *10 July*).

24 September A representative of China to the IAEA General Conference states that his government has decided to 'voluntarily offer to place' some of its civilian nuclear installations under IAEA safeguards at an 'appropriate time'.

27 September In reply to the proposal for a chemical-weapon free zone in Europe, put forward by the governments of Czechoslovakia and the German Democratic Republic (see *13 September*), the Chancellor of the Federal Republic of Germany suggests that the respective delegations enter into talks within the framework of the Geneva Conference on Disarmament in order to discuss the still unresolved questions concerning a treaty for a world-wide ban on chemical weapons.

27 September During his visit to Washington, the Soviet Foreign Minister proposes a 50 per cent cut in the Soviet and US nuclear forces.

3 October In a speech to the French Parliament, General Secretary Gorbachev says that the Soviet Union is prepared for a dialogue with France and Britain on medium-range nuclear weapons in the framework of the European balance of forces.

6 October The US President's national security adviser says that full-scale testing and development of lasers and other advanced anti-missile technologies are 'authorized' by the ABM Treaty.

7 October The United States decides to withdraw its recognition of the compulsory jurisdiction of the International Court of Justice in all legal disputes.

14 October The US Secretary of State says before the North Atlantic Assembly in San Francisco that the US SDI research programme has been structured and will continue to be conducted in accordance with the 'restrictive' interpretation of the ABM Treaty's obligations; SDI deployment would be the subject of consultations with US allies and of discussion and negotiation with the Soviet Union.

22–23 October The participants in a meeting in Sofia of the WTO Political Consultative Committee suggest that the USSR and the USA undertake not to develop and produce new types of conventional weapons comparable in their effects to weapons of mass destruction. They also suggest that the numerical strength of the armed forces of the USSR and the USA, including those outside their territories, should be frozen as of 1 January 1986.

24 October In a joint message addressed to President Reagan and General Secretary Gorbachev, the heads of state or government of Argentina, Greece, India, Mexico, Sweden and Tanzania propose that the two powers suspend all nuclear tests for a period of 12 months. They express readiness to offer their good offices in order to facilitate the establishment of effective verification arrangements and propose to establish verification mechanisms on their own territories.

31 October It is made known in Washington that in accepting the Soviet 'concept' of reducing strategic nuclear arsenals by 50 per cent, the United States would exclude medium-range US bombers and missiles from the total of strategic weapons.

1 November The Netherlands Government decides to accept the deployment of 48 US ground-launched cruise missiles; the deployment is to begin in 1988.

21 November General Secretary Gorbachev and President Reagan issue a joint statement after their summit meeting in Geneva. They agree that 'a nuclear war cannot be won and must never be fought', and emphasize the importance of preventing any war between the two countries. They decide to accelerate the negotiations on nuclear and space arms, and to intensify bilateral discussions at the level of experts on all aspects of a chemical weapons ban, including the question of verification. They further agree to initiate a dialogue on preventing the proliferation of chemical weapons.

27 November General Secretary Gorbachev appeals to President Reagan to join the Soviet Union in a moratorium on nuclear tests.

5 December At the Vienna talks on mutual force reductions, the NATO side proposes, as a first step, the withdrawal of 5000 US troops from Western Europe, and 11 500 Soviet troops from Eastern Europe. NATO withdraws its request for prior agreement on the number of troops on either side in the central region. The plan provides for strict verification, including checkpoints to monitor the departure of troops and on-site inspections.

5 December The Royal Commission that inquired into British tests conducted in Australia in the 1950s and 1960s recommends that all test sites be cleaned up and that all costs be borne by the British Government.

13 December The North Atlantic Council meeting in ministerial session in Brussels expresses concern about the proliferation and use of chemical weapons.

17 December It is announced in Delhi that the Indian and Pakistani leaders have agreed not to attack each other's nuclear facilities.

19 December The United States rejects the Soviet proposal for a moratorium on nuclear testing, saying that continued tests are needed to ensure the safety and reliability of the US nuclear arsenal.

22 December The Bulgarian and Romanian leaders issue an appeal to the neighbouring states for the establishment of a chemical weapon-free zone in the Balkans.

23 December The White House issues a report stating that the USA will continue to abide by the terms of the unratified SALT II Treaty after it expires on 31 December.

23 December In a report sent to Congress, the US Administration lists cases of alleged non-compliance by the Soviet Union with arms control agreements (see also *1 February*).

29 December In a statement by the Soviet Press Agency TASS, the Soviet Union rejects US charges of non-compliance with arms control agreements and accuses the United States of violating the ABM Treaty and the SALT II Treaty.

Errata

World Armaments and Disarmament: SIPRI Yearbook 1985

Page 42, line 15: Should read: 'almost half of the globe in 30 minutes and of the impotence of'.

Page 83, line 16 of text: Should read: 'available in the mid-1950s. Their yields have ranged up to 58 megatons'.

Page 127: In section III, Nuclear winter references, see the following:

Carrier, G. F. *et al.*, line 5: reference to *Science* should read: 'Washington, **226**:1403 (1984).'

Crutzen, Brühl & Galbally reference should read: 'Crutzen, P. J., Galbally, I. E. & Brühl, C., 1984, 'Atmospheric effects from post-nuclear fires', *Climatic Change*, Dordrecht, **6**:323–364.'

Page 128: Under Gromyko *et al.*, reference to *New Perspectives* should read: 'Also, in part: *New Perspectives*, Helsinki, **15**(1):3–6 (1985).'

Hare, *et al.*, should read: 'Hare, F. K. *et al.*, 1985, *Nuclear Winter and Associated Effects: A Canadian Appraisal of the Environmental Impact of Nuclear War* (Ottawa: Royal Society of Canada), 382 pp.'

Under Harwell, M. A., 1984, reference to Westing should read: '*Cf.* Westing, A. H., 1985, *Environment*, Washington, DC, **27**(4), pp. 28–29.'

Hecht *et al.* should read: 'Hecht, A. D. *et al.*, *Interagency Research Report for Assessing Climatic Effects of Nuclear War* (Washington, DC: US Office of Science Technology and Policy), 49 + 2 + 5 pp.'

Page 141, line 9 from bottom: Should read: 'possibly with geosynchronous satellite relay, during the missions.'

Page 262, line 6: Should read: 'by the USA. Domestic military budgets amounted to an estimated $530'.

Page 351, line 1 of text: Should read: 'cent but rose by 130 per cent during the boom in 1975–79. But from then'.

Page 447, line 12: Should read: '3. The precipitous rise in oil prices in 1973–74 and 1979–80 is'.

Page 447, line 14: Should read: 'developing countries rose from $5 billion in 1973 to $67 billion in'.

Page 505: By 'Bulgaria', add in the column for the 'Antarctic Treaty', the entry '1978'.

Page 510: By 'Korea, Republic of (South)', in the column for the Enmod Convention, delete the date of accession '1984'.

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Page 10, line 22: Should read: 'a land-based ASAT system at Johnston Island in the Pacific Ocean.) If there'.

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