World Armaments and Disarmament

SIPRI yearbook 1975

Stockholm International Peace Research Institute

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Stockholm International Peace Research Institute

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PREFACE

The sixth issue of the *SIPRI Yearbook* continues our analysis of the world's arms races, and the attempts to stop them, up to 31 December 1974. As in all SIPRI publications, information has been obtained from open sources only.

The preparation of the Yearbook was directed and supervised by Frank Barnaby.

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Part I: Chapters 1, 2, 3 and 5 (Frank Barnaby) and Chapter 4 (Malvern Lumsden).

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May 1975

Frank Barnaby
Director

CONTENTS

PART II. DEVELOPMENTS IN WORLD ARMAMENTS

PART III. ADVANCES IN WEAPON TECHNOLOGY

PART IV. DEVELOPMENTS IN ARMS CONTROL AND DISARMAMENT

Chapter 14. Disarmament negotiations in 1974

TABLES, CHARTS, MAPS AND PLATES

Chapter 2. Nuclear-weapon proliferation

TABLES

CHART

MAP

Chapter 5. The Indian Ocean

TABLES

Chapter 6. World military expenditure, 1974

TABLES

CHART

Chapter 7. The production and trade of major weapon systems in industrialized countries, 1974

TABLES

CHART

Chapter 8. Major weapon procurement in third world countries, 1974

TABLES

Chapter 10. World stock of fighting vessels, 1950–74

TABLES

CHARTS

Chapter 11. Long-range cruise missiles

TABLE

CHARTS

MAPS

Chapter 12. Drones and remotely piloted vehicles

TABLES

Chapter 13. Reconnaissance satellites

TABLES

CHARTS

PLATES

Chapter 14. Disarmament negotiations in 1974

TABLE

Chapter 15. The implementation of agreements related to disarmament

TABLE

ABBREVIATIONS, CONVENTIONS AND CONVERSIONS

Abbreviations

bn	billion (one thousand million)
cm	centimetre
db	decibel
FY	fiscal year
hr	hour
kg	kilogramme
km	kilometre
kt	kiloton
lb	pound
m	metre
mm	millimetre
mn	million
min	minute
mt	megaton
sec	second

Conventions

Some conventions used with particular tables only are given together with those tables.

. .	Data not available
–	Nil or less than half the final digit shown; negligible; not applicable
( )	Greater degree of uncertainty about estimate
[ ]	Crude estimate

Country terminology

For the convenience of the reader, we have tended to use the geographical rather than the formal official name of certain countries. In addition, several states have recently changed their official names. Examples are given here.

North Viet-Nam	Democratic Republic of Viet-Nam (DRV)
South Viet-Nam	Republic of Viet-Nam
North Korea	Democratic People's Republic of Korea
South Korea	Republic of Korea
China	People's Republic of China
Taiwan	Republic of China
Congo	People's Republic of Congo
Zaire	formerly Democratic Republic of Congo (Congo Kinshasa)
Egypt	Arab Republic of Egypt (formerly United Arab Republic)
Bangla Desh	formerly East Pakistan
Khmer Republic	formerly Cambodia
Sri Lanka	formerly Ceylon
Democratic Yemen	People's Democratic Republic of Yemen (formerly South Yemen)
Yemen	Arab Republic of Yemen

Conversions

Units of length

1 millimetre=0.039 inch
1 inch=25.4 millimetres
1 metre=1.1 yard=3.28 feet
1 foot=30.480 centimetres
1 yard=3 feet=36 inches=0.91 metre
1 kilometre=0.62 statute mile=1 094 yards
1 statute mile=1.61 kilometres=1 760 yards
1 nautical mile=6 076 feet=1 852 metres

Units of mass

1 ton =1 000 kilograms (tonne)=2 205 pounds, avoirdupois=0.98 long ton=1.1 short ton
1 short ton=2 000 pounds=0.91 ton=0.89 long ton
1 long ton=2 240 pounds=1.1 ton=1.12 short ton
1 kiloton=1 000 tons
1 megaton=1 000 000 tons
1 kilogram=2.2 pounds
1 pound=0.45 kilograms.

Part I. 1974, the year in review

1. The main events of the year

Square-bracketed references, thus [1], *refer to the list of references on page 15.*

I. *Nuclear events*

The year 1974 was a record one for nuclear explosions: six countries tested nuclear devices—France and China in the atmosphere; India, the UK, the USA and the USSR underground (see appendix 16 C).

The Indian nuclear test on 18 May dramatically demonstrated the fragility of efforts to prevent the proliferation of nuclear weapons and focussed worldwide attention on the consequences of the spread of peaceful nuclear technology. India has consistently refused to join the Non-Proliferation Treaty (NPT) for reasons summarized by the Indian Defence Minister in 1970:

> I continue to hold the view that we can never agree to sign a non-proliferation treaty which is essentially discriminatory in its character, which does not take note of vertical proliferation and which does not take us even a step further towards stopping the mad race of increasing the nuclear arsenals of the superpowers and those who belong to the nuclear club. Also even in the development of nuclear energy for peaceful purposes, it puts constraints and restraints which are totally unacceptable for us. For all these reasons, we have taken the attitude that we will not sign it. That is a decision which has been made clear in the United Nations, in the Disarmament Conference and even in the discussions relating to the non-proliferation treaty.

The truth of the statement that the NPT has not stopped the "mad race of increasing the nuclear arsenals of the superpowers and those who belong to the nuclear club" cannot be denied. If the nuclear-weapon signatories of the NPT *had*, over the past five years, taken positive steps towards effective nuclear disarmament as the treaty obliges them to do, it is possible that the Indian nuclear explosion would not have taken place. Whether or not attempts to prevent further nuclear weapon proliferation are successful, therefore, depends mainly on the behaviour of the two great powers.

The question now is whether or not India will develop a credible tactical or strategic nuclear force. The Indian government has repeatedly said that it does not want nuclear weapons—statements to this effect have been made by three successive prime ministers, by Nehru in 1957, by Shastri in 1964, and again in 1968 by Mrs Gandhi.

Prime Minister Gandhi stated in 1968: "India has repeatedly announced that she is not making an atom bomb and that she is developing her atomic energy programme exclusively for peaceful purposes . . . We believe that to be militarily strong, it is equally important to be economically and industrially strong. Our programme of atomic energy development for peaceful purposes is related to the real needs of our economy and would be effectively geared to this end". Again, after the 1974 nuclear explosion, Prime Minister Gandhi emphatically repeated that India would produce nuclear explosive devices for peaceful purposes only.

Even if the sincerity of the present Indian government's intentions is not doubted, a future government may make different decisions about the uses it makes of its nuclear explosive devices. And the fact is that the same nuclear explosive device can serve peaceful or military ends.

The plethora of nuclear tests in 1974 indicates the urgent need for the negotiation of a comprehensive ban on nuclear weapon tests. But the prospects for the negotiation of such a ban may have been lessened by the Nixon-Brezhnev bilateral agreement in July on a threshold test ban (see chapter 14). Because of the importance of a comprehensive test ban for progress in arms control and disarmament, and for strengthening the NPT (due for review at a conference in May 1975), this move may prove to be a severe set-back.

The British nuclear test, the first since 1965, was a surprise. It probably involved an indigenously produced improved warhead for the Polaris missile. Sixteen of these triple-warhead missiles are carried in each of the four nuclear submarines which make up the British strategic nuclear force—capable of delivering 192 such 200-kiloton nuclear warheads. At present, these warheads are not independently-targetable at widely separated targets, but the British nuclear force is still formidable—since there are at most only 100 urban and industrial centres in the Soviet Union large enough to be targeted with nuclear warheads. If the UK is, in fact, developing a modified and possibly independently-targetable Polaris warhead, this presumably means that it has decided to continue to rely on up-dated Polaris missiles in the foreseeable future, rather than to invest in the more sophisticated, but very expensive, new US Poseidon missiles, each of which carries about 10 multiple independently-targetable re-entry vehicles (MIRVs). But is even an improved British strategic submarine force credible?

The small size, limited missile range and geographic basing of the British force makes it vulnerable to Soviet antisubmarine forces—particularly nuclear hunter-killer submarines. The Soviet Navy has already deployed 28 of these submarines of various types and an additional 40 nuclear submarines capable of antisubmarine warfare (ASW). The United Kingdom does have seven nuclear hunter-killer submarines, and four more under construction, with which to defend its strategic nuclear submarines. Nevertheless a concentrated attack by Soviet antisubmarine forces could not be effectively repelled by this small British force [1]. The strategic value of the latter would, therefore, be significant only if the Soviet forces were mainly engaged against US strategic nuclear submarines. This argument applies even more strongly to the French strategic nuclear submarines, because France has no hunter-killer submarines with which to defend its strategic submarines at all.

The US-Soviet treaties to limit anti-ballistic missiles established the credibility of the British and French strategic nuclear forces as deterrents to a nuclear attack against the United Kingdom and France. But additional arms control agreements will be necessary to curtail ASW operations drastically in the Atlantic if the survivability of the British and French strategic nuclear submarines is to be increased. Good sense demands, therefore, that the UK and France should do their utmost to encourage further arms limitations agreements between the Soviet Union and the United States—first to halt and then to wind down the nuclear arms race between the two great powers.

The promise of nuclear assistance made by President Nixon to Egypt and Israel (neither of which have ratified the NPT) in June 1974 was a further set-back for the NPT (see chapter 2). If the treaty is to be strengthened, it is of paramount importance that countries which join it are not disadvantaged in obtaining nuclear assistance and supplies compared with those countries which do not join it.

The success of the NPT review conference will be judged mainly on whether or not it leads to improvements in the implementation of Articles III, IV, V and VI of the treaty. The essential provisions of these articles are: (*a*) article III puts an obligation on the non-nuclear-weapon states which are party to the treaty to accept safeguards, as laid down in a special agreement with the IAEA, on their peaceful nuclear activities in order to ensure that there is no diversion of nuclear energy resources to the manufacture of nuclear explosives. The safeguards are to apply to all source or special fissionable materials: enriched uranium-235, uranium-233 and plutonium-239. Article III further prescribes that no state party to the treaty may supply fissionable material or equipment to any non-nuclear-weapon state unless it accepts the safeguards provided for in the treaty; (*b*) article IV affirms that all states which are party to the treaty have the right to undertake research, production and exploitation of nuclear energy for peaceful purposes; and it puts on all states in a position to do so an obligation to assist other countries; (*c*) article V obliges nuclear-weapon states to make nuclear explosives for peaceful purposes available to non-nuclear-weapon states under appropriate international observation and procedure, and for a minimum cost. This cost will not include that of research and development; and (*d*) article VI stipulates that all parties to the treaty undertake, in all good faith, to pursue negotiations on effective measures for nuclear disarmament. This is mainly an obligation for the nuclear-weapon states.

But possibly the most important requirement is that all countries should fully support the efforts of the IAEA to obtain adequate international cooperation in solving the problems raised by the worldwide spread of nuclear energy. Of particular importance is the Agency's programme of technical assistance. The Agency must be given adequate financial and manpower resources to fulfil its functions—resources which must be increased concomitantly with the exponential increase in the use of nuclear energy. Safeguards, for example, must be continually improved (see chapter 2). And the commercial use of breeder reactors, likely to begin in about a decade from now, will put a large additional burden on the Agency. It should soon be given the opportunity to prepare itself for this contingency.

II. *Conflict*

The period since the end of World War II has been characterized by increasing levels of conflict and violence. International efforts to develop mechanisms for peaceful change—crisis management, peace-making and peace-keeping operations—continue but are making only slow progress, as events during 1974 illustrate.

In a recent publication [2], Professor Kende has listed the conflicts which occurred between 1945 and 1969. The definition of war is notoriously difficult and inevitably includes a high degree of subjective judgement—many definitions are, therefore, possible. But a list of wars can be a relative indicator of levels of violence.

Kende defines a war as any armed conflict in which all of the following criteria occur:

1. Activities of regular armed forces (military, police forces, and so on) at least on one side—that is, the presence and engagement of the armed forces of the government in power.

2. A certain degree of organization and organized fighting on both opposing sides, even if this organization extends to organized defence only.

3. A certain continuity between the armed clashes, however sporadic. Centrally organized guerilla forces are also regarded as making war, insofar as their activities extend over a considerable part of the country concerned.

On the basis of this definition, Kende lists 97 wars during the period 1945–69. The total duration of these conflicts exceeded 250 years and there was not a single day in which one or several wars were not fought somewhere in the world. The number of persons killed in action since 1945 amounts to tens of millions.

Whatever criteria are used to define war, the record since 1945 has been appalling. And events in 1974 showed no improvement in the situation. Despite the 1973 Paris Agreements, the war in South Viet-Nam continued. The fragile peace in the Middle East could be broken at any time. And in addition, according to a list provided by Kende [3], armed conflicts were in progress in 1974 in: Burma (since 1948); Angola (since 1961, terminated in October 1974); Ethiopia/Eritrea (since 1961); Guinea-Bissau (since 1963, terminated in August 1974); Mozambique (since 1964, terminated in

September 1974); Oman/Dhofar (since 1965); Thailand (since 1965); Rhodesia (since 1967); Northern Ireland (since 1969); Cambodia (since 1970); the Philippines (since 1970); Iraq (since March 1974) and Cyprus (July 1974 – August 1974).

Besides these 14 wars of various kinds, border clashes and sporadic but repetitive armed clashes took place in a number of regions such as the Middle East—including the borders of Iran and Iraq, Saudi Arabia and South Yemen—and North and South Korea. There were also significant guerilla activities in India, Pakistan/Balutchistan and parts of Malaysia, Indonesia, Namibia, Argentina, Brazil, Chile and Uruguay.

Many of the conflicts since 1945 were fed by supplies of arms, including the most sophisticated weapons, from the industrialized countries (see chapter 6). It is high time that serious efforts were made to control the international trade in conventional arms. Particularly serious are the arms build-ups in the Middle East and Persian Gulf areas (see chapter 8).

It is a sobering thought that any war, however limited, could, by the involvement of the great powers, escalate into an all-out nuclear war—a danger which will become considerably greater as more nuclear-weapon powers emerge.

III. *The Law of the Sea*

An important event in 1974 was the second session of the Third United Nations Conference on the Law of the Sea which took place in Caracas from 20 June to 29 August. The number of participants at the Caracas Conference was impressive—142 nations were represented. However, conference President Ambassador H. S. Amarasinghe said in the closing session of the conference "There has so far been no agreement on any final text on any single subject or issue". He implied that as many as three more sessions may be needed to obtain a signed treaty in 1975. The conference agreed to reconvene in Geneva on 17 March 1975 for a further session—to run until 3 May—and then to return to Venezuela in mid-summer to sign a treaty, if one is negotiated by then.

The major gulf developed between the positions of the industrialized and underdeveloped countries on four crucial issues. The first concerned territorial limits. The underdeveloped countries want virtual sovereign control over all activities within 200 miles of their coasts. But the industrialized nations led by the USA and the USSR, would prefer to give coastal states full control over a 12-mile limit and to establish a further 188-mile economic zone open to fishing and scientific research by other nations. The second controversy was over passage through straits. The USA and the USSR, supported by other industrialized nations, want freedom of passage for warships and merchant ships through all straits (there are more than 100 in the world). But the straits countries, most of them underdeveloped, want to control passage through their straits. The third and fourth issues were deep-sea mining (with the underdeveloped countries arguing for an international authority which would decide who mined where), and pollution control. The developed countries would prefer international standards, uniformly applied, for pollution control whereas the underdeveloped countries argue that they should be subject to milder controls while developing their economies, than the developed nations.

The main military issue involved in these arguments is the effect of a 12-mile territorial limit, of a 200-mile economic zone and of restricted passage through straits on the mobility of warships and military aircraft. The US Defense Department, for example, has argued that free transit through straits and the right of military overflight are essential for US security. And similar arguments are probably used in the Soviet Union.

The major concern of the two great powers is related to their strategic nuclear submarines. Free transit through straits allows these submarines to pass through submerged and, therefore, secretly. Innocent passage would require them to pass through surfaced. The two powers fear that if the strait nations are allowed to insist on innocent passage (as opposed to free transit) then the invulnerability of their strategic nuclear submarines will be impaired. A second issue is related to the right to emplace antisubmarine warfare devices on the continental shelf. Thirdly, the powers fear that if free transit over straits for military aircraft (innocent passage for overflight is not recognized in International Law) is restricted, their security interests will in some way be jeopardized.

Although a Law of the Sea treaty allowing 12-mile territorial sea boundaries and a 200-mile economic zone, with the absence of a provision for free transit of international straits, could undoubtedly impose some difficulties on the operation of strategic nuclear submarines, it is difficult to substantiate the argument that this would significantly affect the invulnerability of these submarines. And even the most restrictive Law of the Sea régime so far anticipated would not undermine the strategic capabilities of the powers on the oceans, particularly when longer-range strategic submarine missiles are operating.

The right to fly over international straits is not critical for military aircraft since overflight of straits is only a small part of the larger overflight problem. A description of ASW technology, published in the SIPRI volume *Tactical and Strategic Antisubmarine Warfare* [1] shows that there is little reason to think that ASW operations could be seriously curtailed even by the broadest limit of coastal state sovereignty on the continental shelf.

It now seems inevitable that the 12-mile territorial sea and the 200-mile economic zone will become the Law of the Sea. The fifth Pacem in Maribus convocation was held in Malta in September 1974 to assess the results of the

Caracas Conference. The convocation concluded that the endorsement by the conference of the economic zone concept in conjunction with the retention of a legal continental shelf now extending to an inadequately defined continental margin means the simultaneous acceptance into international law of criteria of the delimitation of coastal state jurisdiction based on opposing concepts. On the one hand there is a precise delimitation based on a criterion of distance from the coast (the economic zone); on the other hand, a delimitation based on a much less definite geophysical criterion (the continental shelf) has been retained. This latter delimitation invites further discretionary extension of coastal state jurisdiction in the ocean.

It appears likely that the UN Conference will adopt provisions giving considerable scope to further extensions of national jurisdiction in ocean space beyond the exclusive economic zone. In this connection it was stressed that ambiguous provisions such as the probable retention of the inadequately defined continental shelf and the fact that rocks, reefs, and even the smallest islands are likely to retain a maritime jurisdiction identical to substantial land masses, had serious implications; (*a*) they were likely to give rise to international conflicts. These conflicts would in turn make the rational management of ocean space and its resources very difficult; (*b*) they raise problems with regard to the regulation of navigation and scientific research, and the role of the military in the oceans, the implications of which have not yet been fully explored; and (*c*) they may restrict the area of the world's seas to which all nations have unlimited access to such a point that the areas are no longer economically viable and thus of only marginal interest to the majority of states.

Lord Ritchie-Calder, a critic of the new concepts, has pointed out that:

It is estimated that a third of the ocean space will be expropriated by the economic zone principle. By the time we get round to fixing baselines and defining the status of islands, I reckon it will be a great deal more. Although I am convinced that there is great potential wealth in what is left, that one-third-plus contains the known, and confidently-expected, oil and gas reserves, the active fishing grounds and other immediately recoverable wealth. Where there is a narrow Continental Shelf, the 200-mile limit will give a coastal state entitlement to the ferro-manganese nodules which are characteristic of the ocean depths . . . I am surprised how naive political representatives can be. Did they think that the great mercantile powers (I use that to include Britain, no longer a great military power) were conceding the 200-mile limit out of the goodness of their hearts or as part of the packet-deal on the straits?

Of the 24 632 000 square nautical miles of Continental Shelf and adjacent seabed to be allocated under the 200-mile limit, the USA would acquire 2 222 000 square nautical miles of national submarine jurisdiction, the USSR would acquire 1 309 000 and Britain 300 000 (but that does not include dependencies). Japan gets 1 126 000; Portugal (apart from what was its African territories) gets 517 400; Spain 355 000; South Africa expands by 300 000. Some countries enter the Big League; Australia, with an additional 2 000 000 square nautical miles; Indonesia with 1 600 000; New Zealand with 1 400 000; Canada with 1 370 000; and Mexico with 830 000. Of course, the land-locked and straits-locked countries get nothing.

But it is not enough to look at this submerged geography. Consider the industrially advantaged countries in the list who are in a position to go immediately into exploitation of their underseas and, on the other hand, consider those less-developed countries which attach a 200-mile economic zone which they have to police and which hopefully they want to exploit. Of course, they can do a deal with a big multinational corporation but that is inviting the fox to look after the chicken-coop.

The concepts being introduced into the Law of the Sea will have important military ramifications in addition to those mentioned above. For example, navies will have to defend extended zones of influence and equipment (oil rigs, and so on) in these areas (see chapter 10). And the 200-mile limit will make international scrutiny of the numerous on-going naval activites more difficult—in particular, those involving sea-based deterrent and detection systems [1, 4]. This makes international negotiations to restrict the military use of the oceans all the more urgent. In the meantime, regional proposals such as the declaration of the Indian Ocean as a zone of peace deserve support. (See chapter 5.)

IV. *Arms control and disarmament*

Little progress was made during 1974 in arms control and disarmament negotiations. The talks on Mutual Force Reductions (MFR) in Europe, taking place in Vienna, continued sluggishly [5]. The Conference of the Committee on Disarmament (CCD), to be enlarged in 1975 from 26 to 31 members by the addition of the Federal Republic of Germany, the German Democratic Republic, Iran, Peru and Zaire, continued discussions on a chemical weapon treaty and a comprehensive nuclear test ban (see chapter 14), but without significant results. And the Strategic Arms Limitation Talks (SALT) in Geneva appeared to be bogged down by attempts to develop a method for equating strategic nuclear forces (see chapter 14).

Although the Nixon–Brezhnev agreements made in Moscow in July may indicate improvements in the relations between the two great powers, they unfortunately do not produce actual disarmament or even halt the arms race. The talks were probably the last opportunity for the two great powers to make sufficient concessions to the non-nuclear-weapon powers to give the crucially important review conference on the Non-Proliferation Treaty a fair chance of success. The Treaty on the Limitation of Underground Nuclear Weapon Tests may have been intended as such a concession. However, the very high threshold of 150 kilotons which was agreed on is not a significant limitation because most US and Soviet tests during the past few years have not been in excess of 200 kilotons in any case. The treaty will, therefore hardly affect the current developments of nuclear warheads. The commitment to limiting the number of underground nuclear weapon tests seems to be too loose to be meaningful. And the fact that the "limitation" is effective only from 31 March 1976, is bound to raise the suspicion that the powers have left themselves a free hand to test nuclear weapons of any size during the next two years. Presumably, the second generation of Soviet MIRVed warheads is the main issue here.

The anti-ballistic missile protocol, restricting ABMs to a single area out of the two provided in the 1972 ABM treaty, is also a measure in which the parties have agreed to abstain from something they would not have done anyway. The deployment of MIRVs is the reason given for scrapping one ABM site. On this argument, there is absolutely no logical justification for maintaining the other site. A complete renunciation of ABMs would have meant that both sides had finally conceded that their ICBMs were vulnerable; it would also have incidentally reinforced the credibility of the French and British nuclear forces. A total ban on ABMs may be politically difficult to "sell" to defence-minded groups in the United States and the Soviet Union, but the present piecemeal agreement should be seen for what it is: an attempt to divert attention from the failure to obtain an agreement on the limitation of offensive strategic weapons. The goal of a permanent agreement to limit these weapons has been given up in spite of the 1973 US-Soviet commitment to conclude such an agreement before the end of 1974. On 24 November 1974, in Vladivostok, President Ford and General Secretary Brezhnev agreed that the negotiators at the Soviet-US Strategic Arms Limitation Talks (SALT) in Geneva would work for a new agreement (SALT II) under which each side will be limited to 24 000 strategic nuclear delivery vehicles (strategic bombers, land-based intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs)—the so-called Triad mix). Within this number, both sides will be further limited to 1 320 ICBMs and SLBMs equipped with multiple independently-targetable re-entry vehicles (MIRVs). The two leaders, in determining the precise numbers of vehicles to be put into the agreement, appeared confident that the SALT negotiators could formulate the new agreement by 1975, possibly in time for it to be signed as the highlight of the Brezhnev-Ford summit meeting in Washington.

A SALT II agreement would in Kissinger's view mean "that a cap has been put on the arms race for a period of ten years". But just what is it that is being "capped"? Only, it seems, the number of strategic delivery vehicles and MIRVed missiles. Under such an agreement, the actual number of nuclear warheads carried by the bombers, missiles and submarines (and, it is, after all, this number that really counts) could, without any effective limitation, increase to the maximum carrying capacity of these vehicles—an increase which is a very considerable one indeed. The Soviet Union is only now beginning to put MIRVs on its missiles. But once begun, the MIRVing programme is likely to continue rapidly.

Most serious of all—and this is the crux of the matter—the qualitative arms race is not "capped" in any way at all. Exactly how much of a sacrifice then are the two powers making in what Kissinger calls "a breakthrough with the SALT negotiations that we have sought to achieve in recent years''?

There is, of course, a limited number of targets on which it is ''worth'' targeting a thermonuclear weapon. So far as cities are concerned the number is less than 100 in each of the USA, the USSR and China. At the present time, the USA can deliver about 8 000 independent strategic nuclear warheads by bombers and missiles and even this huge number is likely to increase over the next three or so years—to well over 10 000. And the Soviet Union can, and presumably will, roughly match the US numbers by MIRVing its missiles. We can therefore look forward, even with SALT II, to strategic nuclear arsenals containing tens of thousands of thermonuclear weapons.

Even the most enthusiastic Soviet or US military planner must find it difficult to discover targets for so many warheads. The emphasis in the USA has, therefore, already shifted away from numbers of warheads, to improvements of the characteristics of warheads—in particular, of the accuracy of warhead delivery and the reduction in the size of warheads. There is no reason to doubt (we probably will not be sure because of an almost total lack of information on these issues from Soviet sources) that a similar shift will take place in the Soviet Union, as soon as it has completed its MIRVing programme.

Other substantial improvements are being made in delivery weapons. In the USA, for example, the B-1 supersonic (Mach 2.2) bomber (the first scheduled to fly in December 1974) is slated to replace the B-52 strategic bomber, and the Trident nuclear submarine (the first is scheduled for 1978) will replace the Poseidon submarine. In the Soviet Union, a modified strategic submarine, the ''Delta''-class, has been developed to replace the ''Y''-class submarine. Each B-1 bomber will cost at least $56 million and each Trident submarine will cost at least $1.3 billion. At these prices, neither side can afford a large number of new strategic delivery vehicles with or without SALT II.

New weapon systems are being developed by both great powers, which, if deployed, could make nonsense of the proposed SALT II agreement. An example of such a weapon is the cruise missile (see chapter 11). New types of cruise missile, because of the recent development of small, highly efficient turbofan engines and light-weight guidance systems, are small and can be launched from aircraft and submerged submarines. Past cruise missiles (like the US Snark, Mace, Hound Dog and Regulus) driven by older turbojet engines, were relatively large and inefficient, and had to be flown at high altitudes to achieve the necessary range. Turbofan engines, however, allow cruise missiles to fly efficiently at very low altitudes. Because of this, and their small radar cross-section, the new types of cruise missiles can effectively penetrate enemy defences. Moreover, new guidance systems (like the US TERCOM system) are sufficiently accurate to enable the missiles to be effectively deployed against a wide range of targets, including hard military ones.

Cruise missiles would be very difficult to limit by an arms control agreement because of verification difficulties. For example, it is not possible to detect the difference between a tactical and strategic cruise missile by normal intelligence means.

For a variety of reasons, a negotiated mutual arms reduction eventually leading to a programme of effective general nuclear disarmament, during which a rough equilibrium between the powers is carefully maintained, is much preferred, so far as world security is concerned, to a situation in which one of the two opposing sides perceives itself to be at a serious relative military disadvantage brought on purely by the high cost of weapons. Feelings of security (or the lack of them) are largely determined by psychological factors. This is why "the weapons-numbers game"—in which great importance is placed on who has exactly how many of which weapons of precisely what effectiveness—is, in the ultimate analysis, meaningless for the political decision-makers when considering arms control and disarmament matters, at least when both sides have many more weapons than they need for any conceivable purpose. If this type of analysis, the intellectual pursuit of many strategic experts, is used at all by politicians, it is for the *post facto* rationalization of weapons deployment.

In January 1974, US Secretary of Defense Schlesinger announced that the USA intends to adopt a counterforce strategy, as a strategic nuclear option. A counterforce strategy does not replace deterrence but supplements it, with the additional capacity to strike the other side's military targets, including hardened missile silos. But the strategy requires very accurate nuclear warheads—using, for example, terminal guidance (now perfected by the Advanced Ballistic Re-entry Systems project of the US Air Force). On first sight, weapons able to strike military targets near cities without massive damage to civilians may appear more humane than the more indiscriminate weapons. But when the weapons are thermonuclear, the damage done will still be immense, even if the warheads are of relatively low explosive yield. The most serious consequence of a counterforce strategy, however, is that it makes nuclear war more probable because it becomes more thinkable. It will also encourage the proliferation of nuclear weapons. Moreover, few would believe that the use of small accurate nuclear warheads on military targets would not escalate into a massive all-out nuclear exchange. The most probable reason for the adoption of a counterforce strategy is the justification (or rather rationalization) of the deployment of accurate warheads and low-yield nuclear weapons. History shows that once sophisticated new weapons are developed, very strong pressures emerge (and, incidentally, not only military ones) for their deployment. SALT II will do nothing to stop this deployment and, thus, a new round in the arms race—on the contrary, it will encourage it.

The Geneva negotiators will have to take up the question of the verification of whatever restraints are called for. One very knotty problem will be the verification of those missiles which contain independently-targetable warheads—from the outside these missiles are indistinguishable from the ones carrying single warheads. Presumably, the Soviet Union will continue to disallow on-site inspection—and, in any case, would either side let the other look into its missiles? But experience shows that the problem of verification (a familiar excuse for not negotiating an arms control or disarmament treaty) is easily solved once the political will to obtain an agreement is there.

Many assessments have been made of the Ford-Brezhnev "agreement to negotiate an agreement". These vary from the very positive, by those who see the agreement as significantly advancing the Soviet-US accommodation, to the very negative, by those interested in effective measures of disarmament. The US-Soviet strategic arms race will, it is now clear, continue, probably at least until 1985, in the form of a race for quality, and, after Vladivostok, there can be little doubt about Ford's and Brezhnev's perceptions of the high political/military utility of nuclear weapons. Apparently both leaders are exceedingly anxious (and rightly so) about the effect of the further spread of nuclear weapons on world security. But how they can possibly hope to influence this proliferation, except by de-emphasizing the importance of nuclear weapons, is a total mystery.

In spite of there being no significant arms control or disarmament agreements in sight, however, the twenty-ninth session of the UN General Assembly had an imposing list of measures on its agenda (see appendix 14G) including:

Report of the International Atomic Energy Agency

Strengthening of the role of the United Nations with regard to the maintenance and consolidation of international peace and security

Reduction of military budgets

The UN Conference on the Law of the Sea

Napalm and other incendiary weapons

Chemical and biological weapons

Cessation of nuclear tests

Implementation of the UN Resolution concerning the signature and ratification of Additional Protocol I of the Treaty for the prohibition of nuclear weapons in Latin America

Implementation of the UN Resolution concerning the signature and ratification of Additional Protocol II of the Treaty for the prohibition of nuclear weapons in Latin America

Declaration of the Indian Ocean as a zone of peace

International cooperation in the peaceful uses of outer space

World Disarmament Conference

General and Complete Disarmament
Declaration on the strengthening of international security
Peace-keeping operations
Effects of atomic radiation
Definition of aggression
Human rights in armed conflicts
Establishment of a nuclear-free zone in the Middle East
Establishment of a nuclear-free zone in South Asia
Prohibition of action to influence the environment and climate for military purposes.

There is, therefore, no lack of discussion on arms control and disarmament issues—what is serious is the lack of action in negotiating meaningful measures.

In summary, events in 1974 repeated the now familiar pattern of relatively rapid progress in military technology (see chapters 11–13) and little progress in attempts to control the nuclear and conventional arms races taking place across the globe. Most serious of all, the Indian nuclear explosion may signify the start of a new phase of nuclear weapon proliferation which would have unpredictable but serious consequences for world security. The proposed SALT II agreement implies that the chances for the negotiation of general nuclear disarmament are, to say the least, remote until the mid-1980s. In the absence of such disarmament, the probability of further nuclear weapon proliferation is high.

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2. Nuclear-weapon proliferation

Square-bracketed references, thus [1], *refer to the list of references on page 37.*

I. *The Indian nuclear explosion*

On 8 May 1974, the Indian Atomic Energy Commission successfully carried out an underground nuclear explosion, using plutonium as the fissile material, at a depth of about 100 metres in the Pokharan range of the Rajasthan desert, northwestern India—a site chosen mainly because of its geological structure of sand, disintegrated shale and rhiolite. At the moment of the explosion, equivalent to about 12 kilotons of TNT, a mound of sand rose above ground which settled into a crater of 150 metres in diameter. But Dr H. N. Sethna, the Chairman of the Atomic Energy Commission, claimed that aerial surveys made within minutes of the explosion, at heights down to only 30 metres, showed no significant increase in the level of radioactivity.

In its official announcement of the nuclear explosion, the Atomic Energy Commission described it as "a peaceful nuclear explosion experiment using an implosion device. As part of the programme of study of peaceful uses of nuclear explosions, the Government of India has undertaken a programme to keep itself abreast of developments in this technology, particularly with reference to its use in the field of mining and earth-moving operations."

The Commission also stated that India had no intention of producing nuclear weapons and reiterated its strong opposition to the military uses of nuclear explosions. Similar reassurances were given by other government officials. Prime Minister Indira Gandhi declared that "we do not intend to use this knowledge of this power for any other than peaceful purposes and our neighbours need have no fear". Defence Minister Jagjiwan Ram said in a press interview on 19 May that India would never use its nuclear capabilities for military purposes. And the Indian Foreign Minister described the event as an experiment "in the development of nuclear technology for peaceful and economic uses". "We have no intention of developing nuclear weapons", he said.

The issue is really one of intention since there is no technical difference between the initial stages of a programme to develop "peaceful" nuclear devices and one to develop nuclear weapons. There are, however, differences between the development of the Indian nuclear programme and those of the five established nuclear-weapon powers—China, France, the UK, the USA and the USSR. The latter powers began their nuclear programmes for the specific purpose of producing nuclear weapons and then went on to develop civilian nuclear technologies. But India first developed a significant peaceful nuclear programme, of which its nuclear explosion was a by-product.

India may, if it chooses to do so, obtain a delivery system for nuclear weapons in a similar way. It is, for example, developing rocket technology for civil programmes. By the 1980s, it may have a booster vehicle capable of putting a payload exceeding 1 000 kg into synchronous orbit. It could then produce a delivery system for nuclear weapons as a "spin-off" from its civil space programme. Moreover, by this time, Indian nuclear explosive devices may have been further developed to be more compact and more efficient. And India's electronics industry is being developed to produce communications networks, real-time computers, advanced radars and so on. It may be true that the current Indian government may not have the intention at present of becoming a fully-fledged nuclear-weapon power in the sense of developing a military nuclear doctrine, teaching the military nuclear tactics, acquiring sophisticated delivery systems, command and control and surveillance systems and so on. But India will become able to do so with increasing ease, if it so chooses. Prime Minister Gandhi has said that there is a difference between "a nuclear country" and a "nuclear-weapon country", but in practice the difference is simply one of political decision and not one of technological capability.

Nuclear research in India has a long history. As early as 1944, the late Dr H. J. Bhabha envisioned India using nuclear energy for the development of its economy. On 12 March 1944, Dr Bhabha wrote to the Sir Dorabji Trust "When nuclear energy has been successfully applied for power production, in, say, a couple of decades from now, India will not have to look abroad for its experts but will find them ready at hand". A year later, nuclear research began in earnest when the Tata Institute of Fundamental Research was established with Dr Bhabha as Director. Some of the major landmarks in India's nuclear development are:

1948: The Indian Atomic Energy Commission was set up by Act of Parliament.

1954: The Indian government announced the setting up of a separate department of atomic energy under the direction of the Prime Minister.

1956: The first nuclear reactor in Asia went into operation at Trombay. The reactor, named Apsara (celestial dancer), is a research reactor of one megawatt of thermal energy (MWTh) output.

1960: It was announced that India and the Soviet Union had agreed to collaborate in the peaceful uses of nuclear energy, including the design and construction of nuclear power stations. In the same year the Canadian-Indian research reactor went into operation. This reactor, called Cirus, has a power output of 40 MWTh.

1961: India's third research reactor, Zerlina, designed, engineered and built entirely by Indian personnel, became critical. Its power output is 100 WTh.

Table 2.1. India's nuclear reactors

Name	Location	Output	Date of operation	Estimated plutonium produced per year *kg*
Research reactors				
Apsara	Trombay	1 MWth	Aug 1956	Negligible
Cirus	Trombay	40 MWth	Jul 1960	4–6
Zerlina	Trombay	100 Wth (max)	Jan 1961	Negligible
Purnima	Trombay	Zero energy	May 1972	. .
Power reactors				
Tarapur 1	Bombay, Maharashtra	190 MWe	Nov 1969	60
Tarapur 2	Bombay, Maharashtra	190 MWe	Nov 1969	60
Rajasthan 1	Kota, Rajasthan	202 MWe	Dec 1973	65
Rajasthan 2	Kota, Rajasthan	202 MWe	1976	65
Madras 1	Kalpakkam, Tamil Nadu	202 MWe	. .	65
Madras 2	Kalpakkam, Tamil Nadu	202 MWe	. .	65
Narora	Narora, uttar Pradesh	202 MWe	1981	65

1961: Formally inaugurating the Canadian-Indian research reactor, Jawaharlal Nehru said "We will never think in terms of using the reactor for India's progress alone. Let other countries, particularly from Asia and Africa, take advantage of it and utilise its benefits for the good of their people".

1962: India's first heavy-water plant was commissioned at Mangal.

1963: India signed in New Delhi an agreement with the USA to construct a nuclear power plant at Tarapur.

1965: The Prime Minister, Mr Lal Bahadur Shastri, formally opened the reprocessing plant at Trombay for the separation of plutonium.

1969: India's first nuclear power plant went into operation at Tarapur. This has an output of 400 million watts of electricity (MWe) produced by two reactors using enriched uranium fuel. The plant was constructed with US aid.

1970: Prime Minister Indira Gandhi rejected pleas in the Lok Sabha (Parliament) for nuclear explosions for peaceful purposes.

1971: India signed an agreement with the International Atomic Energy Agency (IAEA) to allow inspection of the Rana Pratap Sagar reactor. At about the same time the Atomic Energy Department reported the discovery of new uranium deposits in several parts of the country.

1972: India's fourth research reactor, Purnima, went into operation. This is a zero energy fast reactor.

1973: The first of two nuclear power reactors at Kota, Rajasthan, went into operation with a power output of 200 MWe. A second unit of the same size is under construction at this site. A third nuclear station with two 200-MWe power reactors is under construction at Kalpakkam.

1974: The Prime Minister laid the foundation stone of India's fourth nuclear power station at Narora. It will contain one 200-MWe power reactor and is expected to be completed by 1981 (See table 2.1).

In spite of the fact that, since independence, India has a well-developed civilian nuclear research programme (see map 2.1), that it has eminent nuclear scientists and that its nuclear programme has produced a number of important results, the Indian nuclear explosion came as a surprise to many people. World reaction to the event was varied—ranging from satisfaction to profound regret. (See appendix 15D.)

Many were surprised by the Indian nuclear explosion because they had thought that no underdeveloped country could easily afford the cost of such an experiment. In fact, because the explosion was a by-product of a significant civilian nuclear technology, the cost was relatively very low—according to official Indian estimates, about $400 000, including the cost of the plutonium and preparing the test site. Those who regretted the explosion did so for two main reasons: (*a*) because it may stimulate further nuclear proliferation, and (*b*) because it was seen as disturbing the equilibrium, and therefore the security, of the subcontinent, particularly with reference to Pakistan.

An article in the Washington Post typically summarized these attitudes:

> India's "Peaceful nuclear explosion experiment" is, first of all, the test of a bomb. Not only is there no real distinction between a military and peaceful explosion, but even the United States, with all its time and technology, has yet to find a single feasible peaceful use for nuclear explosives. For India to call its explosion "peaceful" and to abjure all military intent is, in a word, rubbish. It is imaterial that other countries, in going nuclear, have used the same hyperbole. Indian scientists, if not Indian politicians, are too knowledgeable to claim otherwise with a straight face. The fact is that India, which has long had the capability to do so, has now gone nuclear in the political-military sense. It becomes the first country in 10 years—an interval which many had hoped would itself create a permanent barrier against new members—to join the nuclear club.
>
> Its "right" to join is undisputed: it is a sovereign state. Nor can it be faulted for violating the nuclear non-proliferation treaty, which it never accepted. New Delhi did accept the partial test-ban treaty forbidding underground tests which vent and spew fallout across national frontiers, but no such pollution has been reported—so far. Certainly no American or Russian or Briton or Frenchman or Chinese can fairly contend that his country has set an example of nuclear restraint deserving emulation by other states. Nor have the first five members of the nuclear club made the international environment so safe and orderly that no "nth" country could possibly have political reason to make its own bomb.
>
> For all this, the Indian explosion is the height of irresponsibility. Whatever the supposed gains in national pride and governmental prestige and regional political standing, the blast can only further aggravate Pakistan's fears of Indian domination and slow the normalization process that had been unfolding recently in the South Asia subcontinent. In a wider orbit, the Indian test will in effect license and strengthen in various other countries—Japan comes quickly to mind—the internal forces partial to building national nuclear bombs. Many people and many nations have become habituated to the existence of nuclear weapons, but their proliferation

Map 2.1. India's nuclear research and power facilities, 1973

Source: See reference [1].

is no more safe and acceptable now for having been out of our immediate consciousness in recent years. The United Nations is scheduled to hold a conference next year to review and firm up the non-proliferation treaty. The conference and its cause have been dealt a heavy blow [2].

The strongest official reaction came from Canada which had given nuclear assistance to India. Although there was no question but that India had assembled its nuclear device without outside help, it was unclear whether or not the plutonium used in the Rajasthan explosion came from a reactor that Canada had helped the Indian government build and pay for. On 22 May 1974 the Canadian Secretary of State for External Affairs, Mr Mitchell Sharp, made a protest that . . .

First, we are concerned as to the effect that India's action, whatever its motivation, will have on international efforts, to which Canada has been an active party, to limit and control the proliferation of nuclear explosion technology for which there can be no distinction between peaceful and potential military application. For all intents and purposes, therefore, India now has developed the capability of producing a nuclear weapon. The development of this technology by India is bound to have serious and wide-spread repercussions throughout Asia and the world.

Secondly, we are very distressed and concerned that this latest member of the nuclear club should be a country with which successive Canadian Governments have carried on over the past two decades extensive cooperation in the nuclear energy field. This long-standing cooperation with India in the nuclear energy field has involved the gift, under the Colombo Plan, of a nuclear research reactor; the provision of credit, expertise, materials and fuel for two electric generating reactors, and a variety of technical exchanges and training of personnel, etc. All of this assistance was intended to help India in meeting the critical energy needs of the Indian people and was provided to, and accepted by, India on the basis that it would be used for peaceful purposes only. We have made it clear in international discussions and in bilateral exchanges with India that the creation of a nuclear explosion for so-called peaceful purposes could not be considered as a peaceful purpose within the meaning of our cooperative arrangements.

[Canada] fully respects India's sovereignty and independence in all matters. It cannot, however, be expected to assist and subsidize, directly or indirectly, a nuclear programme which, in a key respect, undermines the position which Canada has for a long time been firmly convinced is best for world peace and security.

How did India answer its critics? A typical response was given in a lecture delivered on 1 August 1974 to the Indian International Club, by K. Subrahmanyam, Director of the Institute of Defence Studies and Analyses, New Delhi:

In dealing with this issue from a global point of view one is confronted with the impressive burden of conventional wisdom accumulated over the years. The Nuclear Non-Proliferation Treaty . . . does not make a distinction between a nuclear explosion for weapon purposes and peaceful purposes, Deliberately, peaceful explosions were prohibited by the treaty for non-nuclear weapon states on the ground that the technology underlying both peaceful and weapon explosions is the same. . . . The question is raised: how credible is this declaration and how much is this country committed to this policy? All declarations in international politics are contingent on the prevailing situation. To derive logically from Lord Palmerston's famous formulation that there are no permanent friends and permanent enemies, but only permanent interests, it follows there are no permanent policies, while there might be permanent objectives. Any declaration of this type is valid only so long as in the Government of India's perceptions the considerations that led them to make this declaration continue to be valid. It will be unrealistic to expect that such declarations will continue to be binding irrespective of changes in the international strategic environment. It will be binding only so long as the present perceptions of the international strategic environment continue to persist in the Indian government. These may change not merely because the environment may change, but also if there are changes in the government of this country. . . . In spite of our acknowledged ability to conduct underground explosions the rest of the world, especially the nuclear-weapon powers and the sponsors of the so-called Non-Proliferation Treaty, did not pay any attention to our objections. They were brushed aside. On the other hand, after a few more test explosions, this country may reach the level of credibility and consideration accorded to (for example) Britain today.

That in turn may ensure that our ability to influence the arms control negotiations will be more significant than it is today. In that sense one may legitimately regard the Indian test explosion as a contribution to the increased influence of India in international disarmament negotiations.

Assuming these factors are inherent in the international relations of today, how credible is India's declaration of not going in for weapons? . . . In this world you and I are asked to accept the credibility of the structure of peace built on 7 000 strategic nuclear warheads; in addition to another 7 000 tactical nuclear weapons capable of incinerating all of us on this globe many times over, the credibility of a Non-Proliferation Treaty since the signing of which nuclear weapons have quadrupled in number, the credibility of the stability of deterrence which means a non-stop arms race, the credibility of a no-first-use declaration by a nation which having penetrated into 70–80 miles of our territory talked of its border guards defending their borders and the credibility of peace and freedom being defended by dropping 14 million tons of explosives on Asian peasants. Therefore, before we answer the question how credible India's declaration is, we have to ask for a definition of credibility in international politics. If the world can live with the credibility of the above declarations there is no need for us to worry about credibility. With such double think and double talk the world is so conditioned that it cannot distinguish between really credible and other kinds of declarations. Otherwise how else did a treaty to legitimise the arms race and monopolise technology come to be called the Non-Proliferation Treaty and voted on, or how was an arrangement to legitimise all weapon tests called an arms control measure? There is no need therefore to be apologetic about it.

II. *The spread of nuclear power*

Although recent events have brought home the rapid spread of nuclear technology around the world, few people have a clear idea of how extensive this spread has already become or how rapidly it will continue. At the end of 1974, 170 nuclear power reactors were producing a total of about 73 000 MWe in 19 countries (Argentina, Belgium, Bulgaria, Canada, Czechoslovakia, France, FR Germany, German DR, India, Italy, Japan, the Netherlands, Pakistan, Spain, Sweden, Switzerland, the UK, the USA and

Table 2.2 Worldwide installed nuclear capacity in 1974 and 1980

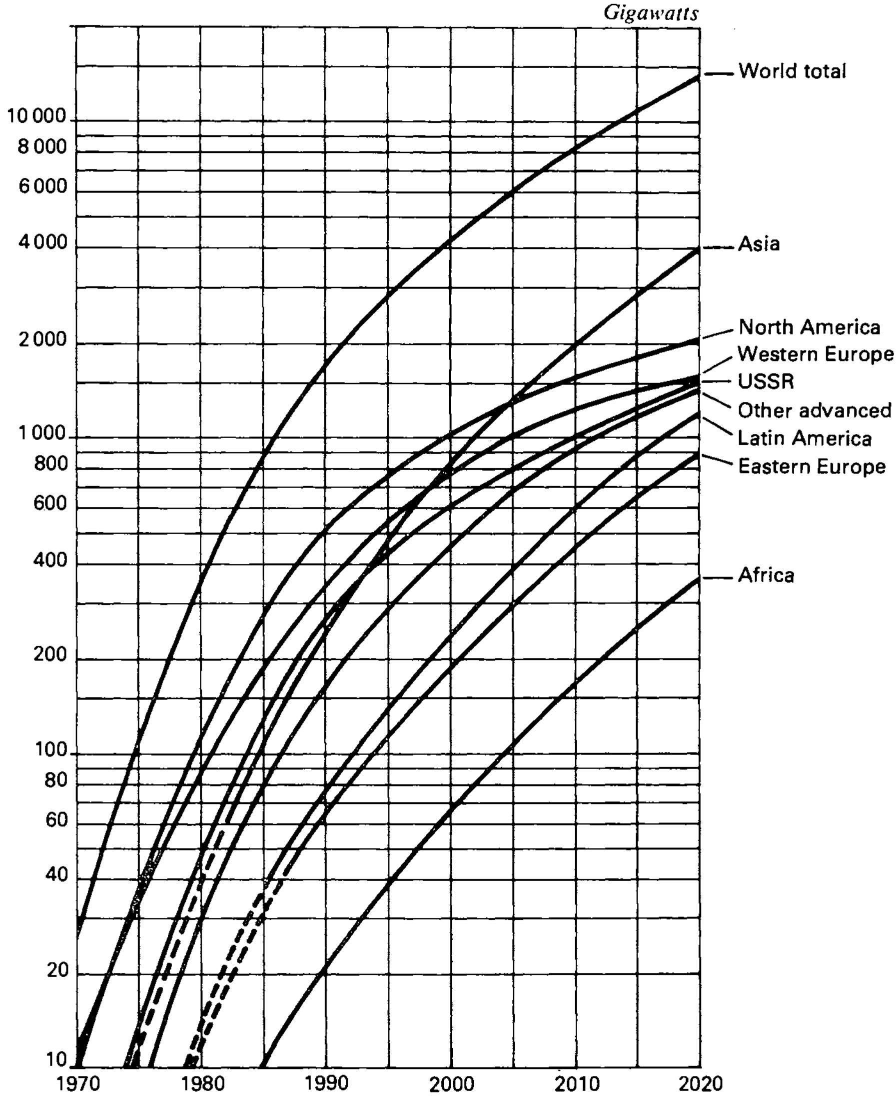
Country	Total nuclear capacity 1974 *MWe*	Number of power reactors (over 20 MWe)	Total nuclear capacity 1980 *MWe*	Number of power reactors *(over 20 MWe)*
Argentina	320	1	920	2
Austria	–	–	700	1
Belgium	400	1	1 700	3
Brazil	–	–	600	1
Bulgaria	440	1	1 800	4
Canada	2 500	7	6 100	12
Czechoslovakia	110	1	1 800	5
Finland	–	–	1 500	3
France	2 900	10	15 000	23
FR Germany	4 200	10	22 000	28
German DR	430	2	800	3
Hungary	–	–	440	1
India	780	4	1 600	8
Italy	600	3	3 400	7
Japan	5 000	10	19 000	29
Korea, South	–	–	1 200	2
Mexico	–	–	1 300	2
Netherlands	530	2	530	2
Pakistan	120	1	120	1
Spain	1 070	3	8 600	11
Sweden	2 600	4	8 300	11
Switzerland	1 100	3	5 700	8
Taiwan	–	–	3 000	4
Thailand	–	–	500	1
UK	5 800	31	11 000	39
USA	40 500	60	138 000	156
USSR	3 500	16	10 000	24
Yugoslavia	–	–	1 400	2
Totals	**1974**		**1980**	
Countries	19		28	
Reactors	170		393	
Capacity MWe	72 800		270 000	

Source: See reference [3].

the USSR). (See table 2.2.) All of these countries except the Netherlands and Pakistan have additional commercial power reactors under construction. A further six countries have their first commercial power reactors under construction: Austria, Brazil, Finland, South Korea, Taiwan and Yugoslavia (see table 2.2). And many other countries, including Australia, Denmark, Egypt, Hungary, Iran, Israel, Mexico, the Philippines, Poland, South Africa, Thailand and Romania have announced plans to acquire power reactors.

By 1980, if present plans are carried through, 28 countries will have installed nuclear power reactors with a total electrical generating capacity of about 300 000 MWe, about 15 times the 1970 figure. Looking further ahead, it is probable, according to the latest predictions, that the 1980 figure will be multiplied more than ten-fold by the year 2000 (see chart 2.1). By

Chart 2.1. Projected annual nuclear electrical generating capacity



Source: See reference [4].

this time, if present trends continue, nuclear power reactors will be commonplace in all continents and it will be rare indeed to find a country without one.

In about the year 2000, it is anticipated that the total growth of electrical and nuclear capability (MWe installed/year) in the underdeveloped world will overtake and surpass the growth in the industrialized world. A number of underdeveloped countries (including Argentina, Brazil, India, Pakistan, South Korea and Taiwan) are, in fact, already operating or constructing nuclear power reactors. Even so, in relative terms, the more technologically advanced countries will continue to install most of the nuclear power until the year 2000. Furthermore, nuclear technology serves as yet another example of the exploitation of a new technology by the industrialized countries which will so deplete a world resource (uranium) that when the underdeveloped countries relatively predominate in nuclear power installation they will have to utilize a still more advanced technology (breeder reactors).

The main reason for the rapid spread of nuclear technology is, of course, economic—nuclear power reactors provide, in most situations, the cheapest, if not the only, means of producing electricity. And recent increases in oil prices have boosted the attraction of nuclear power as a relatively cheap source of electricity.

As an inevitable by-product of this nuclear power production, huge quantities of plutonium will be produced each year. Plutonium can also be produced in research reactors and special plutonium production reactors. About 50 countries already operate research reactors (see table 2.3). Plutonium can be used as the fissionable material for the production of nuclear weapons. It is this link between peaceful nuclear technology and nuclear weapon manufacture which is the key issue in the proliferation problem.

Breeder reactors

During the early 1980s, the character of the growth and spread of nuclear power will begin to change. This change will result from the development and use of commercial breeder reactors. These reactors differ from other types in that they produce more fuel than they consume.

It is possible, by a suitable design, to convert uranium-238 in the core of the reactor and uranium-238 placed in a "blanket" around the core into plutonium. "Breeding" occurs because the fission chain reaction proceeds with a greater neutron surplus than is possible in an ordinary reactor. The stockpile of fissionable material is, therefore, steadily increased, and about every five years an amount of fuel equal to that initially put in is produced. Thus, after about ten years, enough fuel becomes available not only to keep the breeder reactor operating but to fuel a new one of the same size. The countries developing breeder reactors are shown in table 2.4.

Even though uranium may be used as the main fuel for the first generation of breeder reactors, the preferred fuel for subsequent breeder reactors will be plutonium of a type suitable for immediate use in nuclear weapons. About three tons of plutonium will be used as the initial fuel for second-generation breeder reactors of 1 000 MWe. So far as the proliferation of nuclear weapons is concerned, therefore, an already precarious situation will worsen when the commercial use of breeder reactors becomes wide-

Table 2.3. Research reactors in operation, 1974

Countries	Number of research reactors	Power reactors in operation 1974	1980
Argentina	5	Yes	Yes
Australia	2	No	No
Austria	3	No	Yes
Belgium	5	Yes	Yes
Brazil	3	No	Yes
Bulgaria	1	Yes	Yes
Canada	8	Yes	Yes
Chile	1	No	No
Colombia	1	No	No
Czechoslovakia	3	Yes	Yes
Denmark	3	No	No
Egypt	1	No	No
Finland	1	No	Yes
France	23	Yes	Yes
German DR	2	Yes	Yes
FR Germany	33	Yes	Yes
Greece	1	No	No
Hungary	2	No	Yes
India	4	Yes	Yes
Indonesia	1	No	No
Iran	1	No	No
Iraq	1	No	No
Israel	2	No	No
Italy	16	Yes	Yes
Japan	21	Yes	Yes
Korea, South	1	No	Yes
Mexico	2	No	Yes
Netherlands	6	Yes	Yes
Norway	2	No	No
Pakistan	1	Yes	Yes
Philippines	1	No	No
Poland	4	No	No
Portugal	1	No	No
Romania	1	No	No
South Africa	2	No	No
Spain	5	Yes	Yes
Sweden	2	Yes	Yes
Switzerland	6	Yes	Yes
Taiwan	2	No	Yes
Thailand	1	No	Yes
Turkey	1	No	No
UK	24	Yes	Yes
USA	117	Yes	Yes
USSR	26	Yes	Yes
Uruguay	1	No	No
Venezuela	1	No	No
Viet-Nam, South	1	No	No
Yugoslavia	3	No	Yes
Zaire	1	No	No

Source: See reference [3].

spread. Optimistic predictions to the contrary, however, this is unlikely to occur before the year 2000: the burner reactor will remain the dominant type for the rest of this century. After 2000, the breeder reactor will probably be able to satisfy the world's power requirements at reasonable cost, unless or

Table 2.4. Fast-breeder power reactors

Country	Fuel and fuel inventory	Power (MWe gross)	Date of regular power
Power reactors, experimental, in operation			
UK DFR	Natural uranium blanket; 340.4 kg uranium	15	Jul 1963
USA EBR-2	Uranium (52 per cent); plutonium in future; depleted uranium blanket; 599.5 kg uranium	18.5	May 1965
USSR BOR-60	Uranium dioxide (90 per cent); 0.176 tons U-235	12	Dec 1968
Power reactors, experimental, planned			
India FBTR (similar to Rapsodie)		30	1976
Power reactors in operation			
France Phénix	Uranium dioxide (19.2 per cent) and plutonium dioxide (27.1 per cent) 4 369 kg	250	1973
USA Enrico Fermi	Highly enriched uranium + 10 per cent molybdenum (25.6 per cent); depleted uranium (0.36 per cent) blanket	61 (net)	Dec 1965 (Closed down)
USSR BN-350 (first commercial breeder reactor)	Plutonium dioxide (23.19 per cent plutonium) or uranium dioxide; 1 158.5 kg U-235	350	Dec 1972
Power reactors under construction			
UK PFR	Plutonium dioxide (24 per cent) and uranium dioxide (30 per cent); 4 165.8 kg	250	1973
USSR BN-600	Cooled sodium; uranium dioxide and plutonium dioxide mixture	600	Dec 1972
Power reactors planned			
France Super Phénix	Uranium dioxide and plutonium dioxide	1 200	1979
FR Germany KNK 2	Uranium dioxide (6.8 per cent); 1 828.9 kg	21	1972
Kalkar SNR	Uranium dioxide (20 per cent) and plutonium dioxide (30 per cent); 4 673 kg	312	1980
Japan Monju	Uranium dioxide (16.3 per cent) and plutonium dioxide (22.3 per cent)	300	1977
UK CFR		1 300	1979
USA Demo No. 1		300–500	1978–80
Demo No. 2		300–500	–

Source: See reference [4].

until it is superseded by a cheaper and more abundant source, presumably solar energy or fusion. Until this alternative energy source is developed, the world will have to live through a very critical period indeed. Unless, adequate steps are taken to prevent it, we can anticipate a steady increase in the number of nuclear-weapon powers. To expect otherwise is to be totally unrealistic.

III. *Nuclear-weapon proliferation and safeguards*

In terms of world security, the danger of the proliferation of nuclear weapons is undoubtedly the most disturbing aspect of the spread of peaceful nuclear technology—a problem which overshadows other nuclear problems, such as the disposal of radioactive waste, reactor accidents and so on, serious though these are.

The world's nuclear reactors are already producing thousands of kilograms of plutonium each year (the 1975 figure is, in fact, about 25 000 kilograms per year). The rate of production will continue to rise exponentially so that by 1978 they will be producing over 50 000 kilograms annually and by 1982 about 160 000. By 1980, the world will have accumulated about 350 000 kilograms of plutonium (see table 2.5). Because ten kilograms of plutonium are more than enough to manufacture one nuclear weapon of "nominal" (20-kiloton) size, and because plutonium has an extremely high monetary value (higher than gold) and is an exceedingly toxic material, the need for nations to safeguard the plutonium they produce is obvious. No state could rest easy unless it could account, at all times, for the vast majority of the plutonium on its territory. The greater the quantity of fissionable material a state has, the more effective must its national control system be. But much fissionable material and nuclear equipment for peaceful purposes is imported and the exporting state usually insists on special assurances that there will be no diversion of the fissionable material produced by the imported nuclear equipment, to military uses. The task of preventing this source of diversion has become the main activity of the International Atomic Energy Agency. The IAEA has evolved highly sophisticated methods for tracking down and accounting for fissionable material and a number of technical methods for ensuring that diversion of this material cannot take place clandestinely. As will be described below, however, international safeguards could be effectively strengthened.

But not even the best safeguards system can ensure that there is absolutely no diversion from peaceful to military activities. At the present rate of nuclear power reactor construction, we are facing a "bomb-a-week" rate of diversion possibilities even with the best of safeguards technology available. It is therefore necessary to have a credible political barrier, in addition

Table 2.5. World plutonium production and accumlated stocks[a]

Year	Total world nuclear generating capacity *GWe*	Annual commercial plutonium production[b] *tons*	Accumulated commercial plutonium stocks[b] *tons*
1970	20	4	20
1971	26	5	25
1972	35	7	30
1973	47	9	40
1974	72	18	60
1975	100	25	85
1976	150	35	120
1977	180	45	165
1978	210	50	215
1979	260	65	280
1980	300	80	360
1981	470	125	385
1982	570	160	545
1983	670	180	725
1984	770	210	935
1985	870	240	1 175
1986	1 030	270	1 445
1987	1 190	300	1 775
1988	1 350	360	2 135
1989	1 510	400	2 535
1990	1 700	450	3 000

[a] Even if safeguards are 99 per cent effective in 1980, enough plutonium could be diverted without detection to produce nuclear weapons at the rate of one a week.
[b] Approximate numbers.

to a technical one, if the prevention of nuclear weapon proliferation is to be fully effective. This was to have been the function of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) which entered into force on 5 March 1970.

The NPT has added a new dimension to nuclear safeguards. Each non-nuclear-weapon state party to the treaty has undertaken to accept safeguards applied by the IAEA to all fissionable material in all peaceful nuclear activities within its territory, under its jurisdiction, or carried out under its control anywhere. In other words, safeguards under the NPT apply not only to imported fissionable material and that produced or processed in imported nuclear equipment but also to other fissionable material produced indigenously. This is a crucial difference between safeguards under the NPT and safeguards outside the NPT.

Measures to strengthen international safeguards

In the following remarks it is assumed that international safeguards are applied primarily to avoid an increase in the number of states that possess their own nuclear explosive device, and that such safeguards, therefore, whether applied pursuant to the NPT or to any other international legal instrument, are in essence a measure against such proliferation. Accordingly, this section deals primarily with states that do not at present possess their own nuclear explosive capability, that is, those states, which, in NPT terminology, are called "non-nuclear-weapon states".

IAEA safeguards are applied pursuant to agreements concluded in connection with the NPT and the Treaty for the Prohibition of Nuclear Weapons in Latin America (the Treaty of Tlatelolco), or pursuant to agreements for: (*a*) the transfer of safeguards bilaterally agreed upon between states; (*b*) the supply through the Agency of assistance in a particular project; and (*c*) the unilateral submission of nuclear materials and installations to safeguards. Whereas safeguards pursuant to the two treaties apply to all the peaceful nuclear activities in the state, those carried out under the other three categories of agreements as a rule apply only to specific nuclear activities. This leaves the state concerned free to have non-safeguarded nuclear material and facilities and to use them for the development and manufacture of nuclear explosive devices. Moreover, the existence of facilities where no safeguards are applied facilitates the undetected diversion of safeguarded nuclear material. The first measure to strengthen international safeguards is the submission by non-nuclear-weapon states of all their nuclear activities to the IAEA's safeguards. This may be done as a consequence of the state's adherence to the NPT, or, independently from such adherence, in a separate "unilateral submission agreement" concerning all nuclear material in all facilities in the state.

An important element of an adequate safeguards system is a prohibition on the export of safeguarded nuclear materials, unless safeguards follow them to their destination. Parties to the NPT have given an undertaking to this effect, in respect of nuclear material and certain other items exported to non-nuclear-weapon states. All agreements concluded outside the NPT framework should contain a similar undertaking.

The NPT permits the export to nuclear-weapon states of nuclear material without safeguards following them. It is, however, essential that reports on exports are corroborated by information about receipts at the other end. Accordingly, three nuclear-weapon states have undertaken to inform the IAEA of all imports of nuclear material subject to safeguards at the shipping end. It would enhance the efficacy of safeguards if this practice were followed by all nuclear-weapon states, also in respect of consignments of nuclear material received by them, that had previously been safeguarded by virtue of a non-NPT safeguards agreement.

In Article III.2 of the NPT, parties undertake not to provide any non-nuclear-weapon state with (*a*) source or special fissionable (that is, any nuclear) material or (*b*) equipment or material "especially designed for the processing, use or production of special fissionable material" unless that material shall be subject to "the safeguards required by this article". This provision leaves several things unexplained. For example, it is not obvious what items are covered by the phrase "equipment or material especially designed". Unless a generally agreed interpretation is given to this phrase, some exporting states might make the supply of certain items subject to safeguards, while others might not, with the result that the latter category would have a commercial advantage over the former. Recognizing that an interpretation was required to avoid unfair competition among supplying states, a group of actual or potential suppliers have consulted and agreed on a list of items of equipment and non-nuclear materials the export of which, because of their close and usually exclusive connection with the nuclear process, should "trigger" the application of safeguards in the recipient country. A considerable number of states have subscribed to this policy. They include the three depositary powers, a number of states from both Eastern and Western Europe, Canada, Australia and several others. It is highly desirable, in the interest of strengthening safeguards, that all actual and potential suppliers of nuclear material, other material—such as heavy water—particularly connected with the production of special fissionable material, and specialized equipment should participate in this scheme, whether or not they are parties to the NPT. It could, further, be most useful if a permanent consultative body were created, to deliberate and decide, among other things, on the items that should be included in the list. The list must be considered as a minimum which each state may extend in respect of its own purposes. It should then, for the sake of fair competition, have a ready forum in which it can convince other states to do the same. It would not seem logical, for example, that while heavy water is included, installations for the production or regeneration of heavy water are not. The question of whether the supply of technical know-how, designs for nuclear installations and advice on key processes should trigger safeguards may also need further consideration.

The term "the safeguards required by this article" appears hitherto to have been interpreted as meaning the safeguards of the IAEA, to be applied in respect of the specific nuclear activity for which the item in question is exported, including safeguards on special fissionable material produced by its use, wherever this material may be. This interpretation would seem to be unduly restrictive. It leads to the anomaly that states which adhere to the NPT and which therefore have to accept safeguards on all their peaceful nuclear activities may find themselves in an insidious situation *vis-à-vis* non-parties, which may receive supplies on easier conditions. An important factor in the strengthening of safeguards would be the requirement that any nuclear import should be made conditional on the acceptance by the importing country of safeguards in respect of all its present and future nuclear activities.

As a rule, the application of IAEA safeguards other than in the framework of the NPT or the Treaty of Tlatelolco, is based on the Agency's Safeguards

System of 1965, reproduced in IAEA document INFCIRC/66/Rev.2. This document was designed particularly with regard to the application of safeguards to nuclear material in individual facilities. It does not reflect the most recent approaches to safeguards that are incorporated in IAEA document INFCIRC/153, which was drafted particularly with NPT safeguards in mind. It also leaves room for a great deal of flexibility in the negotiation of safeguards agreements, so that these do not always follow the same standard, particularly with respect to the concept of "pursuit", that is, the period of time during which safeguards follow produced special fissionable material.

It is highly desirable that INFCIRC/66/Rev. 2 be updated and improved to take account of the latest developments in safeguards, and to cover the submission of a state's entire nuclear effort, present and future. It should also be couched in terms of a draft agreement, so as to ensure adherence to generally agreed standards. Lastly, it should reflect the concept of non-proliferation inherent in all safeguards arrangements with non-nuclear-weapon states, by clearly stating that the undertaking included in each safeguards agreement, not to use certain items in such a way as to further any military purpose, includes the undertaking not to divert safeguarded nuclear material for the manufacture of any nuclear explosive device.

A redrafted safeguards system should include the principle that the state concerned shall establish and maintain a system of accounting for and control of all nuclear material subject to safeguards, as is the case in document INFCIRC/153. The Agency's primary task should be to verify the findings of the state's system, through independent measurements and observations, among other means. Minimum standards for each country's system should be set, taking into account the nature and extent of its nuclear programme.

For the event of any non-compliance by a state with a safeguards agreement, the Safeguards System of 1965 authorizes the Agency to invoke the sanctions provided in its Statute, that is, a call by the Board of Governors on the state to remedy the non-compliance, and a report to all member states, to the Security Council and the General Assembly of the United Nations. In the event of failure of the state to take fully corrective action the Board may curtail or suspend assistance being provided by the Agency or by a state and call for the return of materials and equipment made available. The non-complying member may also have the privileges and rights of membership suspended. The Agency may find it difficult to prove any non-compliance by diversion, Therefore, if the Safeguards System is redrafted, a provision should be included similar to that contained in the NPT safeguards agreements: that already if the Board finds that the Agency is not able to verify that there has been no diversion of nuclear material it may take the measures provided for in the Statute. These measures should in any case include the suspension of the supply by other states of any item intended for the nuclear programme of the state in question, at least until adequate remedial action has been taken. They should, however, not always be invoked in consequence of minor acts of non-compliance, such as a delay in reporting or the omission of the despatch of an advance notification of an international transfer. On the other hand, such delays or omissions may seriously hamper the application of safeguards and jeopardize their effectiveness. The Agency should study the measures, such as special inspections that might be taken in a new version of its safeguard system, to compensate for the lack of information that might be caused by acts of non-compliance which, by their nature, might not warrant the invocation of the whole set of measures provided in the Statute.

Recently there has been more awareness of the need for adequate protection of nuclear materials against diversion on the sub-national level, theft or sabotage and against interference during international transport. There has so far been insufficient international action in this respect. In 1972 the IAEA published a set of general guidelines for the physical protection of nuclear material, but there is an urgent need for further concerted work in this field, both to complement safeguards and to enhance their credibility. It is recommended in the first place that the IAEA should convene experts for the purpose of drawing up the minimum requirements for any national system of protection of nuclear material. The IAEA should also be in a position to advise states that so request on the measures to be taken, and to check on the adequacy and efficacy of the state's efforts in this respect. Further, the Agency might usefully draw up recommendations for the protection of nuclear material during transit and it could help to prepare a convention on this subject, giving minimum requirements for measures to be adopted internationally and sanctions against tampering with material during transport.

In this connection, the IAEA should, further, establish guidelines for the co-location of facilities, which could reduce the need for transport of nuclear material, and the risk that nuclear material is interfered with during such transport. On the other hand a possibility which would warrant study, but which is not so much directed at the reduction of the risks incurred in international transport as at decreasing chances of governmental diversion and of sub-governmental interference, is the establishment of international reprocessing installations operating under close Agency control.

Both in the interests of physical security and of safeguards proper, it might be useful if the Agency considered giving effect to the provision of its Statute—so far not applied—that excess special fissionable material, particularly plutonium, which is not needed immmediately for purposes of research or power production, should be deposited with the Agency. Dispersed stockpiling of such material under direct Agency supervision might reduce the risks of diversion and of theft, sabotage and similar mishaps.

IAEA safeguards may be applied only in locations, where, according to the declaration of the state involved, there is nuclear material subject to safeguards. The Treaty of Tlatelolco, however, provides in Article 16 for special inspections to be made either at the request of a party which suspects that another party is carrying out an activity prohibited by the treaty, or at the request of a party that is so suspected. In such cases inspectors have "full and free access to all places and all information which may be necessary for the performance of their duties and which are directly or indirectly connected with the suspicion of violation . . .". It is worth considering whether the IAEA should not adopt a similar provision in its safeguard system, or at least one by means of which a state that considers it is being unjustly accused of carrying out prohibited or non-declared nuclear activities could clear itself by having the Agency certify that it has been unable to determine that a violation is taking or has taken place. If the IAEA is called upon to apply its safeguards pursuant to any further regional denuclearization scheme, a provision along these lines might certainly be appropriate.

It is recognized that in an organization like the IAEA, which has both a promotional and a regulatory task, the provision of funds for the latter activity will always be carefully scrutinized by those who wish to emphasize the former. However, safeguards must not be allowed to suffer because of this. It is essential that funds should be available to maintain an adequate safeguards staff and expand this as necessary, to permit this staff to travel as required, so that the efficacy of safeguards is not dependent on budgetary restraints in this respect, and to develop and purchase the necessary equipment.

Non-fulfilment of the obligations of nuclear-weapon states

The Indian nuclear explosion has dramatically demonstrated the present fragility of the NPT as a proliferation preventative. The treaty is weak because two nuclear-weapon powers (China and France) and many important states with ambitious nuclear plans (among others, India, Israel, Brazil, Argentina, Pakistan and South Africa) have not associated themselves with it. Many other states (such as Japan and Egypt) have signed but have not yet ratified the treaty. But most serious of all, the nuclear-weapon parties to the treaty (the UK, the USA and the USSR) have failed to fulfil their main obligation under the treaty (Article VI) to take effective measures towards nuclear disarmament. Nevertheless, fragile though it is, the NPT remains the main political barrier to the proliferation of nuclear weapons.

Any possibility of now re-establishing the NPT as an effective non-proliferation measure, late in the day though it is, has been greatly lessened by the promise of former President Nixon to Egypt and Israel to provide them with nuclear material and equipment for peaceful purposes. This event amounts to an official admission by the United States that it regards the NPT as an ineffective instrument—and this is a serious blow to the treaty. If the United States had confidence in the treaty, then it would surely have insisted that the two states must ratify the treaty as a condition for receiving nuclear assistance. In fact, Articles IV and V of the treaty actually hold out the promise of nuclear assistance by the nuclear-weapon parties, once a state has ratified the treaty, as a powerful incentive to encourage non-nuclear-weapon states to join it. The effectiveness of this incentive has now been greatly weakened, if not entirely lost.

Article V states that all "the potential benefits from any peaceful applications of nuclear explosions will be made available to non-nuclear-weapon states party to the treaty on a non-discriminatory basis". Moreover, this service is promised at bargain prices—"the charge for the explosive devices used will be as low as possible and exclude any charge for research and development". In practice, no steps at all have been taken to set up the mechanisms for the "appropriate international observation" and "appropriate international procedures" specified, even though considerable interest has been shown by several non-nuclear-weapon states in the peaceful applications of nuclear explosions. Whether or not this interest is based on a realistic appraisal of the potential of peaceful nuclear explosive technology is, politically and psychologically, beside the point.

It can hardly be said that the high-sounding promise in Article IV of "the right to participate in the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy", has yet been fulfilled. A recent SIPRI book, *Nuclear Proliferation Problems* [4] says of it—"under present circumstances, Article IV is no more than a pious vow having no practical application, which tries to present in more palatable terms a treaty not always subscribed to with enthusiasm". The main reason for this harsh judgment is that since the nuclear economic stakes are now so huge (the worldwide construction of nuclear power stations alone represents an annual investment of over $10 billion), international nuclear dealings are carried out more and more between industrial firms on the basis of ordinary commercial rules and competition and of national interests. The idealism of Article IV is not compatible with the cut-throat competition of a multi-billion dollar business. Take uranium mining, a considerable component of the nuclear industry, as an example. A considerable amount of uranium is being stockpiled by the main uranium producers simply to maintain prices and protect national commercial interests. These stocks, together with the uranium produced in the next few years, will amount to about four times the amount of uranium required during this period.

The development and construction of nuclear reactors and nuclear fuel fabrication and reprocessing plants, although suitable activities for international cooperation, are also conducted entirely on the basis of commercial and economic considerations, with the full protection of narrow national interests.

The availability of enriched uranium for the nuclear power industry in non-nuclear-weapon countries is clearly of paramount importance. The enriched uranium producers (in practice, the USA and the USSR have a virtual duopoly) show no willingness to share the secrets of their enrichment processes with others. It is true that the proliferation of enrichment plants to non-nuclear-weapon states is either underway (South Africa and the Netherlands) or anticipated (Japan, India and possibly Brazil) but the development is indigenous and in no way related to Article IV. It is to be hoped that the conference to be held in May 1975 to review the operation of the NPT will result in some reinforcement of Articles IV, V and VI of the treaty.

IV. *Legal aspects of nuclear assistance*

The US promise of nuclear assistance to Egypt and Israel raises the question of whether states that are party to the NPT can legally provide nuclear material and equipment for peaceful purposes to non-nuclear-weapon states. Fissionable material, equipment or material especially designed or prepared for the processing, use or production of fissionable material can, in fact, be legally provided for peaceful purposes to any non-nuclear state on the condition that the material is subject to the safeguards required by the NPT.

It is asserted by some that for non-parties to the NPT, safeguards applying only to the material supplied would suffice, as was the case before the entry into force of the treaty. But such an interpretation of the provision of the NPT would lead to the absurd situation where the parties which have formally relinquished the nuclear weapon would be more strictly controlled than non-parties, which have chosen to maintain this option. Supplies of nuclear material and equipment should not be given to non-nuclear-weapon states unless safeguards are applied to all peaceful nuclear activities within those states. This is valid both for parties and for non-parties to the NPT. If a state non-party to the NPT accepted safeguards on all its nuclear activities, it would *de facto* accept the basic obligations of the non-nuclear-weapon parties to the NPT. This was precisely the original intention of the drafters of the treaty. The safeguards should be international, not just bilateral, and spelt out in an agreement negotiated and concluded with the IAEA. It must be emphasized that nuclear supplies effected without comprehensive international safeguards, or under safeguards (even international) applying only to the material supplied, contradict the letter and spirit of the NPT.

In today's world, there is no fool-proof way of preventing the diversion of fissionable material from peaceful to military uses. But experience shows that by far the best chance of preventing the proliferation of nuclear weapons would be through the universal application of IAEA safeguards to all peaceful nuclear activities within a state.

It is a tragedy for world security that the nuclear-weapon parties to the NPT have not fulfilled their obligations under Articles IV, V and VI of the treaty. In particular, some steps (even minor ones) towards real nuclear disarmament would have greatly reinforced the treaty. If many more nuclear-weapon powers emerge, mankind's survival will be even more threatened than it is today.

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3. Nuclear deterrent policies

Square-bracketed references, thus [1], *refer to the list of references on page 46.*

I. *Size of strategic nuclear forces*

The debate about nuclear deterrence policies has continued during 1974. (See the SIPRI Yearbook 1974 for an account of this debate up to December 1973.) The issue was heightened by the announcement of US Secretary of Defense James Schlesinger in January 1974 that the United States intends to adopt what was termed a counterforce strategy as a strategic nuclear option and, to this end, is improving the accuracy of delivery of its nuclear weapon systems. Counterforce strategy does not replace deterrence; rather it supplements it with the additional capability to strike, either pre-emptively or in response to an attack, at the opponent's military targets, including hardened missile silos. Such a strategy requires a large number of accurate powerful nuclear warheads targeted not against cities and industrial and transportation centres but against military installations. In addition, a counterforce strategy implies the capability of fighting a nuclear war if deterrence fails to prevent its outbreak.

US Secretary of State Henry Kissinger and Secretary of Defense Schlesinger appear to have sharply divergent views on nuclear policy. The Secretary of State has argued that the Defense Department is advocating policies that hamper negotiations with the Soviet Union on strategic arms limitations, that threaten to stimulate a new round in the strategic arms race, and that may damage his efforts to develop a détente with the Soviet Union. Kissinger has also argued that the Defense Department is pursuing an outdated concept of "strategic superiority"—outdated in an era of multiple independently-targetable re-entry vehicles (MIRVs) of increasing accuracy. The Secretary of Defense, however, appears to believe that Kissinger is risking US security in order to promote his view of détente.

In explaining the failure of the Nixon-Brezhnev 1973 summit meetings, Kissinger said: "Both sides have to convince their military establishments of the benefits of restraint, and that is not a thought that comes naturally to military men on either side". He also questioned the value of "strategic superiority" when both sides have many thousands of nuclear warheads. "One of the questions we have to ask ourselves as a country is what in the name of God is strategic superiority. What do you do with it?"

But perhaps the largest area of disagreement between the two men is on the number of missiles and warheads the USA and the USSR should be allowed under any future strategic arms limitation agreement. Schlesinger argues that the USA must be ahead by nearly 2 to 1 in the number of MIRVed ICBMs to maintain what he calls "essential equivalence", because of the Soviet advantage in number and total throw-weight of their missiles. There is some evidence that a similar controversy between politicians and strategists is raging in the Soviet Union over nuclear policies (it would be surprising if it were not so) but there has been virtually no public debate there on the issue. But judging from initial reactions to the proposed SALT II agreement, it appears that the defence departments of both powers are now prepared to accept equal levels of strategic delivery vehicles and MIRVed missiles. The USA and the USSR have in any case long since passed the stage of regarding an increase in the number of strategic missiles as an achievement. For about the past ten years in the USA, and probably not much less in the USSR, the challenge has been to increase the number and accuracy of warheads per missile together with reliability, ability to penetrate and so on. In other words the emphasis has been on technological advances and qualitative improvement. The SALT I agreement and the proposed SALT II agreement, since they do nothing to check technological improvement, do little more than encourage a trend that had already emerged. But if the SALT I and the proposed SALT II agreements have put successively higher premiums on *qualitative* improvement to strategic weapons it should not be thought that *quantitative* advancement will suffer. As the following discussion will show, the amount of *effective* damage that the USA and the USSR can inflict on each other will rise astronomically over the next decade even if the limits on the total number of strategic delivery vehicles and MIRVed missiles in the proposed SALT II agreement are established.

A SIPRI report entitled *Offensive Missiles* [1] shows that, in fact, the United States holds a clear strategic advantage over the USSR and could, therefore, afford to be liberal in order to achieve an agreement with the Soviet Union on strategic arms limitation. The report defines a $K \cdot N$ value which is a measure of the countersilo kill capacity of missile warheads. K is the lethality of a re-entry vehicle to an enemy silo, equal to (the yield of the warhead)$^{2/3}$/(circular error probability[1])^2. N is the total number of re-entry vehicles in a nuclear arsenal.

Existing technology could result first, in a doubling of the yield of the Minuteman III and SLBM warheads and second, in an improvement in the accuracy of the Minuteman III to a CEP of about 250 metres (0.13 nautical miles) and of the Poseidon and Trident missiles to better than 0.2 nautical miles. These improvements would increase the K of a Minuteman III to

[1] The "circular error probability" (CEP), a measure of accuracy of warhead delivery is the radius of a circle centred on the target in which half a large number of ICBM warheads fired at the target would fall.

about 40 and that of a Poseidon warhead to more than 8. The total $K{\cdot}N$ value of the US arsenal would then rise to over 110 000, that is, to a value five times more than the Soviet nuclear arsenal could possibly have by 1981–82, and high enough to threaten the Soviet silos with assured destruction.

A warhead with K=40 has a 96 per cent probability of destroying a 300 psi[2] silo. Therefore, for the first time, the United States will possess a warhead with a K value high enough to enable it to destroy a silo with a single shot.

Terminal guidance of US re-entry vehicles could result in accuracies of 30–50 metres. The techniques required for terminal guidance of manoeuvrable re-entry vehicles (MARVs) are beyond the research stage, but they still require extensive development before they can be incorporated into reliable weapon systems. It may, therefore, be ten more years or so before these weapons enter the US strategic arsenal. But the achievement of such accuracies has a number of implications.

A single Minuteman III re-entry vehicle with a 0.2-megaton warhead will have a K=450 for a 50-metre CEP and a K=1 300 for a 30-metre CEP. Similarly, one of the present Poseidon warheads (yield=0.05 megatons) will have a K=170 for a 50-metre CEP and a K=500 for a 30-metre CEP. These K values would allow the destruction of land-based missiles from submarines, since a warhead with K=170 will destroy a 1 000-psi superhardened silo with 97 per cent probability and one with K=500 with virtual certainty.

If the number of launchers, the number of independently-targetable re-entry vehicles, and the yield of warheads all remain the same as they are at present, but the missiles are equipped with re-entry vehicles capable of 30-metre accuracy, the total $K{\cdot}N$ value of US strategic missiles would increase to about four million. This figure includes neither the $K{\cdot}N$ values of systems that are not already deployed, such as the Trident submarine, nor the $K{\cdot}N$ of the existing bomber force.

Accuracies better than about 30 metres are probably unattainable. Soviet missile accuracies will therefore probably sooner or later catch up with those of US missiles, restoring, sometime in the early 1990s, the parity of forces that will have existed twice before—in the early 1970s in number of launchers and in the early 1980s in number of independently-deliverable re-entry vehicles. If arms control negotiations are more productive in a situation of approximate parity, then present weapons developments could, by producing periods of significant disequilibrium, severely jeopardize the prospects for efforts to achieve a limitation and reduction of nuclear weapons.

[2] Missile silos are protected to withstand a certain overpressure measured in pounds per square inch (psi).

If the Soviet leaders decide to maintain the survivability of their strategic missile forces, they could replace their ICBMs with mobile ones, thereby rendering useless US improvements in accuracy. Such a move would, however, complicate further the verification, by national means of inspection, of the number of missiles each country possesses. Thus, terminal guidance has serious ramifications for arms limitation efforts.

The planned improvements in accuracy and yield of US nuclear weapons are of dubious political or strategic value. The presence of the invulnerable Soviet SLBM force ensures that the United States cannot disarm the Soviet Union with a first strike even with the most accurate or reliable re-entry vehicles. And the same argument applies to Soviet forces. It has been argued that the improved accuracy of strategic nuclear weapons will permit the adoption of a policy of limited and flexible response by making possible attacks against military targets near urban centres without massive damage to civilian populations and property. But this is a false argument. Two re-entry vehicles with identical 0.2 megaton warheads, but with accuracies of 0.25 nautical miles and 30 metres respectively will both devastate the same area, a circle with a radius of between two and three nautical miles: the only difference is that in the case of the first weapon, this area will be centred about a point within approximately 0.25 nautical miles of the intended target and in the second, about a point within a few tens of metres of the target. Therefore, if the intended target of the re-entry vehicle is more than two to three nautical miles away from a city neither weapon will cause grave damage, while if it is closer than this, both weapons will cause damage. The more accurate weapon is not more humane. Neither is the politically significant distinction of whether the attack was against a military or a civilian target easier to make in the case of the more accurate weapon. The radius of destruction of nuclear weapons is so much larger than the relative improvement in accuracy envisioned that the results of an attack near a city are the same irrespective of the sophistication of the weapon.

II. *Targeting problems*

In addition to the controversy over the size and quality of strategic nuclear forces, there has been controversy over targeting doctrines. In the 1974 SIPRI Yearbook, it was shown that only a small fraction of US nuclear strategic warheads are targeted on cities in the Soviet Union and China. It was stated that the total number of US warheads ready to be launched at any instant is 4 500 on missiles and probably no less than 800 or so on B-52s. Since the number of warheads needed to destroy securely all the significant civilian targets in the Soviet Union and China is 800, over 4 000 nuclear warheads must have been targeted on military targets for the past several years [2]. A similar argument must also apply to Soviet strategic forces.

Since it is clear that both powers already have a significant capability to destroy military targets, what then is the difference between strategy in the past, and that presently being discussed? The answer can be found in a number of statements made by Secretary of Defense Schlesinger at the Overseas Writers Association on 10 January 1974, where he stated that the change in targeting doctrine was qualitative rather than quantitative, and that emphasis was being shifted away from what he called "assured destruction, which implies a tendency to target Soviet cities initially and massively", to "a set of selective options against different sets of targets". He said

> We would not necessarily specify any particular set of targets. Military targets, whether silos or other military targets, are of course, one of the possible target sets. But it is necessary to maintain a set of options which goes beyond the inherent attack—all-out attack—against enemy cities in the event of nuclear exchanges.

When asked if the USA already had a counterforce capability, the Secretary answered:

> No, that does not follow, that we have a counterforce capability if one is able to destroy countervalue targets [cities] in that way. It depends upon the kinds of military targets that you may be referring to. It is evident, for example, that this large number of weapons in our stockpile provides us with the discriminating ability to go after certain classes of military targets—airfields and the like.

The Secretary of Defense was more explicit on 4 March 1974 during a Senate Hearing on US and Soviet Strategic Doctrine before the Subcommittee on Arms Control, International Law and Organization:

> The issue of retargeting, Mr. Chairman—which I prefer to refer to as a change in targeting doctrine—does not require any change in our force structure. The purpose of the change in the targeting doctrine, which emphasizes flexibility and selectivity, is to shore up deterrence. We believe, for reasons that I can lay out in considerable length, that the change in targeting doctrine serves to shore up deterrence across the entire spectrum of risk and consequently reduces the likelihood, which is fortunately already very low, of any outbreak of nuclear war.
>
> The change in targeting doctrine comes about in the following way: of course, all our delivery vehicles are targeted against specific targets. The point that is different about the targeting doctrine that I have outlined to you is the emphasis on selectivity and flexibility. In the past we have had massive preplanned strikes in which one would be dumping literally thousands of weapons on the Soviet Union. Some of those strikes could to some extent be withheld from going directly against cities, but that was limited even then.
>
> With massive strikes of that sort, it would be impossible to ascertain whether the purpose of a strategic strike was limited or not. It was virtually indistinguishable from an attack on cities. One would not have had blast damage in the cities, but one would have considerable fallout and the rest of it.
>
> So what the change in targeting does is give the President of the United States, whoever he may be, the option of limiting strikes down to a few weapons. It is to be

understood that, if the United States were to strike the Soviet Union in response to some hypothetical act on their part, this would not have to be a massive response. The credibility of a massive response was understandable in the fifties and even in the sixties when the United States had virtually a nuclear monopoly with regard to intercontinental strike forces. But the massiveness of those strikes has reduced the credibility of the deterrent since about 1967–68, when the Soviets began to introduce large numbers of missiles into their force structure [3].

Although the USA has targeted military targets in the Soviet Union with its strategic forces for some time now, the question arises of whether in practice there has been any strategic option other than a massive all-out strike. Schlesinger claims that there has not, and that such an option is only a hypothetical possibility. This surprising admission—counter to assumptions made by most experts in the past—came in answer to the question "Are you saying that the President does not now have the option of a limited strike against missile silos?" Schlesinger replied:

He does *hypothetically* in that he could ask SAC [Strategic Air Command] to construct such a strike in an emergency. But in order to have that kind of capacity one has to do the indoctrination and the planning in anticipation of the difficulties involved. It is ill-advised to attempt to do that under the press of circumstances. Rather one should think through the problems in advance and put together relevant, small packages which a President could choose under the circumstances in which they might be required—which I stress I do not think will arise. I think that this will shore up deterrence in those few areas in which there is weakness.

So that there can be no misunderstanding, Schlesinger repeated this point in answer to a question on whether the USA has the option to withhold retaliation for an appropriate time of deliberation and to what extent now does the USA have the option of delivering less than a massive response.

He said:

At the present time, *we have the hypothetical option*. That is why I indicated that we should separate the change in targeting doctrine from certain funding requests that we are making this year. I think that those funding requests will improve the doctrine, but the doctrine is not dependent on them. We can devise selective, flexible strikes with our existing array of weaponry.

Schlesinger went on to claim that certain improvements should be made in the command and control system, and that funding requests made in 1974 would be used, in general, to make the new targeting doctrine more efficient. When asked whether the type of selective and flexible targeting capability that he was proposing had ever been suggested in the past, and if so, why had it not been adopted, the Secretary of Defense replied.

It has been stated by several Secretaries of Defense . . . But nobody at the political level from 1961 to 1971 has put the energy behind developing the doctrine and the plans. Many statements can be found saying that flexibility or selectivity would be desirable. But before this time it has been sort of an aspiration. Now we are consciously basing our deterrent strategy upon the achievement of flexibility and selectivity in the way that was discussed earlier.

What then exactly did Schlesinger have in mind? It appears that the new targeting strategy placed particular emphasis on a wide selection of targets under "certain hypothetical events that may occur in the future".

In answering the question "Do you think it is possible to have a limited nuclear war, just to exchange a couple of weapons?", the Secretary said: "I believe so". He added "it is easier to think of the circumstances in which limited use might occur than it would be to think of a massive all-out strike against the urban industrial base of another nation, which has the capability of striking back".

The crux of the matter is that because officially adopted counterforce strategy makes nuclear war more "flexible", it makes it more thinkable and, therefore, more probable. Moreover, it demands large numbers of accurate weapons, a requirement which could trigger a new round in the strategic nuclear arms race. And few would allow the possibility that nuclear war could be kept limited. Any use of nuclear weapons, regardless of type, would probably escalate into an all-out nuclear war.

Some of the catastrophic consequences of such a war were described on 5 September 1974 by Dr Fred C. Iklé, Director of the US Arms Control and Disarmament Agency before the Council of Foreign Relations, Chicago. Iklé explained that new information has become available over the past years as a result of accidents and chance discoveries which cast new light on the effects of large-scale nuclear war. He lists six examples.

1. In 1954, the United States exploded an "experimental thermonuclear device" on a coral reef in the Marshall Islands. It was expected to have the power of about 8 million tons of TNT. But actually it exploded with about double the yield predicted —15 million tons of TNT. And it produced much more fallout than expected. An area of more than 7,000 square miles was seriously contaminated. Radioactive debris showered down on a Japanese fishing boat 40 miles from outside the pre-announced test area. About 100 miles downwind from the explosion, Rongelap atoll unexpectedly received serious fallout, so that inhabitants there had to be evacuated. One section of the atoll received about 6 times the lethal dose. And the U. S. Government promptly issued a notice expanding the danger area to about 400 000 square miles or roughly eight times the area previously designated as the danger zone. This experience furnished a dramatic lesson in the difficulty of predicting fallout.

2. The same thermonuclear test unexpectedly drove home to us some of the human meaning of fallout, largely an abstraction to most of the world at the time.

Soon after the explosion, a sandy ash showered down on crew members of the Japanese fishing boat I mentioned, settled in their hair, and on their skin. The crew, having no idea about the nature of this strange substance from the sky, kept working. But before long, the awful symptoms of radiation sickness began to be felt.

At Rongelap atoll it was two days before people on the island were evacuated. By that time they had received about one fourth the lethal dose of radiation. Fortunately, they had not been at the northern end of the island, where the fallout would have brought quick death. But children were later found to have serious permanent thyroid injury, which would retard their growth. Just recently, a young man who was exposed in that test while still in his mother's womb, underwent surgery at Cleveland Metropolitan General Hospital. Growths were removed from his thyroid gland.

This brought to 28 the number of residents of Rongelap who have had such surgery.

3. The third unexpected discovery made us aware how nuclear explosions can bring about massive disruptions to worldwide communications. This type of disruption could have seriously impaired the ability of governments and military commanders to receive attack warning and maintain control. In 1958, the United States exploded two nuclear devices high above Johnson Island in the Pacific. High frequency radio communications which crossed the sky 600 miles from the detonation point were unexpectedly lost. Some interruptions lasted minutes; others many hours. The disruption resulted from complex interactions among effects produced by the explosion: the shock wave's disruption of the ionosphere which normally reflects radio signals back to earth, radiations from debris, and ionization of the atmosphere. The reasons for the unexpected disruption were explained—but only well after the event.

4. The fourth chance discovery made our experts focus on the distant damage to electronic equipment and computers that nuclear detonations can cause. Given that our engineers, happily, had never seen a nuclear war, they were used to worrying primarily about heat and blast damage, familiar to them from Hiroshima and Nagasaki and from subsequent weapons tests. But meanwhile, the British had discovered that the electromagnetic pulse produced by nuclear explosion could destroy critical command and control links and computer memories beyond the range of blast damage. The British, having a much smaller test program than our own, assumed we must be aware of this vulnerability. We weren't. Only through coincidence was knowledge of this effect relayed to our own experts.

5. The fifth discovery alters our assessment of the vulnerability of missile forces that are protected in underground silos such as our Minuteman. As you know, there is continuing concern that our Minuteman missile force might become vulnerable to a sudden attack, hence lose its deterrent value. For years, simplistic calculations have been used—the kind of calculations that a teacher can put on half a blackboard—to show that accurately aimed multiple warheads, so-called MIRVs, would inevitably increase this vulnerability. Then, the complexity of the real world was rediscovered. It was found that through a phenomenon dubbed "fratricide" some of these warheads might destroy or divert each other before they could destroy the intended target. In this case, the discovery suggests something reassuring: our simple calculations may have exaggerated the vulnerability of our missiles.

6. The sixth and last example concerns a new uncertainty about what nuclear war might do to people and to the very environment on which life depends—an uncertainty that has gone unnoticed for 25 years. This is the possibility that a large number of nuclear explosions might bring about the destruction, or partial destruction, of the ozone layer in the stratosphere that helps protect all living things from ultraviolet radiation.

We do know that nuclear explosions in the earth's atmosphere would generate vast quantitites of nitrogen oxides and other pollutants which might deplete the ozone that surrounds the earth. But we do not know how much ozone depletion would occur from a large number of nuclear explosions—it might be imperceptible, but it also might be almost total. We do not know how long such depletion would last—less than one year, or over ten years. And above all, we do not know what this depletion would do to plants, animals, and people. Perhaps it would merely increase the hazard of sunburn. Or perhaps it would destroy critical links of the intricate food chain of plants and animals, and thus shatter the ecological structure that permits man to remain alive on this planet. All we know is that we do not know.

The debate on nuclear deterrent policies underlines the inherent dilemma produced by the existence of large nuclear arsenals. All nuclear doctrines must have severe shortcomings, mainly because they cannot reduce the probability of the use of the weapons to an acceptably low level.

It has now been officially stated that nuclear deterrence has, in practice, been so crude that the only option has been a massive all-out strike. In Schlesinger's words "massive preplanned strikes in which one would be dumping literally thousands of weapons" on the enemy. (The highly sophisticated (but pseudo-scientific) deterrence theories, involving bargaining, limited retaliation and the like, worked out with enormous intellectual effort by strategic analysts have, therefore, had absolutely no effect on official nuclear policies.) But bad though this situation is, the consequences of changing to a more flexible strategy of the type now being adopted are, for the reasons described above, even worse.

By continuing to improve both the quality of nuclear weapons and the numbers of these weapons, the USA and the Soviet Union imply that they perceive a military and/or political utility in them. The official statements of the two powers also imply that they believe that not only does nuclear deterrence work but that it is a good policy. How then can they expect other powers not to acquire nuclear weapons? If nuclear deterrence works in Europe, it should also work in Asia. The USA and the Soviet Union cannot contribute to the prevention of nuclear weapon proliferation unless they show by their actions that they see no utility in nuclear weapons. The only way in which they can demonstrate this, is to reduce their nuclear arsenals, as a step to the total abolition of nuclear weapons.

References

1. *Offensive Missiles,* Stockholm Paper 5 (Stockholm, 1974, Stockholm International Peace Research Institute).
2. *World Armaments and Disarmament, SIPRI Yearbook 1974* (Stockholm, Almqvist & Wiksell, 1974, Stockholm International Peace Research Institute).
3. *Hearings before the Subcommittee on Arms Control, International Law and Organization of the Committee on Foreign Relations,* US Senate, 93rd Congress, 2nd Session, 4 March 1974 (Washington, US Government Printing Office, 1974).

4. The prohibition of inhumane and indiscriminate weapons

Square-bracketed references, thus [1], *refer to the list of references on pages 57–58.*

I. *Introduction*

This chapter reviews several events during 1974 which relate to the current efforts to prohibit the use of certain specific weapons.[1]

A report prepared by an international group of experts under the auspices of the International Committee of the Red Cross in 1973 [2] drew attention to high velocity small arms ammunition, certain blast and fragmentation munitions, delayed action weapons, and some new developments, in particular, laser weapons. Previous reports of the United Nations Secretary-General had described the effects of napalm and other incendiary weapons [3], and surveyed the existing laws of war with regard to specific weapons [4]. These reports led to resolution XIV of the XXII International Conference of the Red Cross that the subject of weapons should be examined at a special conference of government experts.[2] A conference was thus held in Lucerne, Switzerland in September–October 1974, following a diplomatic conference held in Geneva a few months earlier to review international humanitarian law.

The Geneva and Lucerne conferences were significant in that they were the first time that the humanitarian issues raised by certain specific weapons, other than nuclear, chemical or biological weapons, had been discussed at an international level since the early 1930s. In fact, no new specific prohibition of "conventional" weapons has been adopted since the "dumdum" declaration of the Hague Conference in 1899.

However, the results achieved at Geneva and Lucerne have been meagre.

II. *The Geneva Diplomatic Conference*

The first session of the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts was held in Geneva from 20 February–29 March 1974. Early in the

[1] Previous, related events, with particular reference to incendiary weapons, were reviewed in reference [1].
[2] This recommendation was acknowledged in UN General Assembly resolution 3076 (XXVIII).

proceedings it was agreed to set up an *ad hoc* committee to examine the question of the prohibition or restriction of use of specific categories of conventional weapons which may cause unnecessary suffering or have indiscriminate effects [5]. The committee was not permitted to negotiate on specific amendments to the Draft Additional Protocols to the Geneva Conventions of 12 August 1949, which were the subject of the Diplomatic Conference.[3]

The subsequent debate was most unsatisfactory, depending not so much on the lack of technical expertise (many of the same "delegates" to the Diplomatic Conference turned up as "experts" at the Lucerne conference) as on the decision to defer the issue to the conference of government experts. The establishment of the *ad hoc* committee must therefore be evaluated as a political achievement, rather than for its contribution to clarifying the issues at stake.

III. *The Lucerne Conference*

The Conference of Government Experts on Weapons which may Cause Unnecessary Suffering or have Indiscriminate Effects was held in Lucerne, Switzerland, from 24 September – 18 October 1974 [7]. Forty-eight states, two liberation movements, the United Nations, the World Health Organization, the Stockholm International Peace Research Institute, the International Federation of Former Prisoners of War, the Special NGO Committee on Disarmament and national Red Cross societies were represented. The conference included representatives from both the Democratic Republic of Viet-Nam and the Republic of Viet-Nam. Representatives of the Provisional Revolutionary Government of the Republic of South Viet-Nam were not invited, a decision which was regretted by some experts.

The conference began with a brief discussion of the relevant legal criteria. Clarification was sought of the standard of "unnecessary suffering", taken from the Hague Regulations of 1899 and 1907, where it is stated that it is forbidden to employ arms *propres à causer des maux superflus*. There was general agreement that the element of calculation employed in a common English translation ("calculated to cause") was not found in the authentic French text, while the words *maux superflus* (superfluous injuries) were perhaps more precise than the English translation "unnecessary suffering". However, there was a feeling that the more subjective element found in the English term "suffering" might be retained in humanitarian law.

The amount of emphasis placed on the element of military necessity varied considerably. A Swedish delegate suggested that the general princi-

[3] The UN Secretary-General reported on the *ad hoc* committee on 15 October 1974 [6].

ple of the St Petersburg Declaration could be strengthened by a formulation which required that where two weapons were available for a particular military purpose, the one which caused least suffering should be chosen. The debate failed to clarify the issue of how much injury is required to put a man *hors de combat*—a failure which became more apparent when the effects of specific weapons were discussed. However, it was pointed out that, while, in ideal circumstances, a soldier might have a great range of weapons available from which he could choose the least inhumane, in practice weapons were chosen with a certain "overkill" capacity, against the eventuality of a more extreme situation. As a result, graver injuries than the minimum strictly required in a given situation could not always be avoided. The principle that weapons should not have indiscriminate effects was generally accepted, though it was nowhere clearly stated in existing laws.

Reference was also made to the terms "treacherous" and "perfidious" weapons as well as to the Marten's clause, contained in the preamble of the Hague Regulations, according to which "the inhabitants and the belligerents remain under the protection and governance of the principles of the law of nations, derived from the usages established among civilized peoples, from the laws of humanity, and from the dictates of the public conscience".

Though these were the issues discussed in most detail, other important legal issues were raised. Some experts expressed profound scepticism about the usefulness of the traditional criteria and legal instruments, particularly where states which were the victims of aggression did not possess the means of retaliation. In these circumstances an aggressor might blatantly ignore both legal instruments and public opinion. For this reason, some experts argued that a better approach would be to treat the whole matter in the context of disarmament. For other experts, the prime task of humanitarian law lay in protecting man against aggressive war, which should be condemned as a war crime. It was necessary in developing international humanitarian law applicable in armed conflicts to take account of the fact that—contrary to the situation in the nineteenth century when many of the existing laws of war were formulated—under the United Nations Charter, the threat or use of force is illegal, except in self-defence. From this point of view, traditional concepts such as "unnecessary suffering" or "military necessity" contained too many anomalies to be useful. A specific weapon could not be judged "legal or illegal"—rather the human agent using the weapon should be judged.

Incendiary weapons

It was clear from the start of the discussions at Lucerne on specific weapons that incendiary weapons would be most liable to be banned. For this reason considerable effort was expended on questions of definition and classification. Though it was not stated explicitly, the purpose of these exercises was not to deepen the level of scientific study but to limit the scope of possible prohibitions.

Firstly, incendiary weapons were defined in such a way as to exclude nuclear weapons and lasers. Then exceptions were made for smokes, signals and tracers; then for shaped charges, and finally an unsuccessful attempt was made to exclude armour-piercing and high-explosive incendiary projectiles.

In another approach, a distinction was made between antipersonnel and antimatériel incendiary weapons. The implication of this approach was that incendiaries used only against personnel might be prohibited; as it happens few, if any, incendiary weapons are used exclusively against personnel, since they are designed to have "anti-PAM" (antipersonnel and matériel) capability.

During the discussions of particular incendiary weapons it became clear that every effort was being made to defend them against the allegations regarding their use which have been made in previous reports. For example, it was argued that the UN report [3] was in error in emphasizing the high lethality of napalm bombs, and some contrary evidence was presented. In one study of US soldiers subjected to accidental bombing with napalm bombs, 53 soldiers (in several incidents) were affected, but none of them died before evacuation (after 10–20 minutes) at which time all the affected personnel could still carry out a variety of tasks. Four of the soldiers were said to have subsequently died.

Other experts, while appreciating this release of previously classified data, pointed to other published studies which supported the estimates cited in the UN report. In addition, it was pointed out that if napalm was as ineffective as an antipersonnel agent as was implied by this new data then the judgement that the undoubted suffering caused by it was superfluous from a military point of view was reinforced.

There was general agreement that the use of incendiaries for mass attacks on urban areas was now unacceptable. It seems unlikely that a specific legal prohibition of attacks of this kind would meet with significant overt opposition. However, there was less than general agreement that the use of incendiary weapons against combatant personnel should be prohibited or restricted. This view was not supported by some of the larger military powers, but did receive support from some of their traditional allies.

Finally, there was the view, apparently held by a majority of non-aligned nations, that napalm and other incendiary weapons should be absolutely prohibited, with the possible exception of anti-aircraft and anti-armour projectiles provided they were used only for these purposes.

Small calibre projectiles

Perhaps because the parameters determining the wounding effects of a bullet, though complex, are more constant than is the case with many other weapons, the discussion of this topic reached a higher level of scientific sophistication. Nevertheless, it did not prove possible to reach agreement on the fundamental question as to whether the new 5.56-mm bullets,[4] which are fired at very high velocities, cause "superfluous injuries".

There was considerable criticism of the suggestion that a limit of 800 m/sec for the initial velocity of a bullet should be introduced. It was said that there was no significant increment in the severity of wounds caused by projectiles over a velocity of 800 m/sec and that other factors, such as the shape and other characteristics of the bullet, needed to be taken into account.[5]

These criticisms, as far as they go, are justified. But the fact remains that there is a need to limit the wounding power of weapons, even if the limits chosen are arbitrary.

All modern military rifle bullets contain an initial energy which is many times more than that required to incapacitate a man. But the amount of energy deposited in the wound depends in part upon the behaviour of the bullet in the wound. Bullets which expand, flatten, tumble or disintegrate in the wound—rather than continuing, undeformed on a straight path—deposit more of the available energy in the wound.

The criticism directed at the new 5.56-mm bullets is that they tumble and disintegrate readily, thereby transferring more of the available energy to the wound. The heavier 7.62-mm bullets are more likely to perforate the body, leaving at the other side, thereby taking with them as much as 80 per cent of the surplus energy [2a].

To the weapons designer it is more logical to design a bullet which gives up all its energy to the target. However, to deposit the greatest amount of energy while avoiding "explosive-type" wounds, the amount of energy must be reduced. This conflicts with the demand for long range, which was the original purpose of the rifle.

If military demands are to conform to humanitarian requirements, where a high velocity weapon is to be used for both short- and long-range applications, then the bullet must be designed to have a low efficiency of energy deposit at short range (that is, it must not expand, deform, tumble or disintegrate).

[4] See reference [8 a] for a list of the weapons designed to fire these bullets.

[5] Paragraph 112 of the ICRC experts' report [2] states: "Wounds from projectiles that strike at the body at more than about 800 m/sec differ both in degree and in kind from wounds caused by lower velocity projectiles." The criticism may result from ambiguity of this wording, since it is usual to classify bullets from pistols and submachine guns with a velocity of about 350 m/sec as "low velocity", and those from rifles and machine guns, with a velocity usually exceeding 700 m/sec as "high velocity".

Blast and fragmentation weapons

It is not yet universally accepted as proven that the trend towards more but smaller fragments from modern weapons increases the level of superfluous injury. It was agreed that modern munitions had a higher hit probability than older types, and that as they eject a larger number of smaller, higher velocity fragments, a man would be more likely to be hit by a multiplicity of fragments, possibly requiring several surgical teams to operate simultaneously to save a victim—a requirement which was beyond the capacity of most countries. Some speakers saw this as an example of unnecessary injury; others argued that the wounds caused by single, much larger fragments, such as those produced by older shells, were more severe; and in order to cause the same number of casualties with the older munitions it was necessary to fire more of them. Therefore the newer shells represented legitimate battle economy without increasing—and perhaps even decreasing—the average severity of injuries. However, since no evidence was presented at the Lucerne conference regarding the actual casualties occurring in recent conflicts—compared with, say, World War II or Korea—it is impossible to say whether newer munitions cause, on average, more or less severe wounds.

There was some disagreement, also, as to whether the small steel balls used in some modern munitions caused more or less injury than unevenly shaped fragments. However, there are studies that show that while at low velocity a steel sphere may cause less injury than a fragment, at high velocity (more than 750 m/sec) the spheres cause greater injury [9].

Flechettes—small arrows of steel or depleted uranium about 2–3 cm in length—were discussed under the category of fragmentation weapons, though they have also been developed for use in small arms. Large calibre munitions, such as aircraft rockets or artillery projectiles, may contain many thousands of flechettes. Flechettes raise two issues: firstly, that of high velocity effects, and secondly that of multiple wounds. At high velocity a flechette may cause severe wounds; it may bend on impact when, according to one writer, "it becomes totally unstable and imparts its full kinetic energy to the target, producing an explosive-type wound" [10]. At low velocity each wound is less severe, but the victim may suffer from many of them. Evidence was presented in Lucerne of the existence of flechettes with split tips and bimetallic flechettes, designed to increase the wounding power.

A new type of blast weapon which was discussed is the fuel-air explosive, a munition which disperses an explosive mixture of gas in the air and then detonates it. It causes a powerful explosion more evenly distributed over an area than is the case with conventional explosives. The gas may diffuse through trees or into tunnels or foxholes before exploding. While conventional munitions cause most injuries by fragments rather than blast, the fuel-air explosive is a pure blast weapon which can be used for antipersonnel as well as other applications.

There was much discussion as to whether cluster bombs and other aerial or artillery means of dispersing multiple munitions were more indiscriminate than other means. It was said that the area covered by a typical cluster bomb was much less than the 300×900 m given in the ICRC experts' report [2b]; for example, the British BL 755 was said to cover less than one hectare (100 m×100 m). An area of one hectare is the area of a typical "artillery square" at which a barrage of artillery might be aimed.

It is obvious that the larger the coverage of an area weapon, the greater the likelihood that its use will cause casualties among civilians who cannot be evacuated from the risk zone. Equally, a large number of smaller munitions can have the same effect as a large cluster munition.

There is a fundamental difference, however, between an area weapon and the use of a large number of point weapons. In principle an area weapon is one which is directed at a target presumed to be within an area, but which cannot be precisely located. Any civilian or object within the area stands an equal risk of being hit. A point weapon, by contrast is one which requires, first, positive identification of the target, and second, precise aiming at the target. Accidental damage to civilians may occur, but it is not implicit in the use of the weapon.

Artillery fire may be used in either way—as a point weapon directed to a specific target on the basis of positive identification and observed fire, or as an area weapon where the precise location of the target within the area is not known. A cluster bomb, by contrast, can be used only as an area weapon—and even in areas far to the rear of the battle zone where civilians are more likely to be affected. Added to this is the fact that the bomblets of a cluster bomb are in many cases fitted with unreliable delayed-action fuses and may thus remain a long-term hazard.[6]

Delayed action and treacherous weapons

Most attention was paid to the possible indiscriminate effects of delayed action weapons. In addition one speaker proposed the limitation of the explosive content of antipersonnel mines to 30 grams, on the grounds that this was sufficient to disable a man (by crippling him), but was less likely to damage abdominal and genital organs.

[6] The problem of unexploded munitions was not sufficiently considered at Lucerne. Information provided to a US Congressional Committee by the Department of Defense was that the average failure rate for artillery munitions was 1–2 per cent, but that point-detonating fuses operating in the "super quick" mode had a failure rate of 2.5 per cent and in the delay mode from 5–50 per cent [11]. Even at the lower rate of 1–2 per cent it has been calculated that 150 000–300 000 kg of unexploded US munitions remained in Indo-China in 1973 [12].

It was argued that the indiscriminate effects of delayed action weapons can to some extent be reduced by limiting the use of delayed action bombs to military targets (for example, military airfields), or by putting minefields in clearly marked locations. The long-term hazards associated with minefields might be reduced by equipping all mines with reliable devices rendering them inoperative after a predetermined period of time.

Less convincing were the arguments that scatterable mines could be placed accurately. While an aircraft may be navigated accurately to a particular point, the placing of small mines, little more than the size of a tea-bag, cannot be accurately controlled from an aircraft. These small mines were originally developed moreover, for use in remote mountainous and jungle areas where ground troops could not operate, rather than as a short-term adjunct to tactical ground operations, where there might be a requirement for a reliable self-destructive device.

It was argued that mines are essentially defensive weapons. But according to one recent writer the reason for this was that, previously "mines had very limited versatility, were time-consuming to emplace, and could only be used in defensive situations in land that you controlled"[13]. Since the use of force is outlawed by the Charter of the United Nations except in self-defence, weapons fitting this description would appear to be more acceptable than most. However, the same author emphasizes that the new scatterable mines acquire their significance precisely because they enable a more "aggressive" approach in support of "combat operations in areas not necessarily under our control" [13].

Booby-traps, it was agreed, were a standard military technique, but one which in some circumstances could be a particular hazard to civilians. Mention was made of the dropping of toys or other attractive objects containing explosive charges. There was general disapproval of this activity, though no evidence was presented that it had ever occurred: it may be that allegations that toys dropped as part of a psychological warfare campaign contained explosives, were merely rumours spread as psychological countermeasures.[7]

The Australian delegation presented an interesting definition of a "perfidiously used weapon", namely that "[The] use of any weapon in such a way that it places the intended victim under a moral, juridical or humanitarian obligation to act in such a way as to endanger his safety, is perfidious" [7 a]. The example given was that of fitting an explosive device to a wounded or dead man so that it would injure rescue personnel.[8] But the

[7] On 16 October 1973, Damascus Radio warned civilians not to pick up booby-trapped pens and pencils alleged to have been dropped by Israeli aircraft [14]. Allegations of booby trapped toys were made in Beirut [15–16] but were categorically denied by the Israeli Ambassador to the UK [17], who in turn accused the Palestinians of scattering innocuous-looking booby-trapped objects near Israeli schools and public places. The dropping of toys as part of psychological warfare operations in Viet-Nam was officially admitted [18].

[8] Incidents of this kind were reported during World War II [19].

question was raised as to whether this was any different from mixing bomb loads with delayed action bombs, as was common practice during World War II and has been since. From the humanitarian point of view both methods are perfidious.

Future weapons

Brief reference was made at the Lucerne conference to various categories of new or potential weapons, many of which do not fit into existing categories (such as "chemical" or "conventional" weapons). The new devices and methods included:

Laser weapons. Lasers are already in use in a wide range of military applications, such as for range-finding or for guiding munitions to a target. However, there is also a considerable research effort devoted to developing lasers which could be used as weapons, mounted on ships, aircraft or vehicles. Lasers could cause burn injuries to personnel but perhaps even more importantly, temporary or permanent eye damage (due to the focussing action of the eye). This application might be attractive where, for example, it was desired to incapacitate the crews of optically-guided anti-aircraft guns. But the result might be the blinding of many individuals, both military and civilian.

Microwave devices. High intensity microwaves can be generated by radar devices and lasers. Devices of this kind can cause heating of the tissues, leading to an "internal burn". (They are widely used for the rapid cooking of food.) It was claimed by some delegates that military research in this area was not now being actively pursued.

Infrasound devices. Infrasound devices—that is, generators which produce powerful sound waves at frequencies less than 16 Hz—have been developed for "riot control" and might find military applications. If the intensity of the sound reaches about 100 db, minor sensory disturbances occur, while above 150 db major the central nervous system could be affected.

Light-flash devices. Two types of light-flash devices were described. Stroboscopic devices have sometimes been used in combination with infrasound devices, to create uneasiness in crowds, but they may also precipitate epileptic attacks in people with a latent epileptic disposition. A second kind operates on the principle of the flash bulb, using a powerful pyrotechnic or electronic flash device coupled to reflectors. The purpose of such a device would be to induce temporary or even permanent blindness in enemy soldiers engaged in night-fighting. It was suggested that devices of this kind might also be used against anti-aircraft crews at night.

Geophysical warfare. Reference was made to activities designed to modify the weather or climate, or to release earthquakes, for military purposes. It was claimed that such methods would be necessarily indiscriminate.

Environmental warfare. Environmental warfare referred to various means of modifying the natural environment as a means of war, for example, with the intention of denying an enemy natural cover for concealment or preventing the growth of crops. Some experts preferred to treat this category together with geophysical warfare.[9]

Electronic warfare. The term "electronic warfare" was introduced to refer to the use of electronic means to automate the collection of target information, and to guide attacking aircraft or artillery to the target.[10] (The term is more commonly used to refer to electronic means of interfering with radar and radio transmissions, as well as to "electronic countercounter measures" against such methods.) Some speakers claimed that unattended electronic sensors emplaced in the field would be less able to discriminate between military and civilian movements than a human observer. The large numbers of electronic sensors which can be deployed generate enormous quantities of information which must be analysed by computer. In theory the computer may then be programmed to make probabilistic determinations of the optimum distribution of attacks. Aircraft could then be programmed to attack particular coordinates. Where the replacement of manpower with machines is an overriding economic consideration, automating the battlefield may have many attractions. But it raises the question of where to place responsibility for indiscriminate effects which would be likely to result.

Review processes

It has often been said that the effects of new weapons cannot be evaluated in humanitarian terms until there is sufficient experience of their use. Conversely when weapons have been used sufficiently it is said that they are "conventional" and therefore legal.

In view of this contradiction, several experts advocated that governments be urged to weigh up humanitarian as well as military factors in their examination of new weapons. Both the Swedish and US delegates announced that their governments were taking some steps in this direction.

However, other speakers expressed the view that, if a nation was forced into war, it had the right to throw all its ingenuity and technology into the struggle. States with small armed forces faced with a more powerful adversary would wish to make use of all the technology they had available.

[9] In resolution A/3264 (XXIX) the UN General Assembly referred this subject to the Conference of the Committee on Disarmament; see pp. 476–77.
[10] A review of this topic appeared in reference [8 b].

The interrelationship between the military power and technology of states was not discussed in any depth in Lucerne. To an increasing degree, small states cannot afford the costs of keeping up with the technological arms race. As the powerful military states develop their level of military technology they may be increasingly tempted to use it in an attempt to impose their will on smaller states. Reviewing the humanitarian implications of this technology at a national level is hardly likely to be an effective restraint if national policy regards the use of force as legitimate.

Countries should seek to restrain the development and use of inhumane and indiscriminate weapons in the interests of humanity as a whole. An international means of review would be one way of keeping new weapons technology visible to the world community.

Follow-up

As a result of intense negotiations behind the scenes, the chairman of the conference closed with a statement which accepted a proposal to hold a second session of the Lucerne conference (not necessarily at the same place) while at the same time pre-empting any political action at the UN General Assembly or at the second session of the Diplomatic Conference. (See appendix 4A.) While representatives from many aligned countries expressed satisfaction at this solution, the disappointment of many non-aligned countries was made clear.

IV. *The UN General Assembly*

The report of the Lucerne Conference was presented to the General Assembly. Two resolutions were passed, the first (A/3255A) noting with appreciation the willingness of the ICRC to hold a second conference. The second (A/3255B) resolution went further, condemning the use of napalm and other incendiary weapons in circumstances where they may affect human beings or cause damage to the environment or natural resources; and urging all states to refrain from the production, stockpiling, proliferation and use of such weapons, pending conclusion of agreements on the prohibition of these weapons. (See appendix 14G.)

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Appendix 4A

Statement by the President at the Conference of Government Experts, Lucerne, 24 September – 18 October 1974

1. The present session has contributed to an increase in knowledge and understanding of the subject.

2. The report of the Lucerne Conference will be presented to the participants at the second session of the Diplomatic Conference and will be an important point on the agenda of the Ad Hoc Committee; new or revised proposals can also be submitted for consideration by that Committee.

3. Since the newly presented facts need to be digested and further study and research are needed, it was doubted that the Ad Hoc Committee would, at its next session, be ready to adopt new treaty rules concerning the prohibition or restriction on the use of any conventional weapons.

4. Although the Ad Hoc Committee would meet for the number of meetings that would be required for it to go through its agenda it might not prove necessary for it to meet during the full period of the Diplomatic Conference.

5. Further data could usefully be produced and presented in the coming year, e.g. by scientific research agencies, preferably with some international participation or within an appropriate existing international framework.

6. Another conference of government experts could, under ICRC auspices, and preferably in September 1975, usefully be convened, This conference should be well prepared and relevant documentation should be circulated to governments in advance. The conference would both receive and consider new information relevant to the subject matter contributed by the experts and would focus on such weapons as have been—or may become—the subject of proposed bans or restrictions of use and to study the possibility, contents and form of such proposed bans or restrictions. The Ad Hoc Committee of the Diplomatic Conference which by its discussions will contribute to the clarification of the issues, will consider the programme of work for the 1975 Conference of Government Experts. The report of the 1975 Government Experts Conference would be transmitted to all governments with a view to assisting them in their further deliberations.

7. It is hoped that the United Nations General Assembly will take the foregoing into account when drafting any relevant resolutions.

8. The ICRC would be prepared to convene and organize another conference of government experts on the same conditions as it did for the Lucerne meeting.

5. The Indian Ocean

Square-bracketed references, thus [1], *refer to the list of references on pages 89–91.*

I. *The Indian Ocean as a zone of peace*

The lack of progress in disarmament negotiations at the various international forums has led, over the past few years, to a renewed interest in regional arms control and disarmament measures. In this context, the most active recent discussion has been on the proposal to make the Indian Ocean a "zone of peace" and on measures to reduce great power military rivalry in the area.

The idea of declaring the Indian Ocean a peace zone was formulated in September 1970 by the conference of heads of states of non-aligned countries in Lusaka. At the Cairo Conference of October 1964, Mrs S. Bandaranaika, the Prime Minister of Sri Lanka, had proposed a resolution, which was accepted by the Conference, calling for the denuclearization of Africa, the Indian Ocean and the South Atlantic. And at the initiative of Sri Lanka the twenty-sixth UN General Assembly discussed the concept of an Indian Ocean Peace Zone.

The main features of Sri Lanka's proposal[1] were that defensive and offensive armaments and military installations should be excluded from the entire high-sea area of the Indian Ocean, within limits to be specified later. Warships and ships carrying war material would have the right of transit but would not be allowed to stop except for emergency reasons of a mechanical, technical or humanitarian nature. The use of the sea-bed by submarines would also be prohibited except for the reasons mentioned above. There would be a ban on naval manoeuvres, naval intelligence operations and weapon tests. Army, navy and air force bases would be prohibited in the zone.

The next step would be to exclude all foreign military bases from the territories of littoral states and, possibly, the immediate hinterland states of the Indian Ocean. The intention was also to include non-self-governing territories in the zone of peace and to have them demilitarized.

As a regional approach to disarmament, the proposal concerning the Indian Ocean went much further than did the prohibition of nuclear weapons in Latin America (the Treaty of Tlatelolco), the Organization of African Unity's declaration of Africa as a nuclear-free zone or any other

[1] For an analysis of the UN discussions on the Indian Ocean Peace Zone, see reference [1] and chapter 14 of this Yearbook.

suggestion for zonal denuclearization, in that it provided for the exclusion of both nuclear and conventional weapons. It called for total demilitarization and neutralization of the Indian Ocean.

A draft resolution on the subject, submitted in 1971 by Sri Lanka and a few other sponsors, met with a series of reservations. The main objection, as stated by many countries, was that establishment of the proposed "zone of peace" would contradict existing international law on the freedom of navigation on the high seas for *all* ships; it was argued that a group of states in any given region cannot establish a separate legal régime for the high seas in that region. There were misgivings that obstacles to international commerce, fishing, installation of submarine cables and pipelines, as well as overflights, may arise, since the Indian Ocean is of concern not only to littoral states but to the entire international community. The proposed declaration was criticized for not taking account of defence arrangements in the region, as well as for the lack of exact determination of the geographical area to which it referred. The difficulties of verifying the envisaged commitments were also pointed out.

As a result, the original proposal was watered down, its scope restricted and its form modified. Despite these changes, it was adopted by only 61 votes with 55 abstentions. The UN General Assembly resolution of 16 December 1971 called upon the great powers to enter into consultations with the littoral states of the Indian Ocean with a view to halting the escalation and expansion of their military presence in the ocean, and eliminating bases, military installations, logistical supply facilities, nuclear weapons and other weapons of mass destruction and any manifestation of great power military presence "conceived in the context of great power rivalry". It also called upon the littoral and hinterland states of the Indian Ocean, the permanent members of the Security Council and other major maritime states using that ocean, to enter into consultations with a view to ensuring that warships and military aircraft do not make use of the Indian Ocean for any threat or use of force against the sovereignty, territorial integrity and independence of any littoral or hinterland states of the ocean. Subject to the foregoing, and to the norms and principles of international law, the right to free and unimpeded use of the zone by the vessels of all nations should not be affected.

In 1972 the twenty-seventh UN General Assembly called upon the littoral and hinterland states of the Indian Ocean, the permanent members of the Security Council and other major maritime users of the Indian Ocean to support the concept that the Indian Ocean should be a zone of peace. Compared with 1971, the number of states voting in favour of the resolution on the Indian Ocean in 1972 increased from 61 to 95, and included almost all the littoral states, some of which had previously abstained. The vote must be understood as an endorsement of a general concept rather than of any specific undertakings. It was decided to establish an *ad hoc* committee to study the implications of the proposal with special reference to the practical measures that may be taken in furtherance of the objectives of the resolution. The committee consists of Australia, China, India, Indonesia, Iran, Iraq, Japan, Madagascar, Malaysia, Mauritius, Pakistan, Sri Lanka, Tanzania, Yemen and Zambia.

The *Ad Hoc* Committee held 11 meetings in 1973. The report produced by the committee provided information about the questions discussed but contained no recommendations as to what measures should be taken to halt the great powers' accelerating military build-up in the Indian Ocean, and to eliminate from it all bases, military installations, logistical supply facilities, nuclear weapons and weapons of mass destruction and any manifestation of great power military presence in this ocean conceived in the context of great power rivalry—an objective stated in the UN declaration of 1971.

The twenty-eighth UN General Assembly did not debate the issue in much detail. Its action was restricted to the adoption of a resolution by which the *Ad Hoc* Committee was requested to carry out its mandate and the Secretary-General was asked to prepare a "factual statement of the great powers' military presence in all its aspects, in the Indian Ocean, with specific reference to their naval deployments, conceived in the context of great power rivalry". The purpose of the "statement" was to provide the *Ad Hoc* Committee with authoritative information which would help it to assess the implications of foreign military presence in the area.

The discussions on the Indian Ocean Peace Zone that took place in the twenty-ninth UN General Assembly are outlined in chapter 14.

The *Ad Hoc* Committee's report has listed the following 36 states as littoral and hinterland states of the Indian Ocean:

Afghanistan	India	Malaysia	Somalia
Australia	Indonesia	Maldives	Sri Lanka
Bahrain	Iran	Mauritius	Sudan
Bhutan	Iraq	Nepal	Swaziland
Botswana	Kenya	Oman	Thailand
Burma	Kuwait	Pakistan	Uganda
Democratic Yemen	Lesotho	Qatar	Tanzania
Egypt	Madagascar	Saudi Arabia	Yemen
Ethiopia	Malawi	Singapore	Zambia

The list is meant to include coastal states directly bordering on the Indian Ocean or any of its natural extensions, as well as hinterland states whose main access to the sea is the Indian Ocean. This criterion, which seems to have the merit of comprehensiveness, has not been consistently applied; states that have part of their seaboard in the Indian Ocean but whose concerns or interests are—in the opinion of the drafters of the list—related primarily to the Atlantic seaboard, are not treated as littoral states. Thus a number of land-locked states would qualify as Indian Ocean nations, while South Africa, with most of its approximately 2000-mile sea frontage on the Indian Ocean, would not. The list is, therefore, not only incomplete, but it contains incongruities.

II. *Great power military and naval presence in the Indian Ocean*

Military and naval presence in an area is manifested in a number of ways. First there are the visible elements such as the deployment of warships and the maintenance of military installations and naval bases which can be clearly observed and recorded. Then there are a number of less tangible elements such as alliances, various treaty arrangements and areas of influence, which may be politically significant, but are less easily observed. Only the first category will be discussed here.[2]

One visible element of a military and naval presence is the deployment of naval ships, both surface and submarine. The political and psychological impact on the littoral states of the presence of naval vessels of external powers in the Indian Ocean varies according to the nature of the vessels. So far as surface ships are concerned, the presence of naval task forces including aircraft carriers is more intimidating and consequently creates more tension than the presence of those without aircraft carriers. Similarly, a cruiser equipped with surface-to-surface missiles has more potential for intimidation than a less modern vessel. The presence of individual warships is less intimidating than is the presence of naval task forces. The presence of a foreign submarine can add to the uncertainties of the littoral states but the use of a submarine as an instrument of coercion is normally more restricted than that of surface combat vessels.

Another visible element is the maintenance of naval and military establishments in the area. The bases over which external powers have full sovereignty cause greater concern to the littoral states than do bases on their own territories. Recent praxis when base rights are granted to an external power by a littoral state has been that the use of the base is normally subject to some degree of control by the host country. Thus, in a time of conflict, the use of such a base by the external power for its own purposes would probably be restrained by the host country according to the latter's perceptions of how this use would affect its national interests. But bases over which external powers have full sovereignty are not subject to such restraints.

A third element of a military and naval presence is the military use of communications facilities, the use of military staging facilities, and the

[2] Some of the information in this section also appears in references [2–3].

military use of airfields. Others are the naval use of mooring buoys in the ocean, and the use of harbours and ports of littoral states, the use of naval fuelling facilities, the general use of bases and other military facilities, and so on.

Because of the distances involved, it is usually necessary for external powers to make periodic arrangements to obtain bunkering and limited support facilities for their ships from friendly powers in the area. The facilities offered by littoral states to external powers may be granted on a discriminatory or a non-discriminatory basis. If a littoral state extends such facilities preferentially to one great power to the exclusion of the others, then that would tend to encourage the military or naval presence of the favoured power.

III. *Great power naval deployments in the Indian Ocean*

The great power military and naval presence in the Indian Ocean area can be categorized into two types—one primarily related to strategic nuclear forces and the other to conventional forces.

US and Soviet strategic naval deployments

There is no direct evidence of the actual deployment of sea-based strategic nuclear forces, that is, ballistic missile-firing nuclear-powered submarines in the Indian Ocean. But the communications facilities at Asmara in Ethiopia, at the North West Cape Station in Australia, and at Diego Garcia in the Chagos Archipelago, certainly fulfil the function of making possible periodic patrols of US Polaris (A-3) and Poseidon strategic submarines into the ocean. Geographically the northern part of the Indian Ocean area (particularly the Arabian Sea) could be used by the United States to deploy strategic missile submarines offensively against the Soviet Union but a similar offensive use of the Indian Ocean by the Soviet Union against the United States is not possible at present—the range of Soviet strategic submarine missiles currently developed and deployed is insufficient to allow that possibility.

There have been no reports of a US submarine tender in the Indian Ocean and, therefore, US strategic submarines would need to operate from a fixed base. For strategic submarines operating from the US base at Guam in the Pacific, at least 20 days of every 60-day[3] patrol would be spent in transits to

[3] A US strategic submarine has two crews (Blue and Gold). According to reference [4], approximate crew cycles are:

	Blue	*Gold*
60 days	patrol	refresher training
30 days	leave	submarine upkeep
60 days	refresher training	patrol
30 days	submarine upkeep	leave
60 days	patrol	refresher training

and from the deployment area in the Arabian Sea (assuming an average cruising speed of 20 knots). The operating economics would, therefore, be poor.[4] But future alternative bases and patrolling patterns are possible. It is not known if the United States permanently stations strategic missile submarines in the Indian Ocean (the US government maintains that it does not), but parts of the ocean may well have been used as patrol areas. The range of existing Poseidon submarine missiles is about 2800 nautical miles, which makes the Arabian Sea the next best deployment area to the eastern Mediterranean Sea in its range of available targets in the Soviet Union. The US Navy now intends to deploy ballistic missile submarines in the Indian Ocean more frequently in the future as vessels equipped with somewhat longer-range missiles than those carried by earlier versions enter service.

The current stage of strategic missile technology excludes the possibility of the Soviet Union deploying its ballistic missile-firing submarines in the Indian Ocean with missiles targeted on the United States. There have been no reports of sightings of Soviet ballistic missile submarines in the Indian Ocean. But, according to some sources, the Soviet Union has deployed nuclear-powered hunter-killer submarines in the ocean. Both powers could use the Indian Ocean as a deployment area for strategic submarines with missiles targeted on China.

US conventional naval deployments

Since 1950 the US Navy has stationed its Mid-East Force (MIDEASTFOR), under the command of a US Admiral, at Bahrain in the Persian Gulf. This force consists of two destroyers or destroyer escorts and one amphibious ship, the La Salle, converted to the flagship of the US Middle East Force.

The flagship is stationed in Bahrain and the destroyers or destroyer escorts are on rotational assignments from other naval units of the Atlantic fleet. During rotational periods, therefore, four destroyers are present for about seven days. This occurs two or three times per year. MIDEASTFOR has been permanently deployed since 1948 and has taken part regularly in naval exercises undertaken with other allied navies in the western Indian Ocean. In addition, US naval warships have been conducting antisubmarine warfare (ASW) and other fleet exercises in the eastern Indian Ocean [5]. A typical example is the ASW exercise conducted in April 1971 when one aircraft carrier, the Ticonderoga, four destroyers and a submarine, all from the US Seventh (Pacific) Fleet, participated in a five-day exercise in the Indian Ocean. Another example of US naval use of

[4] D. Verrall suggests that a US strategic submarine based at Guam may be able to remain on station in the Indian Ocean for 28 days via the Malacca Straits and only seven days via the south-about route around Australia. "This is not to say that (US strategic submarines) have never been in the Indian Ocean, but it strongly suggests that such deployments are rare" [4].

the Indian Ocean occurred in the summer of 1971, when the nuclear frigate, the Truxton, made a high-speed run through the ocean. Again the September 1971, the nuclear-powered aircraft carrier, the Enterprise, accompanied by the nuclear frigate, the Bainbridge, conducted a four-day exercise in the Indian Ocean.

In December 1971, at the time of the Indo-Pakistani War, the aircraft carrier, the Enterprise, headed a task force (Task Force 74) including an amphibious assault ship, the Tripoli, with a battalion of marines, three guided-missile escorts, four destroyers, a nuclear attack submarine, and an oiler, which entered the Bay of Bengal and was deployed in the Indian Ocean until January 1972 [5].

On 1 January 1972 the operational area of the US Seventh (Pacific) Fleet was extended into the Indian Ocean [6]. In March 1973, the US aircraft carrier, the America, was sent into the ocean, and between October and December 1973, an "Essex"-class aircraft carrier, the Hancock, accompanied by five or six destroyers and an oiler [7], were deployed in the area. On 1 December 1973 the US Navy deployed another aircraft carrier, the Oriskany, with four destroyers and an oiler in the Indian Ocean. The Oriskany left the ocean on 15 January 1974. The US nuclear-powered frigate, the Bainbridge, was in the Indian Ocean between 26 December 1973 and early March 1974. In February 1974 the larger and more modern attack aircraft carrier, the Kitty Hawk, was sent along with four destroyers and one oiler.

Commenting on these latter manoeuvres at a press conference on 22 April 1974, US Secretary of Defense Schlesinger said:

> The Kitty Hawk is just moving out of the Indian Ocean, and it will not immediately be replaced. So for a period of time at least, there will be no American naval forces in the Indian Ocean (other than the Middle East Task Force), but we reiterate that the present plans call for occasional movement of such forces into the Indian Ocean on an intermittent basis.

The Kitty Hawk in fact left the area on 21 April 1974 with its accompanying destroyer.

On 1 July 1974, the US guided-missile cruiser, the Chicago, two destroyers and an oiler entered the Indian Ocean [8], but left the area on 30 August. On 10 November 1974, a US task force entered the Indian Ocean headed by the aircraft carrier, the Constellation, accompanied by three destroyers and a support ship [9]. During November, the Constellation participated in the largest naval exercise ever held in the Indian Ocean [10], which included ships from Iran, Pakistan, Turkey, the UK and the USA. The US force, headed by the Constellation, included the La Salle, two guided-missile destroyers, two destroyer escorts, a nuclear-powered submarine and a fast support ship. The naval exercise, called Midlink-74, was a

CENTO (Central Treaty Organization) enterprise and was held in the Arabian Sea.

At present, the Indian Ocean naval missions are carried out by the US Seventh Fleet with its headquarters in Subic Bay in the Philippines.

Soviet conventional naval deployments

The Soviet naval presence in the Indian Ocean first appeared in 1967 in the form of warships and support vessels apparently mainly in support of Soviet space operations. (The Western part of the Indian Ocean to the north of Madagascar lies under the polar satellite orbit which passes over the Soviet Union's main space control and test centre, and specialized ships are often deployed in the area by the Soviet Union in connection with space shots, mainly because of the absence of Soviet ground tracking stations in the area.)

The current Soviet naval deployment has been continuous since March 1968, when a squadron of three warships visited the ocean, with the exception of a short break in May 1969. After March 1968, the Soviet deployment built up over a two-to-three-year period to a steady-state deployment so that the normal Soviet Indian Ocean squadron consisted, on average, of about three to five surface warships, plus probably two or three submarines. Thus, since 1970 a typical deployment of surface naval ships would be either: (*a*) one or two destroyers (possibly with surface-to-air missiles), two fleet minesweepers, two oilers, two to four supply ships, and two hydrographic (or oceanographic) ships; or (*b*) one cruiser ("Sverdlov"-, "Kresta"- or "Kynda"-class), one or two destroyers, two oilers, two to four supply ships, and two hydrographic (or oceanographic) ships. The submarines are normally "F"-class diesel-powered attack submarines or sometimes "E-II"-class nuclear-powered cruise-missile-firing submarines [11]. Table 5.1 shows the number and types of Soviet naval vessels deployed at spot dates between 1972 and 1974.

The Soviet Union also operates up to 40 fishing trawlers in the ocean, some of which are presumably fitted with electronic surveillance equipment. But it must also be assumed that other external powers operate surveillance ships in the area.

Ships are relieved at about six-monthly intervals,[5] so normally the force

[5] Commenting on Soviet naval deployments in the Indian Ocean, D. Verrall stated that "Since the beginning of 1970 certainly through 1971 the Soviets have maintained a steady state pattern of operations involving a Kotlin destroyer and since October 1970 a T-58 minesweeper backed by an Alligator tank landing ship which, in the absence of other support vessels, is apparently used in this role. On at least two occasions the T-58 has entered and left the Ocean with an F-class submarine suggesting that in some instances it plays the role of a submarine support vessel.

Whereas these vessels spend long periods in the Indian Ocean, between five and six months, on average the more sophisticated vessels visit less frequently and for shorter periods. The

Table 5.1. Soviet naval vessels deployed in the Indian Ocean, at spot dates

Date of deployment	Soviet vessels
1 July 1972	2 Kashin destroyers (4 SAM launchers) 2 minesweepers, T-58 or T-43 2 hydrographic research ships 2 fleet tugs 1 water carrier
1 July 1973	1 Kashin destroyer (4 SAM launchers) 2 minesweepers, T-58 or T-43 1 "F"-class submarine 2 hydrographic research ships 2 fleet tugs 2 fleet oilers 1 light cargo ship 1 water carrier
17 September 1973	1 "F"-class submarine 1 destroyer (with SAM armament) 2 escorts 2 minesweepers T-58 or T-43 1 tank landing ship, Alligator 2 auxiliary vessels
March 1974	1 cruiser 3 Kashin destroyers 2 minesweepers (excluding those in Bangladesh) 5 submarines support ships
2 August 1974	6 surface combat ships 1 submarine 9 minesweepers (including 3 in Bangladesh) 11 support ships

Source: See references [46–49].

is greater only for a brief period between the arrival of new ships and the departure of the old ships.[6] The normal deployment in the winter months (November to April) is higher (in that it includes a cruiser), than that of the rest of the year and the ships tend to be concentrated in the western part of the ocean, in the Aden-Somalia area. When the Soviet force level is at its normal low point in mid-year, there is often no missile-equipped ship in the ocean. This deployment pattern has been broken twice.

When the Bangladesh War started in 1971 there were four Soviet warships in the Indian Ocean, the largest being a relatively old destroyer. None of these ships had any surface-to-surface cruise-missile capability [16]. This force was strengthened by 16 warships so that for a brief period in early

lengthy deployments of the Kotlins and associated vessels suggests that this is an enforced requirement given the shortage of Soviet surface units in relation to the requirement for distant operations.

The relative absence of more modern units, except in times of regional tension when Soviet vessels enter the Ocean in some strength along with the US Navy, suggests that the level of maintenance and support facilities in the area both ashore and afloat is not adequate to cope with the sophisticated electronics aboard the post-1960 generation of vessels" [12].

[6] The deployment of Soviet ships in the Indian Ocean from March 1968 to January 1972 is documented in references [13–16]. Information on deployments since then is less reliable.

Table 5.2. Major Soviet combatants deployed in the Indian Ocean during the Indo-Pakistani War

Date of deployment	Soviet vessels	Arrival in Indian Ocean
1 December 1971 (prior to war)	1 Kotlin destroyer	29 June 1971
	1 T-58 minesweeper	30 June 1971
	1 "F"-class submarine	Late November 1971
	1 Alligator tank landing ship	Mid-November 1971
5 December 1971	1 Kotlin destroyer	. .
	1 T-58 minesweeper	. .
18 December 1971	1 Kynda missile cruiser (8 SSM launchers, 2 SAM launchers)	. .
	1 Kashin destroyer (4 SAM launchers)	. .
	1 "J"-class submarine (4 SSM launchers)	. .
Late December–early January 1972	1 Kresta 1 missile cruiser (4 SSM launchers, 4 SAM launchers)	. .
	1 Kashin SAM destroyer	. .
	1 "F"-class submarine	. .
	1 SSM submarine (if a "J"-class, 4 SSM launchers; if "E-1"-class, 6 SSM launchers; if "E-II"-class, 8 SSM launchers)	. .

Source: See reference [16], quoted in reference [4].

1972, there were 20 combatants (13 surface vessels and seven submarines). Four of the extra Soviet ships, some with surface-to-surface missile capability, were sent into the ocean after the US Navy had dispatched a task force there, headed by the aircraft carrier, the Enterprise. As soon as the US ships had left the Indian Ocean the extra Soviet warships also left [16]. The Indo-Pakistani War led, therefore, to record force levels for both the United States and the Soviet Union—14 warships and auxiliaries for the United States and 26 for the Soviet Union (see table 5.2).

The second occasion when an exceptional number of Soviet ships were sent into the ocean was in October 1973 during the Middle East crisis. The Soviet Navy then dispatched additional warships to make up its squadron in the Indian Ocean from the usual number of less than six[7] warships to a maximum of ten surface combatants and four submarines [11]. The extra ships included:

1 cruiser with surface-to-surface missiles (SSMs) and surface-to-air missiles (SAMs)
1 destroyer with SSMs and SAMs
2 destroyers
3 submarines (1 nuclear)
2 supply ships
1 oiler

[7] Including one "F"-class submarine, one destroyer ("Kashin"-class), two fleet minesweepers and eight auxiliaries (two of them hydrographic research vessels).

Table 5.3. Number of Soviet naval vessels which visited the Indian Ocean, August 1973 – November 1974

	1973				
Ship type	Aug	Sep	Oct	Nov	Dec
Cruisers	–	–	–	1	1
Destroyers	3	3	3	4	4
Submarines					
Diesel-powered	1	1	1	1	3
Nuclear-powered	–	–	–	–	1
Minesweepers	2	2	2	2	2
Landing ships	1	1	1	1	1
Auxiliaries	6	5	6	6	8
Miscellaneous vessels employed for mine-sweeping operations	7	8	8	8	8

Source: See reference [51].

In July 1974, the Soviet Union sent into the Indian Ocean the helicopter carrier, the Leningrad (of the Soviet Mediterranean squadron), accompanied by a trawler, a supply ship and a carrier [17].

Thus, although nominally the number of Soviet naval ships in the Indian Ocean has recently (late 1974) been close to 30, at most eight or nine have been genuine warships. Of the total number, nine or ten are minesweepers and salvage ships engaged in clearing Chittagong harbour in Bangladesh of mines and wrecks left by the 1971 war. About half the rest are support ships and auxiliaries (oilers, repair ships, distiller ships, tenders, and so on) upon which the Soviet warships in the Indian Ocean rely for fuel, provisions and repairs because of a lack of reliable and secure shore-based support facilities.

On 12 November 1974, Australian Minister of Defence Barnard, gave the following information on the Soviet naval presence in the Indian Ocean between August 1973 and November 1974, in a written answer to a question in the House of Representatives.

The number of Soviet naval vessels which visited the Indian Ocean was:

4 cruisers (including 1 helicopter cruiser)
8 destroyers
4 diesel-powered submarines
3 nuclear-powered submarines
4 minesweepers
2 landing ships
29 auxiliaries
20 miscellaneous vessels employed in minesweeping operations in Bangladesh and the Red Sea

1974										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	To 18 Nov
1	1	1	1	1	1	2	2	2	2	–
4	4	3	3	5	3	4	4	4	4	3
3	3	2	2	3	1	1	1	1	1	1
1	1	–	–	–	–	–	–	–	–	–
2	2	2	2	4	9	2	2	2	2	2
1	1	1	1	1	–	–	–	1	1	1
7	4	5	6	5	8	8	9	10	10	7
8	8	6	6	6	5	10	12	10	10	10

Table 5.3 shows this presence on a monthly basis. According to Barnard, the total number of ship-days spent by Soviet naval vessels in the Indian Ocean throughout the period was:

Surface combatants	3 067
Submarines	836
Landing ships	388
Auxiliaries	2 896
Minesweeping group, Bangladesh and Red Sea	3 588
Total	10 775

Table 5.4 gives the number of ship-days on a monthly basis.

Naval visits

Large numbers of naval visits are made each year to the ports in the Indian Ocean by the navies of the two great powers. For example, during 1969 and 1970 a total of 287 port visits were made in the Indian Ocean region by US Navy ships alone, and, in 1971, a typical year, the US Navy made 177 port calls to 20 states in the Indian Ocean region, excluding Bahrain and Thailand [18–19]. In 1971, Soviet naval combatants and auxiliaries made 33 port calls to seven states in the region. A total of 162 Soviet ship visits were paid to Indian Ocean ports during the period 1968–71. Of these, 96 were to ports in the Horn of Africa/Aden area, compared with 57 to the South Asian subcontinent and the Persian Gulf. This pattern has essentially remained the same since 1971, with fewer visits to the South Asian

Table 5.4. Number of Soviet ship-days in the Indian Ocean, August 1973 – November 1974

	1973						
Ship type	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Surface combatants	155	150	155	188	217	217	190
Submarines	31	30	31	30	124	124	91
Landing ships	31	30	31	30	31	31	28
Auxiliaries	113	129	159	182	230	168	149
Minesweeping group	248	240	248	240	232	248	224
Bangladesh and Red Sea							
Total	**578**	**579**	**624**	**670**	**834**	**788**	**682**

Source: See reference [51].

subcontinent and more visits to Iraq, but with a continuing high level of visits to Somali ports, particularly Berbera.[8]

Ship-days in the Indian Ocean

A comparison of the naval presence of the external powers in the Indian Ocean is sometimes made by calculating the number of ship-days spent there by the naval vessels of each power. Such comparisons must, however, be treated with considerable caution since they frequently ignore the actual nature of the ships present and their combat capabilities (for example, one aircraft carrier ship-day cannot meaningfully be equated with that of one frigate).

If only surface combat ships are considered, then the number of ship-days accumulated by the Soviet Navy in 1973, for example, was about 2 500 (approximately double the figure for 1971 and nearly five times the figure for 1968). If all types of Soviet ships are added, including submarines, amphibious ships, support ships, intelligence ships, and so on, the total number of ship-days becomes about 9 000 for 1973, which is about double the totals for 1970 and 1971. Thus, the great majority of ship-days were accumulated by non-combatant Soviet ships. Up to 1971, the number of ship-days accumulated annually by US naval surface combat ships was about

[8] According to D. Verrall, "The deployments into the Indian Ocean area were, initially, concentrated in the north west or Arabian Sea area and a review of the post-1971 reports suggests that this is still substantially correct. An examination of port visits suggests that initial deployments were concerned to examine a wide range of facilities throughout the area.

The subsequent concentration on Somalia (Berbera, Mogadishu), Sudan (Port Sudan) and South Yemen (Aden Hodeida) in the period September 1969 to December 1971, 21 visits as opposed to 4 visits from March 1968 to October 1969, suggests that the available facilities and the political climate in these countries were judged sufficiently reliable to contemplate the establishment of a *point d'appui* for sustained forward deployment in the area" [12].

1974								
Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	To 18 Nov
180	161	250	210	360	155	188	201	90
76	60	68	30	31	31	30	31	18
31	30	25	–	–	11	30	31	18
140	136	152	221	236	185	250	346	100
236	180	154	108	–	310	399	341	180
663	**567**	**649**	**569**	**627**	**692**	**897**	**950**	**406**

800, but in 1973 the number increased to about 1 500 ship-days [17]. Information on the ship-days accumulated by non-combatant US ships is not readily available.

On 12 March 1974, the Chairman of the US Joint Chiefs of Staff gave to the Senate Armed Services Committee figures for the ship-days accumulated by the US and Soviet navies in the Indian Ocean. Considering only combatant ships and excluding auxiliary and support ships and mine-clearing operations in Bangladesh, the number of ship-days accumulated by the US and Soviet navies respectively is shown in table 5.5.

IV. *US and Soviet base facilities*

US base facilities related to strategic nuclear war

The US communication station at the North West Cape was commissioned in April 1967 in pursuance of an agreement signed between the United States and Australia in 1963. One of the most powerful very-low-frequency communication stations in the world, this facility is designed to communicate with submerged missile-firing nuclear submarines [20]. The facility is part of the US communications system which includes stations at Hono-

Table 5.5. Number of ship-days accumulated by the US and Soviet Navies, 1960–73

	1960–67	1968	1969	1970	1971	1972	1973
Soviet Navy	Nil	529	1 138	1 670	1 480	2 387	2 487
US Navy	[800][a]	[800]	[800]	872	858	990	1 410

[a] Approximate number per year.

lulu, Guam, the Philippines, Diego Garcia and Asmara. On 9 January 1974 the United States agreed to share control of the North West Cape station with the Australian Navy. In a joint statement issued by the Australian Deputy Prime Minister and Minister of Defence and the US Secretary of Defense on 10 January 1974, regarding the US naval communications station at the North West Cape: "... the Ministers noted that one important function of the station was to serve as a key element in a complex system of communications supporting the global balance. They noted the importance of effective and reliable deterrence for the promotion of stable relations among the major powers."

A large US military communications base (the Kagnew Station) close to Asmara in Ethiopia, has been in use since 1942, when it was operated jointly with the British. The base, now a relay and satellite tracking station, is a primary unit in the US global military communications network. It is also used to obtain intelligence information by monitoring communications [21]. The size of the base is indicated by the presence there of about 1 700 US servicemen in 1971.

The Diego Garcia naval communications facility serves partly as a link in this chain of facilities to provide a command and control network for nuclear submarines. The British island of Diego Garcia,[9] an uninhabited coral atoll 13 miles long and up to four miles wide situated almost at the centre of the Indian Ocean, has now assumed a major role in the support of US forces in the Indian Ocean area. Agreements between the United States and Britain, signed in 1966 [22] and 1970 [23], permitted the United States to build a $19 million naval communications station on the island for joint use. Construction began in March 1971 and the station went into operation in the spring of 1973. Diego Garcia was then added to the US communications network in the Indian Ocean, extending from Asmaj in Ethiopia to the North West Cape of Australia. A new agreement, announced in the British House of Commons on 5 February 1974, provides for the establishment of US support installations on the island for warships and aircraft. The US government requested a supplemental appropriation of $29 million for improving the facilities on the island, with an immediate down-payment of $15 million.

Diego Garcia has a good harbour and a site for a major airfield. In fiscal year 1973, the US Navy received $6 million for dredging the harbour to create a turning basin that will be 2 000 by 6 000 feet and able to accommo-

[9] The island of Diego Garcia in the Chagos Archipelago, was originally administered as part of Mauritius. When Mauritius was granted independence, Diego Garcia and two other atolls in the Archipelago were bought by the British government from Mauritius for £3 million. They are part of the British Indian Ocean Territory (BIOT), which includes the islands of Aldabra, Farquhar, Desroches (detached from the Seychelles group) and the Chagos Archipelago. The 1966 Anglo-American agreement made the islands comprising the BIOT available to both countries for military purposes for a period of 50 years (see appendix 5A).

date submarines and aircraft carriers.[10] The United States has constructed an 8 000-foot long coral runway on the island and US C-130 and C-141 transport aircraft have been using the airstrip. At present there is a contingent of 200–300 US serviceman at the base. The Pentagon plans to increase this contingent to between 500 and 600 men; to lengthen the airfield runway from 8 000 to 12 000 feet; to build more fuel storage tanks; to expand the airfield parking area; to improve existing quarters (to accommodate 609 persons) and to deepen the lagoon so that it will be able to handle a dozen ships rather than the current two or three. The British Navy will have equal access to the facilities of the base for its own ships and aircraft.

A runway of 12 000 feet can be used by almost any aircraft in the world, including the KC-135 refuelling aircraft for B-52s—even if fully loaded. The other changes will allow the US Navy to bring its power to bear in the Indian Ocean more quickly and effectively than it has been able to do so far. The improvement of the facilities on Diego Garcia[11] will mean that a major US naval squadron will be able to operate more or less continuously in the Indian Ocean. The base will be comparable in function with that at Subic Bay in the Philippines. Fuel, spare parts and other supplies will be readily moveable from the base to ships in the area. Moreover, long-range patrol aircraft, for example the P-3 Orion ASW aircraft, will be able to operate at Diego Garcia for months at a time to search for submarines or surface warships almost anywhere in the central region of the Indian Ocean.

On 1 May 1974 the Minister for Foreign and Commonwealth Affairs stated in the British House of Commons:

> The United States proposal to expand its facilities at Diego Garcia is still being considered. The question is relevant to the general background of the review of defence commitments and capabilities which has already been announced. This review will take full account of the needs for security and stability in the area. The views of Commonwealth and other interested countries will also be carefully considered.

On 3 December 1974 the British Secretary of State for Defence, Mr Mason, stated that the British government had decided to agree to the United States' proposals for an expansion of the facilities at Diego Garcia. Prior to this, at a meeting in New Delhi on 17 November 1974, 30 Indian Ocean states issued a unanimous policy statement opposing the construction of further facilities at Diego Garcia.

The United States shares with Australia a joint defence research facility at Pine Gap, Alice Springs, Australia, which provides control signals and readouts from US early-warning satellites stationed over the Indian Ocean,

[10] A total of well over $40 million has probably been spent so far on the facilities at Diego Garcia.

[11] It should be noted that the servicing of nuclear submarines does not require complex land-based port facilities but only the presence of a tender and preferably access to an airfield to allow a new crew to replace the old one.

to monitor Soviet land-based missile sites and to detect a surprise land-based missile attack.

A US satellite control facility at Nurrungar near Woomera, Australia, receives photographs transmitted from reconnaissance satellites shortly after they pass over the People's Republic of China.

Soviet base facilities related to strategic nuclear war

Until recently, the Soviet Union had no communications facilities in the Indian Ocean of a type similar to those of the United States. However, if US reports (see page 77) of a Soviet communications station near Berbera in Somalia are true, this may indicate a capability to communicate with submerged hunter-killer submarines, both nuclear and conventional, which could operate in the Indian Ocean, or with strategic submarines.

US conventional bases and facilities

According to statements made in hearings before a Subcommittee of the Committee on Foreign Affairs of the US House of Representatives on 12 March 1974, the United States, on 23 December 1971, signed an agreement with Bahrain to use the former British naval base there as a base for its Middle East Force following the evacuation of the British forces from the Persian Gulf. Prior to this, the United States had shared British facilities available at Bahrain. The US contingent at the base which is also used as a communications centre was increased in 1972 from about 200 to 260. In October 1973 Bahrain proposed to the United States the termination of the base rights in one year. Although this request seems to have been shelved, the future status of the base is unclear.

Other conventional bases include Mahé in the Seychelles,[12] where the United States has tracking facilities, and Diego Garcia where, if present proposals for expanding the facilities there are carried out, there will be the logistic support necessary to make it into a conventional naval base.

The United States has also accepted an Australian offer for the use of naval facilities now being constructed at Garden Island in Cockburn Sound, which are expected to be completed in 1978.

Plans have been announced to install an Omega global long-range navigation facility near Deniliquin in south-east Australia (and one on Reunion island). Each of the stations in the planned Omega network[13] will be oper-

[12] Information given by Prime Minister James Mancham of the Seychelles on his visit to the United Nations in May 1974.

[13] Eight Omega ground stations will eventually be provided worldwide to give reasonably even coverage. Five of these stations will be in operation at the end of 1974, two more in 1975 and one in 1976. North Atlantic coverage is provided by three Omega stations in North Dakota, Trinidad and Norway. The Trinidad (experimental) station will be replaced by one in Liberia. The other stations will be located in Japan, Australia, Hawaii, Argentina and Reunion Island.

ated and controlled by an international Omega Policy Board, with representatives from each country that operates a station. The Omega network signals can be used for navigation by civilian and military ships of all nations. The signals are also used by submarines (but probably not Polaris/Poseidon which require a more precise service) to calibrate their navigational equipment.

Soviet conventional bases and facilities

Commenting on the existence of Soviet bases in the Indian Ocean on 20 March 1974, the US Chief of Naval Operations stated to the Committee on Foreign Affairs of the House of Representatives:

> They [the USSR] have built a communications station near the Somali port of Berbera to provide support for their fleet. At the same time they have increased their use of, and are expanding naval facilities at Berbera which currently include a restricted area under Soviet control, a combined barracks and repair ship and housing for Soviet military dependents. In addition, they are engaged in building a new military airfield near Mogadiscio, which could be used for a variety of missions.

The government of Somalia stated, however, on 22 May 1974 that "there are no foreign military bases on the territory of the Somali Democratic Republic and that the statements alleging the establishment of a foreign communications centre or naval and air bases are totally unfounded" [24].

The following facilities were also reported as available to the Soviet Union in the Indian Ocean area by the US Chief of Naval Operations in his statement of 20 March 1974: (*a*) fleet anchorages in several locations near the island of Socotra, and near the Chagos Archipelago; (*b*) permanent mooring buoys at several sites in the ocean;[14] (*c*) access by Soviet naval vessels to the naval port of Umm Qasr in Iraq, "where facilities are being built with the assistance of Soviet technicians"; and, (*d*) the "use of port facilities at the former British base at Aden, and air facilities at the former Royal Air Force field nearby. They [the Soviet Union] maintain personnel ashore in both locations". However, Democratic Yemen has denied offering military facilities to the Soviet Union [26].

On 28 August 1974, President Ford stated at a press conference that the Soviet Union had "three major naval operating bases in the Indian Ocean". These were in Berbera in Somalia, Umm Qasr in Iraq and at Aden. The Soviet Union denied this statement, describing it as "regrettably inaccurate". Iraq also denied the claim, stating that "Iraq, which is a non-aligned country rejects military bases and alliances".

The only other official information from Soviet sources on the Soviet presence in the Indian Ocean is in a letter dated 18 June 1974 from the

[14] These are probably located off the Seychelles, Mauritius and Madagascar, the Chagos Archipelago and off the East African coast [25].

Permanent Representative of the USSR to the United Nations addressed to the Secretary-General. It stated:

The Soviet Union has never had, has not established and is not now establishing any military or naval bases in the Indian Ocean region. Soviet ships and vessels have never posed a threat to anyone in that region. In accordance with the existing rules of international law and with universally recognized international practice, they are engaged in training cruises and in the search for and recovery of Soviet space craft that splash down in the Indian Ocean. It must also be borne in mind that transit routes from the European part of the USSR to the Soviet Far East pass through the Indian Ocean and that accordingly, in order to ensure the safe passage of ships and vessels, the Soviet Union is conducting scientific investigations in the region [27].

The letter added that "normal duty calls by naval ships at various ports for the purpose of replenishing their supplies" should not be "tendentiously depicted . . . as the establishment of Soviet bases in the Indian Ocean region".

The controversy is related to the difficulty of defining "a base". The functions of the naval and military establishments operated by external powers in the Indian Ocean area and the facilities provided for them by other powers vary considerably. Some establishments are merely meteorological stations, others are garrisons for considerable numbers of military and naval personnel. Which of these establishments are regarded as actual military or naval bases is a matter of definition. Similarly, naval facilities can range from simple fuelling facilities to full naval base facilities —meaning sufficient facilities for repairs and maintenance and the provision of sufficient fuel, stores, ammunition, weapons, and so on, to provide complete support to a fleet based there permanently. It is, therefore, possible to deny the existence of a base simply by suitably choosing an appropriate definition.

A more detailed discussion of the reasons for the present unease about the Soviet naval presence in the Indian Ocean is given in chapter 10.

V. *Naval deployments and military presence of other external powers*

British and French naval deployments

The British Navy has a force of six frigates or destroyers stationed east of Suez, including Hong Kong, as part of its contribution to the ANZUK force, visiting the Persian Gulf area and providing a presence in the Indian Ocean [28]. Other vessels also visit the area occasionally.

The British contribution to ANZUK, stationed in the Malaysia area, includes a battalion group with an air platoon and an artillery battery,

Table 5.6. Number of combatant naval vessels deployed in the Indian Ocean and Far East area, 1968–73[a]

	1968	1969	1970	1971	1972	1973
British combatant vessels[a]	43	33	19	18	12	10
French combatant vessels	3	4	5	6	8	7

[a] Also includes those deployed in the Far East area.

Source: See reference [30].

long-range maritime reconnaissance aircraft, a number of helicopters and visits by combat units of all three services [29]. This contribution will probably be modified in the British defence review now taking place.

The deployment of British combatant naval vessels, excluding auxiliary and service ships, in the Indian Ocean and Far East areas (area breakdown not available) for the years 1968 to 1973, is shown in table 5.6. This table also shows the French naval deployment figures for the same period, in the Indian Ocean area only.

Following the agreement of 4 June 1973 whereby France agreed to withdraw its forces from Madagascar, the French Navy created a new naval command for the Indian Ocean operating from a fleet tanker converted into a command ship, La Charente [31]. This ship has a flight deck for helicopters and short take-off and landing aircraft, sophisticated armaments and a high-powered communications system [32]. In addition to La Charente, the French Navy has three frigates as part of the naval command, and three coastal patrol vessels and some assault landing craft are based at Djibouti in the territory of the Afars and the Issas which, together with a squadron of long-range ASW aircraft, patrol the adjoining areas of the Indian Ocean; a coastal patrol vessel and a number of assault landing craft are also based at Diego Suarez. The naval units, landing craft and aircraft of the naval command are linked by a radio relay station on Reunion [33–35].

In October 1974, France strengthened its naval presence in the Indian Ocean with an aircraft carrier, the Clemenceau, a frigate, the Tourville, a destroyer escort, the Bouvet, and two fleet tankers. At the same time, two frigates were withdrawn from the area [36].

British and French naval and military facilities

The United Kingdom has retained a number of staging posts in the Indian Ocean, in addition to Diego Garcia, for the maintenance of communications between Britain and the Far East.

In an agreement signed on 26 July 1965, the government of the Maldives agreed to provide certain defence facilities to the United Kingdom up to 15

December 1986. Under this agreement the United Kingdom would have an airfield on Gan Island and a radio communications station on Hithadoo Island, as well as "unrestricted access by sea and air to the Agreed Areas" and adjacent territorial waters. The military facilities on the Maldives also include a lagoon in the Addu Atoll with a natural harbour and the right to maintain armed forces within the Agreed Areas [37]. Another agreement signed with the Sultanate of Muscat and Oman on 25 July 1958 extended the United Kingdom's existing arrangements to the use by the Royal Air Force of the airfields at Satalah and the island of Masirah [38]. A six-year mutual defence pact signed in March 1968 [39] and terminable on one year's notice by either party after that time, between the United Kingdom and Mauritius provided for the continuation of existing British facilities on the island, including the use of the airfields for military aircraft, ports and harbours and the naval communications facility [40]. On 3 December 1974 the British Secretary of State for Defence, Mr Mason, stated in his parliamentary statement on the British defence review that British forces would be withdrawn from Mauritius and Gan. He added, however, "We do not think it would be right in present circumstances to make any changes in the arrangements we have with the Sultan of Oman".

The United Kingdom has established a military communications system, called Skynet, between the United Kingdom and the Far East. Skynet, which operates in conjunction with the US satellite network, consists of nine Earth stations and two relay space craft. The Royal Air Force is in operational control of the project from its master control centre in England. In addition to the control base, there are eight Earth stations—four fixed stations at Singapore, Gan, Bahrain and Cyprus, two on board British naval ships and two smaller air-transportable stations operated by the British Navy and the headquarters station in southern England. The relay space craft, placed in stationary orbit 23 000 miles above the equator over the Indian Ocean, provides long-distance defence communications [40–42]. Now that the UK is planning further withdrawals from the Indian Ocean, the future of Skynet is unclear.

France has base and other military facilities at Djibouti in the territory of the Afars and the Issas (still a French possession). The strength of the French garrison in 1973 was two battalions. There are, in addition, elements of the Navy and Air Forces [43]. The French plan to install Crotale surface-to-air missiles at Djibouti. The French base in the territory of the Afars and the Issas is of immense strategic importance, especially when the Suez Canal is open. From the area, situated in north-east Africa at the head of the Gulf of Aden, the entrance to the Red Sea, and opposite the southwestern tip of the Arabian Peninsula, across the Bab-el-Mandeb Strait, it is easy to monitor the movement of ships between the Red Sea and the Indian Ocean.

Under a 1960 defence agreement, France had the right to maintain base and other military facilities in Madagascar. A French-Malagasy agreement of 4 June 1973 provided for the withdrawal of French ground and air forces from Madagascar by 1 September 1973. As regards Diego Suarez, the agreement stipulated that the base would pass under the control of Madagascar on 1 September 1973, but French military and civilian personnel would remain for a period of two years during which time Malagasy units would be trained to run the installations. It was also specified that France was to have landing and harbouring rights for refuelling and repairing aircraft and ships, renewable every year by tacit agreement.

The following sections of the French armed forces were evacuated on 1 September 1973 [44]: (*a*) the General Staffs and the military and ancillary services formerly based at Tananarive; (*b*) the third regiment of infantry parachutists at Diego Suarez; (*c*) the second regiment of marine infantry parachutists; and (*d*) air base 181 at Ivato (near Tananarive). The base at Diego Suarez, which is now under Malagasy sovereignty, will be transformed into a naval dockyard.

Following the agreement to withdraw its forces from the Malagasy Republic, the French government decided to establish the island of Reunion as the headquarters of French forces in the southern Indian Ocean, and also to reduce these forces from 4 000 to 3 000 men [45].

France also has meteorological stations at Isle Amsterdam, Crozet and Kerguelen.

VI. *The future security of Indian Ocean bases*

The future security of the bases of the external powers is likely to vary considerably. In some cases, the external power involved is now either under notice to leave (for example, France from Madagascar) or it appears to be running its base down (for example, the United States in Asmara in Ethiopia). The maintenance of some bases depends on agreements which are for a fixed, short term and others are in countries which will soon become independent (for example, the United Kingdom in the Seychelles). However, for those bases which are on virtually unpopulated territory owned by the external power, such as Diego Garcia, or on territory leased on a very long-term basis, the future seems more secure. These latter bases, and others that are the result of long and apparently stable agreements, or those in countries aligned to the external power, such as the US bases in Australia, are likely to remain relatively invulnerable for the foreseeable future. That is, unless bases are dismantled as part of an agreement to make the Indian Ocean a zone of peace.

In this context, the conversion of Diego Garcia into a fully fledged US naval and air base would considerably complicate the delicate situation in the Indian Ocean. If the proposal is carried through, then one great power will have established a major strategic naval base from which it could deploy its strategic nuclear submarines in the Indian Ocean conveniently and economically. The other great power will then almost certainly search for a similar base in the area, and a new strategic arms race will have begun.

Such a development would be unfortunate for the present efforts in making the Indian Ocean a zone of peace. Regional arms control and disarmament measures such as this should not be allowed to divert attention from the urgent problems of more general disarmament, but in the absence of progress in the latter, such measures deserve encouragement.

Appendix 5A

The British Indian Ocean territory

The British Indian Ocean territory consists of the Chagos Archipelago and the islands of Desroches, Farquhar and Aldabra. The administrative headquarters of the territory is at Victoria on the island of Mahé in the Seychelles (which is not itself part of the territory). The territory is administered by a commissioner and an administrator, who are respectively the Governor and Deputy Governor of the Seychelles.

Geography

The Chagos Archipelago is composed of six main groups of islands situated on a large shoal area, the Great Chagos Bank, the whole covering some 21 000 square miles of ocean. The islands consist of small sand cays forming large, roughly circular atolls. The Archipelago is approximately 1 100 miles east of Mahé. Desroches is a small sand cay approximately three miles long, situated on the southern edge of an almost circular atoll 12 miles in diameter; the island is approximately 120 miles south-west of Mahé. Farquhar is an atoll ten miles by five miles in extent, and lies approximately 130 miles south-west of Mahé. The total land area of Farquhar is 2 1/2 square miles. Aldabra is the largest atoll in the territory, being 19 miles in length and up to seven miles in width, with a land area of about 60 square miles. Aldabra is approximately 460 miles south-west of Mahé.

Constitution

The British Indian Ocean territory was established as a separate colony by an Order in Council in 1965 by detaching the Chagos Archipelago from Mauritius and the islands of Aldabra, Farquhar and Desroches from the Seychelles. This was done with the full agreement of the governments of Mauritius and Seychelles to whom compensation was paid (£3 million to Mauritius and an international airport which has been built in the Seychelles).

All the islands in the territory are owned by the Crown and there is no permanent population in the territory. The inhabitants are mainly Mauritian and Seychellois contract labourers engaged on those copra plantations on the islands which are still in production. Their numbers are decreasing as the demand for labour falls. The average annual production of copra at present is approximately 1 000 tons which is marketed in Victoria, Mahé for subsequent export.

Communications

There are no civil air communications in the territory. The islands are served by an administration-owned 500-ton cargo/passenger boat which visits the islands approximately every three months. Small schooners from the Seychelles pay occasional visits.

Defence aspects

Under the Exchange of Notes of December 1966 published in April 1967 (Command 3231), the territory was made available for the defence purposes of the US and British governments for an initial period of 50 years.

Diego Garcia

On 15 December 1970 the US and British governments announced that they had agreed to the construction of a US limited naval communications centre on the island of Diego Garcia. This facility was originally intended to close a gap in the US naval and worldwide communications system and to provide no more than communication links to ships and aircraft transiting the Indian Ocean.

Aldabra

The flora and fauna of Aldabra is of great interest to biologists, ecologists and other scientists in that the island has hardly been disturbed by man. Thus the land area and its inshore waters yield illuminating evidence on the primeval balance of nature. With the exception of the Galapagos Islands it is the only remaining place where the giant tortoise is found in its natural state. The bird life is very rich and includes large colonies of frigate birds, flamingos and a species of flightless rail. It is also one of the breeding grounds of the sacred ibis. In July 1968 the Royal Society of the United Kingdom was granted permission to establish a research station on Aldabra and the island has since been classed as a nature reserve by the administration of the territory.

Appendix 5B

I. *Major bases of external great powers in the Indian Ocean*

Base	Purpose	External power concerned	Remarks
US naval communications station "Harold E. Holt", North West Cape, Western Australia	Defence communications station in US global communications system	USA	The station is under the joint operational control of the US Navy and Australia. The station cannot be used for other than defence communication without the agreement of the Australian government
Asmara, Ethiopia	Military communications base, relay and satellite tracking station in US global communications network	USA	This base is now being run down
Diego Garcia, BIOT	Naval communications centre (part of global system) air field, naval facilities	USA/UK	Joint base. Plans are to expand the facilities into a permanent naval and air base
Berbera, Somalia		USSR	Function unknown – presently denied by the USSR and Somalia
Joint defence space communications station, Woomera, South Australia	A ground terminal for defence space communications involving satellites	USA	The facility operated jointly with Australia
Joint defence space research facility, Alice Springs, Northern Territory	To carry out a variety of defence space research functions	USA	Jointly controlled by Australia and the USA
Bahrain	Naval base for the Mid-East Task Force, communications station	USA	

II. *Other defence-related establishments operated by external powers in the Indian Ocean region.*

Base	Purpose	External power concerned	Remarks
US National Aeronautics and Space Administration Tracking Stations: Deep Space Station 41 Island Lagoon (Woomera), S.A.; Deep Space Station 42, Tidbinbilla, A.C.T. Carnarvon Tracking and Data Acquisition Station, Carnarvon, W.A.; Honeysuckle Creek, A.C.T.; Space Tracking and Data Acquisition Network Station, Orroral Valley, A.C.T.; Applications Technology Satellite Station, Cooby Creek, Qld; Baker-Nunn Camera SC_{23}, Island Lagoon (Woomera), S.A.	Provide support for NASA's programme of space exploration	USA	Australia is responsible for the operation and management of the stations
Tranet Tracking Station, Smithfield, South Australia	Support for the US geodetic satellite observation programme on behalf of US Navy Pacific Missile Range	USA	Australia is responsible for the operation and management of the station
USAF Radio Receiving Station, Norfolk Island	Temporary station assisting the USAF in a research programme involving the study of ionospheric propagation in relation to long-range radio paths	USA	This station is at present operated by a contractor to the US government. Australia has the entitlement to participate in the work of the station
Gan Island, Maldives	Communications, airfield, RAF staging post, naval fuel supplies	UK	Earth station for Skynet. British forces to be withdrawn
Masirah Island	Communications, RAF staging post	UK	
Mahé, Seychelles	Airfield, harbour facilities	UK	Potential staging or transit port
Mauritius	Harbour facilities	UK	British forces to be withdrawn
Djibouti, Territory of the Afars and the Issas	Airfield, harbour, radio station, military base, naval forces, air forces	France	Of great strategic importance if Suez Canal open

Base	Purpose	External power concerned	Remarks
Zanzibar, Tanzania	Telemetry for missile terminal ballistics	China	Existence speculative
US Research Station, RAAF Base, Amberley, Queensland	Joint research programme for the study of physical effects of disturbances in the atmosphere or space, with particular emphasis on radio communications	USA	This station is managed and operated by the USAF. Australia has the entitlement to participate in the work of the station
USAF Geological and Geophysical Research Station, Alice Springs, Northern Territory	Long-term geological and geophysical studies, including studies of earthquakes and attendant phenomena	USA	This station is managed and operated at present by the USAF. Australia has the entitlement to participate in the work or the station
US Geodetic Satellite Observation Programme. Optical Tracking Stations (BC4 Cameras) at Culgoora, N.S.W., Perth, Cocos Island, Mawson and Casey. A Doppler Tracking System is in use at Smithfield, S.A., SECOR stations, at Darwin, N.T. and Manus Island. A BC4 camera is planned for Thursday Island and a Doppler Tracking System is planned for Heard Island	Temporary stations operated as part of the US geodetic satellite observation programme	USA	Operated by the US Army
Trials Wing, Weapons Research Establishment, Salisbury, South Australia and Missile Range and Support facilities, Woomera, South Australia	Plan and direct firings and launchings at Woomera of missiles and vehicles under development as part of the UK/Australia Joint Project or as mutually agreed for third parties, other countries or international organizations	UK	The programme is mutually agreed by Australia and the UK. Australia has sole control over the operation and management of the Trial Wing within the jointly approved programme
Joint Tropical Research Unit, Innisfail, Queensland	Exposure and storage of materials and selected military and other stores under tropical conditions, assessment of deterioration and research into causes and prevention	UK	The programme of the Unit is a joint responsibility with the British government. The Unit is under the operational direction of Australia
Isle Amsterdam	Meteorological station	France	

(Cont.)

Base	Purpose	External power concerned	Remarks
Crozet	Meteorological station	France	
Kerguelen	Meteorological station	France	
La Réunion	Relay radio station	France	HQ of French forces in the Indian Ocean

Source: Information on Australian bases is given in reference [50].

Appendix 5C

List of planned construction at Diego Garcia

Description	Scope	*US $ thousand*
FY 1974 supplemental request		
POL storage facilities	(Deleted)	6 834
Pier	750 foot of berthing	5 100
Parking apron	64 750 square yards	2 279
Runway extension	4 000 feet	2 264
Aircraft arresting gear	–	215
Hangar	–	440
Operations building addition	2 850 square feet	232
Overhaul paving train	–	250
Transit storage building	4 000 square feet	140
Subsistence building addition	3 517 square feet	393
Bachelor enlisted quarters	277 men	3 882
Bachelor officer quarters	32 men	1 360
Armed forces radio/TV station	–	96
Ready issue ammo magazine	–	220
Cold storage addition	4 190 square feet	466
General warehouse addition	26 385 square feet	1 251
Receiver building addition	1 250 square feet	131
Vehicle repair hardstand	1 110 square feet	40
Power plant expansion	2 400 KW	2 265
Utilities	–	1 065
NMCB amp	–	77
Total		**29 000**
FY 1975 request		
Parking apron	25 000 square yards	1 000
POL storage	(Deleted)	1 800
Ammunition storage	6 000 square yards	500
Total		**3 300**

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Part II. Developments in world armaments

Chapter 6. World military expenditure

Introduction / Distribution / Conclusions / Reduction of military budgets / World military expenditure, 1974

Chapter 7. The production and trade of major weapon systems in industrialized countries, 1974

Registers of indigenous and licensed production of major weapons in industrialized countries, 1974 / Register of arms trade to industrialized countries, 1974

Chapter 8. Major weapon procurement in third world countries, 1974

Introduction / The trade pattern / Domestic arms production / The fourth world: arms for oil / Registers of indigenous and licensed production in third world countries, 1974 / Register of arms trade to third world countries, 1974

Chapter 9. Sources and methods for world armaments data

Purpose of the data / Sources / Definitions and restrictions / Military expenditure tables / Registers of indigenously designed weapons in development or production / Arms trade registers

Chapter 10. World stock of fighting vessels, 1950–74

Introduction / The stature of naval forces since World War II / Trends in the estimated value of world naval stock / Aggregate naval strength / Conclusions / Sources and methods

6. World military expenditure, 1974

Square-bracketed references, thus [1], *refer to the list of references on page 102.*

Unless otherwise stated, military expenditure figures, trends and changes are in real terms—that is, price corrections have been made to remove the price increases due to inflation.

The chapter highlights the main developments during 1974. For a discussion of the definition and composition of military expenditure, the reader is referred to reference [1].

I. *Introduction*

Worldwide military expenditure has stabilized following the swift rise after 1965 during the Viet-Nam War as shown in chart 6.1. The latest peak was reached in 1969, and since then military expenditure has been on a plateau.[1]

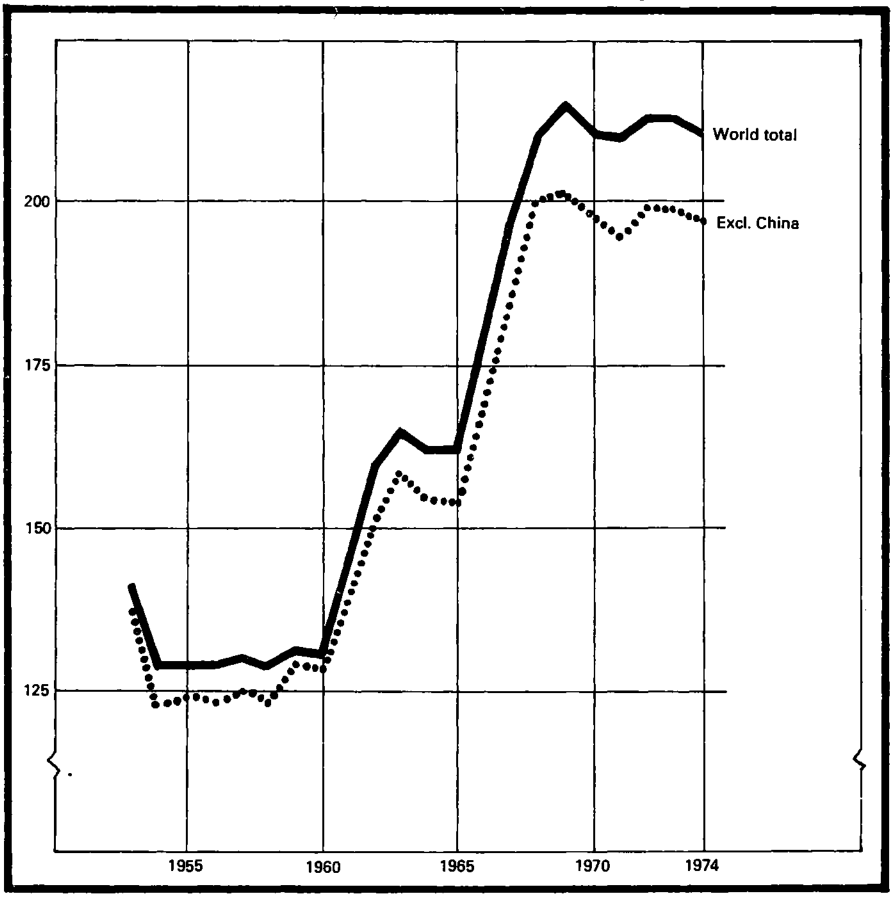
There have been two previous plateaux since World War II. The first was reached after the Korean War, and lasted from 1954 to 1958—the second from 1963 to 1965. Both followed periods of growth both in tension and military manpower. The first was a period in which the strengths of the armed forces of the USA and the USSR were falling and where the United States was no longer involved in the greatly augmented costs of operating forces during an open conflict. In the period between the two plateaux there was a rise in tension and concomitant increases in overall force levels. This was also the period of the initial significant deployment of intercontinental ballistic missiles. The second plateau was similarly marked by a decline in the combined figures for the armed forces of the two major powers.

The present plateau is similar to its predecessors in two ways. It follows a build-up in tension and in the aggregate strength of the forces of the two major powers, as well as the greatly increased US operational costs during the growth of its involvement in the Viet-Nam War. It is also a period where the combined military strength of the two powers has been falling. It is unique in one way—it has now lasted for seven years.

[1] In this context, a plateau is defined as a period where (*a*) the expenditure figures for the first and last year do not differ by more than 2 per cent, and (*b*) where in none of the intervening years does the expenditure vary by more than 2 per cent from the midpoint (mean) between the expenditure in the first and last year. Since even in countries where the accounting systems are highly developed, expenditure figures in any particular year are likely to have a margin of error of 1–2 per cent, variations of up to 2 per cent may be disregarded.

Chart 6.1. World military expenditure, 1953–74

US$ bn, at constant (1970) prices and exchange rates



Source: Appendix 6B.

II. *Distribution*

The way the pattern of distribution of military expenditure throughout the world is changing can be seen in table 6.1. Their share of virtually 90 per cent of the world total gave NATO and the Warsaw Treaty Organization almost total domination of the scene in 1960. In 1974, this share fell below 80 per cent for the first time. Four major industrialized spenders within these alliances—the United States, the Soviet Union, the United Kingdom and France—have seen their portion decline in the same period from approximately 80 per cent in 1960 to some 67 per cent in 1974. The reduction of the share of both groups has been due to the decline in the US percentage. In comparison with its position in 1953, when it was responsible for more than half of world military expenditure, the United States is now responsible for less than one-third.

The concomitants of the fall in the portion of the traditionally dominant spenders over the last 15 years are, first, the third world in general, with its share more than doubling, second, the Middle East in particular with a more than fivefold rise—and third, China, where the percentage has doubled.[2] A further illustration of the change in the pattern of distribution and of increasing militarization throughout the world is that in 1954, eight countries spent more than $1 billion for military purposes and all except China belonged to the two major alliances, six being members of NATO. In 1964, there were 13, of which nine were members of NATO and the WTO. By 1974 the number of countries spending over $1 billion (at constant prices) was 20, a bare majority of 11 belonging to the two major alliances, and no less than four from the Middle East.

NATO and the WTO

These two alliances still dominate the world military scene. Of the most sophisticated indigenously designed weapon systems under development or in large-scale production in 1974 throughout the world, 29 of a total of 38 supersonic fighter/trainers, 13 of 15 ship-to-ship missiles, seven of eight nuclear-powered, eight of 12 conventionally powered submarines, and ten of 13 main battle tank programmes were under way in member countries.

NATO military expenditure again showed a small fall of about 1.5 per cent in 1974 to an estimated total of $96.5 billion. This was due to the drop in US spending which more than offset the small rise shown by the other member countries.

At the beginning of the year when the US budget for fiscal year 1975 was presented to Congress it was expected that, in real terms, expenditure would remain about the same in calendar year 1974 as in calendar year 1973. Successful Congressional pressure to reduce military expenditure resulted in reductions being accepted by the administration of some 6 per cent in operation and maintenance and 13 per cent in procurement of arms and equipment, with substantial additional cuts in research and development (R&D) funding and military aid to Viet-Nam. These reductions, together

[2] By the beginning of 1975, China had published no budgetary data since 1960. Military expenditure figures for China given throughout part II of the Yearbook are derived from recent estimates published by the US Arms Control and Disarmament Agency (ACDA) [1a]. ACDA itself notes that "for the People's Republic of China, very rough estimates are derived from fragmentary information" [1b]. Because of this, chart 6.1 also shows world military expenditure excluding China. The general trend of the two curves is similar. The only significant difference is that if one excludes China, it can be seen that world military expenditure after 1969 has been lower than it was in 1968.

Table 6.1. The distribution of world military expenditure, 1960–74

	1960	1961	1962	1963	1964	1965	1966
NATO	62.3	58.8	58.3	55.9	55.5	55.2	57.1
USA	45.5	43.2	42.7	40.4	39.5	39.3	42.6
WTO	27.3	30.7	30.9	32.5	31.5	30.5	29.0
USSR	25.0	28.4	28.3	29.8	28.8	27.7	26.3
Other Europe	1.8	1.7	1.7	1.7	1.8	1.8	1.7
Sweden	0.6	0.6	0.6	0.6	0.6	0.7	0.6
Other developed	1.1	1.0	1.0	1.0	1.2	1.3	1.3
Japan	0.6	0.6	0.6	0.6	0.7	0.7	0.7
China	3.1	3.3	3.6	3.8	4.6	4.9	5.0
Third world	4.6	4.4	4.6	5.0	5.4	6.3	5.9
Middle East	0.8	0.8	0.8	0.8	1.0	1.1	1.2
World total[a]	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a] Totals may not equal 100 because of rounding.

Source: SIPRI worksheets.

with a higher-than-anticipated rate of inflation, have resulted in an estimated fall in US expenditure in 1974 of 3.3 per cent.

Towards the end of 1974 it was becoming apparent that US pressure on its NATO partners to increase their share of the costs of the alliance, was slackening. There are two principal reasons for this.

An amendment to the US fiscal year 1974 procurement bill requires that the net foreign-exchange cost to the USA of US troops stationed in European NATO countries be reduced to zero, either by European members raising the value of their "offset" purchases from the United States, or by withdrawing troops from Europe. US administration figures showed that in fiscal year 1974 roughly equal purchases by FR Germany and by other NATO members slightly more than offset these foreign-exchange costs. Another reason was the announcement at the NATO ministerial meeting in December that the members of the Eurogroup[3] had increased their expenditure in 1974 by about 4 per cent in real terms.[4] This slackening of pressure was apparently confirmed by the announcement at the end of the year of the US intention to transfer another army brigade to Europe in the spring of 1975.

This increase in expenditure on the part of the Eurogroup members of NATO is, at first sight, somewhat paradoxical in view of the fact that a number of these governments have likewise been under pressure to reduce their military expenditure. However, the combined effect of past Eurogroup programmes, and the adoption of that of 1975, together with increased Turkish outlays due to the Cyprus conflict have all resulted in an actual rise, despite pressures to the contrary.

[3] Belgium, Denmark, FR Germany, Greece, Italy, Luxembourg, the Netherlands, Norway, Turkey and the United Kingdom.

[4] The forecast inflation rates proved to be somewhat low, since based on year-end figures the estimated rise in Eurogroup expenditure was 2.7 per cent.

Per cent

1967	1968	1969	1970	1971	1972	1973	1974
58.3	*55.6*	*52.7*	*49.9*	*47.8*	*47.8*	*46.4*	*45.8*
44.6	*43.1*	*40.4*	*37.2*	*34.4*	*33.9*	*32.4*	*31.5*
28.5	*31.1*	*32.4*	*33.7*	*34.0*	*33.6*	*33.8*	*33.9*
25.8	*28.0*	*29.1*	*30.1*	*30.2*	*29.7*	*29.8*	*29.4*
1.5	*1.5*	*1.5*	*1.6*	*1.6*	*1.7*	*1.7*	*1.7*
0.6	*0.5*	*0.5*	*0.6*	*0.6*	*0.6*	*0.6*	*0.5*
1.3	*1.3*	*1.3*	*1.4*	*1.5*	*1.6*	*1.6*	*1.5*
0.6	*0.6*	*0.7*	*0.8*	*0.8*	*0.9*	*1.0*	*0.9*
4.4	*4.3*	*5.2*	*5.7*	*6.4*	*6.3*	*6.2*	*6.2*
6.0	*6.3*	*6.8*	*7.7*	*8.7*	*9.0*	*10.3*	*10.8*
1.4	*1.6*	*1.8*	*2.2*	*2.6*	*2.7*	*4.1*	*4.9*
100.0	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Nevertheless one general effect of these pressures has been the growing move towards standardization of equipment. One example of this during 1974 has been the lengthy consideration by Belgium, Denmark, the Netherlands and Norway of a joint purchase of aircraft to replace their F-104 Starfighters. The other NATO joint programme on this scale is the multi-role combat aircraft (MRCA) joint production programme linking FR Germany, Italy and the United Kingdom. During 1974 there were strong pressures from US and French manufacturers to abandon this programme on cost grounds and buy US or French alternatives, but despite these, the FR German government's proposal to build prototype aircraft was offically approved in October. The only change made by the British government's plan to reduce the proportion of GNP devoted to military expenditure by 2 per cent over the next ten years, was to suggest a possible extension of the delivery period. Despite the British military expenditure plans, outlays are estimated to have risen by some 2 per cent during the year.

France procured almost all of its arms and equipment from national sources. Such self-sufficiency normally tends to make procurement more expensive. During 1974 it confirmed authorization of a new nuclear-powered PH-75 helicopter carrier. It also has its own national strategic weapon programme, for which a sixth ballistic missile submarine was authorized during 1974. The cost of the programmes authorized as part of the current five-year plan have exceeded the original estimates by a considerable margin. This has necessitated certain reductions, most notably the indefinite suspension of work on the planned third squadron of intermediate range ballistic missiles.

Combined with a higher-than-expected rate of inflation, however, the net effect has been, in contrast to the UK, an estimated reduction of expenditure during 1974 of about 3.7 per cent.

In the Warsaw Treaty Organization the overall pattern was similar to that in NATO—a small decline in total expenditure of all members, with the fall in the budgeted figure for military expenditure by the major partner—the USSR—more than offsetting the rises elsewhere. These rises ranged as high as 15 per cent in the case of Poland and 14 per cent for Bulgaria. There is a lack of consistent and comparable price indices for member countries. It must therefore be stressed that the expenditure series shown in table 6B.5 of appendix 6B is in current prices. Such information about rates of inflation as is available covers all member countries only until 1972. If these rates had been applied, the largest variation would have been an increase of 1.7 per cent in the figure for 1961.[5, 6]

Nevertheless, despite their relative decline within their respective alliances, the United States and the Soviet Union remain by far the dominant military spenders, with roughly equal shares.

III. *Conclusion*

In 1974 world expenditure on military purposes exceeded $200 billion. Since the same was also true of the preceding six years this statement has by now lost much of its novelty. A fact of great concern is that while most people are impressed by the enormity of this figure, few seem to be alarmed by it. The phrase "$200 billion annually" is not by itself very meaningful, and some comparisons often help to convey a better idea of its size. Thus, for example, world military expenditure is greater than either world expenditure on education or health; it is some 15 times larger than official aid provided to the underdeveloped countries; and it is equivalent to the combined gross national product of all the countries in Africa, the Middle East, and South Asia.

Comparisons such as these vividly illustrate the distorted priorities which have prevailed over the post-war period. The official view in many countries, instead of being one of concern, takes comfort in the mere fact that the ratio of military expenditure to GDP is generally falling, certainly in most of the industrialized countries.

Such complacency is certainly unwarranted, however. Generally speak-

[5] Since these variations are less than the 2 per cent mentioned in footnote 1 on p. 95, they have been disregarded.

[6] Since 1970, price indices available for 1974 for Hungary and Poland would give the following alternative series for these two countries:

	US $ million at 1970 prices and exchange rates			
	1971	1972	1973	1974
Hungary	559	518	522	(548)
Poland	2 370	2 485	2 455	(2 629)

The percentage increase for Poland between 1973 and 1974 would in this case be estimated to be 7 per cent.

Table 6.2. Recent changes in the military expenditures of the major spenders[a]

	Military expenditure in 1973, *US $ million, current prices and current exchange rates*	Percentage change		
		1969–74	1972–73	1973–74
NATO:				
USA	78 473	*−20.5*	*−4.8*	*−3.2*
FR Germany	12 027	*26.6*	*3.9*	*5.2*
France	9 056	*−3.1*	*1.9*	*−3.5*
UK	8 597	*14.0*	*−1.5*	*2.0*
Italy	4 107	*23.5*	*−0.2*	*−6.0*
Canada	2 408	*12.7*	*−0.1*	*6.6*
Netherlands	1 967	*22.2*	*1.8*	*7.7*
Belgium	1 259	*23.4*	*3.6*	*4.5*
WTO:				
USSR	63 000	*−0.5*	*0.0*	*−1.7*
Poland	2 463	*34.9*	*−0.7*	*15.3*
German DR	2 457	*41.3*	*9.6*	*6.8*
Czechoslovakia	1 976	*21.2*	*−1.8*	*3.0*
Other developed:				
China	[15 000]	[*18.0*]	[*−2.2*]	[*0.0*]
Japan	3 366	*31.6*	*3.0*	*−7.1*
Sweden	1 696	*−1.5*	*−3.0*	*−3.1*
Australia	1 538	*−9.9*	*−2.2*	*−4.6*
Spain	1 131	*1.2*	*6.5*	*−17.0*
Third world:				
Israel	3 050	*111.0*	*75.6*	*−16.6*
Egypt	2 818	*163.3*	*63.9*	*−5.4*
Iran	2 410	*320.3*	*37.1*	*74.7*
India	2 402	*8.5*	*−5.4*	*−14.6*
Saudi Arabia	1 385	*306.3*	*41.7*	*59.3*
Brazil	1 144	*−5.3*	*8.1*	*−20.1*
World total	**244 603**	*−1.5*	*−0.3*	*−0.7*

[a] Major spenders are defined as countries with military expenditure of $1 billion or more (in current prices and exchange rates) in 1973. The percentage changes were calculated from the constant (1970) price and 1970 exchange-rate figures.

Source: Appendix 6B and SIPRI worksheets.

ing this favourable trend in the allocation of resources is the result of relative increases in gross domestic product and non-military government expenditure; it is not the result of any reduction in military expenditure. The central fact, quite apart from wastage and misallocation of resources, is that the world continues to devote more than $200 billion each year to the maintenance, improvement and expansion of the means of war.

Over the 29 years since the end of World War II some $4 250 billion has gone into the preparation for, and at times the prosecution of, war. This outlay has, for example, financed a nuclear weapon stockpile which, by 1974, had an explosive power of tens of billions of tons of TNT. It has also financed the development and production of several generations of combat aircraft, missiles, tanks, warships and a vast array of lesser weapons with each generation being more lethal than its predecessor. And at the present time a world total of some 400 000 scientists and engineers, supported by $20–25 billion annually, are engaged in military research and development, thus perpetuating this process.

In other words, a reallocation of resources without any substantial reduction in the absolute level of global military expenditure is nowhere near enough. The current level of expenditure provides for the capacity to destroy civilization as we know it and no relative increases in gross domestic product, non-military government expenditure or development aid will alter this fact.

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   (a) —, p. 27.
   (b) —, p. 11.

Appendix 6A

Reduction of military budgets

Square-bracketed references, thus [1], *refer to the list of references on page 118.*

I. *Introduction*

At its twenty-ninth session, the UN General Assembly (in its First Committee) received a report from the Secretary-General under the rather ponderous title "Reduction of the military budgets of states permanent members of the Security Council by 10 per cent and utilisation of part of the funds thus saved to provide assistance to developing countries." This appendix analyses and comments on this report, shortly to be published by the UN. Section II discusses the origin, evolution and presentation of the report. Section III briefly takes up some points of interest from the first part of the report, which discusses military expenditure and development assistance in general, and from the last part which deals with the question of how any forthcoming funds should be distributed. Section IV looks at that part of the report which breaks new ground—the discussion of the "technical problems" of the budget or expenditure approach to disarmament.

II. *Origin, evolution and presentation of the report*

The origin of the setting up of this particular group of experts was described in the *SIPRI Yearbook 1974* (pp. 394 ff.). In recent years the Soviet Union has made a number of proposals in the General Assembly about an internationally agreed reduction of military budgets. In resolution 3093A, it specifically linked this reduction with an increase in development assistance; it proposed that the permanent members of the Security Council—and other powers with major military and economic potential—should reduce their budgets by 10 per cent, and devote 10 per cent of the resources saved to assistance to underdeveloped countries. This proposal was coolly received by all the other permanent members of the Security Council—indeed China dismissed it as a fraud; it was, not unnaturally, welcomed by a majority of the underdeveloped countries. In order to salvage something from an otherwise rather sterile altercation between the great powers, the Mexican delegate added a second resolution (3093B [XXVII]). In this resolution, the General Assembly,

> conscious that the United Nations has been unable to study this important question with the depth and care required requested the Secretary-General to prepare, with the assistance of qualified consultant experts appointed by him, a report on the reduction of the military budgets of the permanent members of the Security Council, which should cover also other states with a major economic and military potential, and on the utilization of a part of the funds thus saved to provide international assistance to developing countries . . .

The group of experts was set up after some delay. Some Western countries were uncertain about whether there was any point in nominating an expert to the group. The United States was in favour; the United Kingdom did not appoint an expert until the study was well under way, and he was in fact prevented by illness from taking any significant part in the proceedings. There was no one from France, the Netherlands or Japan. The Secretary-General invites countries to nominate experts to groups of this kind; some of those nominated in this way have an academic familiarity with the subject, and others are diplomats. The Soviet and US experts normally have official advisers to assist them, and other experts are also often in close touch with their countries' delegations in Geneva or New York. These expert working groups on disarmament questions have a tradition—a short one, but an important one—of unanimity. They are important, therefore, for establishing a kind of "lowest common denominator" of what can be said. Readers must not expect to find in these reports any facts or figures which would reflect badly on any of the major powers. For example, an obvious central fact in the discussion of the reduction of military budgets is that the United States publishes a great deal of material about its military expenditure, the Soviet Union hardly any and China none at all. Nothing so blatant as this will be said in reports of this kind. To take another example, in discussing alternative estimates of world military expenditure, a report such as this will not mention that the main reason for the differences lies in varying estimates of Soviet military expenditure. The significance of these reports, therefore, is not in their bold and forthright treatment of any subject; it lies in the fact that people brought together from East European, West European and third world countries—many of whom have had official briefing from their governments—are able to agree on the propositions which the report presents.

This particular group of experts had a rather difficult remit. The resolution with which they were concerned was clearly closely connected with the Soviet proposal, and it was in no way initially clear to what extent they were limited to considering the Soviet proposal, or to what extent they should give it priority. No guidance came from the Secretariat on this sensitive question. In the event they decided that the Soviet proposal was one important proposal among others but the discussion of the relationship between the two resolutions 3093A and B delayed them for a long time.

Secondly, there were sharply conflicting interests among the main parties concerned, such that a unanimous report initially seemed most unlikely. The Soviet interest was obviously to elicit an endorsement of its proposal as one that was practicable, and one which should be implemented without delay. The US interest was exactly the opposite: to show, by an exhaustive examination of the various problems of definition and verification, that any such move would need considerably more verifiable information. The interest of the underdeveloped countries was to see more resources devoted to development assistance with as little delay as possible. Initially, therefore, it seemed that here was a central issue on which a compromise was very difficult; how could the report say *both* that the Soviet proposal was feasible, *and* also that it would require a large apparatus of information and verification?

On this issue, the group stepped round the trap which had been set for them in a rather cunning way. Having at long last agreed that they were not restricted to consideration of the specific Soviet proposal, they agreed on the preparation of a long and technical section on the various requirements of information and verification for different approaches to agreements on budget reductions. This is a general treatment of the question. Nowhere is it explicitly stated that any of these requirements must apply to the Soviet proposal, nor is it explicitly stated that they do not. The wording of the Soviet proposal is carefully noncommittal: "The measure was *envisaged by the sponsor* as five concurrent unilateral reductions; in this way *it was hoped* to avoid the complex problems which would arise with a formal agreement." (SIPRI italics.) However, notwithstanding the delicate way in which the group side-stepped this particular issue, it would have to be a fairly obtuse reader who failed to draw the conclusion that even the most informal of agreements would need some more information than exists at the moment.

Since the group started work rather late in the year, they were hard-pressed to complete the work in time for the twenty-ninth session. Delegates to the General Assembly had little time to read it before it came up on the agenda of the First Committee. The Secretary-General presented the report with a preface, which is of some interest to connoisseurs of these matters. Technically, the report is the Secretary-General's report and in the past he has normally tended to endorse the conclusions of the experts as a matter of routine. However, the convention that it is the Secretary-General's report is potentially a matter for embarrassment, since he really has no way of influencing what the experts say, and can hardly put in comments of his own in the preface. This time his introductory remarks were rather more cautious, saying in effect, "You asked me to set up an expert group, which I did, and here is their report. You cannot reasonably expect me to endorse every word that they say. So it is up to you to judge the report."

The comments in the debate in the First Committee followed fairly predictable lines. The Albanian and Chinese delegates ignored the report, and simply poured scorn on the Soviet proposal as a hoax. Many of the delegates from underdeveloped countries urged the major powers to get on and do something, so that the resources devoted to assistance could be increased. Thus the Bangladesh delegate said: ". . . to be sure, there are some practical difficulties in ascertaining what constitutes military expenditure in a budget; but this difficulty certainly is not an immeasurable one and should not be used as an argument for lack of action." However, there was perhaps rather more scepticism in the speeches of delegates from underdeveloped countries than there had been in the debate in the twenty-eighth session, and there was some recognition that there would be informational requirements.

Both Eastern and Western delegates in effect claimed that the report supported their point of view. The Czech delegate gave the most sophisticated version of the Eastern position, commenting that the report gives

> a high assessment of the significance of the Soviet proposal, and implicitly calls for the implementation of 3093A . . . [it] touches also on the so-called technical problems, but those relate to treaties officially concluded among states and therefore are not connected with the reduction of military budgets under the Soviet resolution, which . . . calls for a voluntary unilateral decision to be made by every country.

The Hungarian delegate also claimed endorsement: "One does not have to agree with all its details, especially all the rather over-emphasized technical considerations, to be able to support its general message which, not surprisingly, is in line with the Soviet proposal." The Soviet delegate made the most extreme statement here: "the report . . . has once again confirmed that there is no need to conduct all kinds of studies about military budgets as such, since that leads to unnecessary difficulties in the practicable solution of the question of reducing military budgets." However, there were signs that the Soviet delegate realized that readers of the report might find it difficult to interpret it as a simple endorsement of the Soviet proposal and he added, "Moreover, as our delegation now knows, a few considerations contained in the addendum to the report do not reflect the opinions of all experts working on that report."[1]

The report was also welcomed by Western countries. Thus the British delegate said:

> I am glad to see that the report concludes that there are certain conditions for success in this enterprise. The first is that there has to be a sufficient degree of trust between nations; and the second that there has to be sufficient supply of information to maintain the participants' confidence that any agreements are being observed.

[1] In fact there are no important propositions contained in the annexes to the report which are not also included in the main body of the report.

The US delegate commented

> We are gratified that the experts' report examines the whole range of technical questions related to the feasibility of agreed reductions of military budgets . . . [it] points out that reducing military budgets without diminishing the security of States would require careful and thorough preparation. Specifically, the pre-conditions for military budget reductions would include, first, agreement on what is and what is not to be included in military budgets and, secondly, the provision by all parties concerned of detailed data on military expenditure for the purpose of comparative assessment. . . . The technical sections of the experts' report provide valuable guidelines which could be the basis of greater openness concerning defence expenditure.

The Italian delegate said, "It is to be hoped that more detailed information will be provided by all Governments, particularly by those which have suggested the specific initiative for the reduction of military budgets, in order to make it possible to complete a further technical and financial study of the whole matter."

The end result of the debate in the First Committee was resolution 3254 (XXIX) which was initially put forward by Ethiopia, Mexico, Nigeria and Sweden. It noted that governments would not have had the time to study the report carefully, and invited all states to express their views on the matters covered in the report to the Secretary-General by mid-1975. In particular, states were invited to consider what definition of military budgets would have the greatest general acceptance, and whether the UN could establish a system of standardized military budgets. They were also invited to express their views on various aspects of the basic proposal to reduce budgets, and allocate part to international assistance—and on questions such as the percentage reduction advisable, the part of the resources which should be allocated to international assistance, and the system or mechanism for best distributing those resources. The United States and the United Kingdom particularly welcomed the idea of informed discussion of military budgeting. However, the Soviet Union opposed the resolution, on the grounds that it would only lead to more studies of standardization and other such matters, whereas what was needed was action. The resolution was approved by 99 votes in favour, two—those of China and Albania—against, and 12 abstentions. In addition to the Soviet Union and the East European countries, Mongolia, Cuba, Paraguay and France abstained.

III. *The state of the arms race and aid to developing countries*

The sections on military expenditure and on aid do not have a great deal of original material, so they are dealt with briefly.

The section on world military expenditure presents SIPRI and ACDA

Table 6A.1. Estimate of the share of gross national product devoted to military expenditure and to official development assistance, by the developed countries

Per cent of GNP

	1962–64	1965–67	1968–70	1971–73
To military purposes				
ACDA estimate	*8.7*	*7.9*	*7.7*	*6.6*
SIPRI estimate	*7.8*	*7.2*	*7.2*	*5.9*
To official development assistance	*0.40*	*0.35*	*0.29*	*0.26*

Sources: Information on the share of GNP devoted to military expenditure is from references [1–2]; and to official development assistance, from UNCTAD estimates and reference [3].

estimates without comment: it would have been too sensitive a subject for this group to discuss the reasons for the divergencies—which are mainly different estimates of Soviet military expenditure. It has a short section on the multifaceted nature of the arms race in different parts of the world, stressing the technological arms race in the developed world. It presents a table comparing the resources which the developed countries devote to military expenditure, and the resources which they devote to official development assistance; the latter figure includes some rather heroic guesses at the value of official development assistance given by the socialist countries. The figures have not been presented in this form before; they establish an order of magnitude—that the bill for military expenditure is between 20 and 25 times the bill for development assistance (see table 6A. 1).

In discussing the problems of transition for resources freed from military expenditure, one point of interest is that the group said: "We also recognise that some countries may feel less confident than they did a decade ago of their ability to manage their economies precisely as they wish. Nonetheless we are still prepared generally to endorse the conclusions of the report on the economics of disarmament [4], that the problems of transition can be met."

The section which discusses the flow of aid which might result if ever this proposal for reduction in military budgets were taken seriously, suffers from the difficulty that there is really not a great deal to say. If this aid were to be forthcoming, there is no *a priori* reason why it should be treated differently from any other flow of aid. The report takes the opportunity of making a number of points about the aid flow which are in fact of general application. Reforms are suggested in the aid arrangements which, if accepted for this new flow of aid, might just as well be accepted for the old flows too.

Any aid forthcoming from this new source should be additional; the opportunity should not be taken to reduce other flows. It should be an addition in real, and not simply in monetary, terms. It should be continuous—not just a lump sum for one year. It should also be in the form of grants, rather than loans. The report presents some useful material both on the way inflation has eroded the real value of aid, and on the burden of debt. For example, if one corrects the figures for price increases, official development assistance from Western countries has risen by only 1.2 per cent a year during the past decade. Secondly, if one takes both official and private assistance together, and if one subtracts from these figures both interest and repayments of capital, in real terms there has been virtually no increase in this flow at all since 1965.

The report argues that this new flow of aid (if it were ever to eventuate) should be free of conditions unilaterally imposed by donor countries. Donor countries have the habit of using aid as an instrument of policy; the report says that this practice should cease. The new flow of aid should be untied, it should be in convertible currencies, and it should be routed through multilateral institutions. Certainly if this were done it would be very difficult for any individual donor country to use the flow of aid for its own political purposes. However, the demands are, perhaps, rather unrealistic—particularly given the nature of aid from socialist countries, which tends to be in the form of specific agreements to supply particular materials or to construct particular plants. Some qualifications have been inserted into the report to meet this point: "On some occasions economic aid is part of long-term agreements for mutual cooperation between developed and developing countries. Some developing countries consider this practice acceptable. Such agreements often prescribe the exchange of certain specified goods and services." There are also one or two phrases—but not many—which indicate that underdeveloped countries, too, have some responsibilities in the matter. Thus, "aid that comes from reductions in military budgets by donor countries should not be used by the recipient countries to increase their own military expenditure", and ". . . it will be important for recipients to work up, in so far as is possible, effective programmes for the absorption of new assistance."

In sum, the section on aid is essentially a plea for the reform of the system of aid in general, so that it is no longer used as a weapon by donor countries. There are not many points which specifically concern this possible new flow of aid, because there are not really many such specific points to make.

IV. *The technical problems of agreed budget reductions*

The main contribution of this experts' report is in the section on the technical problems of agreed budget reductions in general. Not much has been written about this. There is—as the report points out—a long history of proposals to freeze or reduce military budgets, but few people have put much thought into the problems of reaching an agreement. The idea of budget reductions as a technique of disarmament is attractive, because the alternative approach—of setting limits to the numbers of individual weapons—runs into immense difficulties, now that technological development dictates the extent of the arms race. An agreed limitation on the number of tanks, for instance, would mean first that immense sums would be devoted to "product improvement" of the tank; and second that military expenditure would be expanded in other directions. The potential advantage of agreements on military expenditure is that they are all-embracing.

Definitions

The report begins with definitions. It has no difficulty, of course, in demonstrating that "the military budget" means different things in different countries. In the United States, the development of atomic weapons is hived off to a separate agency; in some countries, military assistance to other countries is included in the military budget, and in others it is not. The conclusion of the report is that it is better to stop talking about military budgets, and talk instead about military expenditure. The report attempts a general definition of the coverage of the military sector:

> We might begin . . . by agreeing that the military sector is that group of activities whose object is the provision, assembly, maintenance, and deployment of current and future force potential intended for application mainly against external forces. This would embrace such traditional elements of military expenditure as procurement of armaments, maintenance and operation of armed forces and their installations, construction of military facilities, and the development of new weapons systems.

Various borderline problems are discussed: paramilitary forces, civil defence (it is feasible to imagine that civilians be required to construct their own bomb shelters) and the stockpiling of strategic commodities. Are all these outlays to be excluded from the definition of military expenditure? Then there is the question of how far back to go in the chain of production—whether or not to include the capital installations which produce military goods—the construction of a new plant for making antitank weapons, for example; the report notes the danger of double-counting here. This problem of definition is a minor problem; the report does not explicitly say this, and it should perhaps have done so. Any international group of national accounts statisticians—assuming that they have been instructed to arrive at an agreed definition of the military sector—could come to reasonable decisions about where to set the boundaries. It is no more difficult than reaching an agreement on an international standardized definition of fixed investment.

The report goes on to discuss subcategories for the military sector, leading on to a discussion of standardized accounting systems. The discus-

Table 6A.2. Example of a standard summary table of military expenditure accounting

Resource input		Force output	Current forces	Forces in the near future	Forces in the distant future	Total programme cost by input
			Programme groups	Programme groups	Programme groups	
			1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	
Intermediate goods and services, by producing sector		1 2 . . . . J				
Primary production factors	Employment	1 2 . . . . . . k				
	Land use	1 2 . : m				
	Direct import	1 2 . : . n				
Total resource cost by programme						Total military expenditure

Example of possible programme groups:

1. Strategic attack
2. Air defence against strategic attack
3. Tactical forces (land, air, naval)
4. Territorial (non-mobile) forces
5. Airlift and sealift
6. Intelligence and communication
7. Civil defence

sion of this matter should perhaps have been linked more clearly with the discussion of verification and information. The subcategories which it would be useful to distinguish in some international standardized accounting system are those which would provide some of the information which would help to maintain confidence in any agreement. Classifications are not "good" in the abstract; they are good if they serve the purpose for which they are intended.

The accounting system suggested in the report is one which divides up both military "output" and military "input". Output, it is suggested, should be divided by time and function.

Table 6A.3. Example of a modified summary table of military expenditure accounting

<table>
<tr><th rowspan="2">Resource input</th><th rowspan="2">Force output</th><th colspan="8">Programme groups</th><th rowspan="2">Total cost programme by input</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td rowspan="4">Operating costs</td><td>Employment</td><td colspan="8" rowspan="9">Example of possible organization-adjusted programme groups:

1. Army
2. Navy
3. Air force
4. Common agencies and administration
5. Para-military forces
6. Civil defence
7. External military assistance

Example of possible breakdown of procurement:

Aircraft and engines
Missiles
Nuclear warheads
Ships
Combat vehicles and ground force weapons
Ordnance and ammunition
Electronics and communication
Vehicles
Other</td><td rowspan="9"></td></tr>
<tr><td>Purchases of ammunition, petroleum products and other materials for current use</td></tr>
<tr><td>Material charges for maintenance of military equipment and facilities</td></tr>
<tr><td>Real estate rents, including maintenance of buildings</td></tr>
<tr><td colspan="2">Procurement and construction</td></tr>
<tr><td rowspan="4">Research and development</td><td>Basic research</td></tr>
<tr><td>General applied research</td></tr>
<tr><td>Development</td></tr>
<tr><td>Testing and evaluation</td></tr>
<tr><td colspan="2">Total resource cost by programme</td><td colspan="8"></td><td>Total military expenditure</td></tr>
</table>

It seems useful to divide annual output of the military sector between, on the one hand, force potential currently applicable, and, on the other hand, contributions to force potential that become operational in the near future—say, the next three—five years of medium-range defence planning—or in the distant future—i.e., the period of long-term defence planning.

For the functional analysis, it suggests familiar distinctions between strategic, tactical, intelligence and communications and so on. Input can be divided between intermediate and primary inputs: and then primary inputs can be disaggregated between employment, land use, and direct imports.

Table 6A.2 is the working group's example of a standard summary table.

The authors concede that many countries—indeed probably most countries—could not fill in a table like this; they suggest a modified form (table 6A.3), which, for instance, deals with the time dimension by separating out procurement and construction, and research and development. A demonstration is included to show that it is possible to fit the Swedish military budget into these frameworks. The reader is reminded that the idea of a standardized and internationally accepted reference budget for military expenditure is not new. Under the auspices of the League of Nations, some of the preparatory committees to the Disarmament Conference put a good deal of work into standardized military accounts, and a number of countries did in fact use this standardized form in reporting their military expenditure to the League.

V. *Military power and the problem of prices*

The report devotes a number of sections to the problem of prices. In any agreement to reduce military expenditure, "negotiators will be concerned to ensure, as far as possible, that these cuts do represent equivalent reductions in military power." To what extent can negotiators be sure that the marginal 10 per cent of military expenditure which might be cut does in fact represent a 10 per cent cut in "force potential"? There cannot be any absolute correspondence; however, it is the business of ministries of defence to try to ensure that the last $10 billion spent on the army provides force potential which is at any rate roughly equivalent to the potential provided by the last $10 billion spent on the air force. The report considers whether there is any way of valuing various items of military output according to their contribution to "force potential"; it concludes that it cannot be done.

The only practical price system appears to be to measure the "resource cost" of military expenditure according to its alternative use in the civil sector—that is, at its "opportunity cost". Many outlays in many military budgets are in effect valued in this way. The price which the military sector pays for food and clothing is the same price as would be paid by any other large-scale purchaser. However, there are also obvious divergencies from opportunity cost. In states which have conscription systems, military pay levels are usually considerably below the rates for comparable labour in the civil sector, thus understating the real cost to the economy of the military use of labour.

The main problem in the field of pricing is to get some correspondence between the pricing system used in the military sector in socialist countries and that used in capitalist countries. It is known that in the civil sector relative prices in the two types of economy tend to be very different: they are probably very different in the military sector also. In centrally planned economies, it is easier for prices to diverge from resource costs. This would clearly be one of the major difficulties in any attempt to reach an agreement on expenditure reductions, and the report does not suggest how the difficulty could be overcome.

VI. *Inflation*

At current rates of inflation, even a short-term agreement to reduce military expenditure would have to cope in some way with the problem of different general rates of inflation in different countries. The report points out that it is very difficult to construct sensible price indices for measuring the real output in the military sector; this is because the process of product improvement is so rapid, so that it is very difficult to say, of any particular increase in cost for a particular type of weapon, how much is a price increase and how much represents product improvement. However, if one is measuring military expenditure in terms of "opportunity cost", then the appropriate price indices are those for the civil sector. It might be acceptable to use a general price index, such as the price index for the gross national product as a whole, or specific civil price indices can be applied to specific types of military expenditure—for instance, the wholesale price index for engineering products could be used for some types of procurement. The report discusses the "index-number problem"[2] at perhaps unnecessary length. It is true that price indices can differ, according to whether they are base-weighted or current-weighted; however, general experience with price indices of this kind suggests that re-weighting does not usually make much difference. This problem is not one of the larger problems.

In the same section, the difficulties are discussed of converting the military expenditure figures for different countries into some common currency. Technically, the problem is the same as that of comparing the standards of living in two countries. Exchange rates are even less acceptable for comparing military expenditure than for comparing standards of living; at best, exchange rates of market economies reflect the average price levels of commodities and services entering into national trade, and this does not cover most of the items in military expenditure. The only proper way of making a comparison of this kind is to take all the "outputs" in country A, and price them according to A's and B's prices respectively, and then to do the same thing for all the outputs in country B. There are then two compari-

[2] In measuring the "average" price change of a group of products between two points of time, the figure can vary according to whether the price changes are weighted by their importance at the beginning of the period, or by their importance at the end of the period.

sons, each equally valid. The whole process becomes very complicated when there are more than two countries. The report comments, "to avoid erection of a major obstacle to agreement . . . it will be necessary to frame an agreement that obviates the necessity of extensive international value comparisons".

VII. *Military expenditure reductions and security*

After this rather pessimistic discussion of the problem of putting figures for different countries into some kind of comparable form, the "technical problems" section goes on to consider a classification of different types of military expenditure limitations. It notes, in passing, another potential advantage of this type of agreement, in addition to the advantage of comprehensiveness—expenditure-reduction agreements would allow countries freedom to readjust the pattern of their military expenditure as they wish. It then presents a rather elaborate taxonomy of possible methods of limitation, classified by "object, form, size of reduction, linkage to force limitations, duration, time-profile, mode and participants". Most of these potential variations are fairly obvious: thus agreements can be for a year, or for longer; the form can be a ceiling at an agreed level, or a standard percentage reduction; and so on. The most interesting characteristic, perhaps, is the "linkage to force limitations"; agreements to limit military expenditure could be linked to an agreement to limit particular forces in physical terms.

The report then considers the possible effects on "security" of various types of military expenditure limitation. It begins with "limitation of total military expenditure with zero linkage", that is, with no collateral agreements about numbers of weapons or other limits on physical forces. It then asks whether the reallocation of expenditure which such an agreement would allow would be "stabilizing" or "destabilizing". It presents examples of either result. Thus a country might "increase the relative weight of outlays on communication and intelligence at the expense of strategic attack forces", which would be stabilizing, or it might do the exact opposite, which would be destabilizing. It examines a number of destabilizing possibilities: for instance, a greater concentration on research and development at the expense of current force maintenance.

In this section on military expenditure limitations and security, the report is essentially a presentation of the considerations which would occur to a rather old-fashioned technical strategist and is rather blind to wider possibilities. It pictures countries as being monolithic entities in their decisions about military expenditure, wholly concerned at all times with maximizing their potential force within any constraints imposed on them. This is probably not a very accurate picture of the way in which decisions about military expenditure are reached. Decisions about its pattern and size are to a large extent the result of an internal struggle between the military and civil arms of government, and these decisions are only loosely related to what other countries do. One advantage of any agreement to reduce military expenditure would be to strengthen the hand of the civil as against the military arm, and in general to demote the importance of military questions and military options in the agenda of government decision.

The report then turns to the consequences of adding linked physical force limitations to the limitations on military expenditure. It points out that this could give a greater guarantee that the existing balance between different types of forces would not be shifted. However, force limitations are themselves very difficult to fix. Further, the more physical force limitations there are, the greater is the restriction on any country's freedom to reallocate its expenditure, which is one of the advantages claimed for the military expenditure approach. The report concludes this section by saying that if sufficient information is available—that is, if any country can find out in what way other countries are reallocating their expenditure—then there might be less need for adding limitations on physical forces to any military expenditure reduction agreement.

VIII. *Verification*

On verification, the first point which the report makes is that under virtually any type of agreement to limit military expenditure, more information would be needed than before the agreement.

> Because a military expenditure limitation agreement would restrict the ability to respond, it imposes the necessity for more complete and accurate information than before the limitation, if the sides are to have confidence that participation in the agreement will not damage their security.

The type and quantity of additional information will obviously differ with the type of agreement reached. The object of verification would be to minimize the possibility of evasion; the two main kinds of possible evasion with an agreement of this kind would be the artificial reduction of the prices at which military transactions are recorded, or the shift of some kinds of military expenditure to non-participant allies or to the civil sector in some way.

The report notes the obvious difficulty that one country which is party to the agreement may in the past have been in the habit of publishing a considerable amount of information, whereas another participant government may have been in the habit of publishing very little. In this case the first country would obviously gain more additional information than the second. This has long been the problem in any discussions of verification between the USA and the USSR. The report discusses how far what it calls "national means of verification"—by which it means satellite photography —would serve the purpose. One difficulty is that at present only two states have access to this means of verification. The report suggests that some provision be made for a joint or internationally sponsored service. However, satellite photography only provides clues to large forces, facilities and weapon deployments. It would be difficult to verify in this way the whole structure of military expenditure in a country, particularly expenditure on qualitative improvements in weapons and on research and development.

The report then suggests that it would help a great deal in verifying the figures for military expenditure if information were provided by such means as national income accounts, input-output tables, flow-of-funds accounts and manpower balances, which would make it possible to check the way in which the military sector fits into the economy as a whole; this would make possible a number of cross-checks to ensure that the size and pattern of the military sector had been correctly stated.

Finally, in one of its more positive sections, the report discusses an "information-disclosure ladder" which might make possible a succession of gradual moves towards military expenditure limitation agreements.

We may conceive of an information-disclosure ladder whose lowest rung is a phase of confidence-building. Because of pre-existing high security controls a breakthrough to mutual confidence is required. Publication of military accounts in somewhat aggregated form accompanied by explanatory material would be an important form of information-release for this purpose. At a higher level on the ladder, provision of price indexes and price-cost information for the estimation of purchasing power parities would facilitate international comparisons. Historical time-series would be important in establishing baselines against which changes under limitation could be measured. On a still higher rung, a major increase in verification capability may be attained by submission of national accounts, input-output tables, R&D financing and support accounts, and the like. At the uppermost rungs, information is made available from intermediate and primary national production and distribution units and opportunity is afforded for non-nationals to audit records by on-site inspection, possibly on a spot or sampling basis. The intrusion on military activity increases as the ladder is ascended, of course, but even at the top, specially sensitive military areas and projects may be safeguarded from external scrutiny.

We may similarly postulate a range of possible mechanisms of verification, from data exchanges between governments that need not necessarily be made public, to disclosures to an international agency, possibly governed by the same rule, and provision for on-site inspection. The more (relevant) data furnished, the more supplementary access granted, the more likely are participants to have confidence that circumventions can be detected.

IX. *Summary assessment of the report*

In the present state of information-exchange, the idea of agreements on military expenditure limitation is precocious. The general impression left by this report on the impartial reader must be that any move in this direction necessitates more information and this is a justifiable conclusion. It is sensible that, in pursuing this subject, the General Assembly should now turn its attention to explore the possibility of standardized reporting of military budgets.

However, the report perhaps gives too pessimistic an impression of the possibilities for advance once there is a move to a greater degree of information-exchange. For example, for the major nations to agree to freeze military expenditure at the present level as a first step, it would not need a great deal more information than is at present available to check that there were no gross violations.

Further, one great advantage of any such agreement is that it would put a powerful weapon into the hands of the civil authorities in every participant country in their annual budget confrontation with military demands. Here the "technical problems" section of the report has this rather old-fashioned picture of the way in which the military budget is determined. It assumes a very close connection between the size and pattern of military expenditure and military security, so that any adjustment of military expenditure could "destabilize" a balance which the military had carefully calculated and precisely preserved. In reality, military demands for resources are more a consequence of a natural bureaucratic desire to preserve, and if possible expand, their general territory; there is normally no carefully calculated balance to be destabilized at all. Certainly in any agreement to reduce military expenditure there would be some additional information requirements. However, the balance of forces between the major powers is in no way as precisely calculated and delicately poised as this report implicity suggests. The information requirements of a first stage agreement to hold military expenditure stable, or reduce it by a small percentage, are formidable, but not impossible.

References

1. *World Armaments and Disarmament, SIPRI Yearbook 1974* (Stockholm, Almqvist and Wiksell, 1974, Stockholm International Peace Research Institute).
2. *World Military Expenditure and Arms Trade 1963–1973* (Washington, US Arms Control and Disarmament Agency, 1975).
3. *Development Co-operation.* Efforts and Policies of the Members of the Development Assistance Committee, 1973 Review (Paris, OECD, 1973).
4. *Economic and Social Consequences of Disarmament.* United Nations Publication (New York, United Nations, 1962).

Appendix 6B

World military expenditure, 1974

For sources and methods, see chapter 9, page 245.

Conventions

[ ] = Rough estimates.
( ) = For military expenditure: estimates based on budget figures or using an estimated consumer price index, or both.
For GDP, NMP data: where sources other than *National Account Statistics* are used.
† = Year of independence.
– = No military expenditure.
❙ = GDP figures used for years after this symbol are not *strictly* comparable with those for preceding years.

Table 6B.1. World summary: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
USA	71 978	62 370	58 850	59 645	60 825	60 858	61 192	59 554	62 008	67 241	66 280
Other NATO	21 382	20 023	19 755	20 795	21 071	19 401	20 924	21 760	22 537	24 576	25 419
Total NATO	**93 360**	**82 393**	**78 605**	**80 440**	**81 896**	**80 259**	**82 116**	**81 314**	**84 545**	**91 817**	**91 699**
USSR	34 300	31 100	34 900	31 600	31 300	30 500	33 000	32 700	40 800	44 600	48 900
Other WTO[a]	2 200	2 150	2 600	2 600	2 700	2 900	3 000	2 958	3 250	4 147	4 469
Total WTO	**36 500**	**33 250**	**37 500**	**34 200**	**34 000**	**33 400**	**36 000**	**35 658**	**44 050**	**48 747**	**53 369**
Other Europe	2 065	2 055	2 040	2 050	2 190	2 235	2 300	2 295	2 465	2 679	2 764
Middle East	425	475	595	755	790	940	1 020	1 035	1 080	1 195	1 335
South Asia	865	870	935	930	1 010	1 015	1 010	1 030	1 075	1 339	2 011
Far East (excl. China)	1 760	1 765	1 770	1 910	2 240	2 525	2 650	2 800	2 940	3 189	3 331
China	[3 700]	[3 700]	[3 700]	[3 700]	[4 000]	[3 700]	[4 100]	[4 100]	[4 800]	[5 600]	[6 300]
Oceania	746	672	687	672	620	610	625	624	626	646	680
Africa (excl. Egypt)	130	130	150	215	250	250	260	305	450	645	705
Central America	230	185	210	235	275	280	290	340	374	417	449
South America	1 165	1 165	1 200	1 425	1 530	1 585	1 315	1 320	1 286	1 337	1 413
World total	**140 946**	**126 660**	**127 392**	**126 532**	**128 801**	**126 799**	**131 686**	**130 821**	**143 691**	**157 611**	**164 056**

[a] At current prices and Benoit-Lubell exchange rates.

Table 6B.2. NATO: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
North America:												
USA	71 978	62 370	58 850	59 645	60 825	60 858	61 192	59 554	62 008	67 241	66 280	64 096
Canada	2 822	2 508	2 576	2 643	2 477	2 306	2 153	2 143	2 202	2 294	2 134	2 221
Europe:												
Belgium	590	605	503	489	511	505	510	519	525	558	611	652
Denmark	253	249	244	235	248	242	236	264	269	328	332	342
France	4 994	4 217	3 922	5 118	5 312	4 905	5 004	5 158	5 316	5 513	5 418	5 568
FR Germany	2 565	2 603	2 968	2 816	3 407	2 535	4 047	4 375	4 612	5 854	6 580	6 306
Greece	155	166	170	221	194	190	197	209	202	206	211	219
Italy	1 317	1 438	1 428	1 464	1 515	1 547	1 614	1 678	1 734	1 903	2 121	2 172
Luxembourg	14	16	17	11	12	11	11	7	7	9	9	11
Netherlands	694	789	827	893	834	734	654	720	839	892	905	984
Norway	279	285	238	231	245	228	241	230	250	276	288	292
Portugal	116	125	132	132	136	140	157	163	261	296	290	316
Turkey	320	328	351	331	321	332	381	401	434	450	463	501
UK	7 263	6 694	6 379	6 215	5 859	5 726	5 719	5 893	5 886	5 997	6 057	6 274
Total NATO	**93 360**	**82 393**	**78 605**	**80 440**	**81 896**	**80 259**	**82 116**	**81 314**	**84 545**	**91 817**	**91 699**	**89 954**
Total NATO (excl. USA)	**21 382**	**20 023**	**19 755**	**20 795**	**21 071**	**19 401**	**20 924**	**21 760**	**22 537**	**24 576**	**25 419**	**25 858**
Total NATO Europe	**18 560**	**17 515**	**17 179**	**18 152**	**18 594**	**17 095**	**18 771**	**19 617**	**20 335**	**22 282**	**23 285**	**23 637**

US $ mn, at 1970 prices and 1970 exchange rates (final column, X, at current prices and exchange rates)

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
64 096	63 748	76 043	87 730	90 103	86 274	77 854	71 776	72 088	68 595	66 351	*78 473*
25 858	25 775	25 930	27 063	26 304	26 273	26 710	28 045	29 373	29 691	30 117	*42 861*
89 954	**89 523**	**101 973**	**114 793**	**116 407**	**112 547**	**104 564**	**99 821**	**101 461**	**98 286**	**96 468**	*121 334*
46 700	44 900	47 000	50 800	58 600	62 200	63 000	63 000	63 000	63 000	61 900	*63 000*
4 471	4 598	4 833	5 267	6 380	7 012	7 600	8 029	8 433	8 667	9 436	*8 667*
51 171	**49 498**	**51 833**	**56 052**	**64 995**	**69 212**	**70 600**	**71 029**	**71 433**	**71 667**	**71 336**	*71 667*
2 916	2 938	3 035	3 030	3 131	3 270	3 362	3 429	3 631	3 545	3 524	*5 133*
1 550	1 785	2 125	2 820	3 265	3 800	4 675	5 319	5 749	8 631	10 310	*11 065*
2 003	2 166	2 169	1 941	2 008	2 139	2 236	2 659	2 967	2 782	2 390	*3 019*
3 583	4 222	4 185	4 553	5 042	5 447	5 858	6 475	7 178	7 130	6 800	*8 602*
[7 500]	[7 900]	[8 900]	[8 600]	[8 900]	[11 100]	[12 000]	[13 400]	[13 400]	[13 100]	[13 100]	*[15 000]*
814	993	1 131	1 232	1 337	1 353	1 332	1 311	1 315	1 286	1 233	*1 728*
839	958	1 010	1 282	1 533	1 917	1 956	2 010	2 125	2 250	2 200	*2 912*
474	469	503	539	604	590	622	638	704	700	680	*791*
1 408	1 726	1 700	2 041	2 013	2 144	2 211	2 602	2 407	2 368	2 230	*3 177*
162 212	**162 178**	**178 564**	**196 883**	**209 235**	**213 519**	**209 416**	**208 693**	**212 370**	**211 745**	**210 271**	*244 428*

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
63 748	76 043	87 730	90 103	86 274	77 854	71 776	72 088	68 595	66 351	*78 473*
1 983	2 035	2 185	2 060	1 942	2 040	2 050	2 055	2 052	2 132	*2 408*
636	646	678	709	709	755	766	808	837	870	*1 259*
363	358	358	381	375	368	403	401	381	408	*583*
5 658	5 821	6 133	6 127	6 045	6 014	6 010	5 952	6 067	5 843	*9 056*
6 232	6 041	6 283	5 578	6 117	6 188	6 625	7 086	7 363	7 757	*12 027*
237	257	331	387	438	474	501	534	533	510	*679*
2 254	2 439	2 381	2 426	2 378	2 506	2 836	3 131	3 126	2 937	*4 107*
11	11	9	8	8	8	8	9	10	11	*15*
959	935	1 034	1 023	1 069	1 103	1 154	1 192	1 213	1 304	*1 967*
338	336	347	367	388	389	399	398	401	427	*611*
316	333	409	430	399	436	457	450	416	416	*681*
532	517	521	551	541	579	677	703	738	(816)	*871*
6 256	6 201	6 394	6 257	5 864	5 850	6 159	6 654	6 554	6 686	*8 597*
89 523	**101 973**	**114 793**	**116 407**	**112 547**	**104 564**	**99 821**	**101 461**	**98 286**	**96 468**	*121 334*
25 775	**25 930**	**27 063**	**26 304**	**26 273**	**26 710**	**28 045**	**29 373**	**29 691**	**30 117**	*42 861*
23 792	**23 895**	**24 878**	**24 244**	**24 331**	**24 670**	**25 995**	**27 318**	**27 639**	**27 985**	*40 453*

Table 6B.3. NATO: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
North America:											
USA	*mn dollars*	49 377	42 786	40 371	41 513	44 159	45 096	45 833	45 380	47 808	52 381
Canada	*mn dollars*	1 970	1 771	1 819	1 888	1 829	1 740	1 642	1 654	1 715	1 810
Europe:											
Belgium	*mn francs*	19 815	20 707	17 067	17 065	18 356	18 312	18 686	19 161	19 561	21 111
Denmark	*mn kroner*	889	885	920	936	1 012	988	986	1 113	1 180	1 551
France	*mn francs*	13 865	11 710	11 020	14 690	15 600	16 569	17 926	19 162	20 395	22 184
FR Germany	*mn marks*	6 195	6 287	7 383	7 211	8 962	6 853	11 087	12 115	13 175	17 233
Greece	*mn drachmas*	2 767	3 428	3 688	4 939	4 477	4 469	4 735	5 110	5 034	5 102
Italy	*bn lire*	480	543	551	584	611	647	667	710	749	861
Luxembourg	*mn francs*	488	565	614	395	439	429	402	263	290	355
Netherlands	*mn guilders*	1 330	1 583	1 699	1 854	1 845	1 656	1 505	1 728	2 013	2 186
Norway	*mn kroner*	1 067	1 141	953	967	1 049	1 024	1 107	1 058	1 179	1 371
Portugal	*mn escudos*	1 975	2 100	2 224	2 297	2 391	2 485	2 820	3 023	4 922	5 744
Turkey	*mn lire*	827	934	1 077	1 159	1 266	1 470	2 153	2 405	2 718	2 940
UK	*mn pounds*	1 681	1 569	1 567	1 615	1 574	1 591	1 589	1 657	1 709	1 814

Table 6B.4. NATO: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
North America:										
USA	*13.4*	*11.6*	*10.0*	*9.8*	*9.9*	*10.0*	*9.4*	*8.9*	*9.1*	*9.3*
Canada	*7.8*	*7.0*	*6.6*	*6.1*	*5.6*	*5.2*	*4.6*	*4.3*	*4.3*	*4.2*
Europe:										
Belgium	*4.8*	*4.8*	*3.8*	*3.5*	*3.6*	*3.6*	*3.5*	*3.4*	*3.3*	*3.3*
Denmark	*3.4*	*3.2*	*3.2*	*3.0*	*3.1*	*2.9*	*2.6*	*2.7*	*2.6*	*3.0*
France	*9.1*	*7.3*	*6.4*	*7.7*	*7.3*	*6.8*	*6.6*	*6.4*	*6.2*	*6.0*
FR Germany	*4.2*	*4.0*	*4.1*	*3.6*	*4.1*	*3.0*	*4.4*	*4.0*	*4.0*	*4.8*
Greece	*5.2*	*5.5*	*5.2*	*6.0*	*5.1*	*4.8*	*4.9*	*4.9*	*4.3*	*4.1*
Italy	*3.8*	*4.0*	*3.7*	*3.6*	*3.5*	*3.4*	*3.3*	*3.3*	*3.1*	*3.2*
Luxembourg	*2.9*	*3.3*	*3.2*	*1.9*	*1.9*	*1.9*	*1.8*	*1.1*	*1.1*	*1.4*
Netherlands	*5.6*	*6.0*	*5.7*	*5.7*	*5.2*	*4.7*	*4.0*	*4.1*	*4.5*	*4.5*
Norway	*5.1*	*5.0*	*3.9*	*3.5*	*3.6*	*3.5*	*3.6*	*3.2*	*3.3*	*3.6*
Portugal	*4.0*	*4.2*	*4.2*	*4.0*	*4.0*	*4.0*	*4.3*	*4.2*	*6.4*	*6.9*
Turkey	*4.9*	*5.4*	*5.1*	*4.7*	*4.1*	*3.8*	*4.5*	*4.7*	*5.0*	*4.9*
UK	*10.0*	*8.8*	*8.2*	*7.8*	*7.2*	*7.0*	*6.6*	*6.5*	*6.3*	*6.4*

Table 6B.5. WTO: current price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Bulgaria	. .	. .	. .	. .	133	149	141	154	187	222	256
Czechoslovakia	988	918	1 227	1 071	1 094	1 047	1 035	1 033	1 119	1 276	1 274
German DR	. .	. .	. .	. .	. .	487	. .	295	295	796	826
Hungary	. .	. .	. .	. .	110	. .	144	179	194	283	374
Poland	647	666	791	754	634	704	898	937	1 069	1 154	1 300
Romania	. .	. .	. .	. .	405	381	365	360	386	416	439
USSR[a]	34 300	31 100	34 900	31 600	31 300	30 500	33 000	32 700	40 800	44 600	48 900
Total WTO	[36 500]	[33 250]	[37 500]	[34 200]	[34 000]	[33 400]	**36 000**	**35 658**	**44 050**	**48 747**	**53 369**

[a] At SIPRI-estimated exchange rates (see *SIPRI Yearbook 1974*, pp. 191 ff.)

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
52 295	51 213	51 827	63 572	75 448	80 732	81 443	77 854	74 862	77 639	78 473	84 332
1 712	1 813	1 659	1 766	1 965	1 927	1 899	2 061	2 131	2 238	2 405	2 770
23 596	26 241	26 606	28 169	30 396	32 676	33 892	37 502	39 670	44 140	48 941	57 315
1 651	1 764	1 974	2 080	2 249	2 591	2 640	2 757	3 195	3 386	3 520	4 343
22 849	24 280	25 300	26 732	28 912	30 200	31 700	33 200	35 000	36 800	40 252	43 963
19 924	19 553	19 915	20 254	21 408	19 310	21 577	22 573	25 450	28 720	31 908	35 964
5 385	5 647	6 290	7 168	9 390	11 003	12 762	14 208	15 480	17 211	19 866	24 126
1 031	1 118	1 212	1 342	1 359	1 403	1 412	1 562	1 852	2 162	2 392	2 676
348	462	477	497	413	374	391	416	442	517	601	677
2 307	2 661	2 714	2 790	3 200	3 280	3 682	3 968	4 466	4 974	5 465	6 437
1 465	1 570	1 897	1 947	2 097	2 300	2 502	2 774	3 022	3 239	3 505	4 081
5 724	6 451	6 680	7 393	9 575	10 692	10 779	12 538	14 699	16 046	16 736	20 910
3 157	3 443	3 821	3 996	4 596	5 159	5 395	6 237	8 487	9 961	12 192	15 831
1 870	2 000	2 091	2 153	2 276	2 332	2 303	2 444	2 815	3 258	3 505	4 148

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
8.8	*8.0*	*7.5*	*8.4*	*9.4*	*9.4*	*8.8*	*7.9*	*7.1*	*6.7*	*6.0*
3.7	*3.6*	*3.0*	*2.8*	*2.9*	*2.6*	*2.4*	*2.4*	*2.3*	*2.1*	*2.0*
3.4	*3.4*	*3.2*	*3.1*	*3.1*	*3.1*	*2.9*	*2.9*	*2.8*	*2.8*	. .
3.0	*2.8*	*2.8*	*2.7*	*2.7*	*2.8*	*2.5*	*2.4*	*2.5*	*2.3*	*2.1*
5.6	*5.3*	*5.2*	*5.0*	*5.0*	*4.8*	*4.3*	*4.1*	*3.9*	*3.7*	. .
5.2	*4.6*	*4.3*	*4.1*	*4.3*	*3.6*	*3.6*	*3.3*	*3.3*	*3.4*	*3.4*
3.9	*3.7*	*3.6*	*3.7*	*4.5*	*4.8*	*4.9*	*4.9*	*4.9*	*4.7*	*4.2*
3.3	*3.3*	*3.3*	*3.4*	*3.1*	*3.0*	*2.7*	*2.7*	*3.0*	*3.2*	*3.0*
1.3	*1.5*	*1.4*	*1.4*	*1.2*	*1.0*	*0.9*	*0.8*	*0.8*	*0.9*	*0.8*
4.4	*4.3*	*3.9*	*3.7*	*3.9*	*3.7*	*3.6*	*3.5*	*3.4*	*3.4*	*3.3*
3.5	*3.4*	*3.7*	*3.5*	*3.5*	*3.6*	*3.6*	*3.5*	*3.4*	*3.3*	*3.2*
6.5	*6.7*	*6.3*	*6.3*	*7.3*	*7.3*	*6.7*	*7.0*	*7.4*	*6.9*	. .
4.6	*4.6*	*4.8*	*4.3*	*4.4*	*4.6*	*4.4*	*4.3*	*4.5*	*4.3*	*4.4*
6.2	*6.1*	*5.9*	*5.7*	*5.7*	*5.4*	*5.0*	*4.9*	*5.1*	*5.3*	. .

US $ mn, at Benoit–Lubell exchange rates

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
224	198	207	213	228	260	279	305	337	364	416
1 202	1 191	1 275	1 457	1 560	1 679	1 755	1 876	2 012	1 976	2 035
855	914	944	1 062	1 711	1 858	2 006	2 124	2 242	2 457	2 625
355	332	301	313	440	567		570	543	567	611
1 374	1 461	1 584	1 661	1 905	2 105	2 244	2 367	2 481	2 463	2 839
461	502	546	610	670	749		787	818	840	910
46 700	44 900	47 000	50 800	58 600	62 200	63 000	63 000	63 000	63 000	61 900
51 171	**49 498**	**51 833**	**56 052**	**64 995**	**69 212**	**70 600**	**71 029**	**71 433**	**71 667**	**71 336**

Table 6B.6. WTO: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Bulgaria	*mn leva*	. .	. .	. .	. .	154	173	163	179	217	258
Czechoslovakia	*mn korunas*	8 400	7 800	10 430	9 100	9 300	8 900	8 800	8 783	9 512	10 845
German DR	*mn marks*	. .	. .	. .	. .	. .	1 650	. .	1 000	1 000	2 700
Hungary	*mn forints*	. .	. .	. .	. .	1 912	. .	2 500	3 100	3 376	4 913
Poland	*mn zlotys*	10 300	10 600	12 600	12 000	10 100	11 200	14 300	14 920	17 019	18 378
Romania	*mn lei*	. .	. .	. .	. .	3 817	3 597	3 446	3 392	3 639	3 924
USSR	*mn roubles*	11 020	10 030	11 210	9 730	9 672	9 400	9 370	9 300	11 600	12 700

Table 6B.7. WTO: military expenditure as a percentage of net material product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Bulgaria	. .	. .	. .	. .	*4.8*	*5.0*	*3.9*	*4.0*	*4.6*	*5.0*
Czechoslovakia	*6.5*	*6.3*	*7.8*	*6.8*	*6.6*	*6.0*	*5.8*	*5.4*	*5.6*	*6.2*
German DR	. .	. .	. .	. .	. .	*2.7*	. .	*1.4*	*1.4*	*3.6*
Hungary	. .	. .	. .	. .	*1.8*	. .	*2.0*	*2.2*	*2.3*	*3.1*
Poland	*4.5*	*4.2*	*5.6*	*4.8*	*3.4*	*3.5*	*4.1*	*4.0*	*4.1*	*4.3*
USSR[a]	*12.9*	*10.9*	*11.4*	*9.1*	*8.6*	*7.4*	*6.9*	*6.4*	*7.6*	*7.7*

[a] An alternative series for the Soviet Union shows the SIPRI estimates of the dollar-equivalent of Soviet military expenditure as a percentage of official Soviet estimates of the dollar-equivalent of Soviet National Income for 1962–1973: *22.5*.

Table 6B.8. Other Europe: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Albania[a]	. .	. .	. .	. .	. .	. .	. .	. .	[60]	[68]	[69]	71
Austria	29	3	12	60	99	113	112	104	101	106	129	163
Finland	62	64	86	82	80	83	98	103	119	167	133	131
Ireland	42	38	35	33	32	31	33	35	37	37	38	42
Spain	298	324	310	332	352	315	296	349	356	415	427	435
Sweden	724	758	781	786	804	813	847	833	875	940	1 002	1 054
Switzerland	270	237	255	229	306	328	316	297	346	382	398	432
Yugoslavia	593	584	512	475	464	499	540	514	571	564	568	588
Total Other Europe	**[2 065]**	**[2 055]**	**[2 040]**	**[2 050]**	**[2 190]**	**[2 235]**	**[2 300]**	**[2 295]**	**2 465**	**2 679**	**2 764**	**2 916**

[a] Figures for Albania are at current prices and Benoit–Lubell exchange rates.

Table 6B.9. Other Europe: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Albania	*mn leks*	. .	. .	. .	. .	. .	. .	. .	. .	[240]	[270]
Austria	*mn schillings*	443	47	188	1 001	1 714	1 986	1 989	1 893	1 890	2 076
Finland	*mn marks*	121	124	163	170	184	206	246	267	314	460
Ireland	*mn pounds*	9.4	8.6	8.1	7.9	8.1	8.3	8.6	9.2	9.9	10.5
Spain	*mn pesetas*	7 431	8 210	8 167	9 330	10 881	11 067	11 115	13 375	13 935	17 173
Sweden	*mn kronor*	2 026	2 147	2 264	2 389	2 557	2 706	2 820	2 898	3 107	3 500
Switzerland	*mn francs*	775	688	750	682	930	1 009	972	924	1 096	1 264
Yugoslavia	*mn new dinars*	1 674	1 627	1 593	1 580	1 590	1 785	1 956	2 077	2 477	2 701

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
297	260	230	240	247	264	302	324	354	391	422	483
10 829	10 217	10 125	10 841	12 385	13 189	14 268	14 919	15 943	17 100	16 800	17 300
2 800	2 900	3 100	3 200	3 600	5 800	6 300	6 800	7 200	7 600	8 328	8 900
6 500	6 163	5 757	5 219	5 433	6 611	7 644	9 848	9 891	9 430	9 848	10 610
20 695	21 881	23 255	25 213	26 438	30 332	33 519	35 124	37 685	39 490	39 206	45 200
4 143	4 346	4 735	4 927	5 146	5 751	6 319	7 067	7 424	7 710	7 922	8 585
13 900	13 300	12 800	13 400	14 500	16 700	17 700	17 900	17 900	17 900	17 900	17 600

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
5.2	*3.1*	*3.5*	*3.3*	*3.1*	*3.1*	*3.2*	*3.1*	*3.4*	*3.5*	*3.5*
6.3	*6.1*	*5.9*	*5.5*	*5.3*	*5.1*	*4.9*	*4.8*	*5.0*	*5.0*	*4.7*
3.7	*3.6*	*3.7*	*3.7*	*3.9*	*(6.2)*	*(6.1)*	*(6.2)*	*(6.3)*	*(6.3)*	*[6.5]*
3.9	*3.6*	*3.4*	*2.8*	*2.6*	*2.9*	*3.0*	*3.6*	*3.4*	*3.0*	*2.8*
4.5	*4.4*	*4.4*	*4.4*	*4.4*	*4.5*	*4.8*	*4.8*	*4.4*	*4.2*	*3.7*
8.2	*7.3*	*6.6*	*6.5*	*6.4*	*6.8*	*6.8*	*6.2*	*5.9*	*5.7*	*5.3*
23.4	*20.2*	*18.1*	..	*17.3*	*18.0*	*17.4*	*16.5*	*15.4*	*14.8*	*13.1*

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
73	69	69	77	106	120	128	141	148	154	*148*
135	155	157	157	162	160	154	164	163	(174)	*259*
134	131	128	147	134	142	155	177	169	(162)	*230*
43	41	42	43	45	51	56	67	62	(56)	*84*
431	509	550	570	592	603	623	678	722	[599]	*1 131*
1 118	1 128	1 098	1 100	1 159	1 190	1 209	1 215	1 179	(1 142)	*1 696*
435	458	446	425	454	467	485	494	468	(454)	*793*
569	544	540	612	618	629	619	695	634	(783)	*792*
2 938	**3 035**	**3 030**	**3 131**	**3 270**	**3 362**	**3 429**	**3 631**	**3 545**	**3 523**	*5 133*

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
[275]	282	288	272	272	304	420	475	508	558	589	610
2 608	3 408	2 957	3 474	3 661	3 775	4 006	4 135	4 166	4 712	5 044	5 879
383	417	446	456	471	589	549	597	692	847	902	1 015
10.8	12.9	14.0	13.7	14.4	15.5	17.3	21.3	25.6	33.2	34.2	(36.0)
19 218	20 920	23 471	29 407	33 850	36 780	39 016	42 067	47 019	55 368	65 700	[63 000]
3 839	4 173	4 646	4 990	5 072	5 176	5 596	6 150	6 714	7 151	7 407	7 882
1 362	1 521	1 586	1 746	1 770	1 726	1 889	2 014	2 232	2 425	2 496	2 662
2 862	3 321	4 305	5 070	5 382	6 406	6 980	7 864	8 948	11 716	12 787	19 559

Table 6B.10. Other Europe: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Austria	*0.5*	*0.1*	*0.2*	*0.8*	*1.3*	*1.5*	*1.4*	*1.2*	*1.0*	*1.1*
Finland	*1.5*	*1.4*	*1.6*	*1.5*	*1.5*	*1.6*	*1.7*	*1.7*	*1.8*	*2.4*
Ireland	*1.9*	*1.7*	*1.6*	*1.5*	*1.5*	*1.5*	*1.4*	*1.4*	*1.4*	*1.4*
Spain	. .	*2.4*	*2.2*	*2.2*	*2.2*	*1.9*	*1.8*	*2.2*	*2.0*	*2.1*
Sweden	*4.9*	*4.9*	*4.8*	*4.7*	*4.6*	*4.7*	*4.6*	*4.0*	*4.0*	*4.1*
Switzerland	*3.3*	*2.7*	*2.8*	*2.4*	*3.0*	*3.2*	*2.9*	*2.5*	*2.7*	*2.8*
Yugoslavia[a]	*14.8*	*12.6*	*10.3*	*9.9*	*7.9*	*9.0*	*8.0*	*7.2*	*7.4*	*7.2*

[a] Percentage of gross material product.

Table 6B.11. Middle East: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Cyprus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	7
Egypt	125	166	251	287	259	[242]	[246]	[264]	[292]	[330]	369	463
Iran	67	78	107	126	151	243	271	216	216	214	218	241
Iraq	76	75	67	94	102	110	129	147	153	164	191	219
Israel	35	32	34	68	97	109	121	144	144	162	201	262
Jordan	(39)	(40)	(41)	(48)	(50)	(59)	(73)	(68)	(67)	(71)	(72)	(71)
Kuwait[a]	. .	. .	. .	. .	. .	. .	. .	. .	17	19	22	20
Lebanon	9	10	12	16	16	18	16	17	20	29	24	26
Oman[a]	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Saudi Arabia	. .	. .	. .	. .	. .	. .	. .	. .	[88]	[111]	136	(129)
Syria	30	28	30	53	44	[79]	77	78	79	90	94	103
Yemen[a]	. .	. .	. .	. .	. .	. .	. .	. .	. .	[1]	[2]	[2]
Total Middle East	**[425]**	**[475]**	**[595]**	**[755]**	**[790]**	**[940]**	**[1 020]**	**[1 035]**	**[1 080]**	**[1 195]**	**[1 335]**	**[1 550]**

[a] At current prices and 1970 exchange rates.

Table 6B.12. Middle East: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Cyprus	*mn pounds*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Egypt	*mn pounds*	37	47	71	83	78	[73]	[74]	[80]	[89]	[95]
Iran	*mn rials*	2 544	3 468	4 956	6 205	7 960	12 771	15 699	13 756	14 183	14 156
Iraq	*mn dinars*	19.4	18.8	17.1	25.8	29.7	31.0	35.8	42.4	44.8	48.2
Israel	*mn pounds*	49	50	57	122	153	212	243	294	313	386
Jordan	*mn dinars*	9.9	10.2	10.5	12.8	13.4	15.9	20.1	19.1	18.9	20.6
Kuwait	*mn dinars*	. .	. .	. .	. .	. .	. .	. .	. .	6.1	6.8
Lebanon	*mn pounds*	21.2	21.7	26.7	38.0	39.1	45.6	43.0	47.8	56.4	80.6
Oman	*mn rials*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Saudi Arabia	*mn rials*	. .	. .	. .	. .	. .	. .	. .	. .	331	428
Syria	*mn pounds*	87	76	82	161	140	[234]	237	251	261	279
Yemen	*mn rials*	. .	. .	. .	. .	. .	. .	. .	. .	. .	[5.3]

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
1.3	*1.5*	*1.2*	*1.3*	*1.3*	*1.2*	*1.2*	*1.1*	*1.0*	*1.0*	*0.9*
1.9	*1.8*	*1.7*	*1.6*	*1.6*	*1.7*	*1.4*	*1.4*	*1.5*	*1.5*	*1.4*
1.3	*1.4*	*1.4*	*1.3*	*1.3*	*1.2*	*1.2*	*1.3*	*1.4*	*1.5*	*1.3*
2.0	*1.9*	*1.8*	*2.0*	*2.1*	*2.0*	*1.9*	*1.9*	*1.8*	*1.8*	*1.8*
4.2	*4.1*	*4.2*	*4.1*	*3.9*	*3.7*	*3.7*	*3.6*	*3.7*	*3.6*	..
2.7	*2.8*	*2.7*	*2.7*	*2.6*	*2.4*	*2.4*	*2.3*	*2.3*	*2.2*	*1.9*
6.2	*5.4*	*5.4*	*5.1*	*5.2*	*5.7*	*5.3*	*5.0*	*4.4*	*4.8*	..

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
9	7	8	7	7	8	8	(7)	(7)	..	*(10)*
501	516	718	740	836	1 263	1 450	1 420	2 327	2 201	*2 818*
323	446	560	636	748	844	1 094	1 313	1 800	(3 145)	*2 410*
268	274	265	321	393	401	445	410	404	(494)	*552*
288	365	562	730	955	1 278	1 370	1 375	2 415	(2 015)	*3 050*
(71)	(85)	115	136	135	105	109	109	95	(83)	*131*
31	35	54	63	67	67	78	88	100	114	*120*
31	35	39	44	43	43	43	61	67	[84]	*95*
..	..	..	..	..	..	[48]	[48]	[80]	140	*[95]*
(138)	(252)	(372)	389	400	446	503	[720]	[1 020]	[1 625]	*1 385*
113	93	102	159	164	162	156	180	289	(356)	*366*
[2]	[2]	5	7	10	13	15	18	[27]	[41]	*[33]*
[1 785]	**[2 125]**	**[2 820]**	**[3 265]**	**[3 800]**	**[4 675]**	**5 319**	**5 749**	**8 631**	**[10 310]**	*[11 065]*

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
..	2.7	3.3	2.8	3.1	2.7	2.7	3.0	3.5	3.4	(3.5)	..
110	143	178	200	280	300	350	549	650	650	1 111	1 225
14 487	16 606	22 826	31 365	40 030	45 734	55 720	63 912	86 315	110 332	131 785	274 575
58.3	66.1	80.6	83.9	83.8	104.1	134.3	143.2	164.6	159.6	164.9	219.0
511	700	825	1 131	1 772	2 351	3 151	4 472	5 370	6 084	12 815	14 625
21.1	21.1	21.5	26.0	35.7	42.2	45.2	37.4	40.7	44.0	42.4	44.2
7.9	7.1	10.9	12.5	19.4	22.6	23.8	24.0	27.8	31.3	35.8	40.6
68.9	76.6	90.1	105.9	121.9	135.9	139.1	138.4	142.3	212.9	247.7	(345.0)
..	..	..	..	..	..	..	..	[20.0]	[20.0]	[33.0]	58.5
541	531	561	1 050	1 579	1 688	1 798	2 005	2 285	3 435	5 110	(8 545)
297	346	365	316	366	587	600	617	625	725	1 400	2 000
[10.6]	[10.6]	[11.7]	[12.7]	[25.1]	[39.2]	[56.7]	[74.3]	82.7	98.3	[150]	[225]

Table 6B.13. Middle East: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Cyprus	..	..	..	..	..	..	..	..	..	..
Egypt	..	..	..	..	..	..	..	5.6	6.0	6.1
Iran	..	..	..	..	..	..	..	4.2	4.1	3.8
Iraq	5.6	4.7	4.1	5.7	6.5	6.0	6.7	7.1	6.9	6.9
Israel	3.6	2.8	2.5	4.6	5.9	5.9	5.9	6.6	5.9	6.1
Jordan	..	..	..	..	..	..	21.5	19.4	15.7	17.3
Kuwait	..	..	..	..	..	..	..	..	..	..
Lebanon	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	..	..	..	..	..	..	..	..	..	..
Syria	..	..	..	..	..	..	..	..	..	..
Yemen Arab Republic[a]	..	..	..	..	..	..	..	..	..	..

[a] GDP at factor cost.

Table 6B.14. South Asia: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Afghanistan	..	..	..	..	..	..	..	..		[44.0]	[56.0]
Bangla Desh	..	..	..	..	..	..	..	..	..	..	..
India	548.2	585.6	610.2	607.1	730.4	723.2	674.2	677.6	728.0	1 003.7	1 642.5
Nepal	..	..	..	..	..	..	..	[3.1]	[4.0]	[3.7]	[4.0]
Pakistan	276.0	240.9	281.3	274.0	226.8	235.7	277.3	290.1	287.4	273.2	295.6
Sri Lanka	4.4	7.2	6.6	7.9	10.4	14.5	15.8	16.0	16.2	14.8	12.7
Total South Asia	**[865.0]**	**[870.0]**	**[935.0]**	**[930.0]**	**[1 010.0]**	**[1 015.0]**	**[1 010.0]**	**[1 030.0]**	**[1 075.0]**	**[1 339.4]**	**[2 010.8]**

Table 6B.15. South Asia: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Afghanistan	*mn afghanis*	..	..	..	..	..	..		[628]	[650]	[650]
Bangla Desh	*mn taka*	..	..	..	..	..	..	..	..	..	..
India	*mn rupees*	1 926	1 969	1 932	2 110	2 665	2 797	2 699	2 774	3 046	4 336
Nepal	*mn rupees*	..	..	..	..	..	..	..	[16.2]	[19.4]	[22.4]
Pakistan	*mn rupees*	817	705	787	793	718	771	878	978	984	938
Sri Lanka	*mn rupees*	19.0	30.2	27.5	32.8	46.0	66.2	71.9	71.3	73.2	67.9

Table 6B.16. South Asia: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
India	[1.7]	[1.8]	[1.7]	[1.7]	[2.1]	[2.0]	[1.9]	[1.9]	1.9	2.6
Nepal	..	..	..	..	..	..	..	..	..	..
Pakistan	[3.6]	[3.1]	[3.4]	[3.1]	[2.5]	[2.6]	[2.8]	2.8	2.6	2.4
Sri Lanka	0.4	0.6	0.5	0.6	0.8	1.1	1.1	1.1	1.1	1.0

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
. .	2.4	2.4	1.8	1.8	1.5	1.3	1.3	1.4	1.2	. .
6.2	7.0	7.7	8.2	11.2	11.5	12.4	18.0	20.1	. .	. .
3.7	3.9	4.7	5.9	6.8	6.8	7.4	7.4	8.2	8.7	. .
8.3	8.2	9.2	8.5	8.4	9.2	11.3	11.1	11.1	. .	. .
6.7	8.0	7.9	9.8	14.7	17.0	19.7	23.6	22.6	20.6	. .
16.3	14.2	12.8	15.2	18.3	22.6	20.5	17.8	18.2	17.6	16.1
1.2	1.0	1.5	1.5	2.2	2.4	2.4	2.3	2.1	. .	. .
. .	2.4	2.6	2.7	3.2	3.2	3.0	2.8	2.4	3.5	. .
[6.6]	5.9	5.7	9.4	11.4	11.0	10.8	10.0	8.9	. .	. .
7.5	7.5	7.9	6.7	5.8	10.6	10.0	9.6	8.4	8.2	15.0
. .	. .	. .	. .	. .	. .	2.6	3.1	2.9	. .	. .

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973x
46.5	44.4	43.3	37.3	33.0	35.0	30.2	24.1	27.6	42.3	. .	42
. .	. .	. .	. .	. .	. .	. .	. .	48.0	55.0	50.0	70
1 607.6	1 567.6	1 480.1	1 373.2	1 429.0	1 511.9	1 558.2	1 854.0	2 030.0	1 920.0	[1 640.0]	2 402
[3.7]	[3.8]	4.1	5.0	5.4	5.5	5.2	5.9	6.2	6.4	[6.0]	7
333.3	537.7	627.8	511.0	525.2	571.1	623.0	746.0	827.0	723.0	(630.0)	459
12.3	12.8	13.5	14.0	14.9	15.1	18.9	29.0	28.1	[35.0]	(16.0)	[39]
2 003.4	**2 166.3**	**2 168.8**	**1 940.5**	**2 007.5**	**2 138.6**	**2 235.5**	**2 659.0**	**2 966.9**	**2 781.7**	**[2 390.0]**	3 019

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
[810]	909	1 023	1 088	1 177	1 273	1 322	1 361	1 360	1 367	1 879	. .
. .	. .	. .	. .	. .	. .	. .	. .	. .	333	545	700
7 306	8 084	8 651	9 027	9 535	10 170	10 840	11 747	14 438	16 803	18 571	20 283
23.7	25.5	28.3	35.2	41.9	45.9	49.0	53.2	59.8	66.8	76.6	89.6
1 029	1 208	2 059	2 575	2 240	2 307	2 588	2 975	3 730	4 350	4 590	5 160
59.6	59.7	62.0	65.4	69.1	78.0	113.0	177.0	183.0	[250.0]	128.0	. .

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
3.8	3.6	3.6	3.4	3.1	3.1	3.1	3.0	. .	. .	. .
. .	. .	[0.4]	[0.5]	0.6	0.6	0.6	0.6	0.6	0.6	. .
2.4	2.6	4.0	4.5	3.5	3.4	3.5	[3.7]	[4.4]	7.3	6.4
0.8	0.8	0.8	0.8	0.8	0.7	1.0	1.4	1.4	[1.9]	. .

Table 6B.17. Far East: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Burma[a]	64.7	77.4	70.8	74.8	79.2	85.1	86.0	89.3	85.4	90.5	100.0
Indonesia	253.0	224.0	182.0	179.0	222.0	281.0	285.0	336.0	373.0	263.0	181.0
Japan	870.4	843.6	795.3	785.8	778.6	786.3	804.1	798.3	826.9	905.4	960.4
Khmer Rep.	. .†	. .	. .	. .	. .	. .	49.2	41.5	41.7	43.8	41.9
Korea, North	. .	. .	. .	. .	. .	. .	. .	. .	[225.0]	[250.0]	[280.0]
Korea, South	119.1	141.3	113.6	110.1	141.6	167.6	175.4	172.5	179.6	207.3	171.9
Laos	. .	. .	. .	. .	. .	. .	. .	. .	. .	64.9	41.1
Malaysia	68.5	64.4	57.8	52.7	54.9	57.3	50.6	46.6	39.4	39.8	53.4†
Mongolia[a]	. .	. .	. .	. .	. .	. .	. .	. .	[15.0]	[15.0]	[15.0]
Philippines	49.6	47.4	46.4	46.7	47.8	50.0	51.8	51.5	66.3	51.3	51.4
Singapore	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Taiwan	91.9	. .	153.2	157.8	172.0	215.0	244.0	226.0	210.0	224.0	271.0
Thailand	65.8	65.5	56.3	50.4	91.2	76.3	81.9	80.2	84.6	88.6	91.3
Viet-Nam, North	. .	. .†	. .	. .	. .	. .	. .	. .	[340.0]	[390.0]	[485.0]
Viet-Nam, South	. .	. .†	. .	. .	. .	308.8	305.3	386.0	396.0	555.0	588.0
Total Far East	**[1760.0]**	**[1765.0]**	**[1770.0]**	**[1 910.0]**	**[2 240.0]**	**[2 525.0]**	**[2 650.0]**	**[2 800.0]**	**[2 940.0]**	**3 188.6**	**3 331.4**

[a] At current prices and 1970 exchange rates.
[b] 1972.

Table 6B.18. Far East: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Brunei	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Burma	*mn kyats*	308.9	369.6	338.0	357.3	378.3	406.5	410.8	426.3	407.7	431.9
Indonesia	*mn new rupiah*	3.9	3.6	3.9	4.4	6.1	11.1	14.1	21.7	31.7	57.4
Japan	*bn yen*	157.5	162.0	151.3	149.5	152.3	153.8	159.3	163.3	178.3	208.5
Khmer Rep.	*mn riels*	. .	. .	. .	. .	. .	. .	1 656	1 495	1 610	1 736
Korea, North	*mn won*	. .	. .	. .	. .	. .	. .	. .	. .	[270]	[300]
Korea, South	*bn won*	2.7	4.4	5.9	7.1	11.3	12.8	14.0	14.8	16.7	20.5
Laos	*mn kips*	. .	. .	. .	. .	. .	. .	. .	. .	. .	2 712
Malaysia	*mn dollars*	210.1	184.4	160.5	148.1	160.6	166.2	142.3	131.3	110.9	112.0
Mongolia	*mn tugriks*	. .	. .	. .	. .	. .	. .	. .	. .	[60]	[60]
Philippines	*mn pesos*	171.8	162.3	157.2	161.6	169.1	182.4	186.9	193.4	201.5	207.6
Singapore	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Taiwan	*bn dollars*	1.5	. .	2.8	3.2	3.8	4.8	6.0	6.6	6.6	7.2
Thailand	*mn baht*	961.0	943.6	855.2	816.7	1 566.7	1 389.7	1 420.5	1 378.4	1 473.0	1 580.0
Viet-Nam, South	*bn piastres*	. .	. .	. .	. .	. .	6.0	6.1	[7.6]	[8.3]	12.0

Table 6B.19. Far East: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Burma	*5.8*	*6.7*	*5.9*	*6.0*	*6.0*	*6.4*	*6.1*	*6.0*	*5.7*	*5.9*
Indonesia	. .	. .	. .	. .	. .	. .	. .	*5.4*	*6.3*	*4.4*
Japan	*2.2*	*2.1*	*1.8*	*1.5*	*1.4*	*1.3*	*1.2*	*1.1*	*0.9*	*1.0*
Khmer Rep.	. .	. .	. .	. .	. .	. .	. .	. .	. .	*7.5*
Korea, South	*5.7*	*6.6*	*5.1*	*4.7*	*5.8*	*6.2*	*6.4*	*6.0*	*5.7*	*5.9*
Malaysia	. .	. .	*3.2*	*2.9*	*3.1*	*3.4*	*2.6*	*2.2*	*1.9*	*1.8*
Philippines	*2.0*	*1.8*	*1.7*	*1.6*	*1.6*	*1.6*	*1.5*	*1.4*	*1.4*	*1.3*
Singapore	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Taiwan	*6.5*	. .	*9.3*	*9.3*	*9.4*	*14.1*	*14.3*	*12.9*	*13.2*	*14.0*
Thailand	*3.0*	*2.8*	*2.4*	*2.1*	*3.4*	*2.9*	*2.8*	*2.6*	*2.5*	*2.5*
Viet-Nam, South	. .	. .	. .	. .	. .	. .	. .	*6.6*	*7.0*	*10.1*

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
97.7	107.0	105.2	101.8	104.3	114.1	121.9	125.0	[128.0]	. .	. .	*[113.0]*[b]
142.0	127.0	79.0	171.0	221.0	284.0	301.0	340.0	382.0	361.0	. .	*477.0*
1 056.4	1 095.6	1 169.2	1 253.1	1 338.0	1 453.9	1 594.8	1 763.0	2 001.0	2 061.0	[1 914.0]	*3 365.0*
45.7	41.4	42.9	45.1	47.2	49.9	124.8	107.0	142.0	. .	. .	*110.0*[b]
[300.0]	[350.0]	[350.0]	[465]	630	700	(745)	(892.0)	1 045.0	1 068.0	1 307.0	*1 155.0*
162.0	170.6	208.1	231.2	272.8	314.7	324.6	383.0	435.0	441.0	(436.0)	*453.0*
31.0	41.2	41.4	38.7	36.7	36.2	38.0	39.0	34.0	31.0	(25.0)	*20.0*
75.1	105.0	129.6	120.2	124.6	121.0	165.0	185.0	183.0	190.0	(177.0)	*280.0*
[15.0]	[15.0]	[15.0]	[20.0]	[25.0]	[33.0]	[38.0]	42.0	(48.0)	53.0	(90.0)	*64.0*
49.0	49.0	53.0	59.0	67.0	75.0	85.0	79.0	89.0	105.0	. .	*140.0*
. .	. .†	20.0	25.7	32.6	97.4	104.4	142.0	203.0	164.0	[122.0]	*265.0*
330.0	370.0	438.0	[447.0]	485.0	[482.0]	482.0	585.0	631.0	(625.0)	[480.0]	*767.0)*
96.9	103.7	112.1	128.9	154.4	180.9	210.0	248.0	260.0	254.0	(226.0)	*304.0*
[585.0]	[620.0]	[640.0]	[630.0]	[630.0]	[585.0]	[585.0]	[585.0]	[585.0]	[520.0]	. .	*[520.0]*
597.0	1 026.0	781.9	815.9	873.0	920.0	938.0	960.0	1 012.0	973.0	737.0	*569.0*
3 582.8	**4 221.5**	**4 185.4**	**4 552.6**	**5 041.6**	**5 447.1**	**5 857.5**	**6 475.0**	**7 178.0**	**[7 130.0]**	**[6 800.0]**	*8 602.0*

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
. .	8.7	29.3	32.3	27.9	27.5	19.4	51.0	38.0	. .	37.0	60.0
477.7	466.3	510.7	502.2	485.9	498.1	544.9	582.2	599.0	[610.0]	. .	. .
92.4	145.0	522.0	3 760	21 600	63 100	86 000	102 200	120 475	144 450	178 525	. .
238.0	272.0	300.5	337.0	375.5	422.5	483.0	570.3	669.0	794.0	913.0	1 055.0
1 764	1 899	1 846	1 851	2 025	2 154	2 478	5 966	10 206	16 956	. .	. .
[336]	[360]	[420]	[420]	[420]	[755]	[840]	(865)	(1 070)	1 254	1 282	1 568
20.5	24.9	29.9	40.7	50.0	65.4	84.9	101.6	136.1	172.7	180.7	221.6
3 312	4 935	7 391	8 463	8 531	8 511	8 672	9 131	9 375	10 330	12 161	14 500
154.9	217.0	303.0	379.5	366.6	379.3	367.3	510.0	581.0	591.0	681.0	. .
[60]	[60]	[60]	[60]	[80]	[100]	[130]	[150]	169	(191)	213	(362)
219.2	227.0	237.0	270.0	318.0	365.0	421.0	500.0	572.0	752.0	949.0	. .
. .	. .	. .	60	78.9	100.8	300.0	322.5	448.0	652.0	650.0	[595.0]
8.9	10.8	12.1	14.6	15.4	17.8	[18.5]	19.3	24.0	27.1	(29.4)	(29.4)
1 643.0	1 778.0	1 921.0	2 150.8	2 575.2	3 151.7	3 768.7	4 420.0	5 319.0	5 788.0	6 318.0	6 960.0
13.6	14.3	28.5	35.2	52.8	72.0	92.0	128.3	155.2	205.0	285.0	336.0

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
6.1	*6.0*	*6.1*	*6.0*	*5.5*	*5.1*	*5.4*	*5.6*	*5.7*	*[5.5]*	. .
2.8	*0.8*	*1.3*	*1.2*	*2.5*	*3.0*	*3.2*	*3.1*	*3.2*	*3.2*	. .
1.0	*0.9*	*0.9*	*0.9*	*0.9*	*0.8*	*0.8*	*0.8*	*0.8*	*0.9*	. .
6.9	*7.1*	*6.1*	*5.9*	. .	. .	. .	. .	. .	. .	. .
4.2	*3.6*	*3.7*	*4.0*	*4.1*	*4.2*	*4.1*	*3.9*	*4.3*	*4.5*	*3.7*
2.4	*3.1*	*4.0*	*4.8*	*4.4*	*4.4*	*3.8*	*5.1*	*5.5*	*5.2*	*4.8*
1.2	*1.1*	*1.1*	*1.3*	*1.4*	*1.5*	*1.2*	*1.2*	*1.2*	*1.3*	. .
. .	. .	. .	. .	*2.0*	*2.2*	*5.9*	*5.4*	*6.5*	*8.3*	*6.7*
12.8	*11.7*	*[11.3]*	*[11.5]*	*[11.2]*	*[11.1]*	*[9.7]*	*8.8*	*9.6*	*9.3*	*(8.2)*
2.4	*2.4*	*2.3*	*2.1*	*2.4*	*2.7*	*2.9*	*3.3*	*3.7*	*3.6*	*3.4*
9.4	*16.8*	*21.2*	*16.0*	*15.8*	*20.1*	*17.2*	*16.5*	*16.2*	*18.9*	*18.3*

Table 6B.20. Oceania: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Australia	636.0	577.0	598.0	583.0	534.0	525.0	537.0	534.0	542.0	564.0	596.0
New Zealand	109.8	94.7	89.2	89.3	86.2	85.0	88.0	89.8	84.4	82.4	84.3
Total Oceania	**745.8**	**671.7**	**687.2**	**672.3**	**620.2**	**610.0**	**625.0**	**623.8**	**626.4**	**646.4**	**680.3**

Table 6B.21. Oceania: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Australia	*mn dollars*	373.0	342.0	362.0	372.0	351.0	349.0	365.0	376.0	391.0	406.0
New Zealand	*mn dollars*	55.0	49.5	48.1	49.6	48.8	50.4	53.7	55.5	53.1	53.2

Table 6B.22. Oceania: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Australia	*4.3*	*3.6*	*3.6*	*3.4*	*3.0*	*2.9*	*2.8*	*2.6*	*2.7*	*2.6*
New Zealand	*3.3*	*2.7*	*2.5*	*2.4*	*2.2*	*2.2*	*2.2*	*2.1*	*1.9*	*1.8*

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
714.0	882.0	1 014.0	1 123.0	1 221.0	1 233.0	1 200.0	1 188.0	1 190.0	1 164.0	(1 111.0)	*1 538*
100.0	111.0	117.0	109.0	116.0	120.0	132.0	123.0	125.0	122.0	122.0	*190*
814.0	**993.0**	**1 131.0**	**1 232.0**	**1 337.0**	**1 353.0**	**1 332.0**	**1 311.0**	**1 315.0**	**1 286.0**	**1 233.0**	*1 728*

Local currency, current prices

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
529.0	678.0	804.0	918.0	1 025.0	1 065.0	1 077.0	1 131.0	1 199.0	1 284.0	1 416.0
68.0	78.0	85.0	84.0	93.0	101.0	118.0	122.0	132.0	140.0	155.0

Per cent

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
2.7	*3.4*	*3.7*	*3.9*	*4.0*	*3.7*	*3.4*	*3.3*	*3.1*	. .
2.0	*2.1*	*2.1*	*2.0*	*2.1*	*2.1*	*2.2*	*2.0*	*1.9*	. .

Table 6B.23. Africa: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Algeria[a]	. .	. .	. .	. .	. .	. .	. .	. .	. .	65 †	79
Burundi	. .	. .	. .	. .	. .	. .	. .	. .	. .	(1.2) †	(1.4)
Cameroon	. .	. .	. .	. .	. .	. .	. .	11.3 †	14.4	17.6	14.9
Central African Republic	. .	. .	. .	. .	. .	. .	. .	. . †	1.4	1.3	1.3
Chad	. .	. .	. .	. .	. .	. .	. .	. . †	. .	1.7	1.9
Congo	. .	. .	. .	. .	. .	. .	. .	. . †	2.5	4.4	(4.5)
Dahomey[a]	. .	. .	. .	. .	. .	. .	. .	. . †	(1.7)	(2.4)	(2.8)
Ethiopia	. .	. .	. .	. .	. .	. .	(20.0)	24.9	(27.3)	29.3	31.5
Gabon	. .	. .	. .	. .	. .	. .	. .	. . †	1.2	1.8	2.7
Ghana	. .	. .	8.9	14.3	17.5	17.9	18.7	30.6	41.9	41.1	36.9
Guinea[a]	. .	. .	. .	. .	. .	. . †	. .	. .	4.1	6.1	6.1
Ivory Coast	. .	. .	. .	. .	. .	. .	. .	. . †	4.7	10.2	9.4
Kenya	. .	. .	. .	6.5	6.9	6.0	5.5	3.1	1.1	0.8	2.1 †
Liberia	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	(3.4)
Libya	. .	. .	. .	. .	. .	. .	(6.1)	(5.9)	(7.3)	(16.6)	(18.1)
Malagasy Rep.	. .	. .	. .	. .	. .	. .	. .	1.9 †	9.7	10.3	9.8
Malawi	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Mali[a]	. .	. .	. .	. .	. .	. .	. .	. . †	. .	3.6	3.8
Mauritania	. .	. .	. .	. .	. .	. .	. .	. . †	[2.7]	[3.9]	4.7
Mauritius	. .	. .	. .	. .	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Morocco	. .	. .	. .	32.7	44.5	52.2	51.6	52.1	59.4	63.1	82.9
Niger	. .	. .	. .	. .	. .	. .	. .	. . †	1.3	1.5	2.0
Nigeria	7.4	[7.6]	7.3	7.3	8.6	20.1	23.8	26.3 †	25.6	31.2	39.3
Rhodesia, S.	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Rwanda	. .	. .	. .	. .	. .	. .	. .	. .	. .	. . †	[1.9]
Senegal	. .	. .	. .	. .	. .	. .	. .	. . †	5.0	7.4	11.8
Sierra Leone	. .	. .	. .	. .	. .	. .	. .	. .	2.3 †	2.4	2.6
Somalia	. .	. .	. .	. .	. .	. .	. .	. . †	4.4	5.1	6.1
South Africa	90	85	86	96	101	75	71	81	128	206	209
Sudan	8.4	10.3	11.7	13.0	17.5	19.9	21.8	24.6	25.1	28.5	31.9
Tanzania	. .	. .	. .	. .	. .	. .	. .	. .	. . †	1.7	3.0
Togo	. .	. .	. .	. .	. .	. .	. .	. . †	(0.3)	(0.6)	0.9
Tunisia	. .	. .	. .	3.6 †	6.1	10.4	16.1	18.6	20.7	16.5	17.3
Uganda	. .	. .	3.0	3.2	3.1	2.9	2.9	1.6	0.2	1.1 †	4.0
Upper Volta	. .	. .	. .	. .	. .	. .	. .	1.5 †	1.8	5.0	5.1
Zaire	. .	. .	. .	. .	. .	. .	. .	. . †	. .	. .	25.2
Zambia	. .	. .	. .	. .	. .	7.6	. .	10.4	15.2	16.2	17.0
Total Africa	**[130.0]**	**[130.0]**	**[150.0]**	**[215.0]**	**[250.0]**	**[250.0]**	**[260.0]**	**[305.0]**	**[450.0]**	**[645.0]**	**[705.0]**

[a] At current prices and 1970 exchange rates.
[b] 1972.
[c] 1971.

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
86	99	99	99	99	99	99	99	101	110	177	*132*
(1.6)	2.4	2.5	2.7	2.8	2.7	3.1	3.0	3.3	. .	. .	*4*[b]
14.5	15.3	16.3	17.6	18.5	19.6	19.8	20.0	21.9	(23.8)	. .	*38*
2.7	2.3	2.4	3.3	4.2	5.5	4.9	4.9	4.2	5.1	. .	*8*
2.1	3.7	6.0	(8.0)	(8.1)	8.6	12.6	13.3	[13.0]	. .	. .	*[15]*[b]
5.3	5.3	7.4	8.3	7.7	8.5	[10.1]	[9.7]	[8.8]	[11.3]	13.6	*[16]*
(3.3)	(3.6)	3.2	3.6	3.6	4.0	4.3	4.7	[5.0]	5.1	. .	*6*
38.0	40.0	37.0	41.5	46.0	46.0	43.0	46.0	52.0	50.0	53.0	*62*
2.1	3.1	3.0	2.9	2.9	4.2	4.6	5.6	5.5	. .	. .	*6*[b]
33.4	29.7	28.0	45.7	50.3	47.6	42.0	40.0	37.2	. .	. .	*34*[b]
6.4	11.1	13.2	14.0	14.2	14.6	[18.0]	[16.8]	[17.2]	. .	. .	*[19]*[b]
12.9	14.5	14.3	15.5	16.3	16.4	17.6	19.4	19.6	19.7	. .	*27*
6.7	10.8	13.6	16.4	16.7	16.1	17.7	22.4	24.9	26.9	. .	*33*
3.3	3.5	3.4	3.8	3.1	3.3	3.8	4.3	3.6	2.9	. .	*4*
20.3	25.9	48.4	136.5	216.1	330.4	[365.0]	[390.0]	[405.0]	[400.0]	[290.0]	*[500]*
9.8	10.7	11.0	11.6	12.4	12.5	12.1	13.1	11.7	. .	. .	*14*
(1.0) †	(1.1)	(1.4)	(1.5)	1.5	1.6	1.4	1.6	1.7	3.2	. .	*4*
4.2	4.3	4.1	4.3	4.2	5.3	6.1	5.7	7.6	8.4	. .	*11*
2.2	2.3	2.1	2.2	2.3	2.4	2.4	2.4	. .	. .	. .	*3*[c]
0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	. .	*1*
74.5	65.1	68.2	73.7	86.3	92.9	87.7	94.0	104.2	133.5	(123.0)	*180*
2.1	2.3	2.8	3.3	3.7	3.5	3.8	4.2	[4.6]	[3.6]	(3.2)	*6*
44.5	51.9	44.0	152.9	262.4	493.6	455.0	358.0	420.0	474.0	(321.0)	*623*
16.0	19.3	18.8	21.1	22.2	22.0	25.5	27.5	33.0	41.9	(51.0)	*47*
[2.1]	2.6	4.7	4.6	4.5	4.0	4.5	4.9	4.9	[4.4]	. .	*6*
15.3	14.6	14.5	15.6	16.5	16.8	16.9	17.2	16.9	16.6	. .	*24*
2.6	2.7	2.4	2.3	2.8	3.4	3.7	4.1	3.1	(4.0)	. .	*4*
6.6	5.5	7.1	8.4	9.0	9.0	11.2	11.4	13.3	[13.1]	(11.7)	*[15]*
293	300	325	361	381	393	365	398	410	504	(656)	*643*
40.7	49.9	54.2	54.5	69.1	81.0	99.0	106.0	99.0	86.6	[77.0]	*115*
5.7	8.3	10.4	12.5	12.1	14.9	24.5	31.0	28.2	32.7	(31.0)	*43*
(2.7)	(2.9)	2.4	2.6	2.7	2.8	3.0	3.2	3.5	3.8	. .	*6*
20.1	16.3	18.6	17.3	21.1	20.2	22.5	22.7	25.9	25.4	(285)	*34*
9.3	14.5	17.5	20.0	25.4	25.0	23.5	44.0	51.7	31.1	. .	*44*
5.1	3.4	3.7	3.7	3.7	3.8	4.2	4.2	(3.9)	[4.0]	. .	*6*
33.9	86.9	78.1	65.8	53.6	63.0	96.0	90.9	75.0	[55.0]	(51.0)	*[102]*
8.5 †	22.5	21.4	23.7	26.2	19.1	22.5	66.0	83.0	52.0	(54.0)	*77*
838.8	**957.6**	**1 010.4**	**1 281.7**	**1 532.5**	**1 916.6**	**1 956.4**	**2 009.6**	**[2 125.0]**	**[2 250.0]**	**[2 200.0]**	*2 912*

Table 6B.24. Africa: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Algeria	*mn dinars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	320
Burundi	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	. .	85.9
Cameroon	*mn francs*	. .	. .	. .	. .	. .	. .	. .	2 186	2 841	3 550
Central African Republic	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	250	250
Chad	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	. .	319
Congo	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	500	915
Dahomey	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	(480)	(655)
Ethiopia	*mn dollars*	. .	. .	. .	. .	. .	. .	33	41	46	50
Gabon	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	245	370
Ghana	*mn cedis*	. .	. .	4.0	6.7	8.3	8.5	9.1	14.9	21.9	23.4
Guinea	*mn sily*	. .	. .	. .	. .	. .	. .	. .	. .	100	150
Ivory Coast	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	990	2 148
Kenya	*mn pounds*	. .	. .	. .	1.8	2.0	1.8	1.6	0.9	0.3	0.2
Liberia	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Libya	*mn dinars*	. .	. .	. .	. .	. .	. .	1.4	1.4	1.8	4.2
Malagasy Rep.	*mn francs*	. .	. .	. .	. .	. .	. .	. .	396	2 094	2 266
Malawi	*mn kwachas*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Mali	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	. .	2 020
Mauritania	*mn rupees*	. .	. .	. .	. .	. .	. .	. .	. .	[100]	[150]
Mauritius	*mn rupees*	. .	. .	. .	. .	2.0	2.0	2.0	1.6	1.3	1.4
Morocco	*mn dirhams*	. .	. .	. .	116	165	198	198	210	244	272
Niger	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	260	300
Nigeria	*mn nairas*	2.6	[2.8]	2.8	3.0	3.6	8.4	10.4	12.2	12.6	16.0
Rhodesia, S.	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Rwanda	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Senegal	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	1 110	1 725
Sierra Leone	*mn leones*	. .	. .	. .	. .	. .	. .	. .	. .	1.3	1.4
Somalia	*mn shillings*	. .	. .	. .	. .	. .	. .	. .	. .	22.6	26.4
South Africa	*mn rands*	41.5	39.5	42.4	48.4	51.7	40.2	38.0	44.0	71.1	116.4
Sudan	*mn pounds*	1.8	2.4	2.8 †	3.0	4.1	5.0	5.4	6.1	6.8	7.9
Tanzania	*mn shillings*	. .	. .	. .	. .	. .	. .	. .	. .	. .	10.0
Togo	*mn francs*	. .	. .	. .	. .	. .	. .	. .	. .	66.3	144.3
Tunisia	*mn dinars*	. .	. .	. .	1.4	2.5	4.4	6.6	7.4	8.6	6.6
Uganda	*mn shillings*	. .	. .	12.9	15.0	14.7	14.2	14.0	7.5	1.0	4.0
Upper Volta	*mn francs*	. .	. .	. .	. .	. .	. .	. .	311	403	1 201
Zaire	*mn zaires*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Zamiba	*mn kwachas*	. .	. .	. .	. .	. .	3.4	. .	4.8	7.2	7.8

[a] GDP figure used excludes Eastern states.

[b] GDP at factor cost.

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
390	425	490	490	490	490	490	488	491	500	545	874
99.9	118.9	181.9	199.8	212.0	237.0	235.0	273.0	276.0	315.0	. .	. .
3 350	3 450	3 700	4 050	4 500	4 800	5 150	5 500	5 808	6 850	8 255	. .
250	580	547	588	827	1 109	1 451	1 351	1 468	1 325	1 714	. .
367	441	820	1 426	(1 950)	(2 000)	2 190	3 500	3 925	[3 950]	. .	. .
990	1 235	1 235	1 910	2 218	2 130	2 336	[2 800]	[2 800]	[2 800]	[3 700]	4 610
(765)	(905)	995	900	1 000	[1 000]	[1 100]	[1 200]	1 300	[1 350]	1 412	. .
55	67	79	83	92	102	104	108	115	122	129	149
620	500	740	740	740	740	1 130	1 285	1 610	1 660	. .	. .
21.9	22.2	25.4	25.5	39.0	47.2	46.8	43.1	42.7	43.6	. .	. .
150	157	275	325	345	350	360	[445]	[415]	[425]	. .	. .
1 976	2 742	3 162	3 260	3 600	4 000	4 185	4 900	5 335	5 425	6 025	. .
0.7	2.1	3.5	4.7	5.7	5.8	5.6	6.3	8.1	9.8	11.4	. .
2.6	2.6	2.8	2.8	3.3	2.8	3.3	3.8	4.3	3.8	3.6	. .
4.7	5.4	7.3	15.0	43.0	71.0	[118.0]	[130.0]	[135.0]	[140.0]	[150.0]	119.0
2 211	2 334	2 644	2 800	2 990	3 220	3 380	3 370	3 840	3 625	. .	. .
. .	0.7	0.8	1.0	1.1	1.1	1.2	1.2	1.4	1.6	3.1	. .
2 130	2 330	2 400	[2 260]	[2 365]	[2 340]	[2 950]	[3 400]	3 175	4 200	4 685	. .
197	99	104	100	108	117	125	135	142	. .	. .	. .
1.5	1.5	1.5	1.5	1.5	1.5	[1.8]	[2.0]	2.0	3.0	3.0	. .
379	354	320	332	356	419	464	444	493	570	760	815
430	465	540	710	855	915	960	[1 050]	1 215	[1 450]	[1 275]	(1 160)
19.6	23.4	28.2	26.0	87	150	310	325	290	350	410	355
. .	10.2	12.6	12.6	14.4	15.5	15.4	18.2	20.2	25.0	[32.7]	42.9
130	[180]	220	480	391	360	450	480	525	520	. .	. .
2 840	3 800	3 750	3 800	4 050	4 300	4 550	4 700	4 900	4 970	5 240	. .
1.5	1.7	1.8	1.7	1.7	2.1	2.6	[3.1]	[3.3]	[2.6]	3.6	. .
32.0	38.7	36.9	46.4	53.8	59.6	64.3	80.0	81.0	92.0	[96.0]	100.0
118.7	170.7	181.6	203.8	234.3	251.0	267.2	260.7	301.7	331.0	(445.0)	647.0
9.2	12.2	14.6	16.1	18.0	20.5	27.0	34.5	37.5	(39.0)	40.0	(44.0)
17.1	33.2	51.2	67.6	83.0	83.0	103	175	233	250	(305)	330
228.6	682.2	678.4	610	650	670	735	830	960	1 104	1 261	. .
7.1	8.6	7.4	8.8	8.4	10.5	10.5	11.8	12.6	14.7	15.0	17.5
19.5	48.0	85.0	101.9	120.3	148	163	168	360	415	310	. .
1 294	1 313	860	960	910	930	1 045	1 160	1 205	1 230	1 400	. .
3.3	6.1	51.3	15.9	18.3	22.9	30.1	48.0	47.7	50.1	[51.0]	52.0
8.0	4.2	12.0	1 216	14.6	17.9	13.3	16.1	50.0	66.3	44.5	50.0

Table 6B.25. Africa: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Algeria	..	..	..	..	..	..	..	..	..	[2.7]
Burundi	..	..	..	..	..	..	..	..	..	..
Cameroon	..	..	..	..	..	..	..	..	..	[2.5]
Central African Republic	..	..	..	..	..	..	..	..	0.7	0.7
Chad	..	..	..	..	..	..	..	..	..	0.1
Congo	..	..	..	..	..	..	..	..	[1.5]	[2.6]
Dahomey	..	..	..	..	..	..	..	..	(1.3)	(1.7)
Ethiopia	..	..	..	..	..	..	..	1.7	1.9	2.0
Gabon	..	..	..	..	..	..	..	..	0.7	0.9
Ghana	..	..	0.6	0.9	1.1	1.1	1.0	1.6	2.1	2.1
Guinea	..	..	..	..	..	..	..	..	[2.0]	[2.7]
Ivory Coast	..	..	..	..	..	..	..	..	0.6	1.3
Kenya	..	..	..	0.9	1.0	0.8	0.7	0.4	0.1	0.1
Liberia	..	..	..	..	..	..	..	..	..	..
Libya	..	..	..	..	..	..	..	..	..	2.4
Malagasy Rep.	..	..	..	..	..	..	..	0.3	[1.5]	1.5
Malawi	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	[2.3]	[3.1]
Mauritius	..	..	..	..	0.3	0.3	0.3	0.2	0.2	0.2
Morocco	..	..	..	1.7	2.3	2.4	2.4	2.3	2.7	2.6
Niger	..	..	..	..	..	..	..	..	0.5	0.5
Nigeria	0.2	[0.2]	0.2	0.2	0.2	0.4	0.5	0.5	0.5	0.6
Rhodesia, S.	..	..	..	..	..	..	..	..	..	..
Rwanda	..	..	..	..	..	..	..	..	..	..
Senegal	..	..	..	..	..	..	..	..	0.7	1.1
Sierra Leone	..	..	..	..	..	..	..	..	..	[0.7]
Somalia	..	..	..	..	..	..	..	..	..	..
South Africa	1.2	1.0	1.0	1.1	1.1	0.8	0.8	0.8	1.3	2.0
Sudan	..	..	..	1.0	1.2	1.5	1.5	1.6	1.7	1.8
Tanzania	..	..	..	..	..	..	..	..	..	0.2
Togo	..	..	..	..	..	..	..	..	[0.2]	[0.5]
Tunisia	..	..	..	..	..	..	..	2.2	2.3	1.8
Uganda	..	..	0.5	0.5	0.5	0.5	0.5	0.3	0.03	0.1
Upper Volta	..	..	..	..	..	..	..	(0.7)	[0.8]	[2.3]
Zaire	..	..	..	..	..	..	..	..	..	..
Zambia	..	..	..	..	..	1.2	..	1.1	1.8	1.9

[a] GDP figure used excludes Eastern states.
[b] GDP at factor cost.

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
(3.1)	[3.5]	[3.4]	[3.4]	[3.0]	(2.7)	(2.4)	[2.1]	..	..	..
(1.4)	..	..	..	..	(1.5)	(1.4)	(1.5)	..	..	..
2.2	2.1	2.1	2.2	2.2	2.0	2.0	1.9	..	..	..
0.7	1.5	(1.3)	(1.3)	1.8	2.2	[2.7]	2.4	..	..	..
0.6	0.7	..	..	..	..	..	(4.7)	..	..	..
(2.7)	[3.2]	[2.9]	[4.2]	[4.6]	(4.0)	(4.0)	[4.4]	[4.0]	..	..
(1.9)	(2.1)	2.2	1.9	2.1	2.0	[2.0]	[2.0]	[2.0]	[2.0]	..
2.1	2.3	2.4	2.5	2.6	2.7	2.6	2.4	2.4	2.6	..
1.4	1.0	1.5	1.3	1.3	1.0	1.3	1.4	[1.4]	1.5	..
1.8	1.6	1.6	1.7	2.6	2.8	2.3	1.9	1.7	1.5	..
(2.7)	..	..	..	..	(4.9)	(4.6)	..	..	..	..
1.0	1.1	1.3	1.3	1.3	1.2	1.1	1.2	1.2	1.1	..
[0.2]	0.6	1.0	1.1	1.3	1.2	1.1	1.1	1.3	1.4	1.4
0.9	0.9	0.9	0.9	0.9	0.7	0.8	0.9	1.0	0.8	..
1.9	1.4	1.4	2.3	5.5	6.4	[9.3]	[9.8]	[8.9]	[8.8]	..
(1.5)	1.5	1.6	1.5	1.6	1.5	1.5	1.4	..	..	..
..	0.5	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.7
3.6	1.4	(1.4)	[1.2]	[1.2]	1.2	(1.3)	[1.3]	[1.3]	..	..
0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	..
3.2	2.8	2.4	2.9	2.9	3.1	3.3	3.0	3.0	3.2	4.0
0.7	0.7	0.7	0.7	0.9	1.0	1.0	..	..	..	..
0.7	0.7	0.8	0.7	2.8	5.2	8.7	6.4	..	..	..
..	1.5	1.7	1.7	1.8	1.8	1.6	1.7	1.6	1.8	2.2
..	..	..	..	2.6	2.4	2.0	2.1	1.8	..	..
1.6	2.0	2.0	1.8	2.0	2.0	2.1	2.0	2.2	1.9	..
[0.7]	0.7	0.7	0.6	0.6	0.7	0.8	0.9	0.9	..	..
(2.7)	..	..	..	..	..	(3.9)	..	..	..	..
1.8	2.5	2.4	2.4	2.5	2.5	2.3	2.1	2.2	2.1	2.4
2.0	2.6	3.0	3.2	3.5	3.7	4.6	5.6	5.4	..	..
0.3	0.6	0.8	1.0	1.1	1.1	1.2	1.9	2.4	2.2	2.4
0.7	1.8	1.6	1.1	1.1	1.1	1.1	1.1	1.2	1.3	..
1.8	2.0	1.5	1.6	1.5	1.7	1.5	1.6	1.5	1.4	1.4
0.4	0.9	1.4	1.7	1.9	2.0	2.0	1.8	3.5	..	..
(2.4)	[2.4]	1.5	1.6	[1.9]	1.6	..	..	..	..	..
..	..	..	..	..	3.2	3.4	3.4	..	..	..
1.9	0.8	1.8	1.6	1.6	1.8	1.1	1.4	4.5	5.4	..

Table 6B.26. Central America: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Costa Rica	2.2	2.4	2.4	2.4	2.7	2.6	2.6	2.6	2.5	2.6	2.5
Cuba[a]	. .	. .	. .	. .	. .	. .	. .	. .	175	200	215
Dominican Rep.	. .	. .	. .	. .	. .	39.9	49.2	39.9	39.1	37.8	35.8
El Salvador	7.2	6.5	7.2	7.6	8.6	8.0	6.7	6.5	6.8	9.5	9.9
Guatemala	6.7	7.4	8.6	9.4	10.0	10.5	10.5	10.2	10.0	9.9	10.9
Haiti	7.0	6.5	6.4	6.5	7.0	8.2	8.5	8.7	9.1	9.9	8.7
Honduras	4.2	4.2	3.9	5.8	5.7	[5.7]	5.8	5.2	8.9	8.9	9.2
Jamaica	. .	. .	. .	. .	. .	. .	. .	. .	. .	1.2†	4.9
Mexico	80.4	64.2	73.4	83.2	98.6	96.5	96.7	106.6	113.9	127.5	140.0
Nicaragua	. .	. .	. .	. .	. .	. .	. .	. .	8.5	9.2	9.3
Panama	. .	. .	. .	. .	. .	. .	. .	. .	. .	0.6	0.6
Trinidad & Tobago	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	2.0
Total Central America	**[230.0]**	**[185.0]**	**[210.0]**	**[235.0]**	**[275.0]**	**[280.0]**	**[290.0]**	**[340.0]**	**373.8**	**417.1**	**448.8**

[a] 1972.

[b] At current prices and 1970 exchange rates.

Table 6B.27. Central America: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Costa Rica	*mn colones*	9.9	11.2	11.6	12.0	13.6	13.2	13.3	13.6	13.5	14.1
Cuba	*mn pesos*	. .	. .	. .	. .	. .	. .	. .	. .	175.0	200.0
Dominican Republic	*mn pesos*	. .	. .	. .	. .	. .	34.5	42.6	33.4	31.6	33.1
El Salvador	*mn colones*	15.4	14.5	16.4	17.4	19.2	19.0	15.6	15.3	15.5	21.7
Guatemala	*mn quetzales*	6.0	6.7	8.0	8.8	9.3	9.8	9.8	9.4	9.2	9.3
Haiti	*mn gourdes*	26.3	25.7	25.9	27.2	29.7	35.0	34.4	33.3	35.5	38.8
Honduras	*mn lempiras*	6.1	6.4	6.4	9.3	8.9	[9.1]	9.3	8.2	14.4	14.5
Jamaica	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	0.7
Mexico	*mn pesos*	479.0	405.0	533.0	632.0	792.0	862.0	883.0	1 021.0	1 111.0	1 258.0
Nicaragua	*mn cordobas*	. .	. .	. .	. .	. .	. .	. .	. .	49.2	53.2
Panama	*mn balboas*	. .	. .	. .	. .	. .	. .	. .	. .	. .	0.5
Trinidad & Tobago	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

Table 6B.28. Central America: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Costa Rica	*0.6*	*0.6*	*0.6*	*0.6*	*0.6*	*0.5*	*0.5*	*0.5*	*0.5*	*0.4*
Cuba[a]	. .	. .	. .	. .	. .	. .	. .	. .	. .	*7.1*
Dominican Republic	. .	. .	. .	. .	. .	*4.8*	*6.1*	*4.6*	*4.5*	*3.7*
El Salvador	. .	. .	. .	. .	. .	*1.4*	*1.2*	*1.1*	*1.1*	*1.4*
Guatemala	*0.8*	*0.9*	*1.0*	*1.0*	*1.0*	*0.9*	*0.9*	*0.9*	*0.9*	*0.8*
Haiti	. .	. .	. .	. .	. .	. .	. .	[2.2]	. .	. .
Honduras	*1.0*	*1.1*	*1.0*	*1.4*	*1.3*	[*1.3*]	*1.2*	*1.1*	*1.8*	*1.7*
Jamaica	. .	. .	. .	. .	. .	. .	. .	. .	. .	*0.1*
Mexico	*0.8*	*0.6*	*0.6*	*0.6*	*0.7*	*0.7*	*0.6*	*0.7*	*0.7*	*0.7*
Nicaragua	. .	. .	. .	. .	. .	. .	. .	. .	*1.7*	*1.7*
Panama	. .	. .	. .	. .	. .	. .	. .	. .	. .	*0.1*
Trinidad & Tobago	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .

[a] Percentage of net material product.

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
[2.4]	[2.7]	[2.9]	[3.0]	[3.9]	[4.2]	[4.2]	[4.0]	3.7	. .	. .	*4*[a]
220	215	215	250	300	250	290	290	[320]	. .	. .	*[320]*[a]
38.7	36.9	34.7	32.8	33.6	32.6	31.3	31.0	31.0	26.0	26.0	*33*
9.8	10.0	10.2	10.2	12.1	29.5	10.6	11.8	14.1	14.4	. .	*16*
13.6	15.4	15.7	17.4	16.4	16.0	28.7	18.6	19.5	18.3	18.1	*21*
8.6	8.0	7.1	7.4	7.3	7.2	7.2	6.7	6.8	. .	. .	*8*[a]
6.8	6.6	7.7	8.3	7.1	14.9	7.1	9.4	11.5	11.1	. .	*12*
5.1	5.3	5.3	5.6	5.7	5.0	5.5	6.4	6.7	. .	. .	*8*[a]
156.7	157.2	191.7	190.2	203.8	215.5	220.2	242.4	270.0	269.2	[245.0]	*344*
8.7	9.1	9.6	10.4	10.4	10.9	12.1	(11.8)	(14.8)	(15.0)	. .	*18*
0.7	0.6	0.5	0.9	0.9	1.3	1.6	2.8	1.9	1.8	. .	*2*
3.0	2.6	2.5	2.6	2.5	2.7	3.4	3.3	4.3	3.6	. .	*5*
474.1	**469.4**	**502.9**	**538.8**	**603.7**	**589.8**	**621.9**	**638.2**	**704.3**	**[700.0]**	**[680.0]**	*791*

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
14.4	[14.0]	[15.5]	[17.0]	[17.5]	[24.0]	[26.5]	[27.5]	[27.0]	26.5	. .	. .
215.0	220.0	215.0	215.0	250.0	300.0	250.0	290.0	290.0	[320.0]	. .	. .
34.0	37.0	35.0	32.4	31.2	32.5	31.0	31.3	31.9	34.4	32.8	36.0
23.0	23.0	23.6	23.9	24.3	29.5	71.8	26.4	29.5	36.0	39.0	. .
10.2	12.7	14.3	14.7	16.3	15.7	15.6	28.7	18.5	19.5	21.0	24.0
35.7	38.8	36.8	35.4	35.8	35.8	35.2	35.8	37.0	39.0	. .	. .
15.4	12.0	12.0	14.1	15.4	13.6	28.9	14.1	19.3	24.7	24.9	. .
3.0	3.2	3.4	3.5	3.8	4.1	3.8	4.6	5.7	6.3	. .	. .
1 388.0	1 589.0	1 651.0	2 100.0	2 148.0	2 355.0	2 560.0	2 750.0	3 125.0	3 700.0	4 300.0	5 292.0
54.3	53.2	37.2	62.4	70.5	70.9	75.0	86.4	90.0	116.0	130.0	. .
0.5	0.6	0.6	0.5	0.8	0.9	1.3	1.6	2.9	2.0	2.1	. .
3.3	4.9	4.3	4.3	4.5	4.7	5.1	6.7	7.9	9.8	9.3	. .

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
0.4	*[0.4]*	*[0.4]*	*[0.4]*	*[0.5]*	*[0.5]*	*[0.5]*	*[0.4]*	*[0.4]*	*[0.3]*	. .
6.6	*5.5*	*5.5*	*5.7*	. .	. .	. .	. .	. .	. .	. .
3.4	*3.4*	*3.7*	*3.1*	*2.8*	*2.8*	*2.4*	*2.1*	*2.0*	. .	. .
1.4	*1.2*	*1.2*	*1.1*	*1.1*	*1.3*	*3.0*	*1.0*	*1.1*	*1.3*	*1.2*
0.8	*1.0*	*1.1*	*1.1*	*1.1*	*1.0*	*0.9*	*1.5*	*0.9*	*0.9*	*0.8*
2.2	. .	. .	. .	*[1.9]*	*1.7*	*1.5*	*1.4*	*1.4*	*1.4*	. .
1.8	*1.3*	*1.2*	*1.3*	*1.3*	*1.0*	*2.2*	*1.0*	*1.3*	*1.5*	. .
0.5	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.4*	*0.4*	*0.5*	*0.5*	. .
0.7	*0.7*	*0.7*	*0.8*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*
1.7	*1.4*	*1.3*	*1.4*	*1.5*	*1.4*	*1.4*	*1.5*	*1.4*	*1.7*	*1.7*
0.1	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.3*	*0.2*	*0.1*
0.3	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	. .	. .	. .	. .	. .

Table 6B.29. South America: constant price figures

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Argentina	398.2	428.9	341.3	428.8	450.3	467.3	368.5	406.3	396.7	380.3	382.0	351.7
Bolivia	8.2	. .	5.6	4.1	4.7	[5.1]	[5.6]	[7.1]	7.7	7.7	17.4	17.0
Brazil	408	394	450	545	603	619	500	462	417	447	439	472
Chile	125.0	79.7	119.2	114.0	122.3	114.2	91.9	98.4	100.6	101.3	91.9	86.4
Colombia	71.3	84.1	83.2	81.1	72.6	66.7	54.9	62.1	73.7	116.3	128.4	121.0
Ecuador	14.2	19.0	22.0	23.4	22.4	21.6	18.9	25.4	24.4	23.2	20.5	23.7
Guyana	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Paraguay	. .	. .	. .	. .	. .	. .	. .	. .	6.9	6.8	[7.6]	[7.6]
Peru	59.3	55.8	59.6	97.7	88.0	99.4	88.2	86.3	[102.0]	[101.0]	139.3	136.1
Uruguay	. .	. .	. .	. .	. .	. .	. .	. .	23.3	24.8	34.0	33.4
Venezuela	57.5	73.9	92.5	103.4	138.8	159.2	154.3	139.7	134.1	128.5	153.1	158.9
Total South America	**[1 165.0]**	**[1 165.0]**	**[1 200.0]**	**[1 425.0]**	**[1 530.0]**	**[1 585.0]**	**[1 315.0]**	**[1 320.0]**	**1 286.4**	**1 336.9**	**1 413.2**	**1 407.8**

[a] 1970.

Table 6B.30. South America: current price figures

	Currency	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Argentina	*mn new pesos*	37.8	42.5	38.1	54.2	71.2	98.3	171	236	263	325
Bolivia	*mn pesos*	1.7	. .	4.7	9.7	23.9	[26.4]	[35.1]	[48.9]	57.9	61
Brazil	*mn cruzeiros*	11.3	13.0	17.8	26.2	34.6	40.8	43.9	69.6	43.9	114
Chile	*mn escudos*	11.7	13.2	34.3	51.7	73.1	82.2	91.1	109	119	135
Colombia	*mn pesos*	214	275	272	283	289	306	272	317	410	664
Ecuador	*mn sucres*	181	250	295	298	289	282	247	336	336	329
Guyana	*mn dollars*	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Paraguay	*mn guaranis*	. .	. .	. .	. .	. .	. .	. .	. .	[750]	[750]
Peru	*mn soles*	562	551	618	1 066	1 039	1 265	1 259	1 340	[1 687]	[1 785]
Uruguay	*mn pesos*	. .	. .	. .	. .	. .	. .	. .	. .	187	221
Venezuela	*mn bolivares*	210	270	338	381	496	601	607	540	533	509

Table 6B.31. South America: military expenditure as a percentage of gross domestic product

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Argentina	*2.9*	*2.9*	*2.2*	*2.5*	*2.6*	*2.5*	*2.3*	*2.3*	*2.2*	*2.2*
Bolivia	*0.5*	. .	*0.3*	*0.4*	*0.8*	[*0.8*]	[*0.9*]	[*1.1*]	*1.2*	*1.1*
Brazil	*2.4*	*2.2*	*2.3*	*2.6*	*2.9*	*2.8*	*2.2*	*2.0*	*1.7*	*1.7*
Chile	*3.3*	*2.2*	*3.3*	*3.1*	*3.2*	*2.7*	*2.2*	*2.6*	*2.5*	*2.4*
Colombia	*2.0*	*2.2*	*2.1*	*1.9*	*1.6*	*1.5*	*1.2*	*1.2*	*1.3*	*1.9*
Ecuador	*1.9*	*2.4*	*2.7*	*2.6*	*2.4*	*2.3*	*1.9*	*2.4*	*2.2*	*2.0*
Guyana	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .
Paraguay	. .	. .	. .	. .	. .	. .	. .	. .	[*1.9*]	[*1.7*]
Peru	*2.5*	*2.1*	*2.1*	*3.2*	*2.9*	*3.1*	*2.7*	*2.4*	[*2.6*]	[*2.4*]
Uruguay	. .	. .	. .	. .	. .	. .	. .	. .	*1.1*	*1.2*
Venezuela	*1.4*	*1.6*	*1.9*	*1.9*	*2.1*	*2.4*	*2.4*	*2.1*	*2.0*	*1.7*

US $ mn, at 1970 prices and 1970 exchange rates (Final column, X, at current prices and exchange rates)

1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1973X
391.7	441.4	480.2	406.2	431.2	449.8	403.0	417.0	349.0	(381.0)	*956*
20.0	18.4	16.9	15.0	16.5	19.2	20.0	27.0	33.6	[31.0]	*29*
697	595	818	822	904	853	1 166	992	1 072	(856)	*1 144*
98.0	120.7	128.2	136.2	150.0	207.0	211.0	254.0	205.0	(238.0)	*229*
133.0	133.9	137.2	180.4	168.0	202.7	235.0	116.6	106.1	[97.0]	*101*
26.6	24.7	26.2	29.1	37.0	38.0	34.0	39.4	47.8	. .	*51*
. .	1.1†	2.3	2.1	2.4	3.8	3.3	3.3	4.1	. .	*5*
[8.2]	9.3	9.9	10.4	11.1	12.0	8.1	14.8	14.3	. .	*19*
135.4	134.7	171.4	171.8	183.5	179.8	219.1	220.4	210.1	(175.0)	*263*
37.5	35.9	41.9	31.5	43.3	47.7	62.8	53.0	56.9	. .	*70*
178.5	184.9	209.2	208.5	197.6	198.0	239.4	269.4	268.8	(321.0)	*310*
1 726.4	**1 700.0**	**2 041.4**	**2 013.2**	**2 144.6**	**2 211.0**	**2 601.7**	**2 406.9**	**2 367.7**	**[2 230.0]**	*3 177*

Local currency, current prices

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
402	452	647	962	1 354	1 329	1 521	1 800	2 170	3 565	4 780	6 390
137	147	178	175	179	168	188	228	242	350	580	691
194	388	924	1 157	2 066	2 574	3 492	3 926	6 498	6 517	8 135	8 200
179	245	358	542	681	917	1 319	2 405	2 951	6 314	23 000	159 700
965	1 072	1 218	1 467	1 627	2 263	2 321	2 998	3 789	2 148	2 400	2 730
307	370	428	413	456	527	714	767	742	933	1 280	. .
. .	. .	. .	1.9	4.3	4.0	4.7	7.6	6.7	7.0	9.6	. .
[860]	[840]	[975]	1 132	1 227	1 292	1 414	1 514	1 075	2 131	2 336	. .
2 614	2 824	3 286	3 575	4 994	5 957	6 769	6 960	9 055	9 765	10 195	9 932
365	509	900	1 500	3 300	5 600	9 300	11 900	19 400	28 900	61 200	. .
613	650	742	782	885	894	867	891	1 113	1 290	1 338	1 733

Per cent

1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
2.2	*1.8*	*1.8*	*2.1*	*2.3*	*1.9*	*1.9*	*1.9*	. .	. .	. .
2.4	*2.3*	*2.5*	*2.2*	*2.0*	*1.6*	*1.7*	*1.9*	*1.8*	*2.3*	. .
1.6	*1.7*	*2.5*	*2.2*	*2.9*	*2.6*	*2.6*	*2.2*	*2.8*	*2.2*	. .
2.1	*1.9*	*2.0*	*2.2*	*2.1*	*2.1*	*2.0*	*2.6*	*2.4*	*2.7*	. .
2.2	*2.0*	*2.0*	*2.0*	*2.0*	*2.3*	*2.1*	*2.3*	*2.5*	*1.2*	. .
1.8	*1.9*	*2.1*	*1.7*	*1.7*	*1.8*	*2.2*	*2.1*	*1.8*	*1.9*	*2.0*
. .	. .	. .	*0.5*	*1.0*	*0.9*	*0.9*	*1.4*	*1.2*	*1.2*	*1.5*
[1.8]	*[1.6]*	*[1.7]*	*1.9*	*2.0*	*2.0*	*2.0*	*2.0*	*1.3*	*2.2*	*1.9*
3.2	*2.9*	*2.9*	*2.6*	*3.2*	*3.2*	*3.2*	*2.9*	*3.4*	*3.3*	. .
1.6	*1.6*	*1.7*	*1.5*	*1.9*	*1.5*	*1.8*	*1.9*	*2.6*	*2.3*	. .
1.9	*1.8*	*2.0*	*2.0*	*2.1*	*2.0*	*1.8*	*1.7*	*2.0*	*2.0*	*1.7*

7. The production and trade of major weapon systems in industrialized countries, 1974

During 1974 the development and production of major weapons continued on a massive scale despite severe inflation and a declining level of economic activity in most industrialized countries. This is, of course, not really surprising. The nature and size of a country's economic resources are important determinants of the scale of the armaments programme that can be supported but the development and production of armaments is fairly insensitive to short-term fluctuations in the level of economic activity. Indeed, it is sometimes the case that armament programmes are expanded to counteract an economic recession. It was alleged, for example, that the US defence budget for fiscal year 1975 was deliberately expanded to boost the economy.

On the other hand, if economic conditions deteriorate over a long period of time, the scale of the armament programmes will ultimately be affected. The outstanding example is the United Kingdom which, in late 1974, announced a ten-year programme intended to reduce the proportion of military expenditure in the gross national product from the prevailing 5.5 per cent to 4.5 per cent.

The current economic situation has, in part, been induced by the rapid and massive increase in the price of oil. But while the overall impact of this development has so far been negative, it has probably stimulated the defence industries in the principal arms-producing countries. The major oil-producing countries now have financial resources so large that their effective employment poses a major problem; even the most ambitious economic development plans in countries like Saudi Arabia and Kuwait leave vast sums unallocated. In 1974, after deducting payments for imports and domestic investments, the countries belonging to the Organization of Petroleum Exporting Countries (OPEC) had surplus revenues from the sale of oil estimated at $50–60 billion.

Many of these countries have therefore been able to accelerate their armament programmes rapidly. Over the past 18 months the announcement of armaments purchases to the tune of billions of dollars, particularly by Middle East countries, became virtually commonplace and in many cases amounted to several years' production of particular weapon systems. Under the condition of diminishing markets in the industrialized countries and impending balance-of-payments deficits due to the high price of imported oil, the competition for these new orders was understandably fierce. Nevertheless, the demand was sufficiently great for the USA, France and the UK (one could probably add the USSR) all to experience record levels of arms exports in 1974. In fact, US military sales increased by 39 per cent in one year; $5 billion in 1974 compared with $3.6 billion in the previous year.

The problem of inflation, considerably aggravated by the greatly increased costs for imported oil, did, however, create an adverse atmosphere for military budgets in most countries. Politicians in many countries were reluctant to increase defence budgets to the same extent as the rate of inflation, with the result that many weapon programmes were carefully re-examined by defence officials for possible cuts. In the United States the Department of Defense submits periodic reports to Congress on the acquisition costs of selected weapons. The report prepared in June 1974 showed that the acquisition cost of 44 major weapon programmes had increased by some $37 billion to a total of nearly $144 billion, due almost completely to the application of more realistic rates of inflation. The December report, covering the same programmes, put the total cost at nearly $148 billion, with 84 per cent of the additional increase attributed to inflation. Although this huge sum will be spread over a considerable number of years, defence officials acknowledge that the planned development and production schedules for all these weapons will be unattainable within the budget constraints which are expected in the near future.

Although there were relatively few outright cancellations, the development period of a number of major weapons was lengthened and in other cases the planned annual rate of production was reduced. The UK, for example, reduced the SRAAM (Short-Range Air-to-Air Missile) programme to a "demonstration of technology" status. This means that no attempt will be made to develop prototypes of this missile for operational testing prior to series production. The US Army's HLH (Heavy Lift Helicopter) suffered a similar fate.

In the United States, Congress remained relatively critical of military expenditure and succeeded in reducing the requested total expenditure for fiscal year 1975 by $4.6 billion. Particularly notable was the refusal of Congress to fund the development of a new strategic submarine to supplement the Trident; furthermore, the authorization of the construction of eight "Sea Control Ships" (small aircraft carriers, operating helicopters and V/STOL aircraft) was deferred for the second year running. Also notable was the reduction in military assistance to South Viet-Nam from a requested $1.4 billion to $700 million. This led, among other things, to the forced procurement by the US Air Force of some 70 F-5E Tiger II light fighters intended for South Viet-Nam.

Another effect of the extremely rapid rates of inflation and the concomitant threat to levels of military expenditure was renewed concern over the

Table 7.1. Numbers of indigenously designed major conventional weapons under development or in

	Aircraft					Missiles[c]				
	Super-sonic fighters/ trainers	Subsonic fighters/ trainers	Others with max. weight >10 000 kg[b]	Others with max. weight <10 000 kg	Heli-copters	Anti-air-craft	Anti-ship	Anti-sub-marine	Anti-tank	Others
USA	12	6	10	5	12	12	4	2	4	9
USSR	6	1	4	–	5	7	8	–	1	1
France	5	–	1	–	3	6	1	1	3	5
UK	1	3	4	4	1	13	2	–	2	–
China	3	–	2	1	2	1	1	–	–	–
Other developed	5	11	8	22	8	13	8	1	7	2

Source: Appendix 7A.

[a] The numbers include the weapon systems that were cancelled, in development, or completed during 1974.
[b] This category includes bombers, medium and heavy transports, maritime patrol and airborne early warning aircraft.
[c] For the purposes of the table missiles were classified according to their target irrespective of the launching platform. The category "other" comprises missiles intended for the destruction of large, fixed ground targets such as cities, missile silos, radar installations, airfields and so on.
[d] The numbers refer to different classes of ships. Ships of less than 1 000 tons displacement are generally regarded as coastal patrol vessels.

viability of national defence industries in Europe, particularly NATO Europe. The intensity of the competition to replace the ageing F-104 Starfighters in Belgium, the Netherlands, Denmark and Norway, is symptomatic of the growing imbalance between the size of individual defence budgets on the one hand and the costs of developing and efficiently producing major weapons on the other. In the countries with established defence industries, the number of individual concerns has gradually but continuously declined over the post-war period, a process dictated by the rapid increase in the cost of developing and producing modern weapons. The most recent illustration of this is the United Kingdom's intention to combine the three largest aerospace companies—the British Aircraft Corporation, Hawker Siddeley Aviation and Hawker Siddeley Dynamics—into a single government-controlled concern. In general, however, these efforts to "rationalize" defence industries have proved inadequate. The growth in the domestic markets for weaponry has fallen far short of the growth in the cost of weapons, thus creating powerful pressures to secure export markets.

Nevertheless, an indigenous capacity at least to manufacture, and, if possible, design and develop weapons remains politically attractive. In October 1974, for example, Greece entered into an agreement with the Lockheed Aircraft Corporation to establish an aircraft industry, initially for the overhaul of military and civilian aircraft, but with licensed production as a longer-term objective. Turkey is negotiating with a number of Western aircraft manufacturers to assist in the establishment of a similar facility. In

large-scale production in 1974[a]

Ships[d]				Armoured vehicles		
Nuclear-powered submarines	Conventionally powered submarines	Surface ships >1 000 tons displacement	Surface ships <1 000 tons displacement	Main battle tanks	Light tanks	Others
3	–	7	1	2	–	6
3	1	3	3	2	1	3
–	1	3	5	1	–	5
1	2	6	3	2	1	2
1	2	2	5	1	2	3
–	5	14	11	4	1	10

addition, countries with nascent defence industries are continually striving to increase both the level and the range of their expertise. Japan, for example, whose capacity to develop and manufacture modern weapons was essentially nil 20 years ago is now producing or developing an indigenous supersonic aircraft, a main battle tank, submarines and a range of antitank, antishipping and air-to-air missiles. A similar trend exists in China. Although a disproportionate share of the resources devoted to military activities has gone into nuclear weapons a continual expansion of the capacity to develop and manufacture conventional armaments is apparent. China has progressed from the manufacture of Soviet-designed weapon systems (without the benefit of Soviet technical assistance since 1960) through indigenous modifications of these designs to systems which, at least in the aircraft field, are wholly designed and developed in China. (China is reported to be working on a delta-wing fighter-bomber with a maximum speed in excess of Mach 2.) This tendency for more and more countries to acquire and then expand the ability to manufacture (and develop) selected weapons extends to the third world (see chapter 8).

Added to the economic pressures in the main arms-producing countries is the acknowledged fact that, within NATO, the multitude of comparable weapon systems deployed, developed and produced represents a wasteful duplication of resources and undermines the military effectiveness of NATO's forces. It is estimated that duplicated R&D expenditure within NATO amounts to as much as $1 billion annually. During 1974 the perennial advocation of greater standardization of equipment within NATO and more collaboration between national armament industries gathered some momentum, although the emphasis was on cooperation and collaboration among the European members of NATO. Most observers consider that unless drastic steps are taken in this direction the European members of NATO will become increasingly dependent on US equipment and technology. A statistic which indicates the probability of this occurring is that in

Table 7.2. Indigenous major weapon programmes initiated in 1974

Country	Designation, description
Aircraft	
USA	*ACF* Air Combat Fighter
	VFAX carrier-based light fighter
	HSX ASW helicopter
USSR	.. strategic bomber
China	.. fighter-bomber
Japan	*KH-7* utility helicopter
Missiles	
France	.. air-to-surface (nuclear)
FR Germany	.. air-to-air
	Hydra air-to-ship
USA	*Pershing 2* surface-to-surface (tactical nuclear)
	Hellfire helicopter-launched antitank
	CLAW air-to-air
	ALCM Air Launched Cruise Missile (nuclear)
USSR	*SS-N-12* ship-to-ship
	SA-9 mobile anti-aircraft
Ships	
Belgium	*E-71* missile-armed frigate
France	*C-70* ASW destroyer
Italy	.. missile-armed frigate
Netherlands	*S* missile-armed frigate
UK	*Type 22* missile-armed frigate
USA	*Trident* strategic submarine
	PF missile-armed frigate
USSR	*Turya* hydrofoil patrol boat

Source: Appendix 7A.

fiscal year 1974 US Department of Defense purchases from US industry amounted to $34 billion, roughly equivalent to the combined total military expenditure of the European NATO countries. Although no major new joint weapon programmes were announced during 1974, one concrete achievement was an agreement among 13 European nations not to proceed individually with the development of a new long-range antishipping missile until the possibility of a joint programme had been thoroughly explored. Three other developments along these general lines are worth noting. The Netherlands and FR Germany agreed to standardize as far as possible the new frigates which the Netherlands is currently building and which FR Germany plans to build. Secondly, Norway and FR Germany will jointly design a new class of coastal submarine (type 210). Norway plans to acquire 15 of these and FR Germany five or six. Finally, there was the announcement, in January 1975, that the Franco-German Roland II missile system had been selected as the basis for the US Army's short-range air defence system (Shorads). Although this missile system will be further developed in the USA (at a cost of $108 million) the purchase of a major item of foreign weapon technology by the USA is rare, the only other recent example being the British Harrier VTOL strike aircraft.

Table 7.3. Indigenous major weapon programmes terminated in 1974

Country	Cancelled in development	Production completed
Aircraft		
Canada		*Caribou* STOL transport
France		*Atlantic* maritime patrol
Italy	*A 106* ASW helicopter	
UK		*Wasp* ASW helicopter
USA		*C-5A* heavy transport *T-43A* navigation trainer
Missiles		
FR Germany	*Viper* air-to-air	
USA		*Pershing 1A* surface-to-surface (nuclear) *AIM-7E* air-to-air
Ships		
FR Germany		*Type 206* coastal submarine
Turkey		"*Berk*"-class frigate
USSR		"*Y*"-class strategic submarine
Armoured vehicles		
UK	*Vixen* armoured car	
USA	*ARSV* Armoured Reconnaissance Scout Vehicle	

Source: Appendix 7A.

Generally speaking, the existing major weapon programmes conducted on a joint basis by NATO countries (seven aircraft, seven missiles, a hydrofoil missile boat and a main battle tank) continued as planned. The only exception was the AV-16A (or Super Harrier) that was to have been jointly developed by the USA and the UK. Largely for financial reasons the UK reduced its participation in this programme to a nominal level but retained the option to renew participation at a later date. In December 1974 it was still not clear whether the USA would proceed independently with the development of this aircraft. A contrary development was the invitation extended to FR Germany, in January 1975, to submit its prototype Leopard II main battle tank in the US XM-1 main battle tank competition. An agreement already exists to hold a competition to select a common gun for the Anglo-German FMBT-80 and the US XM-1.

Despite the general tenor of the foregoing comments, the great majority of major weapon programmes underway in the industrialized countries survived, and a number of significant new programmes were added, during what can reasonably be called an unfavourable economic period. It should be borne in mind that the documentation of major weapon programmes, though providing an impressive list, leaves a substantial part of the story untold. The resources devoted to the modification of existing weapon systems and equipment and in the pursuit of general technological develop-

Chart 7.1. The pattern of trade in major weapons and components in industrialized countries, 1974

	Belgium	Canada	Denmark	France	FR Germany	Greece	Italy	Luxembourg	Netherlands	Norway	Portugal	Turkey	UK	USA	Bulgaria	Czechoslovakia	German DR	Hungary	Poland	Romania	USSR	Albania	Austria	Finland	Ireland	Spain	Sweden	Switzerland	Yugoslavia	Australia	China	Japan	New Zealand
Belgium																																	
Canada			1		3	1				1		1	3													1		3					
Denmark																											3						
France	1 3				1 2 3	1	1 3		1		3	1	1 3							1 2			(1) 3		1	1 2 3	1 3	1 2	2		1	3	
FR Germany	1 2		1	1 3		1	2 3		1	3		1 2	3													1 2		3		(1)			
Greece																																	
Italy	3			3	3							1 3	3	3											1	1	1						
Luxembourg																																	
Netherlands	3	3			3		1						3	3																			
Norway					3							1															1						
Portugal																																	
Turkey																																	
UK	1 2 3	1		1 3	1 3	1	3		1 3					1 3						2						3	(1) 3	1 3	2 3	1		3	1
USA	1	1 2 3	1	1 3	1 2 3	1	1 2 3	1	1 3	1 2		1	1 2 3											3		1 3	1 2 3	3		1 2 3		1 2 3	3
Bulgaria																																	
Czechoslovakia																	1	1 2	2	1	1												
German DR																																	
Hungary																																	
Poland																					(1)												
Romania																																	
USSR																1 2 3		1	1 2 3	1 3				1					1				
Albania																																	
Austria																																	
Finland																																	
Ireland																																	
Spain											1																						
Sweden			1	3																				2				1					
Switzerland					1 3		3							2													3						
Yugoslavia																																	
Australia							(1)						3																				
China																											1						
Japan																														1			
New Zealand																																	

Source: Appendices 8A and 8B.
Code: 1=trade in complete weapon. 2=trade in licences. 3=trade in major components or sub-systems (or in the technology for those items).

ments are very substantial indeed. In the USA, for example, modifications to the B-52 strategic bomber, including programmes currently underway, have absorbed $3.1 billion since 1955 and the conversion of 290 AH-1G attack helicopters to the more advanced AH-1Q configuration is expected to cost $113.4 million. Similarly, a wide-ranging programme is underway in the USA to improve the performance of ICBMs. Two of these programmes, the Advanced Ballistic Re-entry System (ABRES) programme and the Advanced ICBM Technology Program, absorbed some $157 million in fiscal year 1974 alone. Some of the improved systems developed under these programmes will be incorporated in existing missiles while a longer-range possibility is an entirely new ICBM, currently called MX.

In the field of strategic weapons the level of activity remained high during 1974. By the end of that year the USA had deployed roughly 90 per cent of its planned 550 Minuteman III MIRVed ICBMs and had re-equipped 26 (out of a planned total of 31) strategic submarines with the Poseidon MIRVed SLBM. Development work continued on the Trident I (C4) and Trident II (D5) SLBMs and two strategic cruise missile programmes, one air-launched and the other submarine-launched, were initiated. The first of ten Trident strategic submarines was laid down, the possibility of launching an ICBM from an aircraft was demonstrated and the B-1 strategic bomber made its maiden flight.

In the Soviet Union production and deployment of the SS-11 Mod 3 ICBM with MRVs continued, as did the construction of "Delta"-class strategic submarines armed with the 7 752-km SS-N-8 SLBM. But the main event was the initial deployment of the SS-X-18 ICBM. The deployment of this missile was announced by the US Secretary of Defense in January 1975 so that event presumably took place late in 1974. Although this missile has been flight tested with MIRVed warheads, US defence officials describe these first operational missiles as carrying only a single warhead. Conversion to MIRV warheads, however, is still highly probable. In addition, development work continued on the MIRVed SS-X-17 and SS-X-19 ICBMs, believed to be competitive prototypes for a follow-on missile to the SS-11, and on the single warhead, solid propellant SS-X-16 ICBM.

In France, development of a new IRBM and an SLBM with MRV continued, and the decision to build a sixth strategic submarine was announced. Finally, China has MRBMs and IRBMs deployed and is working on its first ICBM and SLBM.

Table 7.1 provides a numerical summary of the information on conventional weapons contained in the registers in appendix 7A, and tables 7.2 and 7.3 list the programmes initiated, cancelled or completed in 1974 respectively. Table 7.1, though limited in scope, gives some idea of the powerful and wide-ranging momentum the arms race has at the present time. Although the level of activity is high in all four categories of weapons (aircraft, missiles, ships and armoured vehicles) the most dynamic field is clearly missiles. The NATO countries, for example, have (including versions) six antishipping missiles in production and another 13 under development; eight air-to-air missiles in production and another 11 under development: and ten air-to-surface missiles in production and another five under development. Perhaps more than anything else, these figures (and those for the other categories of weapons) indicate the breadth and depth of the technological opportunities available. Missiles, for example, can be launched from the ground or from armoured vehicles, from aircraft (both fixed-wing and helicopters) and from ships and submarines; they can be short- medium- or long-range and they can employ a wide variety of guidance and control techniques. Another area of rapid expansion is naval forces. The extent of the naval build-up and some possible reasons for it is discussed in more detail in chapter 10 below.

Another important factor contributing to the multiplicity of weapon systems is undoubtedly the sheer size of the worldwide market. As a rough approximation one could say that 30 per cent of annual world military expenditure consists of expenditure on weapons, munitions and other equipment. This means that the value of the world's weapon market is some $65 billion *annually*. Even if one excludes the USA and the USSR, the only two countries that are really self-sufficient in this field (although a case could be made for the inclusion of France), the residual market is still probably well in excess of $20 billion. A market of this size inevitably attracts suppliers particularly as a growing proportion of demand stems from countries that, at least at present, have little or no indigenous capacity to develop and manufacture modern armaments and related equipment.

Although the majority of industrialized countries have eschewed any ambition to establish or maintain *comprehensive* defence industries, the capacity to design, develop and manufacture selected weapons, electronic equipment and so on is widespread. This situation has created on extensive international trade in weapons between industrialized countries. The structure of this trade is extremely complicated owing to the ability of many recipient countries to manufacture even the most complex items of military equipment. Arrangements, such as licensed-production, co-production and international sub-contracting are becoming increasingly common, particularly as the need to secure export orders becomes more and more pressing in the principal supplying countries. Another notable feature of this complex picture is that some countries, for example, the Netherlands and Switzerland, have specialized in particular areas of weapon technology (radars and fire-control systems) which are available for incorporation into complete weapon systems. A specific example is the Swiss sale of a mobile anti-aircraft fire-control system (Skyguard) to Austria. The net result is that it is becoming rare (outside the USA and the USSR) to find a major weapon system which is wholly designed or even wholly manufactured in one country.

Chart 7.1 summarizes the links between the major programmes of weapons acquisition in the industrialized countries, as outlined in the appendices to this chapter. While the pattern revealed is one of a surprisingly high degree of interdependence, it is certain that a comprehensive survey would show an even more complex picture. The inclusion of guns and artillery, for example, would almost certainly reveal that Belgium, Czechoslovakia and Sweden, to name only three, exported weaponry to a considerably larger number of countries than is indicated here. Similarly a comprehensive account of the international flow of components in connection with major weapons developed and/or produced jointly by a number of countries would considerably complicate the picture. (For example, six NATO countries are producing components for the Sea Sparrow point-defence missile system.)

A statistical summary of chart 7.1 is nonetheless impressive: for transactions in complete major weapon systems there were 29 importing countries and 16 exporting countries; 19 countries manufactured foreign-designed major weapons under licence and eight countries granted these licences; three countries used major components of foreign design in their indigenous weapon programmes and 13 countries supplied these components (or permitted them to be produced under licence).

Appendix 7A

Registers of indigenous and licensed production of major weapons in industrialized countries, 1974

For sources and methods, see chapter 9.

Abbreviations and conventions

. . =Information not available
( ) =Uncertain data. All future dates (post 31 December 1974) are in brackets
\+ =At least the figure given and probably more
* =Number produced by 1974
– =Nil or not applicable
[ ] =Standardized rather than official descriptions
No. =Total number planned or on order

Powerplant for aircraft

J =Jet
T =Turboprop (fixed wing), turboshaft (helicopter)
P =Piston

for missiles

S =Solid propellant
L =Liquid propellant
SL =Storable liquid
J =Jet

for ships

N =Nuclear
GT =Gas turbine
ST =Steam turbine
D =Diesel

Aircraft descriptions

VTOL =Vertical take-off and landing
STOL =Short take-off and landing
V/STOL =Vertical or short take-off and landing
VG =Variable geometry
recce. =Reconnaissance
hel. =Helicopter
transp. =Transport
A/S or ASW =Antisubmarine warfare
AEW =Airborne early warning
ECM =Electronic countermeasures
com.&con. =Command and control
car.-b. =Aircraft-carrier based
car./l.-b. =Aircraft-carrier based or land-based

Missile launch platform and target descriptions

fixed =Fixed land-based
towed =Towed ground-based
SP =Self-propelled ground-based
mobile =Mobile ground-based
portable =Portable (man-carried)
miss. =Missile
air. =Fixed-wing aircraft
hel. =Helicopter
sub. =Submarine

Missile warheads

N =Nuclear
kt =Kiloton (1 000 tons of TNT equivalent)
mt =Megaton (1 000 000 tons of TNT equivalent)
HE =High explosive

Ship armament

S-A =Ship-to-air missile
S-S =Ship-to-ship missile
S-Sub. =Ship-to-submarine missile
Sub.-S =Submarine-to-ship or -surface missile
Sub.-Sub. =Submarine-to-submarine missile
TT =Torpedo tubes
A/STT =Antisubmarine torpedo tubes

Foreign-designed components

Co-prod =Co-production
A =Armament
E =Electronic equipment
E-d =Computer/data processing equipment
E-f =Fire-control system (for armaments)
E-g =Guidance system (for missiles)
E-n =Navigation equipment
E-r =Radar
E-s =Sonar
P =Powerplant

I. Register of indigenously designed weapons in development or production in industrialized countries, 1974

For sources and methods, see chapter 9. For conventions, see page 154.

Part 1. *Aircraft*

Country	Designation, description	Power-plant	Weight, *kg*	Speed, *km/hr* or *Mach no.*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, $ *mn*	Unit price, $ *mn*	Foreign-designed Powerplant, Electronics or Armaments
NATO											
Canada	*CX-84 V/STOL* light-strike/ASW	T	6 577	517	. .	1965	no	. .	. .	. .	P (USA)
	DHC-5D Buffalo STOL transport	T	22 500	815	. .	. .	1974[a]	–/19	. .	(2)	P (USA)
	Caribou STOL transport	P	12 925	350	1956	1958	1962	(307)[b]	. .	(0.8)	P (USA)
	Twin Otter STOL utility	T	5 670	340	1964	1965	(1965)	(340)	. .	(0.6)	–
France	*G8 VG* fighter/strike	J	20 000	M 2.5	. .	1971	no	. .	. .	. .	. .
	Super Mirage[c] fighter/strike	J	28 158	M 2.5	1973	(1976)	(1979)	(200)/–	(1 000)	(12)	. .
	F1 fighter/strike	J	15 200	M 2.2	1964	1966	1972	105/143	. .	5[d]	. .
	F1 International	J	15 590	M 2.2	1973	1974	(1976)	(35)/. .	. .	(5.8)	. .
	Mirage III fighter/strike	J	13 500	M 2.2	. .	1956	1958	(400)/(560)	. .	(3)	E-r (UK)
	Mirage 5 ground attack version	. .	. .	. .	. .	1967	1969	50/(350)		1.9	. .
	Milan ground attack version	. .	. .	. .	. .	1969	1971	. .			. .
	Super Etendard strike/fighter car.-b.	J	11 500	1.0	. .	1974	(1977)	100/–		3.4	E-n (USA)
	Atlantic Mk I maritime patrol	T	43 500	660	1958	1961	1965	40/47[e]	. .	(8)	P (UK). Co-prod.
	Mk II[f]	T/J	52 160	(897)	1970	1976	1979	(40)/. .	. .	. .	(Bel. FRG, It. Neth UK)
	Alouette III utility helicopter	T	2 250	220	. .	1959	(1960)	(1 239)	. .	(0.1)	–
	SA 360 utility helicopter	T	2 730	310	. .	1972	(1975)	26/. .	. .	. .	. .
	SA 365 twin-engine version										
	SA 315B Lama light utility hel.	T	1 750	210	1968	1969	(1970)	–/161	. .	. .	. .

Country	Designation, description	Power-plant	Weight, *kg*	Speed, *km/hr* or *Mach no.*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, $ *mn*	Unit price, $ *mn*	Foreign-designed Powerplant, Electronics or Armaments
FR Germany	*VAK 191B* V/STOL light strike	J	9 000	. .	1964	1971	no[g]	. .	(180)	. .	P (UK)
	Do 24/72 rescue flying boat	T	18 600	(400)	(1973)	. .	no	. ./. .	(30)	. .	P (USA)
	Am-C111 STOL light transport	T	6 800	400	. .	. .	no	. ./. .	. .	. .	P (Can.)
	Do 28D-2 STOL utility	P	3 650	320	. .	1966	1968	145/30	. .	0.25	P (USA)
	Bo 115 attack helicopter[f]	T	. .	. .	1972	. .	no	(150/. .)	. .	. .	. .
	Bo 105 utility helicopter	T	2 100	250	1962	1967	1971	304/(30)	(25)	0.26	P (USA)
	Do 132 light utility helicopter	T	1 650	230	. .	(1972)	no	. .	. .	. .	P (Can.)
International:											
FRG (42.5%) UK (42.5%) It. (15%)											
	Panavia 200 MRCA fighter/strike/ recce.	J	(18 145)	M 2+	1969	1974	(1977)	807	(1 000)	9.2[h]	E-r (USA)
Fr. (50%) UK (50%)	*Jaguar* strike/jet trainer	J	13 500	M 1.7	1964	1969	1972	400	(380)	. .	. .
	Jaguar International						1975	–/24	3.9		
USA UK[i]	*AV-16A* (US)/*Super Harrier* (UK) V/STOL Strike	J	. .	(M 1.0+)	1973	. .	no	(342)[j]	(450)	(3.3)	–
Fr. (50%) FRG (50%)	*Alpha-Jet* trainer/light strike	J	7 000	1 000	1969	1973	1976	390/33	. .	1.1	. .
Fr. UK[k]	*SA 330 Puma*[l] medium transport helicopter	T	7 000	274	. .	1965	1968	164/140	. .	1.1	. .
	Lynx multi-purpose helicopter	T	4 130	295	(1968)	1971	1974	242/. .	(78)	(1.2)	. .
	SA 341 Gazelle light utility hel.	T	1 700	310	. .	1967	1971	(568)	. .	0.24	. .
Italy	*G91Y* light fighter/strike	J	8 700	1 050	1965	1966	1971	75/–	. .	1.1	P (USA)
	M326[m] light strike/jet trainer	J							. .	. .	P (UK)
	326K		5 670	890	. .	1970	yes	–/. .			
	326GB		5 216	797	. .	1967	yes	6/(150)[g]			
	G222 transport	J	26 000	530	. .	1970	1974	44/–	. .	(5)	P (USA)
	PD-808 light transport	J	8 165	852	. .	. .	(1970)	(17)/–	. .	. .	P (UK)
	S210M light utility	P	1 850	340	. .	1970	yes	20/. .	. .	. .	P (USA)
	AM-3C light utility	P	1 700	280	1965	1967	(1972)	. ./43	. .	. .	P (USA)
	SF 260M/W light utility	P	1 360	340	. .	1969	yes	(20)/166	. .	. .	P (USA)
	S 208M light utility	P	1 350	300	. .	1967	1968	44/–	. .	. .	P (USA)
	SM 1019 light utility	P	1 270	250	1969	1969	1973	100/–	. .	. .	P (USA)
	A129 attack helicopter	J	2 600	290	(1972)	. .	no	. .	. .	. .	P (USA)
	A109 utility helicopter	J	2 300	275	. .	1971	(1974)	. ./. .		0.34	P (USA)
	A106 light ASW helicopter	J	1 400	125	1965	. .	no[n]	. .	. .	. .	P (Fr.)

Netherlands	*F27* MK 400M transport	T	20 410	485	. .	1955	1958	(40)	. .	. .	P (UK)
Portugal	. . STOL light transport	T	6 000	(420)	(1972)	. .	no	. .	. .	. .	P (Fr.)
UK	*Buccaneer S Mk.2* strike/recce.	J	28 120	1 040	. .	1963	1964	126/16	. .	(8)	–
	Harrier V/STOL strike/fighter	J	11 340	(M 1.1)	(1959)	1966	1968	105/118	. .		–
	carrier-based version				(1973)	. .	no	25/. .	(25)		–
	Strikemaster light strike	J	5 215	760	. .	1967	yes	–/134	. .	0.6	–
	Nimrod maritime patrol	J	87 100	925	1964	1967	1968	49/–[o]	. .	10.2[p]	. .
	airborne early warning				1973	. .	no	. .	. .	. .	. .
	Mainliner STOL transport	T	28 400	. .	1972	. .	no	. .	(60)	. .	. .
	HS748 Andover transport	T	20 180	450	1959	1960	1961	31/(40)	. .	1.3	–
	Coast guarder maritime patrol				(1973)	. .[q]	no	–/. .	. .	. .	. .
	SD3-M STOL transport	T	10 660	367	. .	(1974)	no	. .	. .	. .	P (Can.)
	Skyvan STOL light transport	T	6 575	326	. .	1970	1970	–/(50)	. .	(0.8)	P (USA)
	Hawk jet trainer/lightstrike	J	7 500	M 0.9	(1971)	1974	(1976)	175/–	(125)	(1.2)	P (UK+Fr.)
	Defender utility/light strike	P	3 150	290	. .	(1971)	1972	–/10	. .	0.3	. .
	Jetstream 200 trainer	T	5 670	460	. .	(1970)	1972	26/–	. .	. .	P (Fr.)
	Bulldog 120 primary trainer	P	1 065	240	1968	1969	(1971)	132/124	. .	. .	P (USA)
	200 light strike version		1 182	278	1974	(1975)	(1976)	. .	. .	. .	
	Wasp light ASW helicopter	T	2 495	200	. .	1962	1963	100/50[r]	. .	. .	–
USA	*B-1* strategic bomber	J	176 815	M 2.2	1970	1974	1976	241/–	3 200	(41)	–
	F-111 fighter bomber	J	40 816	M 2.5							
	F-111F latest production version				. .	. .	yes	118/–	. .	14.9[a]	–
	F-15A Eagle fighter	J	24 490	M 2.3	1965	1972	1973	749/	1 700	7.5[b]	–
	TF-15A 2-seat trainer										
	F-14A Tomcat fighter/strike car.-b.	J	28 570	M 2+	. .	1970	1971	334/80	. .	11.3	–
	F-14B with advanced engine	J				1973					
	VFAX light fighter/strike car.-b.[c]	J	(13 500)	(M 1.6)	1974	. .	. .	(400)/–	(514)	. .	–
	XFV-12A VTOL light fighter car.-b.	J	8 845	(M 2)	1973		no	. .	. .	. .	–
	F-4II fighter/strike	J						(5 000)			
	F-4E AF/export version		26 304	M 2.2	. .	. .	1967	835/(295)	. .	4.2	–
	FR-4E recce. version		26 304	M 2.2	. .	. .	yes	–/102	. .		–
	ACF-Air Combat Fighter[d]	J	. .	M 2+	1974	. .	. .	650/. .	473	(4.6)	–
	Lightweight fighter	J		M 2+	1972	1974	no	. .	104	4.5	–
	YF-17 competitive prototype		(13 000)								
	YF-16 competitive prototype		12 280								
	F-5E/F Tiger II light fighter	J		M 1.6							
	F-5E first production version		10 922		1970	1972	1973	71/(530)	(140)	(2.7)	–
	F-5F 2-seat version		. .		. .	1974	1975	(157)/128	50	(3)	–
	F-5 Freedom Fighter light fighter	J						–/(815)	. .	. .	–
	F-5B current production version		9 298	M 1.34	. .	1964	yes	–/134			
	A-10A strike	J	20 206	740	1970	1972	1975	729/. .	381	2.4	–
	A-7 Corsair II strike	J	19 050								

Country	Designation, description	Power-plant	Weight, *kg*	Speed, *km/hr* or *Mach no.*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, *$ mn*	Unit price, *$ mn*	Foreign-designed Powerplant, Electronics or Armaments
	A-7E carrier-based version			M 1	. .	1968	1968	646/–	. .	3.5	P (UK)
	A-7D close air support			M 1	. .	1968	1968	669/–	. .	2.9	P (UK)
	A-6 Intruder strike car./land-b.	J		M 1.1							
	A-6E latest production version		27 397		. .	1970	1970	189/–	. .	6.6	–
	EA-6B ECM version		26 576		1966	1968	1969	77/. .	. .	14	–
	A-4 Skyhawk strike car./land-b.	J									
	A-4N improved export version		. .	. .	. .	1972	1972	–/. .	. .	. .	–
	A-4M latest production version		11 100	1 086	. .	1970	1970	141/–	. .	2.3	–
	A-37B Dragonfly light strike	J	6 350	843	1967	1967	(1968)	453	. .	0.4	–
	OV-10C/E Bronco light strike	T	6 563	452	. .	1973	(1974)	–/48[e]	. .	. .	–
	P-3 Orion ASW patrol	T						414			
	P-3F export 3C, simpler electronics		64 410	761	. .	. .	1973	–/16	. .	. .	–
	P-3C latest production version		64 410	761	. .	1968	1968	220/–	. .	10.2	–
	S-3A Viking ASW carrier-based	J	23 827	880	1969	1972	1972	187/15	. .	(10)	–
	S-3 Utility car.-b. transport version		20 022	819	(1974)	(1976)	(1978)	24/–	. .	. .	
	E-4R AABNCP-Advanced Airborne National Command Post com.&con.	J	. .	. .	. .	1973	. .	/–	. .	68[a]	–
	E-3A AWACS-Airborne Warning and Control System AEW/com.&con.	J	147 392	926	. .	1972	1975	34/–	(1 200)	40	–
	E-2C Hawkeye AEW carrier-based	T	23 391	602	. .	1971	1973	34/–	. .	16.7	–
	U-2 EP-X reconnaissance	J	7 833	795	1972	1973	. .	. .	. .	. .	–
	C-5A Galaxy heavy transport	J	346 770	1 018	1963	1968	1968	81/–[f]	. .	. .	–
	AMST-Advanced Medium STOL Transport				1972		(1979)	. .	(230)[g]	(7.8)	–
	YC-15 competitive prototype	J	73 000	805		(1975)					
	YC-14 competitive prototype		77 720	740		(1976)					
	C-130 Hercules medium transport	T	79 380	618				908/307			
	KC-130R tanker				. .	. .	1973	16/ .	. .	6.5	–
	EC-130Q airborne comm. relay				. .	. .	yes	24/–	. .	(10.6)	–
	C-130H latest standard version				. .	1964	1965	131/161	. .	5	–
	C-9B Skytrain II medium transport	J	49 887	926	. .	. .	1972	34/–	. .	5.7	–
	CT-39 Sabreliner light transport	J	8 498	906	. .	. .	1971	103/–	. .	1.7	–
	T-43A navigation trainer	J	52 608	926	. .	1973	1973	19/–[h]	. .	. .	–
	T-37C basic jet trainer	J	3 632	578	. .	. .	yes	–/(250)	. .	. .	–
	C-12/Huron light transport	T	5 443	488	1970	1972	1974	50/–	. .	. .	–
	Beechcraft Baron B55 light utility	P	2 313	380	. .	1960	1965	65/. .	. .	. .	–
	Beechcraft Bonanza F33A/C trainer	P	1 542	322	. .	1959	(1960)	–/. .	. .	. .	–

	T-41D primary trainer	P	907	221	. .	. .	yes	(250)	. .	<0.5	–
	T-2C/D Buckeye jet trainer car./land-b.[h]	J	5 977	840	. .	1968	1968	243/52	. .	. .	–
	HSX ASW helicopter		. .	. .	(1974)	. .	. .	.	(440)[i]	. .	–
	AAH-Advanced Attack Helicopter	T	. .	. .	1971	(1975)	(1978)	(472)/–	(410)	(2.5)	–
	S-67 Blackhawk attack helicopter	T	10 002	370	1969	1970	no	. .	. .	. .	–
	AH-1 attack helicopter										
	AH-1Q (improved) Cobra/TOW	T	4 309	352	. .	1973	1974	395[j]/–	. .	(1.3)	–
	AH-1J Sea Cobra	T	4 535	333	. .	. .	1969	124/202	. .	(2)	–
	XCH-62 HLH-Heavy Lift Helicopter	T	67 135	130	1971	(1975)	. .	. .[k]	(200)	7.8	–
	UTTAS-Utility Tactical Transport Aircraft System medium transp. hel.	T		175	1965	1974	(1978)	1 107/–	426	(1.9)	–
	YUH-61A competitive prototype		. .								
	YUH-60A competitive prototype		7 189								
	H-53 multi-purpose helicopter	T									
	YCH-53E shipborne heavy lift		10 000	254	1971	1974	(1976)	70/–	100	(6.5)	–
	UH-53D executive transport		10 286	315	. .	. .	1973	6/–	. .	(5)	–
	RH-53D mine countermeasures		10 286	315	1970	1972	1972	30/6	. .	. .	–
	HH-53 rescue version		. .	. .	. .	. .	1967	72/–[l]	. .	. .	–
	CH-47C Chinook transport helicopter	T	20 865	306	. .	1967	1968	51/34[m]	. .	2.2	–
	Bell Model 214 Huey Plus utility	T	5 896	305	1970	1974	1974	–/287[n]	. .	. .	–
	UH-1 Iroquois utility helicopter										
	UH-1N latest production version	T	4 762	203	1968	. .	1969	293/50	. .	0.8	–
	UH-1H AF version	T	4 309	204	. .	. .	1967	1 408/9	. .	0.3	–
	LAMPS Mk III Light Airborne Multi-Purpose System multi-purpose hel.[o]	T	(8 640)	. .	1972	(1978)	no	(200)/–	. .	(3)	–
	XV-15 Bell Model 301 tilt rotor research vehicle	T	6 804	574	1973	(1975)	. .	. .	(26)	. .	–
Warsaw Treaty Organization											
Czechoslovakia	*L-39 Albatros* jet trainer	J	4 535	750	. .	1968	1972	. ./. .	. .	. .	P (USSR)
	L-39Z light strike version							. ./. .			
	L-29 Delfin jet trainer/light strike	J	3 540	655	. .	1959	1963	(3 000)		(0.4)	. .
Poland	*TS-11 Iskra* jet trainer/	J	3 800	722	. .	1960	1962	(700)	. .	. .	. .
	light strike utility hel.	T	(1 700)	(250)	(1973)	. .	no	. .	. .	. .	P (USSR)
Romania	*IS-24* light utility	P	1 900	220	. .	(1971)	yes	. .	. .	. .	P (USA)
USSR	. . strategic bomber	J	(136 000)	. .	. .	(1974)	. .	. .	. .	. .	–
	TU-. . "Backfire" bomber	J	123 350	M 2.5	(1969)	(1971)	(1973)	25*/–	. .	. .	–
	MiG-25A "Foxbat-A" fighter	J	29 120	M 3.2	. .	1965	(1970)	. ./. .	. .	. .	–
	"Foxbat-B" recce. version						(1969)	. ./. .			

Country	Designation, description	Power-plant	Weight, *kg*	Speed, *km/hr* or *Mach no.*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, $ *mn*	Unit price, $ *mn*	Foreign-designed Powerplant, Electronics or Armaments
	MiG-23 "Flogger" VG fighter	J	12 700	M 2.3	. .	1967	(1970)	. ./. .	. .	. .	–
	"Flogger-A" initial version										
	"Flogger-B" fighter/strike version										
	"Flogger-C" two-seat version										
	. . *"Fencer"* fighter/strike	J	. .	. .	. .	. .	yes	. .	. .	. .	–
	MiG-21 MF "Fishbed J, K, L" light fighter	J	9 400	M 2.1	. .	1967	yes	. ./. .	. .	. .	–
	SU-15 "Flagon A" fighter	J	16 000	M 2.5	. .	1967	(1968)	(1 000)	. .	. .	–
	SU-20 (improved) *"Fitter B"* STOL strike	J	17 700	M 2.1	. .	1967	(1970)	. .	. .	. .	–
	Yak-36 "Freehand" VTOL strike	J	–	<M 1	. .	1967	no	.	. .	. .	–
	Il-38 "May" ASW	T	(60 000)	645	. .	1967	yes	. .	. .	. .	–
	An-22 "Cock" heavy transport	T	250 000	740	. .	1965	(1967)	. .	. .	. .	–
	Il-76 "Candid" medium transport	J	157 000	850	. .	1971	(1972)	. .	. .	. .	–
	Mi-24 "Hind A, B" attack helicopter	T	. .	(250)	. .	1973	(1974)	. .	. .	. .	–
	Mi-12 "Homer" heavy lift helicopter	T	105 000	260	. .	1969	(1972)	. .	. .	. .	–
	Mi-6 "Hook" heavy lift helicopter	T	42 500	300	. .	1957	(1962)	(650)	. .	. .	–
	Mi-8 "Hip" transport helicopter	T	12 000	260		(1960)	yes	(700)/(300)	. .	. .	–
	Ka-25 "Hormone" ASW/transport helicopter	T	7 300	220	. .	1961	(1964)	. ./9	. .	. .	–
Other Europe											
Finland	*LEKO-70* primary trainer	P	1 150	240	(1973)	(1974)	no	. .	. .	. .	P (USA)
International:											
Yugoslavia, Romania	*Jurom* light fighter	J	. .	. .	. .	. .	no	. .	. .	. .	P (UK)
Spain	*Casa-401* STOL transport	T	24 500	470	(1972)	. .	no	. .	. .	. .	P (USA)
	T12 Aviocar STOL light transport	T	6 300	400	1964	1970	1973	50/28	. .	0.65	P (USA)
Sweden	*Project 80* fighter	J	. .	. .	1973	. .	(1984)	. .	. .	. .	. .
	JA.37 Viggen fighter	J		(M 2)	(1968)	1974	(1977)	150/–	(340)	(6)	P (USA, Swe) E-d, E-n (USA) A (Switz.)
	AJ.37 Viggen strike/recce.	J	16 000	M 2	1962	1967	1970	175/–	(295)	4.9	P (USA, Swe.)
	J.35 Draken fighter/strike	J	15 000	M 2	1955	. .	yes	(550/63)[a]	. .	(1.5)	P (UK)
	SAAB 105G jet trainer/light strike	J	6 500	960	. .	1972	no	–/. .		. .	P (USA) E-r (UK)
	MFI-17 Supporter light utility	P	1 100	260	. .	1969	(1972)	–/132	. .	0.07	P (USA)

Switzerland	*Turbo Porter* STOL light utility	T	2 200	260	1957	1959	(1960)	. ./. .	. .	0.17	P (Can.)
	Swiss Trainer trainer	P	720	. .	(1965)	. .	no	. .	. .	. .	P (USA)
Yugoslavia	*Jastreb* light strike	J	4 665	820	. .	. .	yes	. ./. .	. .	(0.17)	P (UK)
	Galeb 3 jet trainer/light strike	J	4 810	800	1969	1970	no	. .	. .	. .	P (UK) E-n (UK)
	Galeb 2 jet trainer/light strike	J	4 180	810	1957	1961	1963	. ./. .	. .	(0.16)	P (UK)
Other Developed											
Australia	*Nomad* STOL utility	T	3 630	320	1965	1971	1973	11/25	. .	(0.35)	P (USA)
China[b]	. . *(Tu-16)* medium bomber	J	68 000	945	. .	(1971)	(1971)	100/–	. .	. .	. .
	. . *(Il-28)* light bomber	J	19 545	928	. .	. .	yes	. ./–	. .	. .	. .
	. . *(MiG-21)* light fighter	J		M 2.0	. .	. .	(1973)	(75)/. .	. .	. .	. .
	F-9 (Improved MiG-19) light fighter	J	10 000	M 2.0	. .	. .	1971	(300)/–	. .	. .	. .
	F-6 (MiG-19) light fighter	J	8 700	M 1.3	. .	. .	1963	1 000/	. .	. .	. .
	. . jet transport	J	. .	. .	1972	. .	no	. .	. .	. .	P (Can.)
	"Whirlwind" (Mi-4) medium transport hel.	P	7 200	210	. .	. .	1959	(400)/. .	. .	. .	. .
	. . helicopter	T	. .	. .	1972	. .	no	. .	. .	. .	P (Can.)
Japan	*T-2* advanced trainer	J	13 500	M 1.6	1967	1971	1974	59/1–	. .	5.5[c]	P (Fr., UK) E-n (UK)
	F-1 Kai light strike version		. .		1973	(1975)	(1977)	(70)/–	. .	(8)	. .
	PS-1 ASW flying boat	T	43 000	545	1959	1967	(1972)	23/–	. .	(17)	P (USA)
	US-1 rescue version							3/–			
	C-1 transport	J	38 700	815	1966	1970	1973	(23)/–	(50)	. .	P (USA)
	Mu-2J/K utility	T	4 560	550	. .	1967	(1969)	14/	. .	. .	P (USA)
	KH-7 utility helicopter	T	(2 700)	. .	1974	(1975)	no	. .	. .	. .	A (USA)
	KM-2B trainer	. .	. .	. .	. .	1974	no	. .	. .	. .	. .
New Zealand	*CT.4* trainer	P	1 066	295	. .	1972	1972	13/61	. .	. .	P (USA)

NATO excluding USA

[a] Production of earlier models ended in 1972 (59 aircraft). Production line re-opened in 1974 due to export orders.

[b] Production completed late 1973 or early 1974.

[c] Previously called ACF-Avion de Combat Futur.

[d] Including spares but excluding R&D.

[e] Production completed July 1974.

[f] So far this is a purely French programme.

[g] West German government support for this programme stopped early 1973 but US Navy is leasing the prototypes for VTOL research.

[h] In December 1973 prices.

[i] The UK has substantially reduced the scale of its involvement but has the option to resume full partnership at a later date.

[j] Anticipated number for the US Marine Corps.

[k] Puma and Gazelle predominantly of French design, Lynx predominantly of British design. All three aircraft co-produced by the two countries.

[l] Aérospatiale (France) is developing an improved version designated SA331 "Super Puma".

[m] A successor aircraft, designated MB339, is in the early design stage.

[n] Project abandoned in 1974.

[o] New avionic subsystems are under development for the Mk-2 version of this aircraft.

[p] Including R&D.

[q] No prototypes will be constructed; production to order.
[r] Production completed early 1974.
[s] Final assembly of 112 of these aircraft is taking place in Brazil.
[t] This programme involves a degree of collaboration with the Italian A129 attack helicopter.

USA

[a] Programme unit cost, that is, including a share of R&D costs.
[b] Assuming a production run of 729 aircraft.
[c] Congress has stipulated that this aircraft be derived from one of the competitors in the Air Force Light-weight Fighter programme.
[d] In January 1975 it was announced that the YF-16 had won the Light-weight Fighter competition and a $473 million contract was issued for further development of this aircraft into the ACF. The ACF is the official US entrant in the competition to replace the F-104 Starfighters in Belgium, the Netherlands, Denmark and Norway.
[e] Production line re-opened to satisfy new export orders for 48 aircraft.
[f] Production line closed in May 1974. Iran has expressed interest in buying this aircraft and is willing to pay the cost (estimated at $175 million) of re-opening the line.
[g] Estimated R&D expenditure up to the completion of four prototypes.
[h] Production completed in July 1974.
[i] Estimated R&D costs through FY 1979.
[j] In addition 298 AH-1Gs will be converted to AH-1Qs.
[k] Recent decision to proceed only to the prototype stage; no commitment to full development and production.
[l] Last delivered late 1974.
[m] 1973/74 orders only.
[n] Ordered by Iran. Most R&D costs paid by Iran.
[o] In January 1975 it was announced that this system would be a variant of one of the competitors in the UTTAS programme.

Other Europe/Other Developed

[a] Current production consists of unassembled aircraft for Finland.
[b] Aircraft of Soviet origin are shown with the Soviet designation in brackets. They are listed as indigenous weapons because China has been almost totally isolated from Soviet technology since 1960. There are reports of a Mach 2+, delta-wing fighter under development. A delta-wing configuration suggests a wholly indigenous design.
[c] Unit cost including spares.

Part 2. *Missiles*

Country	Designation, description	Power-plant	Warhead weight, *kg* (if nuclear, *kt/mt*)	Range, *km*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, *$ mn*	Unit price, *$ mn*	Foreign-designed Powerplant, Electronics or Armaments
NATO											
Canada	*Sea Sparrow system*[a] ship-to-air./ miss./ship	S	HE	. .	. .	. .	(1972)	. ./–	. .	. .	E-f (Neth.)
France	*S-3* fixed-to-fixed	S	(1 mt)	3 500	(1971)	. .	no	(27)/–	. .	. .	. .
	Pluton mobile-to-fixed	S	15 kt	120	. .	(1969)	(1973)	120/–	. .	. .	. .
	Harpon mobile/air.-to-fixed/tank	S	(2.6)	3	. .	. .	yes	. ./. .	. .	. .	. .
	SS/AS-11 mobile/air.-to-fixed/tank	S	(2.6)	3	. .	. .	1962	(160 000)	. .	. .	–
	SS/AS-12 mobile/air.-to-fixed/tank	S	30	8	. .	. .	yes	1 800	. .	. .	–
	ACRA **mobile-to-tank**	[b]	HE	3	1963	. .	no	. ./–	. .	. .	–
	Crotale[c] mobile/ship-to-air.	S	15	13	1964	1965	1968	. ./25	. .	(5)	. .
	. . air.-to-fixed	. .	(500 kt)	(150)	(1974)	. .	. .	. ./–	. .	. .	–
	AS.20 air.-to-fixed/ship	S	30	7	. .	. .	yes	(8 000+)	. .	. .	. .
	AS.30 air.-to-fixed/ship	S	230	12	. .	. .	yes	(8 500)	. .	. .	. .
	AS.30L lighter version		115	. .	. .	. .	yes	. ./. .	. .	. .	. .
	R.530 air.-to-air.	S	27	18	1958	. .	(1963)	(2 500)	. .	. .	. .
	Super 530 air.-to-air.	S	HE	(40)	1971	. .	(1975)	(1 000)	. .	. .	. .
	R.550 Magic air.-to-air.	S	HE	10	1968	1972	1974	. ./. .	. .	. .	. .
	Masurca ship-to-air.	S	HE	(40)	. .	. .	(1965)	. ./. .	. .	. .	E-d (USA)
	Hirondelle system[d] ship-to-air./miss.	S	HE	(40)	. .	. .	(1975)	. ./. .	. .	. .	. .
	Exocet (antishipping)	S	200								
	MM-38 ship-to-ship			(38)	(1967)	. .	1972	(700)	. .	0.3	E-d (UK)
	AM-39 air.-to-ship			70	. .	(1975)	(1976)	. ./. .	. .	0.3	. .
	MM-39 ship-to-ship development			50	. .	. .	. .	. .	. .	. .	. .
	MM-40 long-range version			(70)	. .	. .	(1977)	. .	. .	. .	. .
	Malafon ship-to-sub.	S	. .	13	1956	(1958)	yes	. ./–	. .	. .	. .
	M-2 sub.-to-fixed	S	(500 kt)	(3 000)	. .	. .	(1971)	. ./–	. .	. .	. .
	M-20 sub.-to-fixed	S	(1 mt)	(3 000)	. .	. .	(1975)	. ./–	. .	. .	. .
	M-4 MRV sub.-to-fixed	S	(3–5× 150 kt	5 550	. .	. .	(1979)	. ./–	. .	. .	. .

Country	Designation, description	Power-plant	Warhead weight, *kg* (if nuclear, *kt/mt*)	Range, *km*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, *$ mn*	Unit price, *$ mn*	Foreign-designed Powerplant, Electronics or Armaments
FR Germany	*Cobra* portable-to-tank	S	2.5	2	1957	. .	1960	(150 000)	. .	. .	P (Switz.)
	Mamba portable-to-tank	S	2.7	2	. .	1972	1974	. ./. .	. .	. .	. .
	Jumbo air.-to-fixed	S	N/500	(40)	(1972)	. .	no	. .	. .	. .	. .
	. . air.-to-air.	S	. .	. .	1974	. .	. .	. .	. .	. .	. .
	Viper air.-to-air.	S	HE	. .	. .	1973	. .[m]	. .	. .	. .	P (Nor.)
	AS.34 Kormoran air.-to-ship	S	160	(37)	1964	(1969)	1974	350/–		0.36	E-g (fr.)
	Hydra air.-to-ship	. .	HE	. .	1974	. .	. .	. .	. .	. .	
International											
FR Germany, France	*HOT* mobile/hel.-to-tank	S	6	4	1964	. .	1975	(20 000)	(44)	. .	. .
	MILAN portable-to-tank	S	3	2	1963	. .	1972	28 000	. .	. .	. .
Belgium, UK	*Atlas* portable-to-tank	S	HE	. .	(1969)	. .	no	. .	. .	. .	. .
Nato consortium	*SAM 80*[q] fixed-to-air.	. .	HE	. .	1973	. .	no	. .	(1 000)	. .	. .
FR Germany, France	*Roland* mobile-to-air.	S	6.5								
	I clear weather version			. .	1964	(1968)	1974	. ./. .	(94)	. .	. .
	II all weather version[o]			75	. .	(1973)	no	. ./. .	. .	. .	. .
France, UK	*Martel* air.-to-fixed	S	HE	(60)	1963	(1966)	1973	. ./. .	. .	. .	. .
	AS.37 anti-radar version										
	AJ.168 TV-guided version										
Belgium, Denmark, Italy, Netherlands, Norway, USA	*Sea Sparrow system*[c] ship-to-air./miss.	S	HE	. .	1969	. .	(1973)	. ./. .	(35)	. .	. .
France, Italy	*Otomat* ship/air.-to-ship	J	210								
	I initial version			60	1969	1971	yes	. ./. .	(50)	. .	. .
	II longer-range version[r]			(100)	. .	1973	1974	. ./. .	. .		
Italy	*Spada system*[f] fixed-to-air.	S	HE	. .	. .	1974	no	. ./. .	. .	. .	. .
	Indigo mobile-to-air.	S	27	10	1962	. .	(1972)	. ./. .	. .	. .	E-f (Switz.)
	Mosquito[g] portable-to-tank	S	4	2.3	. .	. .	yes	. ./. .	. .	. .	. .
	Sparviero portable-to-tank	S	4	(3)	(1972)	. .	no	. ./. .	. .	. .	. .
	Aspide air./fixed-to-air.	S	(35)	. .	1969	1974	(1976)	. ./. .	. .	. .	. .
	Airtos air.-to-ship	S	35	11	(1969)	(1974)	no	–/. .	. .	. .	. .
	Marte system[h] hel.-to-ship	S	HE	(25)	1969	(1975)	no	. ./. .	. .	. .	. .

	Albatros system[i] ship-to-air./miss.	S	HE	. .	1966	(1970)	1973	. ./. .	. .	. .	. .
	Sea killer ship/hel.-to-ship	S									
	II current version		70	(25)	1965	1969	1972	–/. .	. .	. .	E-f (Switz.)
	III under development		150	(45)	(1972)	. .	. .	. ./. .	. .	. .	. .
Norway	*Penguin* ship-to-ship	S	120	21	1961	. .	1969	. ./. .	(60)	. .	. .
UK	*Thunderbird 2* fixed-to-air.	S	HE	. .	1956	. .	(1964)	. ./. .	. .	. .	. .
	Swingfire mobile-to-tank	S	HE	4	1958	. .	(1968)	. ./. .	. .	. .	. .
	Beeswing infantry version										
	Hawkswing hel.-launched version										
	Vigilant portable-to-tank	S	5.4	1.4	1956	(1957)	1960	(15 000)	(2.5)	. .	–
	Rapier[n] mobile-to-air.	S	HE	(6)	1963	. .	1967	. ./(2 000)	. .		–
	Tigercat towed/fixed-to-air.	S	HE	5	. .	. .	(1969)	. ./. .	. .	. .	–
	Blowpipe portable-to-air.	S	HE	. .	1966	. .	(1973)	. ./. .	. .	. .	–
	Hellcat air.-to-mobile/ship	S	HE	6.8	. .	. .	(1968)	. ./. .	. .	. .	–
	Taildog air.-to-air.	. .	HE		(1973)	. .	. .	. .	. .	. .	. .
	Red Top air.-to-air.	S	31	(12)	1957	. .	. .	. ./. .	. .	. .	. .
	XJ521 Goshawk[j] air.-to-air.	S	HE	. .	1973	. .	(1974)	. ./. .	. .	. .	. .
	SRAAM (QC 434)[k] air.-to-air	S	10	. .	1972	. .	no	. .	. .	. .	. .
	Skua air.-to-ship	S	20	(15)	(1970)	. .	no	. ./. .	. .	. .	. .
	Sea Dart ship-to-air.	S/L	HE	(80)	(1962)	(1965)	1972	. ./. .	. .	. .	. .
	Seacat ship-to-air.	S	HE	. .	(1958)	. .	(1962)	. ./. .	. .	. .	. .
	Sea Wolf ship-to-miss./air./ship	S	(14)	. .	(1967)	. .	(1976)	. ./–	(68)	. .	. .
	SLAM—Submarine-Launched Airflight Missile[l] sub./ship-to-air./ship	S	HE	. .	1968	(1972)	(1974)	–/. .	. .	(0.6)	. .
	CL137 Swordfish sub.-to-ship	. .	HE	. .	(1972)	. .	. .	. ./–	. .	. .	. .
USA	*LGM-30G Minuteman 3* MIRV fixed-to-fixed	S	3× 170 kt	13 000	. .	1968	1970	550/–	. .	9.1[a]	–
	BGM-71A TOW—Tube-launched, Optically-tracked, Wire-guided fixed/hel.-to-tank	S	HE	3	1962	1965	1968	. ./. .	. .	. .	–
	Site Defense fixed-to-miss.[b]	. .	N	. .	1971	(1977)	no	. ./–	875	. .	–
	Safeguard system fixed-to-miss.								2 200		
	LIM-49R Spartan high altitude	S	N-mt	185	1965	1968	1970	. ./–	. .	. .	–
	Sprint low altitude	S	N-kt	45	1963	1965	1970	. ./–	. .	. .	–
	MGM-52 Lance SP/towed-to fixed	SL	N/HE	110	1962	1965	1971	. ./. .	. .	. .	–
	MGM-31A Pershing 1A mobile-to-fixed	S	N	. .	. .	. .	1968	. ./. .[c]	. .	. .	–
	Pershing 2 high precision development	S	(1 kt)	(640)	(1974)	. .	. .	. ./. .	. .	(0.3)	–
	SAM-D—Surface-to-Air Missile Development mobile-to-air.	S	N/HE	. .	1965	1970	no	. ./. .	. .	. .	–
	MIM-23B Improved HAWK mobile-to-air.	S	HE	41	1964	1971	1972	2 647/. .[d]	. .	0.1	–

Country	Designation, description	Power-plant	Warhead weight, *kg* (if nuclear, *kt/mt*)	Range, *km*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, $ *mn*	Unit price, $ *mn*	Foreign-designed Powerplant, Electronics or Armaments
	MIM-72A Chaparral[h] mobile-to-air.	S	HE	. .	1965	1965	1966	. ./. .	. .	. .	–
	FGM-77A Dragon portable-to-tank	S	HE	1	1964	1968	1973	. ./. .	. .	. .	–
	XFIM 92A Stinger[e] portable-to-air.	S	3	1	(1970)	1973	(1975)	. ./. .	. .	. .	–
	AGM-69A SRAM—Short Range Attack Missile air.-to-fixed	S	170 kt	160	1963	1969	1971	1 500/–[f]	. .	(1)	–
	AGM-86A ALCM—Air-Launched Cruise Missile[q] air.-to-fixed	J	N-kt	. .	1974	(1976)	. .	. .	(316)[p]	(0.5)	–
	Guided unpowered bombs ("smart bombs") air.-to-fixed	–									
	Walleye 2 with larger warhead	–	907	. .	1968	. .	(1972)	. ./. .	. .	. .	–
	Walleye 1 original version	–	385	. .	1964	. .	1966	. ./. .	. .	. .	–
	HARM—High Speed Anti-Radiation Missile air.-to-(fixed) radar	S	. .	. .	(1973)	(1975)	no	. ./. .	. .	. .	–
	AGM-78A Standard ARM-Anti-Radiation Missile air.-to-(fixed) radar	S	100	25	1966	1967	1968	. ./. .	. .	. .	–
	AGM-45A Shrike air.-to-(fixed) radar	S	HE	16	1962	. .	1963	12 623/. .	. .	(0.37)	–
	AGM-65A Maverick air.-to-fixed/ tank	S	59	. .	1966	1969	1972	17 000/. .	. .	0.02	–
	AGM-65B longer-range version				. .	1974	no	. ./. .	. .	. .	
	Laser Maverick all-weather version[i]				(1972)	. .	no	. ./. .	(36)	. .	–
	AGM-83A Bulldog[j] air.to-fixed/tank	S			1969	1972	no		16.4		
	Hellfire-Helicopter—launched fire and forget air-to-fixed/tank	S			1974	(1976)	no	. ./. .	. .	. .	–
	ADSM-Air Defense Suppression Missile[k] hel.-to-tank	S	. .	. .	1973	1974	no	. ./. .			
	Seekbat XAIM-97A[m] air.to.air.	. .	. .	. .	1972	. .	no	. ./. .	. .	. .	–
	AIM-95 Agile air.-to-air.	. .	. .	. .	1968	. .	no	. ./. .	268	0.05	–
	CLAW[l] air.-to-air.	. .	. .	. .	1974	. .	no	. ./. .	. .	. .	–
	AIM-54 Phoenix air.-to-air./miss.	S	HE	165	1962	1965	1970	2 532/. .	. .	0.44[n]	–
	AIM-9 Sidewinder IR/IC air.-to-air.	S	11								
	9L new IR version in development			. .	1972	. .	(1975)	. ./. .	. .	. .	–
	9H/J advanced IR versions			3.5	. .	. .	1971	6 870/. .	. .	(0.02)	–
	9D/G longer-range IC versions			18	. .	. .	1965	. ./. .	. .	. .	–
	AIM-7 Sparrow III air.-to-air.	S	30								–

	Brazo with anti-radar sensor			..	1972	1974	no				
	7F with longer range			45			1974	../..	..	(0.09)	
	7E recent production version			22	..	..	yes[n]	../..	..	(0.04)	
	AGM-53 Condor air.-to-ship/fixed	S	286	92	1965	1970	(1975)	538/..	(250)	(0.4)	–
	RGM-66D Standard[o] ship-to-(fixed/ ship) radar	S									–
	SSM (ARM) semi-active homing		100	..	1972	..	(1973)	88/–	..	0.1	
	Active SSM active homing		..	..	1973	..	(1975)	74/–	..	0.4	
	Aegis system[p] ship-to-air./miss.	S	..	..	1969	1973	no	../..	(550)	..	–
	Standard I ship-to-air./miss./ship	S	HE		1964	..	1966	../..	..		–
	RIM-67A ER -Extended range			56				4 428/..		0.1	
	RIM-66B MR -Medium range			20				../..		0.1	
	Standard Missile 2 ship-to-air./miss.	S	..	..		(1975)	no				–
	Harpoon (anti-shipping)		232	(110)				2 922/..	..	0.25	–
	AGM-84A air.-to-ship	J			1968	1970	(1975)				
	RGM-84A-1 ship-to-ship	J+S			1968	1970	(1975)				
	Encapsulated sub.-to-ship	J+S			1970	1974	no			..	
	RUR-SA Asroc ship-to-sub.	S	N/HE	(10)	1955	..	1959	../..	..	..	–
	Trident MIRV sub.-to-fixed	S	N								–
	II (D-5) larger, longer-range version			10 000	(1972)	..	no	../..	1 380	..	–
	I (C-4) current version			7 000	(1971)	(1976)	(1976)	579/–	2 926	..	–
	UGM-73A Poseidon C-3 MIRV sub.-to-fixed	S	(10× 40 kt)	4 630	1965	1968	1969	../..	..	..	–
	Strategic Cruise Missile sub./ship-to-fixed[r]	J	N	(1 950)	1972	(1976)	..	../–	(800)	(0.6)	–
	UBGM-110 competitive prototype										
	UBGM-109 competitive prototype										
	UUM-44A Subroc sub.-to-sub.	S	N	56	1958	1964	1965	../–	..	..	–

Warsaw Treaty Organization

USSR	*"SSX-18"* MIRV fixed-to-fixed	SL	(5–8 MIRV)	..	..	1973	1974[a]	../–	..	..	–
	"SS-11" replacement MIRV fixed-to-fixed	SL					no[a]	../–	..	..	–
	"SSX-19" competitive prototype	L	(4–6 MIRV)	..	..	1973					
	"SSX-17" competitive prototype	L	4× (200 kt)	..	..	1972					
	Improved *"SS-11"* MRV fixed-to-fixed	SL	3× (200 kt)	10 500	..	1970	1972	(40)/–[b]			–
	"SSX-16" fixed/(mobile)-to-fixed	S	(1 mt)	..	..	1973	no[a]	../..	..	..	–

Country	Designation, description	Power-plant	Warhead weight, *kg* (if nuclear, *kt/mt*)	Range, *km*	Design begun	Proto-type flight	In pro-duction	No.: do-mestic/ export or total	R&D cost, $ *mn*	Unit price, $ *mn*	Foreign-designed Powerplant, Electronics or Armaments
	"SS-12 Scaleboard" mobile-to-fixed	SL	N	(725)	. .	1967	(1970)[c]	. ./–	. .	. .	–
	"Sagger" mobile-to-tank	S	11.5	2.5	. .	1965	yes[d]	. ./. .	. .	. .	–
	"SA-6 Gainful" mobile-to-air.	SL	80	35[e]	. .	1967	1970[f]	. ./. .	. .	. .	–
	Improved *"SA-2 Guideline"* mobile-to-air.	SL	130[g]	40	. .	1967[h]	yes	. ./. .	. .	. .	–
	"SA-9" mobile-to-air.[u]	S	. .	. .	. .	. .	yes	. ./. .	. .	. .	–
	"SA-7 Grail" portable-to-air.	S	1.8	2.5	. .	1971[i]	yes	. ./. .	. .	. .	–
	"AS-6" air.-to-ship/fixed	. .	. .	(550)	. .	1972	. .[j]	. ./. .	. .	. .	–
	"AS-5 Kelt" air.-to-ship/fixed	L		220	. .	1968	1970	. ./. .	. .	. .	–
	"AA-4 AWI"[k] air.-to-air.	S	. .	18	. .	. .	yes	. ./. .			
	"SS-N-13" ship-to-ship/fixed	. .	. .	(640)	. .	1973	(1974)[v]	. ./–	. .	. .	–
	"SS-N-12" ship-to-ship/fixed	. .	. .	(750)	. .	. .	. .	. ./–			
	"SS-N-11" ship-to-ship	S	. .	(55)	. .	1973	1973[l]	. ./. .	. .	. .	–
	"SS-N-10" ship-to-ship	. .	. .	(55)	. .	1969	yes[m]	. ./. .	. .	. .	–
	"SS-N-9" ship-to-ship	. .	. .	(275)[n]	. .	1969	yes[o]	. ./. .	. .	. .	–
	"SA-N-4" ship-to-hel.	. .	. .	(37)	. .	1969	yes[p]	. ./. .	. .	. .	–
	"SA-N-3 Goblet" ship-to-air.	S	. .	(37)	. .	1967	yes[q]	. ./–	. .	. .	–
	"SS-N-8" sub.-to-fixed	S	(1–1.5 mt)	7 725	. .	1972	(1973)[r]	. ./–	. .	. .	–
	"SS-N-6" sub.-to-fixed	S	(1 mt)	2 780	. .	1967	(1967)[s]	. ./. .	. .	. .	–
	"SS-N-7" sub.-to-ship	S	HE	56	. .	1967	(1968)[t]	. ./. .	. .	. .	–
Other Europe											
Sweden	*RbS 70* mobile-to-air.	S	HE	(5)	1969	(1973)		. ./. .	(20)[a]	. .	. .
	Bantam portable/mobile/air./hel.-to-tank	S	1.9	2	1956	. .	1962	. ./. .	. .	. .	. .
	Rb 05A air.-to-ship/fixed	L	HE	. .	1960	(1968)	1971	. ./–	. .	. .	. .
	Rb 04E air.-to-ship	S	HE	. .	(1969)	(1972)	yes	. ./–	. .	. .	E-g (Fr.)
	. . air.-to-air.	S	(HE)	. .	. .	. .	no	. .	. .	. .	. .
Switzerland	*Micon* fixed/mobile-to-air.	S	HE	35			no	. ./. .	. .	. .	. .
Other Developed											
Australia	*Ikara* ship-to-sub.	S	HE	(20)[b]	. .	. .	1961	. ./. .	. .	. .	[c]

Japan	*Tan Sam* fixed-to-air.	. .	HE	. .	. .	. .	no	. ./–	. .	. .	. .
	KAM-9[i] mobile/ship-to-tank/ship	. .	HE	(3)	1964	. .	1974	. ./. .	. .	. .	. .
	KAM-3D portable-to-tank	S	HE	1.8	1956	. .	(1962)	. ./. .	. .	. .	. .
	ASM-1 air.-to-fixed/ship	S	136	45	1973	(1977)	no	68/–	(32)	. .	. .
	AAM-1 air.-to-air.	S	HE	. .	. .	. .	1968	330/–	. .	. .	. .
	AAM-2 air.-to-air.	. .	HE	. .	. .	. .	(1975)	. ./. .	. .	. .	. .
China[d]	. . fixed-to-fixed	(L)	(3 mt)	(5 500)	. .	. .	no	. .	. .	. .	–
	. . fixed-to-fixed	(L)	(1 mt)	(4 000)	. .	. .	yes	(30)*/–	. .	. .	–
	SA-2 mobile-to-air.	SL	(130)	(40)	. .	. .	yes	. .	. .	. .	–
	SS-N-2 ship-to-ship	S	HE	42	. .	. .	yes	. ./. .	. .	. .	–

NATO excluding the USA

[a] With US AIM-7 Sparrow missiles.

[b] Gun-launched.

[c] Developed with South African funds. Naval version recently adopted by the French Navy.

[d] With the Super 530 missile.

[e] Referred to in the USA as "improved point defense surface missile system."

[f] With US AIM-7 Sparrow or Italian Aspide missiles.

[g] Initially developed by Contraves (Switzerland). Further developed and subsequently produced by Contraves (Italy).

[h] With Sea Killer missiles.

[i] With US RIM-7H Sparrow or Italian Aspide missiles.

[j] US AIM-7E Sparrow with new seeker head developed in the UK.

[k] Programme reduced to a demonstration of technology.

[l] With Blowpipe missiles.

[m] Project cancelled in May 1974.

[n] Fully mobile version mounted on the M113A-1 armoured vehicle is under development. R&D finance is provided by the UK and Iran.

[o] In January 1975 the US Army announced that its Short-range air defense system (Shorads) would be based on the Roland II missile system. The Roland II system will be further developed to meet US requirements and presumably manufactured entirely from US-made components.

[p] Gun-launched.

[q] Both France and the UK are undertaking design studies. A collaborative programme (possibly with additional participants) is considered highly probable in view of the large development costs.

[r] An Italian venture. Also called Tesio.

USA

[a] Programme unit cost, that is, including a prorated share of R&D costs.

[b] Employs a developed version of the Sprint missile called Sprint II.

[c] Production apparently completed in 1974.

[d] US procurement, fiscal years 1973–75.

[e] Present development is passive IR homing. An alternative version with a laser designator guidance technique is also under development with prototype flights scheduled for July 1975.

[f] Number to be procured for B-52 and FB-111 deployment; additional missiles to be procured if B-1 ordered into production.

[g] This missile employs much of the technology developed under the SCAD (Subsonic Cruise Armed Decoy) programme on which $68 million was spent prior to cancellation in 1973.

[h] System incorporating Sidewinder IC missiles.

[i] Also called the Close Air Support Weapon Systems (CASWS).

[j] Developed from the AGM-12 Bullpup missile: was to be procured in FY 1975 but decision made to wait until CASWS is available.

[k] Designed to destroy radar-directed, tank-mounted anti-aircraft gun systems. This missile employs the basic airframe of the Hellfire missile but with a specialized radio frequency/infrared seeker.

[l] Acronym for Concept for Low-cost Air-to-Air Weapon.

[m] Based on the Standard ARM missile.

[n] Production line scheduled to close during 1974.

[o] With developed standard MR.

[p] With Standard Missile 2.

[q] Congress directed the Air Force and the Navy to collaborate on their cruise missile programmes. See Strategic Cruise Missile below.

[r] A tactical antishipping variant of this missile, with a 450 kg conventional warhead and a range of about 550 km, will also be developed.

USSR

[a] In January 1975 the Secretary of Defense stated that the US had confirmed evidence of the deployment of this missile.

[b] **Number deployed as of late 1973. Admiral Moorer states that these missiles** (called SS-11 MOD 3) are being deployed "rapidly" (FY 1975 Posture Statement).
[c] Reported to make up increasing proportion of 300 Soviet nuclear short-range ballistic missiles.
[d] In addition to original production, this missile is now entering service on a new vehicle (BMP-76PB), first seen in 1967.
[e] Max. range at low-medium altitude.
[f] Reported first deployed in Egypt in 1971.
[g] One version (Mk 4) shown in 1967 with white-painted nose may have nuclear warhead.
[h] Improved versions reported in production.
[i] Reported to have been deployed in Egypt in 1971 and Viet-Nam in 1972. May have been in service in Soviet and other WTO forces earlier.
[j] Reported seen on the Tupolev "Backfire" bomber which is now in production, that is, this missile may be in production.
[k] Deployed on the MiG-25 "Foxbat". Several of the older air-to-air missiles may still be in production, including "Ash" (deployed on Tu-28P), "Atoll" (deployed on MiG-21 and Yak-28P) and "Anab" (deployed on Yak-28P, Su-9 and Su-11).
[l] Deployed on "Osa II"-class patrol boats and "Kildin"-class destroyers.
[m] Deployed on "Kara"-, "Krivak"- and "Kresta II"-class ships.
[n] Effective range probably about 90 km.
[o] Deployed on "Nanuchka"-class corvettes.
[p] Deployed on "Kara"-, "Krivak"-, "Nanuchka"- and "Grisha"-class vessels.
[q] Deployed on "Moskva"-, "Kara"- and "Kresta II"-class vessels.
[r] Deployed on Delta"-class submarines.
[s] Deployed on "Y"-class submarines. Tests of a multiple-warhead (MRV) version of this missile have been observed.
[t] Deployed on "C"-class submarines.
[u] Deployed on the BRDM-2 armoured vehicle. Some sources also report an "SA-10" surface-to-air missile but no details are available.
[v] Some authorities consider that this missile is already operational on the "Kara"-class cruiser "Nikolayev".

Other Europe/Other Developed

[a] Switzerland is considering the purchase of this system. In this event it will share the development costs and probably become a coproducer.
[b] Range is determined more by the effective range of sonar than by the Ikara missile itself.
[c] RN version subsequently jointly developed by Australia and the UK. Version under development for Brazil called Branik.
[d] A submarine-launched ballistic missile is also believed to be under development. In addition China has manufactured air-to-air missiles of Soviet design (for example, "Ash" and "Atoll"). In view of the continued production of fighter aircraft this is presumably still the case but no details are available.
[e] Also known as TAN-SSM.

Part 3. *Ships*

Country	Class, description, armaments	Power-plant	Displace-ment, *tons*	Speed, *knots*	Laid down	Launched	Com-mis-sioned or com-pleted	No.: do-mestic/ export or total	Aircraft capacity	Unit price, $ *mn*	Foreign-designed Powerplant, Electronics or Armaments
NATO											
Belgium	*E71* frigate S-S, S-A, 100 mm, A/STT	GT	1 500	28	1974	. .	(1976)	4/–	. .	. .	P (UK) A (NATO+ Fr.) E-r (Neth.+It.)
Denmark	. . frigate 76 mm	D	(1 300)	18	1970	. .	1975	1/–	1 hel.	. .	A (Fr.)
	Tb68 missile boat S-S, 76 mm or 57 mm	GT	220	40	1971	. .	1975	8/–	–	. .	P (UK)
France	*Le Redoutable* strategic submarine 16 Sub.-S.	N	7 500	(25)	1964	1967	1971	6/–	–	(230)	–
	Agosta patrol submarine 4A/STT	D	1 200	20	1972	1974	1976	4/. .	–	. .	–
	P4-75 helicopter carrier S-A	N	16 400	28	(1975)	. .	(1980)	1/–	(25) hel.	(170)	A-hel. (UK+Fr.)
	Tourville [destroyer] S-S, S-sub., 3×100 mm, 2 A/STT	GT	4 580	31	1970	1972	(1973)	3/–	2 hel.	. .	A-hel. (UK+Fr.)
	C-70 [destroyer]	GT	3 950	30					2 hel.	. .	A-hel. (UK+Fr.)
	C-70 A/S S-S, S-Sub., 2×100 mm, 10TT				1974	. .	(1978)	(17)/–			
	C-70 A/S S-A, 2×10 mm, 10TT				(1976)	. .	. .	(6)/			
	A69 [corvette] 100 mm, 2×20 mm, 4A/STT	D	950	24	1972	1973	1975	12/1	–	. .	. .
	PR70 missile boat S-S, 76 mm	D	370	28	1973	. .	. .	–/2	. .	. .	P (FRG)
	S148 missile boat S-S, 76 mm, 40 mm	D	234	38	1971	. .	1973	–/20	–	(14)	P (FRG) A (It., Swe.)
	La Combattante II missile boat S-S	D	234	40	. .	. .	. .	–/12	–	. .	A (USA)
	La Combattante III missile boat, S-S, 2×76 mm 2A/STT	D	(350)	40	. .	. .	. .	–/4	–	. .	–
	. . missile boat S-S, 40 mm	D	115	25	1973	. .	. .	2/–	–	. .	. .
FR Germany	*Type 209* patrol submarine 8TT	D	1 000	22	. .	. .	. .	–/12	–	. .	E-f (Neth.)
	Type 206 coastal submarine 8TT	D	500	17	(1969)	1971	1972	18/–[a]	–	. .	Co-design (UK) E-f (Neth.)
	Type 143 missile boat S-S, 76 mm, 2TT	D	360	38	1972	1973	. .	10/–	–	27[a]	E-f (Neth.) A (Fr., It.)
	. . missile boat S-S, 76 mm, 40 mm	D	230	40	. .	. .	. .	–/6	–	. .	A (Israel)
	. . patrol boat	D	240	40	. .	. .	. .	–/2	–	. .	. .

Country	Class, description, armaments	Power-plant	Displace-ment, *tons*	Speed, *knots*	Laid down	Launched	Com-mis-sioned or com-pleted	No.: do-mestic/ export or total	Aircraft capacity	Unit price, *$ mn*	Foreign-designed Powerplant, Electronics or Armaments
	. . patrol boat 40 mm, 20 mm	D	120	35	(1970)	. .	. .	–/6	–	. .	. .
International:											
FR Germany, Italy, USA	*PHM-Patrol Hydrofoil Missile* missile boat S-S, 76 mm	GT	220	40+	1973	1974	1975	(45)[b]	–	(25)	E-r (Neth.)
FR Germany, Norway	*Type 210* coastal submarine	D	(370)	. .	(1975)	. .	. .	21	–	. .	. .
Italy	*Sauro* patrol submarine	D	1 300	19	(1973)	. .	. .	2/–	–	. .	. .
	. . frigates S-S, S-A, 127 mm, 2×35 mm	GT	2 208	35	1974	. .	. .	4/2	. .[c]	. .	–
Netherlands	*Tromp* destroyer S-A, 2×120 mm	GT	4 300	30	1971	1973	1975	2/–	1 A/S hel.	. .	P (UK) A (USA) A-hel. (UK, Fr.)
	"S" frigate S-S, S-A, 76 mm, 6A/STT	GT	3 500	30	1974	. .	(1978)	8/–	1/2 hel.	(70)	P (UK) A (. .) A-hel. (UK, Fr.)
Norway	*Jägaren* missile boat S-S, 57 mm	D	140	35	(1975)	. .	. .	–/16	–	(5)	P (FRG)
Turkey	*Berk* frigate 4×76 mm, 6TT	D	1 450	25	1967	1971	1972	2/–[d]	1 hel.	. .	P (It.)
UK	*Swiftsure* attack submarine 5A/STT	N	3 500	(30)	1969	1971	1973	5/–	–	(75)	. .
	Oberon patrol submarine 8TT	D	1 610	17	1957	1959	1961	13/14[e]	–	(12)	. .
	500-ton coastal submarine S-A, 8TT	D	500	17	(1972)	. .	(1975)	–/3	–	. .	Design UK+FRG
	Invincible A/S cruiser S-A/S-S	GT	(18 000)	30	1973	. .	. .	3/–	9 hel.	. .	A (Fr.)
	Type 42 destroyer S-A/S-S, 115 mm	GT	3 500	30	1970	1971	1974	6/1	A/S hel.	(45)	. .
	Vosper Mk 10 destroyer S-S, 2×115 mm	GT	3 300	30	1972	. .	(1976)	–/2	hel.	(45)	E-r (Neth.+It.) A (Fr.)
	A/S version S-A, S-Sub., 115 mm							–/2[f]	hel.	(45)	E-r (Neth.+It.) A (Aust.+Swe.)
	Type 22 frigate S-S, S-A, 2×40 mm	GT	(3 800)	30	1974	. .	1978	. ./–	2 hel.	. .	A (Fr.)
	Type 21 frigate S-S, S-A, 115 mm, 6TT	GT	2 500	34	1969	1971	1973	8/–	A/S hel.	. .	A (Fr.)
	Leander frigate S-S, S-A, 2×115 mm	GT	2 500	30	1971	. .	. .	–/2	hel.	. .	A (Fr.)
	. . missile boat S-S, 76 mm	D	150	30	1973	. .	. .	–/3	–	. .	P (FRG) E-r, E-f (It.) A (Fr./It.)
	. . patrol boat version 76 mm							–/3			
	BH.7 air cushion missile boat S-S	GT	10	60	(1972)	. .	. .	–/4	–	. .	. .
	VT 2 air cushion missile boat S-S	GT	(100)	(60)	. .	(1974)	. .	. .	–	. .	. .
USA	*SSBN-Trident* strategic submarine 24 Sub.-S	N	(12 000)	30	1974	(1976)	(1978)	10/–	–	(890)	–
	SSN-688 Los Angeles attack submarine Sub.-Sub., 4A/STT	N	6 900	40	1972	1974	(1975)	26/–	–	(200)	–

	SSN-685 Lipscomb attack submarine Sub.-Sub., 4A/STT	N	5 000	25	1971	1973	1974	1/–	–	(175)	–
	SSN-637 Sturgeon attack submarine Sub.-Sub., 4A/STT	N	3 860	30	1963	1966	1967	37/–	–	. .	–
	CVN-68 Nimitz aircraft carrier S-A	N	91 400	30+	1968	1972	1975	3/–	90	782	–
	SCS-Sea Control Ship aircraft/hel. cruiser	GT	14 300	25	(1975)	. .	(1978)	8/–	3 VTOL +14 hel.	125	–
	DLGN-38 Virginia [cruiser] S-A/Sub., 2×127 mm, 6A/STT	N	10 000	30+	1972	1974	1975	5/–	2 hel.	275	–
	DLGN-36 California [cruiser] S-A, S-Sub., 2×127 mm, 4A/STT	N	10 150	30+	1970	1971	1974	2/–	–	190	–
	DD963 Spruance destroyer S-A, S-Sub., 2×127 mm, 6A/STT	GT	6 900	30+	. .	1973	1974	30/7	1 hel.	(100)	–
	DE-1052 Knox excort S-A, S-Sub., 127 mm, 4A/STT	. .	3 011	27+	1965	2966	1969	46/–	1 hel.	(20)	–
	PF-Patrol Frigate S-S/A, 16 mm, 6A/STT	GT	3 530	(28)	1974	. .	1977	50/6	2 hel.	(70)	A (It.) E-f (Neth.)
	SES-Surface Effect Ship air cushion frigate	GT	[2 000]	[80]	. .	. .	(1980s)	. .	[VTOL/ hel.]	547[n]	–
	Tarawa amphibious assault	T	39 300	24	. .	1973	1975	5/–	(30) hel.	230	–
	AALC-Amphibious Assault Landing Craft	GT	(160)	(50)	. .	1975	. .	. .	–	82[o]	
Warsaw Treaty Organization											
German DR	*Kondor II* coastal minesweeper 6×25 mm	D	245	21	. .	. .	(1971)	(30)*/–	–	. .	. .
Poland	*Wisla* patrol boat 2×30 mm, 4TT	D	70	30+	. .	. .	. .	9*/–	–	. .	. .
USSR	*DII* strategic submarine [16] Sub.-S.	N	. .	. .	(1973)	. .	. .	2*/–	–	. .	–
	D strategic submarine 12 Sub.-S	N	(8 000)	25	. .	1972	. .	5*/–	–	. .	–
	Y strategic submarine 16 Sub.-S	N	8 000	25	. .	1967	(1969)	33/–[h]	–	. .	–
	P anti-shipping submarine Sub.-S, TT	N	. .	. .	. .	(1971)	(1974)	. ./–	–	. .	–
	C anti-shipping submarine 8 Sub.-S, 8TT	N	4 300	(30)	. .	1967	(1969)	11*/–	–	. .	–
	V patrol submarine 8TT	N	3 600	30+	. .	(1966)	(1968)	14*/–	–	. .	–
	T patrol submarine	D	(1 500)	. .	. .	. .	(1973)	1*/–	–	. .	–
	Kuril [aircraft carrier] S-A, S.-Sub., 28×57 mm	. .	(40 000)	(30)	1970	1972	(1975)	2*/–	25 VTOL +25 hel.	. .	–
	Kara cruiser S-A, S-S, 4×76 mm, 4×30 mm, 10TT	GT	8 200	(34)	. .	. .	(1973)	2*/–	1 hel.	. .	–
	Krivak destroyer S-S, S-A, 4×76 mm, 8TT	GT	4 800	38	. .	. .	(1971)	7*/–	–	. .	–
	Grisha corvette S-A, 2×57 mm, 4A/STT	GT	750	30	. .	1970	1972	14*/–	–	. .	–
	Nanuchka corvette S-S, S-A, 2×57 mm	D	(800)	32	. .	1971	. .	9*/–	–	. .	–
	Turya hydrofoil patrol boat 57 mm,	D	165	(40+)	. .	. .	(1974)	. ./–	–	. .	–

Country	Class, description, armaments	Power-plant	Displace-ment, *tons*	Speed, *knots*	Laid down	Launched	Com-mis-sioned or com-pleted	No.: do-mestic/ export or total	Aircraft capacity	Unit price, *$ mn*	Foreign-designed Powerplant, Electronics or Armaments
Other Europe											
Spain	*SCS-Sea Control Ship* air./hel. cruiser	GT	14 300	25	(1975)[i]	. .	. .	1/–	. .	. .	P (USA) E (USA)
	Baleares frigate S-A, S.-Sub., 127 mm, 4A/STT	T	3 000	28	1969	1971	1974	5/–	–	. .	E-r, E-s (USA) A (USA)
	João Coutinho frigate 100 mm, 2×40 mm	D	1 200	24	(1973)	. .	. .	–/4	–	. .	P (Fr.) E-r (UK) A (Fr.)
	. . frigates	D	(1 200)	. .	1973	. .	. .	10/–	–	. .	. .
Sweden	*A14* patrol submarine 8TT	D	980	(20)	1973	. .	. .	5/–	–	(20)	. .
	Spica II patrol boat 57 mm	GT	230	40	. .	1972	1973	12/–	–	(8)	P (UK) E-r (Den.)
Yugoslavia	. . patrol boat[j]	GT	. .	. .	(1973)	. .	. .	. .	–	. .	P (UK)
Other Developed											
China	*Han* (attack) submarine	N	. .	. .	(1971)	. .	. .	1*/–	. .	. .	. .
	Ming patrol submarine (6TT)	D	(1 500)	. .	(1971)	. .	. .	1*/–	. .	. .	. .
	"Romeo"[k] patrol submarine 6TT	D	1 100	17	. .	. .	. .	24*/–	. .	. .	. .
	Luta destroyer S-S, 4×130 mm	GT	3 250	32+	. .	. .	1971	7*/–	. .	. .	. .
	Kiangtung frigate S-S (4×100 mm)	. .	(1 500)	. .	(1971)		(1973)	2*/–	. .	. .	. .
	Hai Nan corvette 2×76 mm	GT	500	(20)	(1963)	. .	. .	14*/–	. .	. .	. .
	Hola[l] missile boat S-S, 4×30 mm	D	165	32	(1972)	. .	. .	(10)/–	. .	. .	. .
	Hoku[m] missile boat S-S, 2×25 mm	D	70	40	(1972)	. .	. .	(10)/–	. .	. .	. .
	Shanghai patrol boat	D	120	30	(1960)	. .	. .	320*/(24)	. .	. .	. .
	Shantung patrol boat	. .	(85)	40	(1972)	. .	. .	10*/–	. .	. .	. .
Japan	*Uzushio* patrol submarine 6TT	D	1 850	20	1968	1970	1971	8/–	–	. .	. .
	Haruna destroyer S.-Sub., 2×127 mm, 6A/STT	GT	4 700	32	1970	1972	1973	3/–	3 A/S hel.	. .	A (USA)
	Tachikaze destroyer S-A, S.-Sub., 2×127 mm, 6A/STT	GT	3 850	32	1973	1974	1976	2/–	–	. .	A (USA)
	Minegumo destroyer 4×76 mm, 6A/STT	D	2 150	27	1967	1967	1968	5/–	1 hel.	. .	A-hel. (USA)
	Chikugo escort S.-Sub., 2×76 mm, 1–2×40 mm	D	1 470	25	1968	1970	1971	12/–	–	. .	A (USA)
	. . patrol boat 2×40 mm, 4TT	D	100	40	1970	. .	1971	6/–	–	. .	. .

[a] Production completed at the end of 1974.
[b] The USA plans to acquire 30, FR Germany 10 (to be built in the USA) and Italy five to six (to be built in Italy).
[c] Four vessels of this type ordered by Peru, two of which will be built in Peru. Peruvian vessels will carry a helicopter.
[d] Production completed in 1974.
[e] Current production entirely for export.
[f] Two more vessels of this type are under construction in Brazil with material and technical assistance provided by the UK.
[g] R&D costs including two prototypes.
[h] Production of this class appears to have been completed.
[i] Spain is hoping to construct an SCS on a schedule slightly behind that of the USA so as to benefit from the latter's experience. It is not known what effect the deferment of the SCS programme in the USA will have on Spanish plans.
[j] Believed to be based on the Swedish "Spica II"-class.
[k] NATO designation for the equivalent Soviet class.
[l] Slightly modified versions of the Soviet "Osa"-class.
[m] Slightly modified versions of the Soviet "Komar"-class.
[n] Total programme costs up to the construction of two 2 200 prototypes.
[o] Including development costs and subsystems.

Part 4. *Armoured vehicles*[a]

Country	Designation, description	Main armament, *mm*	Combat weight, *tons*	Road speed, *km/hr*	Design begun	Prototype test	In production	No.: domestic/ export or total	R&D cost, *$ mn*	Unit price, *$ mn*	Foreign-designed Powerplant, Electronics or Armaments
NATO											
France	*AMX-30* main battle tank	105	36	65	1957	. .	1966	(1 000)/(550)	. .	. .	–
	VXB 170A armoured personnel carrier	20	15.5	85	1965	. .	(1972)	(240)/. .	. .	. .	–
	170 B anti-aircraft version	20	. .	. .							
	AMX-10P armoured personnel carrier	20	13.8	65	(1965)	1971	1972	. ./(250)	. .	. .	–
	AMX-10RC antitank variant	105									
	VAB Front Armoured vehicle										
	M4 competitive prototype	. .	9.5	80	(1968)	1973	. .				
	. . competitive prototype[b]	. .	12.9	90	(1969)	1973	. .				
	M3VTT armoured personnel carrier	. .	5.5	90	. .	. .	(1972)	. ./. .	. .	. .	–
	M3VDA anti-aircraft version	20			. .	. .	no	. .	. .	. .	–
	AML H60-7 armoured car	. .	4.8	90	. .	. .	yes	. ./. .	. .	. .	–
FR Germany	*Leopard II* main battle tank	120	50.5	68	(1966)	1973	(1978)	. ./. .	. .	. .	
	Leopard I main battle tank	105	40	65	1957	. .	1965	2 440/(1 400)	(25)	(0.25)	A (UK)
	Gepard anti-aircraft tank system[c]	35	. .	. .	1966	(1969)	(1974)	432/150	. .	(1.5)	A (Switz.) E-r (Switz., or Neth.)
	Marder armoured personnel carrier	20	28.2	75	1959	. .	1970	2 136/–	. .	0.2	. .
	Spähpanzer-2 armoured car	20	19	100	. .	1972	(1975)	408/. .	. .	. .	. .
	UR416 armoured personnel carrier	. .	6.3	80	. .	1973		. ./106	. .	. .	. .
International:											
FR Germany, UK	*FMBT-80* main battle tank[d]	(120)	. .	. .	1972	. .	no	. .	. .	. .	. .
Italy	*Type 6616* armoured recce. car	20	7	100	. .	1973	no	. ./. .	. .	. .	A (FRG)
UK	*Chieftain Mk3* main battle tank	120	53.8	48	(1958)	1960	1965	(800)/800	. .	0.5	. .
	Vickers Mk3 main battle tank	105	38.6	56	. .	1972	no	–/. .	. .	. .	. .
	Falcon anti-aircraft tank	30	16	48	. .	1970		. ./. .	. .	. .	A (Fr.)
	Scorpion light tank	76	8	80	1964	. .	1971	. ./(300)	. .	(0.16)	. .
	FV721 Fox[e] armoured car	30	6	100	. .	. .	1972	. ./. .	. .	. .	. .
USA	*XM-1* main battle tank	105–120	50	80	1972	1976	1977	3 312/. .	. .	0.8	–
	M-60 main battle tank	105	52	48				5 740[f]/. .	. .	0.4	–
	M-60A1 current production version				. .	. .	1962	3 470[f]/. .			
	M-60A3 improved vehicle & equipment				1971	–	1974	. ./. .			
	LVTP7 amphibious assault vehicle	20	23	64	. .	1964	1970	942/. .[g]	. .	0.1	–

	XM723 MICV-Mechanized Infantry Combat Vehicle	20–30	8.8	72	1967	1974		1 200/. .	. .	. .	–
	M113A1 armoured personnel carrier	12.7	10.8	64	. .	1964	(1965)	. ./. .[h]	. .	. .	–
	XM800 ARSV-Armoured Reconnaissance Scout Vehicle[m]	20	7	. .	1972		. .	1 150/. .	(35)	(0.08)	–
	. . wheeled competitive prototype					1973					
	. . tracked competitive prototype					1973					
	Commando V-100 armoured car	. .	7.4	100	(1960)	. .	(1965)	. ./. .			–
	V-200 larger version	20	14.1	96	. .	. .	–/. .				
	V-150 recent version										
	XM-163 (Vulcan)[i] anti-aircraft vehicle	20	. .	(64)	. .	1964	yes	. ./. .	. .	(0.5)	–
Warsaw Treaty Organization											
Czechoslovakia	*SKOT-2A (OT 64)* armoured personnel carrier	14.5	12.8	95	. .	. .	(1963)	. ./. .	. .	. .	–
USSR	*T-70* main battle tank	(115)	(40)	. .	. .	. .	no	. ./. .	. .	. .	–
	T-62 main battle tank	115	36.5	48	. .	1963	(1965)	. ./. .	. .	. .	–
	BMP-76PB infantry combat vehicle	76	10	60	. .	1967	yes	. ./. .	. .	. .	–
	. . APC derivative	. .	10	50	. .	. .	(1970)	. ./. .			–
	BRDM-2 (BTR-40PB) armoured recce. car	14.5	7	100	. .	1966	yes	. ./. .	. .	. .	–
	BMD [light tank][j]	73	(10)	. .	. .	. .	(1973)	. ./. .	. .	. .	–
	ZSU-23-4 anti-aircraft vehicle	23	14.5	44	. .	. .	(1965)	. ./. .	. .	(1)	–
Other Europe											
Austria	*Panzerjäger K* antitank vehicle	105	17	65	1965	(1968)	(1974)	(115)/–	. .	. .	A (Fr.)
Sweden	*IKv 91* light tank	90	15.5	67	1968	(1970)	1973	. ./. .	. .	. .	. .
	Pbv 302 (improved) APC	20	13	65	. .	. .	yes	. ./–	. .	. .	. .
Switzerland	*Pz68* main battle tank	105	38	55	. .	. .	(1967)	170/. .	. .	0.4	P (FRG) A (UK)
	Tornado 2 infantry combat vehicle	20	20	70	1967	1968	no[k]	–/. .	. .	. .	. .
Other Developed											
China[l]	*T-59 (T-54)* main battle tank	100	32	. .	. .	. .	1968	. ./. .	. .	. .	–
	T-62 light tank	85	21	. .	. .	. .	1968	. ./. .	. .	. .	–
	T-60 (PT-76) light amphibious tank	85	. .	. .	. .	. .	yes	. ./. .	. .	. .	–
	. . tracked armoured car	. .	11	. .	. .	. .	yes	. ./. .	. .	. .	–
	. . wheeled armoured car (BTR-40)	. .	. .	. .	. .	. .	yes	. ./. .	. .	. .	–
	. . wheeled armoured car (BTR-152)	. .	. .	. .	. .	. .	yes	. ./. .	. .	. .	–
Japan	*ST-B* main battle tank	105	38	60	1966	1969	(1974)	(280)/–	. .	(0.66)	A (UK)
	Type 70 infantry combat vehicle	12.7	13.5	60	. .	. .	(1974)	. ./–	. .	. .	. .

[a] Only basic vehicles are listed. It is common for numerous versions/derivatives of a basic vehicle to be produced or at least designed and available for production if ordered.
[b] In 1974 it was announced that this vehicle had won the competition.
[c] This system has a complicated background. The turret with twin 35-mm guns and associated fire-control system was developed in Switzerland under an FR Germany contract. The search radar was developed in the Netherlands under contract to Switzerland. Several versions are now available with surveillance or tracking radars from Switzerland, FR Germany or the Netherlands. In all cases the guns are Swiss and the vehicle German.
[d] Known as KPz-3 in FR Germany.
[e] A derivative vehicle, the "Vixen", was cancelled in late 1974 while still under development.
[f] US Army inventory plus Army and Marine Corps procurement for fiscal year 1975.
[g] Production of units for USA completed April 1974.
[h] Total production of M113 series in the USA approximately 50000 units.
[i] This is a modified M113A-1 carrying the six-barrel Vulcan gun. A towed version, designated XM-167, is also in production.
[j] This is an air-droppable paratroop fire-support vehicle.
[k] Development continuing. Enlarged version (24 tons) called "Taifun"; version with 90-mm antitank gun called "Gepard". Intended for export and/or licensed production.
[l] Vehicles of Soviet origin shown with Soviet designation in brackets. They are listed as indigenous because China has been almost totally isolated from Soviet technology since 1960.
[m] Cancelled in September 1974.

II. Register of licensed production of major weapons in industrialized countries, 1974

For sources and methods, see chapter 9. For conventions, see page 154.

Part 1. *Aircraft*

Country	Licenser	Date	Designation, description	Power-plant	Weight, *kg*	Speed *km/hr* or *Mach no.*	Nature of licence, technical changes by licensee	In production	No.: domestic/export or total	Unit price, $ *mn*
NATO										
Canada	USA	. .	*F-5* light fighter	J	9 300	M 1.5	Indigenous manufacture, improved electronics	1967	135/75[a]	. .
		1969	*CH-53D* medium transport hel.	T	19 050	315	Indigenous manufacture except avionics	1971	110/–	. .
Italy	USA	(1966)	*F-104S* fighter/strike	J	14 060	M 2.2	. .	1968	205/18	. .
		1965	*SH-3D* A/S helicopter[b]	T	9 525	265	Indigenous manufacture except radar	1967	(60)	. .
		. .	*AB 204AS* A/S helicopter	T	4 310	195	Indigenously developed A/S version of US aircraft	. .	. . .	
		. .	*AB 212AS* A/S helicopter[c]	T	(4 990)	(195)	Indigenously developed A/S version of US aircraft, powerplant imported (Can.)	(1975)	28/25	. .
		1961	*AB 206B-1* utility helicopter	T	1 520	220	Indigenous manufacture	1971	. .	(0.5)
		1968	*CH-47C* transport hel.	T	17 780	285	Partial indigenous manufacture	1970	26/44	. .
		. .	*AB 205* utility helicopter	T	4 310	220	Indigenous manufacture	. .	. ./(50)	. .
		. .	*S-61R* utility helicopter	T	9 988	254	Indigenous manufacture	1973	20	. .
		. .	*NH-500M* light helicopter	T	1 157	244	Assembly	1973	. .[d]/	. .
Portugal	Brazil	1974	*T-23 Uirapuru* trainer	P	840	225	Indigenous manufacture	(1974)	110/–	. .
UK	USA	1966	*SH-3 Sea King* A/S helicopter	T	9 300	(215)	Indigenous manufacture, UK avionics	1969	56/92	. .
			Commando Transport version		9 525	208		1972	–/30	. .

Country	Licenser	Date	Designation, description	Power-plant	Weight, *kg*	Speed *km/hr* or *Mach no.*	Nature of licence, technical changes by licensee	In production	No.: domestic/ export or total	Unit price, $ *mn*
USA	Switzerland	(1965)	*AU-23A Peacemaker* COIN aircraft	T	2 200	216	Military version of Porter developed in the USA	(1970)	15/31	. .
Warsaw Treaty Organization										
Poland	USSR	1964	*Mi-2* utility helicopter	T	3 550	210	Indigenous manufacture	1966	. ./. .	. .
Romania	UK	1968	*Islander* light transport	P	2 860	290	Indigenous manufacture	1969	215	. .
	France	1971	*Alouette III* utility helicopter	T	2 250	220	Assembly, some indigenous manufacture	1971	50/–	. .
		1974	*Puma* medium transport hel.	T	7 000	274	. .	(1975)	100/–[e]	. .
Other Europe										
Finland	Sweden	1966	*Draken* fighter/strike	J	15 000	M 2	Assembly	1974	12/–	. .
Spain	FR Germany	. .	*CASA 223K1* trainer	P	821	249	Indigenous manufacture	1972	–/50	. .
Switzerland	France	1969	*Alouette III* utility helicopter	T	2 250	220	. .	(1971)	60/–[a]	. .
Yugoslavia	UK, France	1971	*Gazelle* light utility helicopter	T	1 700	310	Assembly	1973	. .	. .
Other Developed										
Australia	USA	1971	*B206B-1* utility helicopter	T	1 520	220	Ultimately wholly indigenous manufacture	1973	(75)/-	
Japan	USA	1969	*F-4E* fighter/bomber	J	24 765	M 2.4	Mainly indigenous manufacture	1972	118/–	. .
		1959	*P-2J* maritime patrol	T	34 000	(370)	Indigenous manufacture, substantial modification of US design	1969	101/–	10.1
		(1962)	*SH-3 A/D* A/S helicopter	T	9 300	265	Assembly	yes	96/–	4.1
		(1961)	*KV-107 II/II A* transport hel.	T	8 620	270	Indigenous manufacture	(1962)	115/7	2.3
		. .	*B205A-1* utility helicopter	T	4 310	220	. .	(1972)	55/–	1.1
		1967	*OH-6J* light helicopter	T	1 225	240	Assembly	1969	135/–	0.4
		. .	*TH-55J* light helicopter	P	861	169	. .	1974	48/–	. .

Part 2. *Missiles*

Country	Licenser	Date	Designation, description	Power-plant	Warhead weight, *kg* (if nuclear, *kt/mt*)	Range, *km*	Nature of licence, technical changes by licensee	In production	No.: domestic/export or total	Unit price, $ *mn*
NATO										
FR Germany	France	. .	*AS.20* air.-to-fixed/ship	S	30	7	Indigenous manufacture	yes	1 056/–[a]	. .
International: European NATO consortium (leader, FRG)	USA	. .	*Sidewinder* air-to-air	S	HE	. .	Consortium manufacture, improved homing system	yes	. .	. .
European NATO consortium (leader, Norway)	USA	. .	*Bullpup* air-to-ship/fixed	S	113	11	. .	yes	. .	. .
Italy	USA	. .	*Sparrow III* air./ship/fixed-to-air./miss.	S	30	(25)	Indigenous manufacture	yes	. .	. .
Turkey	FR Germany	. .	*Cobra 2000* portable-to-tank	S	2.5	2	. .	yes	. .	. .
Other Europe										
Sweden	USA	. .	*Falcon*[f] air-to-air.	S	(18)	. .	. .	yes	. .	. .
Other Developed										
Japan	USA	1972	*Nike-J* fixed-to-air.	S	HE	(140)	. .	(1973)	(36)/–	(3.0)
		1972	*HAWK* mobile-to-air	S	HE	(11)	. .	(1973)	(30)/–	(2.5)
		. .	*Sparrow III* air.-to-air.	S	30	(25)	. .	(1973)	600/–	. .

Part 3. *Ships*

Country	Licenser	Date	Class, description	Dis-place-ment, *tons*	Speed, *knots*	Nature of licence, technical changes by licensee	Laid down	Launched	Commis-sioned or completed	No.: do-mestic/ export or total	Unit price, $ *mn*
NATO											
Turkey	FR Germany	. .	*Jaguar III* missile boat S-S	(400)	(38)	. .	. .	. .	(1974)	3/–[g]	. .
Other Europe											
Spain	France	. .	*Agosta* submarine 4A/STT	1 200	20	. .	1974	. .	. .	2/–	. .
		. .	*Daphne* submarine 12 TT	970	16	Extensive French assistance	1968	1972	1973	4/–[h]	. .

Part 4. *Armoured vehicles*

Country	Licenser	Date	Designation, description	Main arma- ment, *mm*	Combat weight, *tons*	Road speed, *km/hr*	Nature of licence, technical changes by licensee	In pro- duction	No.: do- mestic/ export or total	Unit price, *$ mn*
NATO										
Belgium	UK	. .	*Scorpion*[i] light tank	76	8	87	Substantial indigenous manufacture	(1973)	. ./–	. .
	FR Germany	(1973)	*Jagdpaner, Kanone* antitank	90	25.7	70	Assembly	(1974)	84/–	. .
Italy	FR Germany	. .	*Leopard* main battle tank	105	40	65	Indigenous manufacture	(1973)	600/–	. .
	USA	1963	*M113* armoured personnel carrier	–	10	65	Indigenous manufacture	yes	3 300/1 620	. .
Warsaw Treaty Organization										
Czechoslovakia	USSR	. .	*T-62* main battle tank	115	36.5	48	Probably indigenous manufacture	. .	. ./. .	. .
Hungary	Czechoslovakia	. .	*OT-64* armoured personnel carrier	14.5	12.8	95	. .	. .	. ./–[j]	. .
Poland[k]	USSR	. .	*T-62* main battle tank	115	36.5	48	. .	. .	. ./. .	. .
	Czechoslovakia		*OT-64* armoured personnel carrier	14.5	12.8	95	. .	. .	. ./–[j]	. .
Other Europe										
Spain	France	1972	*AMX-30* main battle tank	105	36	65	Assembly	yes	180/–	. .

[a] Production completed in 1974.
[b] The production of 20 air/sea rescue versions of this helicopter, designated HH-3F will commence in 1975.
[c] A version with air-to-surface missiles is under development, designated *AB 212 AWW* (Above-Water Warfare).
[d] Initial production for civil orders; military observation and ASW versions are planned.
[e] Total number; some will be imported directly from France.
[f] Both radar and infrared-homing versions are produced.
[g] A fourth unit will be built in FR Germany.
[h] Fourth unit completed in 1974.
[i] The version of this vehicle armed with "Swingfire" antitank missiles, called "Striker", is also licence-produced in Belgium.
[j] Production may be complete.
[k] The BMP-76 infantry combat vehicle may also be licence-produced in Poland.

Appendix 7B

Register of arms trade to industrialized countries, 1974

For sources and methods, see chapter 9. For abbreviations of manufacturers' names, see *Arms Trade Registers: The Arms Trade with the Third World* (Stockholm, Almqvist & Wiksell, 1975, Stockholm International Peace Research Institute), pp. 131–48.

Abbreviations and conventions

. .	=Not available
( )	=Uncertain data
+	=At least the number given and probably more
batt	=battery (of missiles)
Displ	=Displacement of naval vessels, in tons
1969–	=1969 and subsequent years
Mk	=Mark
Srs	=Series
t	=Tons
U.c.	=Unit cost
AAM	=Air-to-air missile
A-A missile	=Air-to-air missile
AC	=Armoured car
AD	=Air defence
AF	=Air Force
APC	=Armoured personnel carrier
ASM	=Air-to-surface missile
ASW	=Antisubmarine warfare
ATM	=Antitank missile
COIN	=Counterinsurgency
ECM	=Electronic countermeasures
LOH	=Light observation helicopter
LST	=Landing-ship, tank
MAP	=(US) Military Assistance Program
MBT	=Main battle tank
SAM	=Surface-to-air missile
SAR	=Search and rescue/sea-air rescue
ShAM	=Ship-to-air missile
ShShM	=Ship-to-ship missile
SLAM	=Submarine-launched air missile
SSM	=Surface-to-surface missile
STOL	=Short take-off and landing
USAF	=United States Air Force
USN	=United States Navy
VG	=Variable geometry
VIP	=Very important person
V/STOL	=Vertical or short take-off and landing
WEU	=Western European Union

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
NATO							
North America:							
USA	UK	90	HS AV-8A Harrier	V/STOL fighter	$58.2 mn incl initial spares;	1969–73	1971–74
		12	HS AV-8A Harrier	V/STOL fighter	$53.6 mn incl initial spares; these 20 are the final batch of total purchase of 110	1974	Due by end of 1975
		8	HS TAV-8A Harrier	V/STOL trainer			
Canada	UK	100	Short Blowpipe	Anti-aircraft missile system	$28 mn	May 1973	1974–76
	USA	8	Boeing-Vertol Chinook CH-147	Transport helicopter	$30 mn incl spares and support equipment	1973	1974–75
		5	Lockheed C-130H Hercules	Transport	$26.4 mn	1974	1974–75
		150	Hughes TOW launcher	A-T missile system	$30 mn incl missiles and support equipment	1973	1975–
Europe:							
Belgium	France/ FR Germany	33	Dassault-Breguet/Dornier Alpha-Jet	Trainer	U.c.: $1.9–2.3 mn; letter of intent to purchase	. .	(1977–78)
	FR Germany	55	Krauss-Maffei Leopard	Main battle tank	In addition to 334 previously purchased	July 1973	. .
		80	Rheinstahl 90 mm tank destroyer		About $25 mn, incl spare parts etc	Dec 1972	1975
	FR Germany/ Switzerland	55	Krauss-Maffei-Oerlikon-Contraves 5 PFZ Gepard	35 mm anti-aircraft tank		1973	. .
	UK	3	HS 748-2A	Transport	($7.5 mn)	(May) 1974	1975–76
		5	Westland Sea King Mk 48	SAR helicopter	($14 mn)	(May) 1974	1975
		. .	BAC Swingfire	A-T missile system with missiles	To equip 43 Striker launching vehicles	May 1973	1974–76
	USA	. .	LTV MGM-52A Lance	S-S missile system		. .	. .
Denmark	Canada	15	Canadair CF-104 Starfighter	Fighter/bomber	U.c.: $265 000	1971	1973–
		7	Canadair CF-104D Starfighter	Trainer			
	FR Germany	120	Krauss-Maffei Leopard I A3	Main battle tank	$85 mn	June 1974	1976–
	Sweden	5	Saab TF-35 Draken	Trainer	$13 mn; in addition to 46 previously purchased	1973	1974–77
	USA	3	Lockheed C-130H Hercules	Transport	$19 mn, incl spares	1973	1975

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
		4	NA F-100F	Trainer	Refurbished ex-USAF	1973	March 1974
		10	NA TF-100F				
		. .	Hughes TOW	A-T missile		1973	. .
France	FR Germany	4	Dornier Do 28B	Light STOL transport	From civil source	. .	1974
	Italy	1	Fokker-VFW F27	Transport	From civil source	. .	1974
	UK	6	Gloster Meteor TT 20	Target towing aircraft	From RAF surplus	. .	1974
		1	McDonnell-Douglas DC-8	ECM aircraft	$8.7 mn	(1973)	(1975)
FR Germany	France	320	Aérospatiale AS-30	A-S missile		1973	. .
		20	Fast missile patrol boat, type 148	Displ: 265 t		1970	1973–75
		200	Aérospatiale Exocet	S-S missile	To equip 30 patrol boats and 4 destroyers	1970	. .
	Switzerland	3	Contraves Skyguard-M	Autonomous S-A missile system	Prototypes	1971	. .
	UK	22	Westland Sea King Mk 41	SAR helicopter	$85.3 mn incl spares, crew training and infrastructure	1969	1974–
		. .	Short Seacat	Naval S-A missile		. .	. .
	USA	175	McDonnell-Douglas F-4F Phantom II	Fighter		1971	1973–
		100	Hughes TOW launcher	A-T missile system		1972	1972–
		3 000	Missile				
		26	LTV MGM-52A Lance	S-S missile system	($100 mn)	June 1974	1974–
Greece	Canada	2	Canadair CL-215	Amphibian		1973	(1974)
	France	40	Dassault-Breguet Mirage F1	Fighter-bomber			
		4	Fast missile patrol boat, "La Combattante III"-class	Displ: 400 t			
		. .	Aérospatiale (Exocet)	S-S missile	$350 mn deal	Mid-1974	1975–
		At least 100	APC				
		130	AMX-30	Main battle tank			
	France/ FR Germany	. .	Aérospatiale/Messerschmitt-Bölkow-Blohm (MBB) Milan	A-T missile		1974	. .
	USA	4	Lockheed C-130H Hercules	Transport		Late 1974	. .
		60	LTV A-7 Corsair	Fighter	U.c.: $3.8 mn incl spares	June 1974	1975–
		38	McDonnell-Douglas F-4E Phantom	Fighter		1972	1974
		40	NAA Rockwell T-2C Buckeye	Trainer		Mid-1974	1976–
		. .	Hughes TOW	A-T missile system		(1974)	. .

Iceland	Denmark	1	Patrol vessel	(Displ: 1 800 t)	Under construction	1973	. .
Italy	Australia	1	Government Aircraft Factories (GAF) Nomad	Utility aircraft		1974	. .
	France	18	Dassault-Breguet 1150 Atlantic	ASW aircraft	$111 mn	1968	1972–74
	Netherlands	2	Fokker-VFW F-28	Transport		(1974)	. .
	USA	2	Boeing-Vertol CH-47C Chinook	Helicopter		(1974)	(1974–)
		130	Hughes TOW launcher	A-T missile system	$51.5 mn	1972	(1973–74)
		5 000	Missile				
	USA	1	Submarine, "Tang"-class	Displ: 2 100 t	Transferred after modernization	. .	1974
Luxembourg	USA	6	Hughes TOW launcher	A-T missile system		Aug 1974	. .
		60	Missile				
Netherlands	FR Germany	30	MBB B0-105C	Observation and liaison helicopter	$19.5–22.5 mn	Late 1974	1975–76
	FR Germany/ Switzerland	6	Krauss-Maffei/Oerlikon-Contraves Gepard	35 mm anti-aircraft tank	1 prototype and 5 pre-series	1968	1974
		60	Krauss-Maffei/Oerlikon Contraves Gepard	35 mm anti-aircraft tank	$86 mn	1973	1977–
		35	Krauss-Maffei/Oerlikon-Contraves Gepard	35 mm anti-aircraft tank	Earlier option converted to order	Nov 1974	. .
	UK/France	6	Westland/Aérospatiale WG 13 Sea Lynx	Helicopter	$15 mn	Nov 1974	1976–
	UK	1	Westland Wasp	ASW helicopter		. .	1974
	USA	. .	Hughes TOW	A-T missile system	Initial contract worth $15 mn	1971	1975
		. .			Second contract	1973	. .
		. .	McDonnell-Douglas Harpoon	Sh-Sh-missile	To arm new frigates	1974	(1976–78)
Norway	Canada	22	Canadair CF-104 Starfighter	Fighter	$13.2 mn incl spares and cost of conversion to F-104 G standard	1972–73	1973–74
	USA	2	Dassault Falcon	Transport	Second hand	(1973)	(1974)
		. .	Hughes TOW	A-T missile system	($21.7 mn)	(Jan 1974)	(1975)
Portugal	Spain	28	Casa C.212 Aviocar	Transport		March 1974	1974–75
Turkey	Canada	15	Canadair/Lockheed T-33	Trainer		Nov 1973	. .
	FR Germany	1	Fast missile patrol boat, "Jaguar III"-class	Displ: 400 t	First of 4: other 3 to be built in Turkey	(1974)	Late 1976
		4	Submarine	Displ: 900 t surface	Under construction	. .	. .
	Italy	18	Aeritalia/Lockheed F-104S Starfighter	Multirole fighter	In addition, option on a further 18	(Nov) 1974	(Dec) 1974–75
	Norway	. .	Kongsberg Våpenfabrikk Penguin	Sh-Sh-missile	To equip some "Kartal"-class FPB	(July 1974)	. .
	Spain	15	CASA (MBB) 223 A1 Flamingo	Utility aircraft	On order	. .	. .
	USA	40	McDonnell-Douglas F-4E Phantom	Multirole fighter	($250 mn, incl spares and training)	1972	Aug 1974 –

						Date: number of items	
Recipient	Supplier	Number	Item	Description	Comment	Ordered	Delivered
		. .	Hughes TOW	A-T missile	On order	1973	(1975–76)
		. .	McDonnell-Douglas Harpoon	Sh-Sh-missile	To equip Jaguar III type fast missile patrol boats	(1974)	
		1	Destroyer, "Gearing"-class	Displ: 2 425 t		. .	July 1974
	USA	1	Landing ship, tank	Displ: 2 580 t		. .	Aug 1974
UK	France	300	Aérospatiale MM-38 Exocet	Sh-Sh-missile		(1971)	(1972–)
	USA	. .	LTV MGM 52 Lance	S-S missile system		June 1974	1975–
Warsaw Treaty Organization							
Bulgaria	Czechoslovakia	. .	Aero L-39	Trainer	On order, to replace L-29 Delfin	. .	. .
German DR	Czechoslovakia	. .	Aero L-39	Trainer	On order; to replace L-29 Delfin	. .	. .
Hungary	Czechoslovakia	. .	Aero L-39	Trainer	On order; to replace L-29 Delfin	. .	. .
Poland	USSR	1 regiment	Sukhoi SU-20	VG ground attack aircraft		. .	. .
		. .	SA-9	SAM		. .	1974
Romania	Czechoslovakia	. .	Aero L-39	Trainer	On order; to replace L-29 Delfin	. .	. .
	France	100	Aérospatiale SA 330 Puma	Helicopter	To be mainly licence-produced	. .	. .
USSR	Czechoslovakia	. .	Aero L-39	Trainer	On order; to replace L-29 Delfin	. .	. .
	Finland	3	Icebreaker, shallow water type			March 1974	1976
Other Europe							
Finland	Sweden	12	Saab 35S Draken	Fighter/bomber	$70–75 mn incl weapons and ground support; assembly in Finland	1970	1974–75
	USSR	1 squadron	MiG-21 MF "Fishbed J"	Multirole fighter		. .	(1974)
Ireland	France	1–2	Aérospatiale Alouette III	Helicopter		1973–74	(1974)
		6	Aérospatiale Super Magister	Trainer/COIN	($2.5 mn)	1974	1974–75
Malta	Libya	2	Thornycroft type, coastal patrol craft			. .	1974
Spain	Canada	8	Canadair CL-215	Tactical support amphibian	In addition to 2 received earlier	. .	(1974)
	France	15	Dassault Mirage F-1C	Fighter	*Ca.* $260 mn	(1972–73)	(1975–)
		. .	Matra 550 "Magic"	A-A missile	Spain thought to be customer	1974	. .

		(12)	Fast missile patrol boat, "La Combattante II" type	Displ: 234 t	Will probably have Otomat ShShM	1973	. .
		2	Submarine "Agosta" type	Displ: 1 200 t		1974	. .
	Italy	. .	Agusta-Bell 212 AS	ASW and strike helicopter		(1974)	1974
	USA	12	Beechcraft Bonanza F 33C	Utility aircraft		1973	1974
		2	Beechcraft King Air A100	Trainer/transport	Several million dollars	1973	1974
		6	Beechcraft King Air C 90				
		12	Bell AH-1G Huey-Cobra	Strike helicopter	Under 1974 defence agreement with USA	1974	. .
		. .	Bell Kiowa	Helicopter		. .	. .
		6	Bell UH-1H Iroquois	Helicopter	On order at the end of 1973	. .	(1974)
		6	Boeing-Vertol CH-47C Chinook	Transport helicopter	$18 mn	(Aug) 1972	(1972–74)
		6	HS Harrier Mk 50	V/STOL fighter	$30 mn; 6 built to AV-8A standard, 2 to TAV-8A standard	1973	1975–76
		2	HS Harrier Mk 50	V/STOL trainer			
		4	Hughes 369HM (500)	ASW helicopter		. .	1974
		4	Lockheed C-130H Hercules	Transport		. .	1974
		12	Sikorsky SH-3D Sea King	ASW helicopter	Under 1974 defence agreement with USA	1974	1974: 2
		. .	Raytheon Sea Sparrow	Sh-A missile	To equip new patrol frigates	1974	. .
		1	Submarine "Guppy II A" type	Displ: 1 975 t		. .	Mid-1974
Sweden	Finland	1	Icebreaker		Similar to "URHO" class	Pre-1971	(1974)
		1	Icebreaker			. .	(1975)
	Japan	(6)	Mitsubishi MU-2	Utility aircraft		. .	(1974)
		1	Kawasaki (Boeing-Vertol) KV-107/II-5		In addition to 7 previously delivered		(March 1974)
	USA	1	Lockheed C-130 Hercules	Transport	*Ca.* $8 mn	(1974)	1975
Switzerland	Sweden	. .	Bofors Bantam	A-T missile		. .	. .
	UK	30	HS Hunter	Fighter	($23.2 mn); refurbished	(1971)	(1974–75)
		22	HS Hunter	Fighter	($42 mn); additional refurbished aircraft	1973	(1975–)
		8	HS Hunter	Trainer		. .	. .
Far East							
China	Czechoslovakia	4	Aero L-29 Delfin	Trainer		(1974)	. .
	France	13	Aérospatiale Super Frelon	Helicopter		(1973)	1973: 1 1974–
Japan	USA	1	Beechcraft C-90 King Air	Trainer		1974	. .
		14	McDonnell-Douglas RF-4E Phantom	Tactical reconnaissance aircraft		1973	1974–75
		. .	General Dynamics Tartar	S-A missile	$31 mn; for new guided-missile destroyer	July 1973	. .

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
Oceania							
Australia	New Zealand	37	N.Z. Aerospace Industries CT-4 Airtrainer	Trainer	$2.6–3.4 mn	1973	1975–
	UK	10	Westland Sea King Mk 50	Helicopter	*Ca.* $24 mn	1972	1975–
		2	Submarine, "Oberon"-class	Displ: 1 610 t	($44.7 mn)	1971	(1975: 1) (1976: 1)
	USA	12	Bell UH-1 Iroquois	Helicopter		1973	1974: 6
		12	Boeing-Vertol CH-47C Chinook	Transport helicopter	$44.2 mn	March 1972	(1974)
New Zealand	UK	6	BAC 167 Strikemaster Mk 88	Strike/trainer	$6.6 mn incl spares and equipment	April 1974	Jan 1975
		4	Patrol craft, "Lake"-class	Displ: 105 t		. .	1974

8. Major weapon procurement in third world countries, 1974

Square-bracketed references, thus [1], refer to the list of references on page 203.

I. *Introduction*

Between 1973 and 1974 the sale of major weapons to third world countries increased by over 40 per cent. This development was predicted—in trend if not in degree—in earlier SIPRI Yearbooks, on the basis of the large increase in new orders from about 1972. According to SIPRI assessments of major weapon transfers, the value of deliveries in 1974 reached a record level of almost $4 billion. Table 8B.2 on page 220 shows the distribution of this total among third world regions. The Middle East alone accounts for 57 per cent of all third world arms imports, but other regions also show a remarkable increase, particularly Sub-Saharan Africa and South Africa. Only the Far East differs from this pattern, but judging from the new contracts concluded in the region during 1974, this will only be a termporary aberration. However, the ranking of suppliers and recipients on the basis of annual figures can sometimes be misleading. For example, the 1974 register in appendix 8B shows Syria as the leading recipient ($774 million) followed by Iran ($564 million), but a longer-term view establishes Iran as by far the largest importer of arms in the Middle East.

As far as weapon suppliers are concerned, the Soviet Union was the largest supplier of major weapons to the third world during 1974, outstripping the United States by some 50 per cent. This also applies to the period 1950–74 taken as a whole—but with a reduced margin over the USA of about 12 per cent. It is worth pointing out, however, that Soviet arms exports tend to be directed at a relatively small number of countries. Thus, in 1974, for example, Syria received over 50 per cent of total Soviet exports and another 15 per cent was accounted for by the licensed production of MiG fighters and missiles in India.

The SIPRI values are calculated on the basis of effected deliveries per year only, while the information occasionally published on actual prices paid for arms by third world countries often refers to contracts under which deliveries may be spread over several years. This, coupled with the fact that SIPRI covers only major weapons, accounts for much of the apparent inconsistency between SIPRI values and official data provided by some of the leading arms exporters. For instance, in fiscal year 1974 the US cash foreign military sales programme totalled $8 billion, a figure which clearly establishes this country as the world's leading arms exporter at the present time; official US estimates put total Soviet arms exports at about $3 billion for 1974.[1] However, the US figure is largely made up of contracts for armaments that have yet to be delivered, such as the current purchase by Iran of 80 F-14A air superiority fighters for an estimated $1.5 billion, the delivery of which will commence in 1976. In other respects, however, SIPRI's data agrees closely with official figures. According to the latter, the three largest recipients of US arms in fiscal year 1974 were Iran ($3.8 billion), Israel ($2.1 billion) and Saudi Arabia ($588 million); the same ranking appears in the SIPRI values.

On the basis of the SIPRI valuations, four major groups of suppliers can be discerned, in order of importance, from table 8B.1. Dominating the export of major weapons to the third world are the United States and the Soviet Union; the United Kingdom and France follow, as medium-size exporters; China, FR Germany and Italy make up a third category, and all the remainder are relatively minor suppliers. More specifically, it can be seen from table 8B.1 that the UK increased its sales to the third world despite fierce competition with France for this lucrative market. Prospective exporters are FR Germany and Italy, both of which showed striking increases between 1973 and 1974. Among the arms exporting countries in the third world, Israel occupies a leading position because of its domestic arms industry, followed by Brazil and South Africa. But the largest third world arms exporter is Iran, reselling US-supplied F-5 aircraft to Ethiopia and Jordan. Collectively, the third world arms exporting countries were the fifth-ranking source of major weapons supplied to the third world in 1974.

All the most important arms supplying countries listed in table 8B.1, with the sole exception of Canada, show relatively large increases, reflecting a development away from political responsibility to commercialism. In view of this, the occasional expressions of concern voiced by government spokesmen sound increasingly hollow against the background of this growing and particularly lethal trade. In 1974, former US Secretary of Defense, Melvin Laird, declared, "To me the most important agreement that can be worked out in the next four or five years is to involve the Soviet Union, the United States, and all other arms-producing countries to limit the sale and delivery of conventional military equipment into the Middle East, South Asia, Latin America and Africa" [1]. However, in reality the third world—and particularly the countries in this group that are rich in raw materials—have become a large and rapidly growing market for the latter-day merchants of death, namely, the governments of the dominant industrialized countries.

[1] These figures refer to world sales.

II. *The trade pattern*

In the Middle East, the Persian Gulf states[2] are by far the largest arms clients, although accounting for only 36 per cent of actual deliveries to the region in 1974. These states will be dealt with separately in section IV. But the trend of arms imports to those countries that are also participants in the Arab-Israeli conflict[3] shows both a qualitative and a quantitative rise. The inflow of major arms to these countries—by all appearances preparing for a final show-down when they have built up their military strength after the losses of the October 1973 War—has continued to rise, despite mounting outside concern over its nature and extent. The double standards inherent in a policy of advocating an arms embargo on the one hand and actively contributing to an unlimited build-up of military power on the other, are only to be found on the supply side. The Middle East states have never accepted the idea of limiting their arms procurement, and the new trends in arms supplies rather point to the fact that the supplying countries have in practice abandoned all attempts to limit the arms build-up—if indeed such attempts ever reflected any serious concern.

These new developments, as illustrated by the arms trade register in appendix 8B, are primarily related to a change in the supply pattern. Before the October 1973 War, the United States and the Soviet Union were in a monopoly position as sole military suppliers to Israel and Egypt respectively. But since then, France, the UK and FR Germany have re-entered the arms trade market in the Middle East, selling both to Israel and to the Arab states. Following its eventual acknowledgement that Libyan Mirage aircraft had been transferred to Egypt during the October War, the French government officially declared in August 1974 that it was lifting its embargo on the combatant states in the Middle East.

Towards the end of 1974, it became known that Egypt had not in fact received war replacements from the Soviet Union in anything like the quantities generally assumed. From April 1974 until the end of the year, no Soviet arms were delivered to Egypt. For example, the several hundred battle tanks supplied immediately after October 1973 as war replacements came from Yugoslavia, not the Soviet Union. Presumably in response to this limitation on supplies from the Soviet Union, the Egyptian government concluded agreements with Abu Dhabi, Kuwait and Saudi Arabia to acquire sophisticated weaponry from the West, with the result that Mirage fighter planes contracted for by Kuwait and Saudi Arabia from France began to be delivered directly from France to Egypt. Similarly, the UK agreed to supply ASW and troop transport helicopters directly to Egypt, under a contract

[2] The largest arms importing Persian Gulf states are the oil producing countries Abu Dhabi, Iran, Kuwait, Oman and Saudi Arabia.
[3] Egypt, Iraq, Israel, Jordan, Lebanon and Syria.

concluded with Saudi Arabia. The latest information indicates that in 1975 France is ready to agree on bilateral arms sales to Egypt. At the same time, the UK and FR Germany reappeared in 1974 as arms suppliers to Israel and the latter is reportedly renegotiating for Mirage fighters from France.

It is clear that some of the arms purchased from the West by the Persian Gulf states are directly related to the Arab-Israeli conflict and may ultimately be used in a future war in this connection, rather than in the Persian Gulf context. The 1973 October War has aroused great interest because it was the first occasion on which both sides made extensive use of some of the most sophisticated tactical weapon systems available in the world. In addition to restocking their arsenals, the countries involved have requested —and almost invariably received—weapons and equipment to round out their capabilities in those areas where the recent war revealed weaknesses. Particularly notable is the Israeli acquisition of high-precision bombs, air-to-surface missiles and electronic countermeasure systems.

Much was heard in 1974 about the "lessons" learned in the October War. Unfortunately, these lessons were exclusively of a military nature. From the point of view of achieving peace and a viable long-term political solution to the Arab-Israeli conflict, the spiralling arms race in the countries involved is far more likely to be counterproductive. Even countries that were previously small clients in the arms trade market, such as Jordan and Lebanon, are being drawn into the arms build-up. Thus, the United States has agreed to supply Jordan with modern fighter aircraft and air defence systems, which, in turn, has resulted in the much publicized Jordanian sale of its old equipment to South Africa.

Major arms transfers to Sub-Saharan Africa more than doubled between 1973 and 1974, the leading purchasing nations being Ethiopia, Ghana, Nigeria, Tanzania, Uganda and Zaire. The current arms build-up in Tanzania and Zaire reflects the escalating tension in Southern Africa between the black-ruled states and the white minority régimes in South Africa and Rhodesia. But in 1974, the Republic of South Africa alone acquired major arms worth $161 million, compared with $227 million for the entire rest of Africa, except Egypt. Of the total figure for South Africa, more than 50 per cent consisted of the Jordanian arms deal: through a private South African company based in Liechtenstein, the Jordanian government sold its entire Tigercat air defence system with all support equipment and over 50 missiles, as well as 41 Centurion tanks, and by May 1974 the delivery had already been completed. It was reported that President Sadat of Egypt personally stopped the additional transfer to South Africa of Jordan's 60 Hawker Hunter fighter planes. It was generally assumed that these weapons were in fact destined for Rhodesia but whether this retransfer will take place is still not clear. South Africa is currently deploying the highly sophisticated Cactus air defence system, developed in France with South African funding, and known in France as the Crotale system. South Africa also has a relatively large tank inventory, and in the near future will probably embark on a licensed construction programme of heavy tanks.

In Latin America, the policy of purchasing European arms in order to counteract US attempts at limiting the inflow of sophisticated weaponry to the region, is being reversed, and within a few years the United States will probably revert to its former leading position. In 1974, British weapons still accounted for almost 50 per cent of the total value of arms imports, with FR Germany as the second largest supplier—mainly of submarines—and the USA third. In addition, France concluded a number of large new contracts with several Latin American states. Together, Central and South America show an increase of 30 per cent in arms imports since last year. The largest purchaser is Chile—in evident contrast to its position during the Allende régime—followed by Argentina, Venezuela, Peru and Brazil. Chile is receiving arms from the USA, the UK and France. Ecuador was the first country to purchase the Franco-British Jaguar International fighter/interceptor aircraft (the second being Oman in the Persian Gulf), and with the wealth gained from the production of its newly discovered oil deposits, is in the market for the US F-5 fighter.

In the Far East, South Viet-Nam stands out as the largest single recipient of major arms in 1974, all of which came from the USA. North Korea took delivery of new MiG fighters in 1974. Thailand was the third largest customer in this region with imports from the USA, the UK, Italy and New Zealand. In the Indian subcontinent, India's major arms imports in 1974 were almost twice the size of Pakistan's. This was mostly accounted for by the licensed production of Soviet fighter aircraft.

III. *Domestic arms production*

The trend towards domestic arms production—in the form of licensed production, co-production or collaboration projects—and indigenous design was discussed in chapter 7. This trend is particularly apparent in a number of third world countries, and the establishment of local defence industries is a rapidly spreading phenomenon. Particularly those nations that have been subjected to arms embargoes from their traditional suppliers—such as Egypt, Israel, India, Pakistan and South Africa—are expanding their domestic production capacity. In 1960, virtually no third world country possessed the capacity to produce major arms—with the notable exception of Argentina and Brazil. By 1974, 18 third world countries are listed in the SIPRI register of licensed production of major weapons. Of these, 14 also appear in the register of countries which have acquired a domestic design and development capacity.

The motivation underlying decisions to invest in this type of industrial development is usually a mixture of political and economic considerations. It is argued, for example, that in time of conflict, an importing country risks being cut off from the resupply of the arms that it needs, and from spare parts and additional support equipment for those arms already purchased. Thus, the argument that a domestic production capacity makes a government politically more independent of supplier nations is regarded as undeniable. This motivation has been openly acknowledged on several occasions by governmental or defence spokesmen in South Africa, India and Israel. Moreover it is argued that once production capacity has been acquired, the original seller of a licence has little possibility of stopping production. Provided that the indigenous content of production is close to 100 per cent, the country undertaking licensed production is relatively invulnerable. The continuing production in Pakistan of West German Cobra antitank missiles and Cessna light planes without licences is a good illustration of this.

However, there is a reverse side to such arguments. Economic dependence on traditional arms suppliers may actually increase with the establishment of domestic arms industries in new countries, and this has often been cited by critics as showing that *political* dependence in fact also increases. As shown in the register of indigenous arms production in appendix 8B, for most third world projects, aero-engines and electronics are imported from the traditional arms sellers. This is, however, not the same as being dependent on a foreign country for the entire weapon: the sale of electronic components and related equipment often escapes embargo regulations and may not even be fully known by the government in the selling countries. Only the rules of commercialism apply. Thus for example, a private company may claim that concluded contracts must be fulfilled, and may withhold details of contracts to protect itself from competitors for lucrative orders. For instance, Rolls-Royce aero-engines for the HS748 military transport aircraft, licence-produced in India for over ten years, are never mentioned in connection with arms embargo policies. Under a collaboration agreement, economic dependence even works in favour of the buyer: India produces components for French Alouette helicopters, which are resold to France. For the seller, this is in fact one of the means of profiting from cheap labour costs in an underdeveloped country. On the supply side, national economic interests weigh more heavily than more theoretical argumentation against the transfer of military know-how to countries where it is an understatement to say that resources are scarce. The efforts required, in terms of funding, infrastructure, training of manpower and establishment of related industries to produce the raw materials and components needed in the arms industries are incalculable and almost impossible to translate into monetary terms, especially for such countries as India with a constant profile of underdevelopment, foreign aid needs and hunger catastrophes.

Brazil, India, Israel and South Africa are practically self-sufficient in the production of small arms, ammunition, bombs, explosives and unguided rockets. Argentina, Brazil and Israel all produce domestically developed light trainers or transports, suitable for counterinsurgency warfare and attractive on the export market as cheaper than their competitors from the traditional suppliers.

India and South Africa produce advanced jet fighters under licence, with the result that these countries actually provide the main combat strength of their air forces themselves. The Italian M.B 326 armed jet trainer, a typical counterinsurgency aircraft, is locally produced in Brazil and South Africa, creating a local air force COIN capacity.

The Latin American nations are showing a substantial shift away from direct arms imports towards co-production programmes by the industries of the manufacturing nations. Northrop, for example, is negotiating an agreement with the Embraer company in Brazil for partial licensed production of the F-5E fighter.

In the Far East, Taiwan stands out as an example of a country that has shifted from direct imports to licensed production. A large number of Bell helicopters are produced locally, as well as the F-5E fighter. The additional motivation for the seller is obvious: a production agreement is less noticeable and may attract less public attention and political embarrassment than a direct large transfer of, say, fighter aircraft to a controversial customer. South Viet-Nam and South Korea are both establishing aircraft industries.

In the Middle East, an important development in this field in 1974 was the opening of serious negotiations between Egypt and the UK for the licensed production in Egypt of a large number of Lynx multi-purpose helicopters. Plans for a joint Arab defence industry have been under way for some years, with the oil producing countries including Libya as the primary source of finance. Pakistan is involved in this scheme as a producing nation and may play an important role in the future. In 1974, Saudi Arabia and Abu Dhabi placed orders for warships in Pakistan.

Israel and South Africa produce indigenously designed missile systems, also for export to other countries.

The spread of military know-how to new producing nations creates an increasingly complex and obscure pattern of interdependence. The chances of securing any form of control over the arms trade diminishes in direct proportion to the number of countries possessing the technical and industrial skills necessary for the production of modern weapons.

The weapons purchased or produced in the third world countries have a number of distinguishing characteristics, as compared with the arms inventories in the industrialized world. The US advanced fighter interceptor F-5E Tiger II was developed as a "poor man's weapon", suitable for use under more primitive battle conditions than those anticipated, for example, in Europe. The F-5 is being sold all over the world—to South Viet-Nam, South Korea, Taiwan, Ethiopia, Iran and to several Latin American nations. The French Mirage F-1 is a close competitor and is in demand in a large number of countries, including Israel and Egypt. The Mirage F-1 is also the combat aircraft of the future in South Africa, where licensed production will begin in 1977 and is planned to continue well into the 1980s. Armed trainers, light strike aircraft and helicopters are suitable for counterinsurgency warfare, and typical in the third world inventory: the Italian M.B. 326 is purchased by many countries, as is the SF.260W Warrior.

FR Germany's main export items to the third world include Dornier light transport aircraft, and type 209 light patrol submarines with a displacement of 1 000 tons. Guided missile high-speed boats, especially of French and German designs will, in a few years, equip many navies in the third world.

On the other hand, there is the growing willingness on the part of the major arms suppliers to sell highly sophisticated conventional weapons to selected countries. Outstanding examples are the F-14A (USA), the MiG-23 (USSR) variable-geometry fighters and the US HAWK surface-to-air missile. And it should also be borne in mind that the capabilities of so-called poor man's weapons are limited only in a relative sense. In virtually every case, the acquisition of such weapons by a third world country represents a major increase in military capability.

IV. *The fourth world: arms for oil*

In 1974, the Persian Gulf states stand out as the largest single group of major arms importers among the third world, if the values of new contracts concluded during the year are taken into account. The arms race in the Persian Gulf in fact started several years ago in connection with the announcement of the British withdrawal from east of Suez. But it was only after the October 1973 War and the ensuing Arab oil boycott of the West, coupled with the European energy crisis, that a new type of weapons spiral began—the so-called oil-for-arms deals. This development has for the first time focused worldwide attention on the subject of the arms trade as such. It has also brought about the sudden recognition of the major oil producing nations—sometimes collectively referred to as the fourth world—as a separate and powerful entity in international relations.

The spiralling arms race in the Persian Gulf states was already established during the 1960s, but this development took place in the shadow of the arms build-up in Israel and Egypt, and received relatively little attention. Iran was one of the earliest recipients of US military aid and was regarded as the most important link in the CENTO defence organization. Nevertheless when the United States agreed in 1964 to supply HAWK missiles and F-5 fighters to Iran, the contract covered much less military equipment than Iran had asked for, because it was felt that additional supplies would put a strain on Iran's economy. Until 1968, arms purchases by all the Persian Gulf states were mainly related to a number of bilateral or internal conflicts in the area. Iran and Iraq were involved in a long-standing dispute over their territorial rights in the area; the Iraqi régime was engaged in a civil war against the Kurds; Arab demands were voiced that Iran's richest oil area —the Arab-populated Khuzistan—should belong to the Arab nations; Kuwait became involved in disputes with both Iran and Iraq; the wars in the two Yemen states called for arms imports; the nine Persian Gulf sheikdoms undertook a military build-up with British aid, and Oman became engaged in an antiguerilla war against the Dhofar guerillas who were supported by Southern Yemen.

In 1968, Britain announced that it would withdraw its military forces from east of Suez by 1971. The oil-rich Persian Gulf area would accordingly be left in a military vacuum, and this triggered off an arms build-up in the area. Between 1968 and 1970, all the countries involved—and especially Iran—showed substantial increases in military expenditure and arms imports, undertaken to create local defence forces for the whole area. The founding of OPEC,[4] and the shift in policy by the oil producing countries that began in 1970, finally put an end to the period when the traditional arms supplying nations hesitated to deliver too advanced weaponry for fear that the Persian Gulf recipients would not be able to pay.

In 1974, the price of oil had risen to $11.65 a barrel, from $1.80 in 1970. During the same period, control of the oil was wrested from the multinational oil companies by the oil producing countries, which then proceeded to set the terms and prices of the oil trade themselves. By 1974, the Persian Gulf states had amassed almost limitless oil revenues, thus reducing even lavish expenditure on military equipment to marginal significance.

US Assistant Secretary of State, Alfred L. Atherton, summarized the economic situation thus: "We now find a situation where a small group of countries on the Persian Gulf are well on their way to becoming financial giants, since the world must continue to depend on the oil resources of the region" [2]. In testimony before the Subcommittee on the Near East of the House Foreign Affairs Committee in August 1974, Mr Atherton said that the Gulf countries were amassing some $3 billion *each month* in foreign exchange assets, or so-called "petrodollars". In 1974 their combined oil resources were expected to exceed $62 billion. Other estimates go as high as $110 billion in 1974. For example, David Rockefeller of the Chase Manhattan Bank estimates that, at present prices and levels of production, the OPEC member countries will receive over $100 billion per year for their oil exports. Of this, no more than $40 billion will be spent on goods and services, leaving $60 billion for reinvestment.

The actual prices paid for arms purchases concluded during 1974 came

[4] The OPEC members are Algeria, Ecuador, Gabon, Iran, Iraq, Indonesia, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates (including Abu Dhabi) and Venezuela.

nowhere near the limits of the Persian Gulf states' resources. In addition to direct purchases of arms, a number of investments were made in the arms industries of the West. Iran acquired a 25 per cent interest in the steel works of FR Germany's giant Krupp enterprise and joined a banking consortium to provide a $200 million loan to Grumman, the US corporation responsible for developing and producing the F-14A air superiority fighter. Iran also gave a much needed boost to the trouble-plagued F-14 programme by initially ordering 30, and later 50 more aircraft. Another weapon in which Iran has been interested is the C-54 Galaxy heavy transport plane. The US Air Force would like more of these aircraft because of their long range and heavy payload, but the prospects of getting such a request through Congress are considered negligible. Iran's order for ten of these aircraft, coupled with $175 million for reopening the production line, will considerably reduce the anticipated opposition to additional procurement of these aircraft by the USA. Iran also financed the development of the Bell 214 helicopter and has ordered 287 units of this type. Similarly, Saudi Arabia is paying the R&D costs of several weapons ordered from the West.

Britain has also profited from Iranian capital. The development of the improved BAC Rapier missile system using Blindfire radar mounted on tracked vehicles, which will become one of the most sophisticated air defence systems in the world, is being financed by Iran.

In early 1974, the energy crisis following the October 1973 War and the Arab oil boycott of the West ushered in an entirely new pattern of arms trade—namely, arms-for-oil deals. In the first two weeks of January 1974, France concluded a deal with Saudi Arabia for Mirage fighter-bombers, low-level SAMs, air-to-air missiles, an additional 250 AMX-30 tanks and other advanced military equipment, in exchange for an undertaking by Saudi Arabia to supply France with 800 000 barrels of crude petroleum a day for the next 20 years. At the same time Abu Dhabi signed a $90 million contract for the supply of Mirage planes. FR Germany has reportedly signed an arms-for-oil deal in which it will supply Saudi Arabia with technological expertise in exchange for oil. And in late 1973, the Arabs lifted the oil boycott of Japan in exchange for the supply of military equipment.

The implications of these developments are both complex and alarming. The US government has protested on several occasions against European arms-for-oil deals. This is understandable in the context of Kissinger's disclosures that the USA would consider military intervention in oil-producing areas—including the Persian Gulf region—in the event of a new oil embargo on the West [3]. Even more disturbing is the military build-up taking place in Iran. Iran did not take part in the boycott of the West, and has been rapidly expanding its position as the region's leading military power. This development seems to be motivated by the Shah's view of Iran as "the guardian and protector" of the enormous oil reserves in the Persian Gulf area, and he has made repeated statements to that effect [4].

Table 8.1. Arms imports to the Persian Gulf, 1964–74

US $ mn, at 1973 constant prices

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Abu Dhabi	. .	. .	. .	. .	4	8	9	3	8	20	63
Iran	40	171	79	136	202	153	136	381	165	155	733
Iraq	61	18	54	90	44	45	48	49	6	67	89
Kuwait	4	1	5	3	36	40	9	17	. .	. .	3
Oman	0.5	0.5	1	2	. .	3	9	12	4	11	67
Saudi Arabia	0.5	18	45	22	80	125	49	40	30	61	69

Source: SIPRI worksheets.

In an interview with Arnaud de Brochgrave of *Newsweek* in 1973, the Shah listed his current inventory at that time:

We have now 80 Phantoms which cost $2.5 million each, and another 100 coming in that will cost $5 million each and will give us a fighter-bomber force of well over 300. We have ordered 700 choppers, including 200 gunships plus 18 large Chinooks and 18 ASW Sikorskys. . . We are also buying 800 Chieftain tanks from Britain which will cost us another $480 million and meanwhile we're modernizing 400 M-47 tanks that we have. This will give us a tank force of about 1 700.

The 1974 orders for 80 Grumman air superiority fighters which recently went into production in the United States, will add to this military strength. The Grumman fighter will be armed with the Phoenix air-to-air missile and an associated fire-control system which can locate, track and engage a maximum of six targets simultaneously. A $575 million deal was concluded with the UK for 250 Alvis Scorpion armed reconnaissance vehicles, equipped with the BAC Swingfire antitank missile and an order was placed in the USA for ten C-5A Galaxy transport planes at a unit cost of $55 million.

Further purchases include 12 guided missile attack boats equipped with the US Harpoon ship-to-ship missile from France; 22 Chinook helicopters at a cost of $110 million from Italy, in addition to the 16 delivered in 1974; and seven "Spruance"-class destroyers from the USA at a unit cost of $100 million. By 1976, when current orders have been fulfilled, Iran will possess approximately 500 highly advanced combat aircraft, close to 800 military helicopters, 1 700 tanks and several hundred other military vehicles such as armoured personnel carriers and armoured cars. In addition, Iran is deploying the largest guided-missile hovercraft fleet in the world, purchased from the UK.

In a possible future war in the Persian Gulf region, none of the other states will be able to match the military power of Iran. Table 8.1 clearly reflects its military power at the present time. Saudi Arabia has purchased Northrop F-5E and Phantom fighters from the USA, Sikorsky S-61 troop-carrying helicopters and Lockheed Hercules transport aircraft. But the stock of modern weaponry in the other Persian Gulf states will still be very small in the immediate future.

Nevertheless, the flow of sophisticated weaponry in the small sheikdoms on the Persian Gulf has taken on unprecedented proportions. The arms deliveries to Abu Dhabi reached a record value of $63 million in 1974, as compared with an annual average of $8 million worth of arms imports during the past few years. Abu Dhabi made several major new purchases during the year. In December 1974 an $80.5 million contract was signed with the British Aircraft Corporation for the Rapier air defence missile system using Blindfire radar trackers, that is, the new system that is being financed by Iran and developed in Britain. Abu Dhabi also purchased the SS.11 antitank missile system for a total of $16 million, together with Harpon antitank missiles from France. The tiny sheikdom of Dubai, also a member of the Union of Arab Emirates, contracted for five counterinsurgency strike aircraft from Italy in 1974.

Kuwait has embarked on a $1 billion military expansion programme. Thirty military helicopters were ordered from France, armed with SS.11 and Harpon missiles worth $8.5 million. In addition, Kuwait became one of the first third world customers for the Franco-German Euromissile HOT, also an antitank weapon. The largest arms deal ever concluded by Kuwait was the contract signed on 7 November 1974, with the US company McDonnell Douglas, for 36 A-4 Skyhawk fighter bombers.The contract, worth $250 million, covers the supply of spare parts, training and support equipment. Deliveries are to be completed by 1976. The Skyhawk was eventually chosen in favour of the Franco-British Jaguar International advanced fighter. On the same date an order was announced for some 50 improved Hawk missiles worth $90 million. Once these orders have been fulfilled, Kuwait will have one of the world's most modern air defence systems. Oman's arms imports reached $67 million in 1974, an unprecedented total for this small country. Its most sophisticated weapons came from the UK. Several new contracts were signed in 1974, including the purchase of eight Britten-Norman Defender counterinsurgency aircraft worth over $2 million. Four BAC Strikemaster fighters were also purchased, in addition to the 20 already being deployed. The most significant purchase, in terms of military capability, was Oman's order for 12 Jaguar International strike fighters worth $83 million from the British Aircraft Corporation. The BAC Rapier air defence system costing $108 million and a large number of armoured cars were also purchased.

Qatar concluded a deal with Brazil for the sophisticated Cascavel armoured vehicle, to be fitted in France with infrared guidance equipment, a 90-mm cannon and other weapons under a $20 million contract.

By providing pilots and training, Pakistan plays a significant role in the military build-up in these small Gulf states. From the type of weapons purchased, it is also evident that guerilla action in this area is regarded as a serious threat and all the Gulf sheikdoms are acquiring counterinsurgency weapons.

These arms build-ups in the smaller states, though relatively sizeable, cannot compare with that of Iran. Iraq—traditionally in a state of animosity with Iran—is the only country in the Persian Gulf in a position to challenge it. Table 8.1 on page 201 shows that Iraq was the second largest weapons recipient in the region, although the difference was very large—$733 million as against $89 million. Iraq has for many years depended almost exclusively on the Soviet Union for weapons. However, this pattern was broken in 1974, with the order for 31 Alouette III helicopters, armed with SS.11 antitank missiles from France.

According to US intelligence reports, Iraq may have received some 12 MiG-23B "Flogger" advanced fighters from the Soviet Union in 1974. If the reports are correct, Iraq has upgraded its air combat strength considerably. It also received two more "Osa"-class guided-missile attack boats, armed with the "Styx" ship-to-ship missile.

The major Western countries have two objectives with regard to oil: (*a*) to finance the increased costs of imported oil, and (*b*) to secure stable supplies irrespective of price. The export of armaments to achieve the first objective is at best a partial solution, even on the present scale, and could well prove to be inconsistent with the second objective. Unless there is a war it is unlikely that armament exports will continue at their present level for very long; within a few years the Persian Gulf states will have completed the initial build-up of their armed forces and thereafter the demand for weaponry will decrease. On the other hand, any major conflict in this region would inevitably involve the disruption of oil supplies and this disruption would probably be far more extensive than that following the Arab-Israeli War in October 1973. Arguments occasionally advanced to support the view that a "balanced" military build-up contributes to prospects for peace and stability in a region have little credibility with respect to the present situation in the Persian Gulf or the Middle East in general. There are now so many suppliers and recipients and the pace of events is so rapid that it is difficult to detect any evidence of control or moderation on the part of any participant. In fact it is unlikely that any single participant could now effect such control even if it felt inclined to do so.

References

1. Quoted in the US Senate debate on the Foreign Assistance Act, 1974; Congressional Record-Senate, 4 December 1974, p. S 20578.
2. *New York Times*, 25 August 1974.
3. *Interavia Air Letter*, 7 February 1975.
4. *International Herald Tribune*, 17 January 1975.

Appendix 8A

Registers of indigenous and licensed production in third world countries, 1974

For sources and methods, see chapter 9.

Abbreviations and conventions

. . =Information not available
( ) =Uncertain data. All future dates (post 31 December 1974) are in brackets
\+ =At least the figure given and probably more
* =Number produced by 1974
– =Nil or not applicable
[ ] =Standardized rather than official descriptions
No. =Total number planned or on order

Powerplant
for aircraft

J =Jet
T =Turboprop (fixed wing), turboshaft (helicopter)
P =Piston

for missiles

S =Solid propellant
L =Liquid propellant
SL =Storable liquid
J =Jet

for ships

N =Nuclear
GT =Gas turbine
ST =Steam turbine
D =Diesel

Licensed production

(MB-326M) =Seller's designation
(I: USA) =Imported from USA
(L: USA) =US licence

Aircraft descriptions

VTOL =Vertical take-off and landing
STOL =Short take-off and landing
VSTOL =Vertical or short take-off and landing
VG =Variable geometry
recce. =Reconnaissance
hel. =Helicopter
transp. =Transport
A/S or ASW =Antisubmarine warfare
AEW =Airborne early warning
ECM =Electronic countermeasures
com.&con. =Command and control
car.-b. =Aircraft-carrier based
car./l.-b. =Aircraft-carrier based or land-based

Missile launch platform and target descriptions

fixed =Fixed land-based
towed =Towed ground-based
SP =Self-propelled ground-based
mobile =Mobile ground-based
portable =Portable (man-carried)
miss. =Missile
air. =Fixed-wing aircraft
hel. =Helicopter
sub. =Submarine

Arms

MG =Machine gun
AA =Anti-aircraft
ATM =Antitank missile
RL =Rocket launcher

Missile warheads

N =Nuclear
kt =Kiloton (1 000 tons of TNT equivalent)
mt =Megaton (1 000 000 tons of TNT equivalent)
HE =High explosive

Ship armament

S-A =Ship-to-air missile
S-S =Ship-to-ship missile
S-Sub. =Ship-to-submarine missile
Sub.-S =Submarine-to-ship or -surface missile
Sub.-Sub. =Submarine-to-submarine missile
TT =Torpedo tubes
A/STT =Antisubmarine torpedo tubes

Foreign-designed components

A =Armament
E =Electronic equipment
E-d =Computer/data processing equipment
E-f =Fire-control system (for armaments)
E-g =Guidance system (for missiles)
E-n =Navigation equipment
E-r =Radar
E-s =Sonar
Co-prod =Co-production
P =Powerplant

I. Register of licensed production of major weapons in third world countries, 1974[a]

For sources and methods, see chapter 9. For conventions, see page 204.

Country	Licenser	Designation, description	Power-plant	Armament	Date of licence	Entered production	Indigenous per cent	Production rate	Total nos. produced	Unit price, $mn	Other information
Argentina	USA	*FMA Cessna 182* monoplane	P (I: USA)	. .	1971	1971	Manufacture from indigenous components	7 month	(300)	. .	Primarily civilian; in addition to 1965 agreement for 500
		FMA Cessna 150 trainer	P (I: USA)	–	1971	1973	Assembly from imported components	. .	. .	. .	. .
		Chincul Piper Cherokee light plane	P (I: USA)	–	1973	1973	Assembly from imported knocked-down parts	5 phases	(50)	Chincul investment in Piper prod: 2	Air Force order expected
		Chincul Piper Seneca light plane	P (I: USA)	–	1973	1973	Assembly from imported knocked-down parts	5 phases	(10)	. .	Air Force order expected
		Raca OH-6A light helicopter	T (I: USA)	–	1973	. .	*22*	15/month	. .	0.07	Three-service req.: 100
	Switzerland	*Mowag Roland* APC two versions	D (I: Switz.)	MG on version I (I: Switz.)	(1970)	1974	. .	. .	. .	. .	. .

Country	Licenser	Designation, description	Power-plant	Armament	Date of licence	Entered production	Indigenous per cent	Production rate	Total nos. produced	Unit price, $mn	Other information
	FR Germany	*Type 209* submarine	D (I: FRG)	8 TT	Jan 1969	Launched first: Nov 1972; second: May 1973	Assembly	Both to be commissioned 1974	2	. .	Displ: 1 000 t; 22 knots; E (I: Fr.)
		Combattante II type fast attack patrol boat	D (I: FRG)	Oto Melara AA guns (I: It.); TT	1970	Launched first: Dec 1973; second May 1974	Partial assembly	. .	2	. .	Displ: 240 t; 40 knots
	UK	*Type 42* guided missile armed destroyer	GT (I: UK)	Sea Dart SSM (I: UK); 1 Lynx hel. (I: UK); AA guns (I: Switz.)	May 1970	Launched first: Oct 1972; second Mar 1974	Assembly	Completion first: 1975; second: 1976	2	. .	Displ: 3 500 t; 1 built in UK; 1 in Argentina
		Type 21 destroyer	GT (I: UK)	Seacat or Seawolf SSM (I: UK); 12 Lynx hel. (I: UK)	(Early (1975)	–	. .	–	6 planned	Total; 345	Displ: 2 500 t; to be produced in Argentina
Brazil	Italy	*EMB AT 26 Xavante* armed trainer/COIN (MB-326 B)	J (I: UK)	(I: It., Fr., Switz., UK)	1970	Nov 1971	Airframe	2/month	72 of total order of 112	Aug 1972 0.6	
		EMB MB 326 K light strike/COIN	J (I: UK)	. .	(1975)	(1975)	. .	–	–	. .	To succeed Xavante production
		Audi SH-4 Silvercraft utility helicopter (SIAI Marchetti SH-4)	P (I: USA)	–	Sep 1973	–	. .	. .	100 planned	. .	

	USA	*Piper Navajo* light plane *Piper Seneca* light plane	P (I: USA)	–	1974	(1975)	. .	100/year	–	. .	Air Force order expected
	France	*Aérospatiale/MBB Roland* SAM system version I and II	S	Warhead: HE	Dec 1971	(1975)	Partial assembly only	–	. .	0.2	Initial delivery of 4 Marder ACs fitted with missiles in France
	FR Germany	*MBB Cobra* ATM	S	Warhead: HE	1973	1974	. .	. .	. .	. .	
	UK	*"Nitheroi"*-class ASW frigate	GT (I: UK) D (I: FRG)	Ikara ASM (I: Austr.); Lynx hel. (I: UK); Vickers gun (I: UK); Bofors RL/gun (I: Swe.); Seacat SAM (I: UK)	1970	First launched Feb 1974 in UK; 2 laid down June 1972 in Brazil	. .	Completion: 1976–79	1 of total order of 6	45	Displ: 3 500 t; 30 knots; 2 being built in Brazil; 4 in UK
Colombia	USA	*Cessna* utility lightplane various types	P (I: USA)	–	(1971)	(1972)	*25*	10/month	158	. .	Cessna Agwagon agricultural plane: 40 per cent of annual production
	Italy	*Midget* experimental assault submarine	D	TT	1971	1972	Assembly	. .	2 ordered	. .	Displ: 70 t; 14 knots
Egypt	UK	*Westland-Aérospatiale WG-13 Lynx* helicopter	T (I: UK or Can.)	. .	(1975)	–	Component production by 1977	–	26 by 1977	. .	Advanced negotiations; financed by Saudi Arabia
		HS Hawk strike/trainer	T (I: UK, Fr.)	. .	(1975)	–	. .	–	. .	. .	Advanced negotiations; financed by Saudi Arabia

Country	Licenser	Designation, description	Power-plant	Arma-ment	Date of licence	Entered produc-tion	Indigenous per cent	Production rate	Total nos. produced	Unit price, $*mn*	Other in-formation
India	Czecho-slovakia	*OT-62* APC	. .	. .	1970	. .	. .	. .	. .	. .	Czech version of BTR-50
	France	*HAL SA-315 Cheetah* high-altitude helicopter (Aérospatiale SA-315 Lama)	T (I: Fr.)	. .	Sep 1970	1972	Phase 1: assembly from imported components	. .	40 of total order of 140	. .	Delivery to Air Force under way
		HAL Alouette III helicopter	T (I: Fr.)	. .	1962	1965	Manuf. from local raw materials	. .	~150 of total order of 160	. .	
		Bharat SS-11 ATM	S	Warhead: HE	1970	1971	*~100*	. .	. .	. .	Complete production rights handed over in 1974
		Type A69 Avisos frigate	D (I: Fr.)	Exocet SSM (I: Fr.); ASW; RL; TT	Feb 1974	First to be laid down mid-1975	. .	First to be launched 1978	25–30 planned	. .	Displ.: 1 260 t; 25 knots
	UK	*HAL Ajit* light weight fighter (Gnat Mark II)	J (L: UK)	Aden cannon (I: UK)	1973	1976	*~90*; Indian R&D	. .	First prototype test late 1974	. .	A total of 300 may be ordered for Air Force
		HAL HS-748 transport	J (L: UK)	–		1959	Assembly from imported kits	2–3/year	68 of initial order for 100	1.5	Production may end with completion of 69th plane in 1975
		Vijayanta medium battle tank	D (I: UK)	105 mm guns	1965	1967	*80*	100/year	~700 of total order of 1 000	. .	. .

		"Leander"-class ASW frigate	T (I: UK)	1 Wasp hel. (I: UK); 2 Seacat SAM launchers (I: UK); ASW	1965	Launch dates: Oct 1968 May 1970 Oct 1972 Mar 1974	First: *53*	1/year from 1974	2 of total order of 6; first compl. 1972	. .	Displ: 2 450 t; 30 knots; second nearing completion
	USSR	*HAL MiG-21 FL* fighter Mach 2.0	J (L: USSR)	Atoll AAM (L: USSR)	1964	1966	*80*	30/year	~200	2	E: (L: USSR); production completed 1974
		HAL MiG-21 M fighter Mach 2.0	J (L: USSR)	Atoll AAM (L: USSR)	1970	1973	*60*	10/year	20 of total order of 150	. .	Production may be cut down if payment in dollars is demanded
		HAL MiG-21 FMA multi-role version	J (L: USSR)	. .	1974	(1975)	Assembly of 23 from knocked-down parts	. .	50 ordered		27 delivered complete from USSR
		Bharat K-13A Atoll AAM	S	Warhead: HE	1964	(1970)	. .	. .	200+ of total order of 300+	. .	Arming HAL MiG-21 fighter
Iran	FR Germany	*Krauss Maffei Leopard 2* main battle tank	D (L: FRG)	Rheinmetall 105 mm, 120 mm guns (L: FRG)	(1975)	(1980)	Assembly	. .	. .	. .	Advanced negotiations
Korea, South	USA	*Bell* helicopter transport version	T (I: USA)	–	(1975)	(1977)	. .	–	–	. .	US offer $1 bn
	USA	. . Fighter	–	–	–	–	Component production and assembly		Requirement: 400	–	Seeking US aid
Korea, North	USSR	*"P-6"*-class fast attack/ torpedo boat	D (I: USSR)	TT	(1970)	(1972)	. .	. .	~10	. .	Navy has total of 30

Country	Licenser	Designation, description	Power-plant	Arma-ment	Date of licence	Entered produc-tion	Indigenous per cent	Production rate	Total nos. produced	Unit price, $mn	Other in-formation
Pakistan	China	. . SAM system	–	–	(1975)	–	–	–	–	–	Advanced ne-gotiations
	FR Ger-many	*MB Bo-810 Cobra* ATM	S	Warhead: 2.7 kg	1963	(1964)	*~100*	. .	. .	. .	Production con-tinuing des-pite FRG arms embargo since 1965
	France	*Dhamial Alouette III* heli-copter	T (I: Fr.)	. .	1971	1972	Assembly of im-ported components	. .	. .	. .	All three ser-vices re-ceiving
		Dassault Mirage F-1 fighter	J (I: Fr.)	. .	Negotia-tions started 1972	–	Assembly	–	–	–	Advanced ne-gotiations
	USA	*Cessna 0.1 Bird Dog* light plane	. .	. .	–	1970	60	1/month	. .	. .	No licence acquired
Peru	Italy	"*Super Alpino*"-class guided missile frigate	D (I: It.); GT (I: It.)	Otomat SSM (I: It.); ASW; 1 hel.	1974	. .	. .	. .	2 to be built in Peru of to-tal order of 4	. .	2 to be built in Italy
Philip-pines	FR Ger-many	*PADC MBB Bo-105* heli-copter	T (I: FRG)	. .	1974	1974	Assembly of imported components	. .	5 of total order of 38	. .	5 delivered complete; 5 in compo-nent form
	UK	*BN Islander* light transport	P (I: USA)	–	1974	1974	Partial assembly	1974: 6 1975: 14	6 of total order of 100	. .	Cost of deal: $15 mn

Singapore	FR Germany	"*Jaguar*"-class fast missile boat	D (I: FRG)	Gabriel SSM (I: Israel)	. .	1973	. .	First 2 completed 1973	2 of total order of 6	. .	2 imported in 1972; 4 built in Singapore
South Africa	France	*Atlas Mirage F-1* fighter	J (I: Fr.)	AAM; ASM	1971	1977	. .	Phase 1: import of 16;phase 2: manufacture of components for 32	Requirement 100; initial order: 48	. .	Import of first 16 to start Jan 1975
		Eland AC (Panhard AML 60/90)	Indigenous	60 mm, 90 mm cannon	1965	1967	*~100*	100/year	~800	. .	Second generation developed locally
	FR Germany	. . Main battle tank	. .	. .	(1975)	(1976)	–	–	–	–	Advanced negotiations
	FR Germany/ Spain/ Portugal	"*Joao Coutinho*"-class corvette	D (I: FRG)	SSM (I: Fr.); 2 hel.; TT	1971	–	Hull construction in Portugal; fitting in S. Africa	–	6 ordered	. .	Project may have been cancelled in 1974
	Italy	*Atlas Impala I* armed trainer/COIN (MB-326 M)	J (I: UK)	. .	1965	1967	*70*	. .	260	0.4	Production near completion
		Atlas Impala II light strike (MB-326 K)	J (I: UK)	. .	1973	(1975)	. .	Total of 100+ on order	. .	0.6	4 supplied complete from Italy in 1974
		AFIC RSA-200 Falcon civil/ military lightplane	P (I: It.)	–	1965	1967	. .	. .	40	. .	Possible military use with Commando Air Force
Taiwan	USA	*Northrop F-5 E Tiger II* fighter	J (I: USA)	. .	1973	1974	Manufacture of components	First plane delivered Nov 1974	~100 on order	. .	E (I: USA)

Country	Licenser	Designation, description	Power-plant	Arma-ment	Date of licence	Entered produc-tion	Indigenous per cent	Production rate	Total nos. produced	Unit price, *$mn*	Other in-formation
		Bell 205 A-1 utility heli-copter	T (I: USA)	. .	1972	1973	. .	. .	50 of total order of 118	. .	Following pre-vious manu-facture of Bell 205
		AIDC PL-B Chienshov light trainer (Pazmany PL-1B)	P (I: USA)	–	1968	1968	. .	. .	~100		. .
Venezuela	Italy	. . Corvette	. .	. .	Mar 1973	1974	. .	. .	Some to be built in Vene-zuela; total order: 21	. .	. .
Viet-Nam, South	USA	*Pazmany PL-2* light trainer	P (I: USA)	–	1971	1971	. .	. .	11	. .	Negotiating for further 10

[a] The values of the licence-produced weapons are included in the arms trade tables, pages 220–21, estimated at 100 per cent of the import value.

II. Register of indigenously designed weapons in development or production in third world countries, 1974

For sources and methods, see chapter 9. For conventions, see page 204.

Country	Designation, description	Power-plant	Arma-ment	Design begun	In pro-duction	Produc-tion rate	Total nos. produced	Unit price, $ *mn*	Other information
Argen-tina	*IA-50 Guarani II* light transport	T (Fr.)	–	1960	1966	. .	43	. .	24 in Air Force; E: USA
	IA-58 Pucara COIN combat	T (Fr.)	MG (USA); Cannon (Switz.)	1966	1972	. .	30 ordered for Air Force	. .	Earliest delivery 1975; E: UK, USA: 1
	Pucara jet version	J (Fr.)	. .	. .	. .	. .	. .	. .	Developing
	Pucara 8-seat high-speed version	. .	. .	. .	. .	. .	. .	. .	Developing; speed Mach 0.66
	Survey ship	D (FRG)	–	. .	1971	. .	Completed 1974	. .	Displ: 655 t
	Small arms	–	–	. .	. .	. .	. .	. .	
	Unguided rockets	–	–	. .	. .	. .	. .	. .	. .
Brazil	*Aerotec T-23 Uirapuru* primary trainer	P (USA)	–	1965	1968	4/month	100+	0.02	Air Force: 90; Licence sold to Portugal 1974: 110; export Bolivia: 18
	Aerotec Uirapuru 144 four-seat tourer version	P (USA)	–	Design completed	–	–	–	–	Prototype trial mid-1975
	EMB-110C[a] *Bandeirante* light transport	P (Can.)	–	1965	1973	2/month	80	0.7	Air Force req.: 100; E: UK, Fr.
	EMB-120 Bandeirante 11-seat pressurised version	P (Can.)		1972	1974	. .	–	. .	E: UK, Fr.
	EMB-111 maritime surveillance	T (USA)	Rockets	. .	(1974)	–	–	. .	Air Force order for 12 expected July 1974
	EMB-CX twin-engine medium transport	P (UK)	–	Designing	Prototype flight 1974	–	–	–	Negotiating for Rolls Royce engines
	EMB Maraba medium transport	. .	–	1974	–	–	–	–	Army req. Revival of Maraba project; cancelled 1970

Country	Designation, description	Power-plant	Armament	Design begun	In production	Production rate	Total nos. produced	Unit price, $ *mn*	Other information
	Neiva T-25 Universal basic trainer	P (USA)	Braz.: MG, bombs rockets	1963	1971	. .	~130 of total order of 150		. .
	Neiva N-621A Universal II T-25 trainer version	P (USA)	. .	1972	(1975)	–	–	–	Prototype construction ordered 1974
	Neiva N-721 Caraja T-25 turboprop version	T (USA)	2 fixed 7.62 mm MG	1973	–	–	–	–	Designing
	Avibras MAS-1 ASM	. .	Warhead: HE	. .	1973	. .	. .	. .	. .
	CCM wire-guided ATM	. .	Warhead: HE	1967	. .	. .	. .	. .	Developing; range: 3 km
	EE-9 Cascavel COIN APC/ armed recce.	. .	MG/90 mm cannon	1970	1972	. .	Small pre-prod. series	. .	9 tons; negotiating export to Qatar; French arms
	EE-11 Urutu amphibious APC	USA	–	1970	(1974)	. .	Small pre-prod. series	. .	Capacity: 14 armed troops; on order for Navy and Army
	"*Pedro Teixeira*"-class river patrol ship	D	AA; MG helicopter platforms	Laid down 1970	Second completed Feb 1974	. .	2	. .	Displ: 700 t; 16 knots; first completed June 1973
	"*Roraima*"-class river patrol ship	D	AA; MG	. .	. .	. .	3 completed 1974	. .	Displ: 340 t
	Electronics	–	–	. .	. .	. .	. .	. .	. .
	Computers	–	–	. .	. .	. .	. .	. .	. .
	Engines	–	–	. .	. .	. .	. .	. .	. .
	Small arms	–	–	. .	. .	. .	. .	. .	. .
	Unguided rockets	–	–	. .	. .	. .	. .	. .	. .
Chile	Unguided rockets	–	–	. .	. .	. .	. .	. .	. .
	Small arms	–	–	. .	. .	. .	. .	. .	. .
Egypt	Small arms	–	–	. .	. .	. .	. .	. .	Joint Arab arms industry planned

India	*HAL HJT-16 Kiran* jet trainer/COIN	J: UK; Planned J	MG 7.62 mm: (Belg); rockets: (Fr); bombs	1961	1968	25/year	~75	Export 1972: 0.4	E: UK; Air Force req.: 150; Navy req.: 12–15
	HAL HF-24 Marut Mk I light-fighter bomber Mach 1.02	J (L: UK)	Aden guns: (UK); rockets; bombs	1956	1963	. .	~80 1976: 130	Export 1973: 1.04 mn	E: UK
	HAL HF-24 Marut Mk I T tandem trainer version	J (L: UK)	Aden guns: UK; rockets: bombs	1967	1974	. .	2	. .	Air Force: 10
	HAL HF-24 Marut MK II	J (UK or Fr.)	. .	1969	Test flight 1972	–	–	. .	4 pre-prod. planes ordered
	HAL HF-73 deep-penetration strike fighter; *HAL HF-24* derivative	J (UK)	. .	1969	Prototype flight 1980	–	–	–	FRG cooperation with re-engining
	HAL HAC-33 light STOL transport	T (Fr. or UK)	. .	Design completed 1974	–	–	–	Est. cost 0.3	Air Force req.: 60
	HAL HPT-32 trainer	P (USA)	–	Design completed 1974	–	–	–	Est. cost 0.08 on production run of 50	Air Force favours licensed manuf. of New Zeal. CT-4
	Light tank	–	–	1970	. .	. .	. .	. .	. .
	APC	–	–	Prototype trials 1973	. .	. .	. .	. .	APC production plant to be set up at Raipur
	Main battle tank	–	–	(1970)	1980	–	–	. .	Design: Avidi Research and Development Dept.
	"*Ajay*"-class patrol boat	D	AA gun	Similar to UK "Ford"-class	"Asit" launched 1969	. .	4	. .	Displ: 120 t; 18 knots; in addition to 4 completed 1960–62
	Corvette-type patrol boat	. .	. .	1974	. .	. .	. .	. .	Planning
	Nuclear-powered submarine	N	. .	1974	Design to be completed 1980	. .	. .	. .	Planning; design team assigned
	Electronics	. .	. .	. .	. .	. .	. .	. .	. .
	Unguided rockets	. .	. .	. .	. .	. .	. .	. .	. .
	Small arms	. .	. .	. .	. .	. .	. .	. .	. .
	Target drones	. .	. .	. .	. .	. .	. .	. .	. .
	Aeroengines	. .	. .	. .	. .	. .	. .	. .	. .
Indonesia	"*Mawar*"-class submarine chaser	D	Guns	. .	(1970)	(1974)	3	. .	Displ: 147 tons; 21 knots; in addition to 2 completed 1972

Country	Designation, description	Power-plant	Arma-ment	Design begun	In pro-duction	Produc-tion rate	Total nos. produced	Unit price, $ *mn*	Other information
	Small arms	–	–	. .	. .	. .	. .	. .	. .
Israel	*IAI Arava* STOL military transport	T (Can.)	MG	1966	1972	2–4/month	100+	0.7	Exported to Latin America
	IAI Barak STOL fighter Mach 2.5	J (USA)	AA cannon	1968	(1972)	1–2/month	~70	. .	Mirage III conversion AF req.: 200
	IAI Westwind[b] light transport	J (USA)	. .	. .	1971	1974: 22	~50	. .	E: USA
	Jericho fixed-to-fixed	S	Warhead: HE/N	1966	No	–	–	–	Design range: 450 km
	Rafael Shafrir air-to-air IR-homing	S	11 kg	1965	1969	. .	. .	0.02	Range 5 km
	Gabriel ship-to-ship versions I and II	S	180 kg	1966	1970	. .	(200)	1971: 0.09 missile; $2.5 mn on board system of 6 launchers	Range: 41 km; export to: South Africa, Singapore, Latin America
	Luz air.-to-air	. .	. .	. .	. .	. .	. .	. .	Developing, TV-guided
	Sabra medium tank	D (USA)	150 mm gun: (UK)	(1969)	1971	. .	. .	. .	40 tons
	Soltam L-33 155 mm self-prop. howitzer	. .	7.62 mm MG	. .	(1971)	. .	. .	. .	41.5 tons; M4AI Sherman tank chassis
	Armoured car	. .	. .	. .	. .	. .	. .	. .	Demonstrated in Nicaragua; built for commando raids
	SAAR IV fast missile boat	D (FRG)	7 Gabriel S-S; 276 mm guns (It.) 220 mm cannon	First launched 1973	First completed 1973	. .	4 out of 6 ordered	Without arms $8.9 mn	415 tons; 32 knots; E: Israel; available for export after filling navy requirement
	Electronics and avionics	–	–	. .	. .	. .	. .	. .	. .
	Engines	–	–	. .	. .	. .	. .	. .	. .
	Small arms	–	–	. .	. .	. .	. .	. .	. .
	Napalm	–	–	. .	. .	. .	. .	. .	. .
Kuwait	Rockets	–	–	. .	Tested 1974	. .	. .	. .	With guiding device

Malaysia	Munitions	–	–	..	Factory 1971	–	..	..	..
Pakistan	..	..	..	(1974)	..	..	..	..	Karachi shipyard constructing 8 ships for Saudi Arabia and Abu Dhabi
	Small arms	–	–	..	Ordnance factory 1970, Chinese built	..	..	..	..
Saudi Arabia	Small arms	–	–	..	..	..	..	..	Self-sufficient in small fire-arms
Singapore	Vosper Thornycroft fast patrol boat	.	..	..	1974: 2	First launched May 1974	3	Total 5 mn	UK-owned subsidiary
	Electronics	–	–	1974	..	..	..	..	Precision equipment for military aircraft
South-Africa	Mine-clearing vehicles	–	–	..	1973	..	..	..	..
	Atlas AAM IR homing	S	Warhead: HE	1966	1972	..	..	..	..
	Small arms	–	–	..	..	..	..	..	..
	Napalm	–	–	..	..	..	..	..	..
	Electronics	–	–	..	..	..	..	..	..
Taiwan	*XT-CH-IA Chunghsing* medium trainer	T (USA)	–	1970	1974	..	..	..	E: USA
	Medium-range SSM	..	Warhead: HE	(1973)	..	..	..	..	Under development
	Small arms	..	..	..	..	..	..	..	..
	Electronics	..	..	..	..	..	..	..	..

Note: The following countries have shipbuilding industries, but no specific information on current projects: Argentina, Brazil, Burma, Cameroon, Chile, Colombia, Congo, Cuba, Dominican Republic, Egypt, Gabon, Guyana, Ivory Coast, N. Korea, S. Korea, Mexico, Philippines, Syria, Taiwan, Thailand, Venezuela, N. Viet-Nam, S. Viet-Nam.

[a] Civilian variants EMB-110E, EMB-110F in production.

[b] Entire production and marketing rights purchased in 1967 from the NA Rockwell Corp. for the then *Jet Commodore*.

Appendix 8B

Register of arms trade to third world countries, 1974

For sources and methods, see chapter 9. For abbreviations of manufacturers' names, see *Arms Trade Registers: The Arms Trade with the Third World* (Stockholm, Almqvist & Wiksell, 1975, Stockholm International Peace Research Institute), pp. 131–48.

Abbreviations and conventions

. .	=Not available
( )	=Uncertain data
+	=At least the number given and probably more
batt	=battery (of missiles)
Displ	=Displacement of naval vessels, in tons
1969–	=1969 and subsequent years
Mk	=Mark
Recce.	=Reconnaissance
Squads.	=Squadrons
Srs	=Series
t	=Tons
U.c.	=Unit cost
AAM	=Air-to-air missile
A-A missile	=Air-to-air missile
AC	=Armoured car
AD	=Air defence
AF	=Air Force
APC	=Armoured personnel carrier
ARM	=Anti-radar missile
ASM	=Air-to-surface missile
ASW	=Antisubmarine warfare
ATM	=Anti-tank missile
COIN	=Counterinsurgency
ECM	=Electronic countermeasures
LOH	=Light observation helicopter
LST	=Landing-ship, tank
MAP	=(US) Military Assistance Program
MBT	=Main battle tank
SAM	=Surface-to-air missile
SAR	=Search and rescue/sea-air rescue
SLAM	=Submarine-launched air missile
SSM	=surface-to-surface missile
STOL	=Short take-off and landing
USAF	=United States Air Force
USN	=United States Navy
VG	=Variable geometry
VIP	=Very important person
V/STOL	=Vertical or short take-off and landing
WEU	=Western European Union

Table 8B.1. Values of imports of major weapons by third world countries: by region, 1950–74

Region	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Far East, excl. Viet-Nam	147	152	87	209	174	222	227	211	506	396	583
South Asia	44	20	19	92	104	108	176	254	488	148	205
Middle East	35	55	12	70	81	186	350	300	249	238	123
North Africa	–	–	–	–	–	–	6	5	4	6	9
Sub-Saharan Africa	*	5	4	16	18	12	1	1	3	46	27
South Africa	8	–	16	15	17	15	54	22	18	17	4
Central America	6	5	27	12	10	18	15	6	11	14	45
South America	54	52	35	73	144	195	118	112	134	45	139
Total[a] excl. Viet-Nam	**294**	**289**	**201**	**488**	**547**	**755**	**947**	**912**	**1 413**	**911**	**1 135**
Viet-Nam, North and South	–	–	–	–	9	9	11	7	48	9	24
Total[a]	**294**	**289**	**201**	**488**	**556**	**765**	**957**	**919**	**1 461**	**920**	**1 159**

[a] Items may not add up to totals due to rounding.
* Less than the smallest digit shown.

Source: SIPRI worksheets.

Table 8B.2. Values of exports of major weapons to regions listed in table 8B.1: by supplier,

Country	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
USA	91	109	103	73	280	302	326	346	379	247	530
USSR	25	43	28	176	6	62	145	252	193	108	158
UK	96	64	46	165	166	175	198	180	358	183	196
France	3	3	1	41	66	67	120	70	129	47	35
Canada	14	4	1	*	–	1	39	4	4	66	11
China	23	23	–	–	–	–	–	1	191	133	125
Czechoslovakia	–	–	–	–	–	43	58	6	23	58	45
FR Germany	*	*	–	1	4	7	9	5	7	26	23
Italy	7	29	–	2	–	2	31	29	28	*	7
Japan	–	–	–	1	15	–	9	11	23	12	–
Netherlands	35	14	6	2	1	85	1	2	1	4	1
Sweden	*	1	16	5	6	6	6	–	37	*	1
Other ind. west	–	–	–	7	*	5	*	–	–	–	1
Other ind. east	–	–	–	–	–	–	2	*	29	24	*
Other third world	–	–	–	15	1	1	3	5	11	2	3
Total[b]	**294**	**289**	**201**	**488**	**547**	**755**	**947**	**912**	**1 413**	**911**	**1 135**

[a] Excluding North and South Viet-Nam.
[b] Items may not add up to totals due to rounding.
* Less than the smallest digit shown.

Source: SIPRI worksheets.

US $ mn, at constant (1973) prices

1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
153	272	237	300	260	380	152	203	448	207	320	124	231	190
221	144	169	61	163	299	207	227	239	229	381	313	221	285
150	439	301	296	337	336	813	962	927	1 118	1 345	823	1 691	2 207
12	30	26	30	62	93	103	64	67	92	94	128	111	174
43	36	36	52	72	71	62	42	55	93	102	68	116	295
3	12	118	39	142	70	60	34	35	59	53	19	28	210
162	228	74	26	14	16	13	6	8	4	36	27	43	67
156	83	55	39	84	106	98	159	121	113	170	237	270	341
900	**1 245**	**1 015**	**844**	**1 135**	**1 372**	**1 507**	**1 697**	**1 898**	**1 916**	**2 502**	**1 738**	**2 711**	**3 769**
56	57	43	70	57	181	378	362	228	331	333	917	63	142
957	**1 302**	**1 058**	**914**	**1 192**	**1 553**	**1 885**	**2 059**	**2 126**	**2 247**	**2 835**	**2 656**	**2 773**	**3 911**

1950–74[a]

US $ mn, at constant (1973) prices

1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
263	240	353	264	374	373	310	497	784	724	740	360	749	940
374	773	326	276	398	590	861	571	588	786	1 003	570	1 175	1 467
185	95	135	137	203	148	155	225	266	142	300	283	242	481
38	92	148	105	74	107	52	220	131	156	211	269	411	343
14	*	10	9	14	9	9	36	14	28	42	30	3	0.5
–	–	–	–	7	27	13	4	–	6	66	101	21	80
5	5	12	7	3	6	9	30	17	24	11	10	1	11
5	2	10	20	10	64	3	8	13	1	19	28	2	88
–	*	15	15	5	1	16	51	41	33	32	39	43	106
11	18	1	1	5	9	23	38	2	*	*	–	–	2
2	2	*	9	17	1	–	4	19	7	26	20	30	25
*	–	–	–	–	1	–	–	*	–	–	4	1	5
2	1	2	*	23	18	45	6	8	3	37	10	16	9
–	8	*	–	*	–	1	–	1	–	4	–	–	–
2	8	3	2	3	19	12	7	16	6	11	14	16	211
900	**1 245**	**1 015**	**844**	**1 135**	**1 372**	**1 507**	**1 697**	**1 898**	**1 916**	**2 502**	**1 738**	**2 711**	**3 769**

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items	
						Ordered	Delivered
Middle East							
Abu Dhabi	France	12	Dassault Mirage 5	Fighter	$15 mn; 3 delivered 1973; Pakistan AF training, technical aid; Arms: Martel missile (France)	29 June 1972	1973–74
		2	Dassault Mirage 5-D	Trainer			
		18	Dassault Mirage III	Fighter		Feb 1974	1974–75
		. .	Harpon	A-T missile		1974	–
		. .	Matra/HSD Martel	A-R missile	Arming 14 Mirage 5s	29 June 1972	1973–74
		. .	SNIAS SS.11	A-T missile	$16 mn	1974	–
	Pakistan	8	. .	Warship	Building in Karachi shipyard	1974	–
	UK	2	BAC VC.10	Transport	$3.5 mn; for AF; ex-British Airways	1974	1974
		2	Short Skyvan 3M	STOL transport	Transferred to Yemen Arab Republic Sept 1974	1974	1974
		. .	BAC Rapier	S-A missile	$80.5 mn; incl Blindfire radar trackers	. .	. .
		4	Patrol boat, "Spear"-class		2 delivered 1973	1972	1973–74
	USA	2	Lockheed C-130H Hercules	Transport	Repeat order for 2 more expected	1974	April–May 1975
Dubai	Italy	3	Aermacchi M.B. 326K	Light strike/COIN		1974	–
		1	Aermacchi M.B. 326L	Trainer			
			Agusta-Bell 205A	Utility helicopter	For Police Air Wing	Jan 1974	Dec 1974
			SIAI-Marchetti SF 260W Warrior	Trainer/COIN		1974	1974
	UK	. .	Alvis Scorpion	Armed recce. vehicle	For National Guard	Sept 1973	–
	USA	1	Bell 206B JetRanger	Helicopter	In addition to 2 delivered in 1972	Jan 1974	1974
Egypt	France/Kuwait	20	Dassault Mirage F-1	Fighter	Kuwait, Qatar, Abu Dhabi and Saudi Arabia to supply 1973 war replacement of 120 aircraft; not provided from USSR; direct delivery France–Egypt expected	Late 1973 through Kuwait	–
	France/Saudi Arabia	38	Dassault Mirage III	Fighter	See above; first 3 delivered direct to Egypt	Late 1974 through Saudi Arabia	Oct–Nov 1974: 3

	Saudi Arabia	. .	BAC Lighting	Interceptor	Expected as 1973 war replacement; supplied to Saudi Arabia from UK in 1966–69	(1973)	–
	UK/Saudi Arabia	6	Westland (Sikorsky) Sea King	ASW helicopter	See above; $70 mn; first 5 Commandos delivered direct to Egypt	23 Oct 1973 through Saudi Arabia	1974: 5
		24	Westland (Sikorsky) Commando	Troop transport helicopter			
	UK	. .	BAC Rapier	S-A missile system	Advanced negotiations	(1975)	–
Iran	France	. .	SNIAS AS.12	A-S missile	Arming AB 212 helicopters (Italy)	Jan 1974	–
		12	Missile boat, "La Combattante II" 1972 type	Displ: 230 t	Arms: Harpoon SSM (USA); Oto Melara cannon (Italy)	1974	–
	FR Germany	3	Patrol boat	Displ: 70 t	Under construction by Abekin & Rasmussen	1969	–
		2	Supply ship		Combination of tanker, dry freighter, aircraft carrier	(1972)	1974
	Italy	91	Agusta-Bell 206 Jet Ranger	Helicopter	In addition to 48 previously delivered	Feb 1973	–
		6	Agusta-Bell 212	Helicopter	Arms: AS:12 ATMs (France)	Jan 1974	–
		16	Meridionali-Boeing Vertol CH-47C Chinook	Helicopter	In addition to 4 delivered in 1973	1970	1974
		22	Meridionali-Boeing Vertol CH-47C Chinook	Helicopter	$110 mn	1974	–
	Netherlands	6	Fokker-VFW F.27 Friendship	Transport	2 delivered in 1973	Feb 1973	1974: 4
		4	Fokker-VFW F.27 Friendship	Transport	2 Mk 400M, 2 Mk 600; for Navy liaison; in addition to 20 previously delivered	Sept 1973	1974
	UK	10	Westland (Sikorsky) Sea King	ASW helicopter	For Navy	1974	–
		. .	BAC-Rapier/Blindfire	S-A missile	Iran sharing R&D costs for fully mobile Rapier system with Blindfire radar unit mounted on M-13 tracked vehicle (USA); first tests July 1974	Sept 1974	–
	UK	. .	SISTEL Sea Killer I and II	S-S missile	Arming 4 Vosper Thornycroft fast frigates	(1973)	1974
	UK	. .	Short Tigercat	S-A missile	Second order; excl new launchers	1974	–
		. .	BAC Swingfire	A-T missile	To arm 250 Alvis Scorpion ACs (UK)	Sept 1973	1974
		250	Alvis Scorpion	Armed recce. vehicle	$575 mn; Arms: Swingfire ATM (UK); Repeat order for ~100 expected	Sept 1973	1974
		800	Chieftain Mk 3 and Mk 5	Tank	~600 delivered	. .	1972–75

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
		6	BH.7 "Wellington"-class guided missile hovercraft	Warship	6th to be delivered early 1975; Arms: Harpoon SSM (USA) expected to be ordered	March 1971	1974: 1
		2	Logistic support warship	Displ: 2 500 t	First ship launched 24 Sept 1974; second laid down 1973	1972	1975
	USA	12	Beechcraft F33C Bonanza	Aircraft	In addition to 18 delivered in 1972–73	Jan 1974	1974
		15	Beechcraft F33C Bonanza	Aircraft		July 1974	1975
		4	Beechcraft F33C Bonanza	Aircraft	Brings total order to 49	Oct 1974	1975
		202	Bell AH-1J Sea Cobra	Gunship helicopter	For Army; delivery began mid-1974; Arms: Hughes TOW ATM (USA)	Dec 1972	1974–77
		287	Bell 215 A-1 Isfahan	Utility helicopter	Production began 1974; delivery began mid-1974, to reach 10/month in 1976	Dec 1972	1974–77
		6	Boeing 707-320C	Tanker/transport	To serve F-4 and F-5 fighters; 6 more expected	1972	1974: 6
		80	Grumman F-14 Tomcat	Fighter/interceptor	$900 mn; Arms: Phoenix AAM (USA); Iranian contribution to R&D costs	July 1974	1976–
		10	Lockheed C-5A Galaxy	Long-range transport	U.c.: $55 mn plus Iranian funding $175 mn for re-opening of production line; agreement with Lockheed reached in principle	(1975)	–
		12	Lockheed C-130 Hercules	Transport		1972	1974
		6	Lockheed P-3C Orion	ASW patrol aircraft	$98 mn; repeat order for 6 expected; Arms: Harpoon ASM (USA) expected to be ordered	1972	1974: 4
		108	McDonnell Douglas F-4E Phantom	Fighter	To equip 8 more squadrons in addition to 72 F-4 D/Es in 4 squadrons	1973	1974–75
		36	McDonnell Douglas F-4E Phantom	Fighter	$150 mn; letter of intent signed 2 Oct 1974	1974	1976
		141	Northrop F-5E Tiger II	Fighter	U.c.: $1.16 mn	1973	1974–75
		. .	Hughes AIM-54A Phoenix	A-S missile	U.c.: $250 000; arming 80 F-14 fighters	July 1974	–
		2 500+	Hughes AGM-65A Maverick	TV-guided A-S missile	$50 mn+; arming F-4E Phantom fighters	1973	1974–75

		..	Hughes BGM-71A TOW	A-T missile	Repeat order	1973	1974
		..	McDonnell Douglas AGM-84A Harpoon	A-S/S-S missile	Arming 6 Orion ASW aircraft (USA); 7 Spruance destroyers (USA) and possibly BH.7 missile hovercraft (UK)	1974	–
		7	Destroyer, "Spruance"-class	Displ: 7 600 t	U.c.: $100 mn; Arms: Harpoon SSM (USA)	1974	–
Iraq	Czechoslovakia	..	Aero L-39 Z	Trainer/ground attack		1973	1973–74
	France	31	Aérospatiale Alouette III	Helicopter		1974	–
		..	Aérospatiale SS.11	A-T missile	$18.8 mn; arming Alouette III helicopter (France)	1974	–
	(USSR	12	MiG-23 "Flogger"	Fighter	US intelligence reports	1973	1974)
		(..	Sukhoi-20	Aircraft	US intelligence reports	1973	–)
		..	SS-N-2 "Styx"	Naval S-S missile	4 launchers on each of 2 "Osa"-class boats	(1973)	1974
		2	Fast attack missile boat, "Osa"-class	Displ: 165 t	Ex-USSR; Arms: Styx SSM (USSR); in addition to 3 previously delivered	(1973)	1974
Israel	FR Germany	~15	Dornier Do-28	Light transport		..	Dec 1974
	UK	12	Short Blowpipe	Submarine-launched air-flight missile system	4 launchers on each of 3 submarines being built in UK; first foreign buyer of Blowpipe SLAM	(Mid-1973)	–
		400	Centurion	Main battle tank	$69 mn; to be modernized in Israel: re-engined, new 105 mm guns; UK to supply radar, electronic tracking, detection devices	1974	1974–75
		3	Submarine		FR German design; being built	April 1972	–
	USA	~12	Beechcraft Queen Air	Light transport		..	Dec 1974
		~8	Boeing-Vertol CH-47C Chinook	Helicopter	Ordered before Oct 1973 War	1973	(1974)
		48	McDonnell Douglas F-4 Phantom	Fighter	$220 mn for total of 48 Phantoms and 36 Skyhawks; delivery rate: 12/year through 1977; current inventory: 123	Sept 1973	1974–77
		50	McDonnell Douglas F-4 Phantom	Fighter		Sept 1974	1975–
		12	Sikorsky S-61R	Long-range logistic helicopter	Ordered before Oct 1973 War	1973	(1974)
		(9)	McDonnell Douglas A-4 Skyhawk	Fighter	$220 mn for total of 36 planes, plus 48 Phantoms; partly surplus A-4E; current inventory: ~125 A-4s in 6 units	Sept 1973	1974–77

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
	US offer	48	Grumman F-14A Tomcat	Air superiority fighter	U.c.: F-15; $13 mn; total requirement ~150; General Dynamics YF-16 reportedly competitor to F-14A	Letter of offer Dec 1974	1975
		48	McDonnell Douglas F-15 Eagle				
		4	Philco-Ford and Teledyne Ryan	RP vehicle	Total $4 mn; incl training, support and ground control equipment; sale approved by US government Nov 1974	Nov 1974	–
		(144)	AGM-12B Bullpup	A-S missile	Arming F-4 Phantoms	Sept 1973	1974
		. .	AGM-45A Strike	Passive radar homing A-S missile	US government approved sale Nov 1974	Nov 1974	–
		(144)	AIM-9 Sidewinder	A-A missile	Arming F-4 Phantoms	Sept 1973	1974
		. .	General Dynamics Redeye	Passive IR-homing A-A missile	US government approved sale Nov 1974	Nov 1974	–
		. .	Hughes TOW	A-T missile system	Incl M-113 APC, TOW launchers, heat attack missiles, practice missiles; US government approved sale Nov 1974	Nov 1974	–
		. .	Hughes TOW	A-T missile	Arming XR-311 recce. vehicle; delivery 1974; in addition to 2 000 supplied during October War	. .	1974
		~100	LTV Lance	S-S missile	US government approved sale Nov 1974; requested by Israel since 1971 for 2 brigades	Nov 1974	–
		. .	MiM-72A Chaparral/Vulcan	Low-level S-A missile system	U.c.: Vulcan: $470 000; U.c.: Chaparral system: $928 000; four-round launcher for modified Sidewinder mounted on M 730 tracked vehicle, Vulcan AA-gun mounted on M 741 APC; first delivered during Oct 1973 War	(1973)	1974
		. .	General Electric M-163	Armoured personnel carrier	Vulcan AA-gun carrier, incl in Chaparral air defence system	(1973)	1974
		200	M-60	Main battle tank	Agreement during Prime minister Rabin's visit to USA, Sept 1974;	Sept 1974	1974–75

					total tank requirement: 600, in addition to 450 supplied since Oct 1973 War		
		..	M-113	Armoured personnel carrier	Hughes TOW ATM carrier; US government approved sale Nov 1974	Nov 1974	–
		..	M-741	Tracked vehicle	Modified Sidewinder AAM carrier; incl in Chaparral air defence system composed of M-113 AC and M-163	(1973)	1974
		..	XR-311	Recce. vehicle	Armed with Hughes TOW ATM	..	1974
		..	Fast patrol boat, Firefish III	Displ: 6 t	Under construction; remote-controlled	(1971)	–
Jordan	Iran	24	Northrop F-5A	Fighter	US government approval Jan 1975; ex-Iranian AF	1974	1975
	UK	5	Scottish Aviation Bulldog	Trainer	$353 000	1974	June 1974
	USA	1	Fairchild C-119K Packet	Transport	In addition to 2 delivered in 1972	..	1974
		36	Northrop F-5E/F-5B	Fighter	U.c.: $2.7 mn MAP	Feb 1974	–
		..	Chaparral	S-A missile system		1974	–
		..	Raytheon Improved Hawk	S-A missile system	US government approved Jan 1975	1974	–
		..	Hughes TOW	A-T missile system	MAP; for Army	(1973)	1974
Kuwait	France	10	Aérospatiale SA-330 Puma	Helicopter		1974	–
		20	Aérospatiale SA-341 Gazelle	Helicopter		1974	–
		20	Dassault Mirage F.1	Fighter	Delivery direct to Egypt	Late 1973	–
		..	Aérospatiale SS.11	A-T missile	$8.5 mn	1974	–
		..	Harpon	A-T missile			
		..	Euromissile HOT	A-T missile	Arming Gazelle and Puma helicopters (France)	(1974)	–
		..	Matra Magic	A-A missile	Arming Mirage F.1s for Egypt	Late 1973	–
	Singapore	2	Patrol boat, 56 ft type	Displ: 25 t	Completed June 1974	Sept 1973	–
	USA	36	Mc-Donnell Douglas A-4 Skyhawk	Fighter/bomber	$250 mn incl spares, support, training; part of $1 000 mn expansion programme; purchased instead of Jaguar fighter	2 Nov 1974	Completed 1976
		50	Raytheon Improved Hawk	S-A missile	$90 mn	Nov 1974	–
Lebanon	France	6+	Aérospatiale Alouette III	Helicopter	In addition to 6 delivered in 1973	1973	1974
		4	Fouga Magister	Jet trainer	In addition to 4 previously purchased	..	1974

						Date: number of items	
Recipient	Supplier	Number	Item	Description	Comment	Ordered	Delivered
	FR Germany	3	Patrol boat		$3 mn	Jan 1974	–
	Italy	6	Agusta-Bell AB 212	Helicopter	4 delivered in 1974	Mid-1972	1973–74
	UK	6	HS Hunter	Fighter	Replacement for losses	1973	1974
	USA	. .	Hughes TOW	A-T missile	in Oct 1973 war	1974	Jan 1975
Oman	Abu Dhabi	28	Saladin	Armoured car	Gift	1974	1974
	Italy	10	Agusta-Bell AB 205A	Helicopter		1974	–
		5	Agusta-Bell AB 214A	Helicopter		1974	–
	Netherlands	2	Patrol boat		Refitted before transfer; ex-Dutch reserve	1974	–
	Switzerland	1	Pilatus PC-6/B Turbo-Porter	STOL transport		1974	Sept 1974
	UK	3	BAC 111	Aircraft		1974	Late 1974
		4	BAC 167 Strikemaster	Trainer/strike	$4.7 mn; improved equipment; in addition to 20 previously delivered	1974	–
		12	BAC/Breguet Jaguar	Strike/fighter	$83 mn	Sept 1974	–
		8	Britten-Norman Defender	Strike/COIN	$2.1 mn+	1974	1974
		1	Caledonian VC-10	Long-range transport	Ex-UK	1974	1974
		6	Short Skyvan 3M	Transport	$4.7 mn; in addition to 10 previously delivered	1974	–
		21/3 batt.	BAC Rapier	S-A missile system	$108 mn: incl 28 fire units, support, maintenance	Sept 1974	–
		40	Saladin	Armoured car		1974	1974
		4	Fast patrol boat		$14 mn; construction started late 1974	1973	Completed 1977
Qatar	Brazil/France	20	EE-9 Cascavel	Armed recce. vehicle	To be fitted out in France with 90 mm cannon, infrared guidance under a $20 mn contract	Mid-1974	–
	France	2	Aérospatiale SA-341 Gazelle	Helicopter		1974	–
	UK	2	Westland Commando Mk 2	Assault helicopter		1974	–
		6	Large patrol boat, Vosper Thornycroft "103 ft" type	Displ: 120 t		1972–73	1975–76
Saudi Arabia	France	8	Aérospatiale Alouette III	Helicopter		1974	–
		38	Dassault Mirage III-E	Fighter	$870 mn: incl Crotales and 450	Dec 1974	1975–79

					tanks (France); purchased instead of F-4 Phantom (USA)		
		38	Dassault Mirage 5	Fighter	For Egypt; 3 delivered directly in 1974	Late 1973	1974–75
		. .	Aérospatiale SS.11	A-T missile		1974	–
		. .	Matra-CSF-Thomson Crotale "Chahinn"	S-A missile system	Derived from standard Crotale: 6 missiles deployed on each AMX-30 chassis	Dec 1974	1975–79
		200	AMX-30	Medium battle tank	Some are Crotale missile carriers	Dec 1974	1975–79
		250	AMX-10	Light tank		Dec 1974	1975–79
	Pakistan	8	Warship		$145 mn; being built in Karachi shipyard	1974	–
	UK	6	Westland (Sikorsky) Sea King	ASW helicopter	For Egypt; first 5 Commandos delivered in 1974	Oct 1973	1974: 5
		24	Westland (Sikorsky) Commando	Troop transport helicopter			
	USA	200	Bell AH-1J Sea Cobra	Helicopter	Offer Dec 1974; USA will deliver 440 helicopters to Saudi Arabia 1978–84	. .	–
		10	Lockheed C-130H Hercules	Transport	In addition to 12 C-130E previously delivered	1974	–
		4	Lockheed KC-130H	Tanker-transport		1974	Mid-1974
		30	Northrop F-5E Tiger II	Fighter	In addition to 20 F-5Bs delivered in 1973	1973	1974
		60	Northrop F-5E Tiger II	Fighter	$756 mn incl 20 F-5F; Arms: Maverick ASM (USA); laser-guided weapons; R&D funding for special weapon equipment by Saudi Arabia	Jan 1975	–
		. .	Hughes Maverick	A-S missile	Arming 60 F-5 E/F	Jan 1975	–
		. .	. .	A-T missile	$828 mn "arms-for-oil" deal; agreement in principle in Dec 1974; incl ASMs, ATMs, tanks (USA)	Jan 1975	–
		. .	Raytheon MiM-23B improved Hawk	S-A missile system	$260 mn; in addition to 15 batteries standard version supplied by 1973	April 1974	–
		250	Armoured personnel carrier		See above	Jan 1975	–
		. .	M-60A1	Battle tank	See above; plus machine-gun carriers; towed and self-propelled	Jan 1975	–
		26	Destroyer and guided missile boat		Ex-US destroyers	1974	1978–84
Syria	USSR	54	MiG-21	Fighter		Late 1973	May 1974
		45	MiG-23 "Flogger"	Fighter	Israeli intelligence reports	Late 1973	1974

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
		25	Sukhoi Su-7	Fighter/ground attack		Late 1973	1974
		115	Frog-7	S-S missile		1973	1974
		. .	SAM-7	S-A missile	US intelligence reports	1973	1974
		. .	SAM-6	S-A missile		. .	. .
		30	SS-1C "Scud" long-range	S-S missile	Nuclear or conventional warhead	1973	1974
		. .	"Styx"	S-S missile	4 launched on each of 3 "Osa" missile boats	1973	1974
		110	BTR-50	Armoured personnel carrier		1973	1974
		320	T-62	Battle tank		1973	1974
		3	Missile boat, "Osa"-class		Replacement of Oct 1973 War	1973	1974
Yemen	Abu Dhabi	2	Short Skyvan 3M	STOL/transport	Transferred to Yemen upon delivery mid-1974 from UK to Abu Dhabi	1974	1974
Democratic Yemen	USSR	1 squad.	MiG-21	Fighter		. .	1974
South Asia							
Bangladesh	India	1	Large patrol boat, "Ajay"-class	Displ: 120 t	Ex-Indian Navy; gift; Indian-built; completed 1968	. .	July 1974
	USSR	4	Mil Mi-8	Helicopter	Gift	. .	1974
India	Czechoslovakia	100	Aero L-39	Basic trainer	Order due to delays in production of HAL HJT-16 Kiran trainer	1974	–
		20	Aero L-29 Delfin	Basic trainer	Delivery pending completion of L-39 order	1974	1974
	France	2	Patrol boat, ASW equipped		Advanced negotiations	. .	(1975)
	Sweden	5–10	Submarine, "A-14"-class		Negotiating; submarines to be built in Sweden and fitted out in India	(1974)	–
	UK	3	Westland Sea King	ASW helicopter	In addition to 3 delivered in 1973	1972	1974

		. .	Short Seacat	S-S missile	To arm licence-produced "Leander"-class frigates	. .	. .
	USSR	50	MiG-23 "Flogger"	Strike/interceptor		. .	. .
		(. .	YAK-36	VTOL strike fighter	Believed chosen instead of UK Harrier	1974	. .)
		(. .	SAM-6	S-A missile system		1974	1975)
		1	Frigate, "Petya"-class	Displ: 1 050 t	In addition to 9 previously delivered	. .	1974
		4	Submarine, "Foxtrot"-class	Displ: 2 000 t	In addition to 4 delivered in 1968–70	1973	1974: 2
Nepal	India	. .	HAL Alouette III	Helicopter	Gift; licence-produced in India	. .	1974
	UK	1	HS 748	Transport	For conversion to paratrooping and supply dropping	1974	Jan 1975
Pakistan	China	1 squad.	Shenyang MiG-19	Fighter	Incl spares; brings total to 120	1973	Late 1974
		. .	SAM-6	S-A missile system	New production in China	1973	–
		159	T-59	Tank		1973	Aug 1974
	France	3	Breguet Atlantic	ASW plane	Ex-Aéronavale	1974	–
		28	Dassault Mirage 5	Fighter	Last 5 delivered March 1974	March 1971	1972–74
	Iran	. .	Lockheed C-130E Hercules	Transport	Ex-Iran; in addition to previous 7 C-130Bs	1973	1974
	Sweden	45	Saab Supporter	Primary trainer	5 pre-series planes delivered 1974; production of 40 to start early 1975 in Sweden	1974	1974–75
	UK	6	Westland (Sikorsky) Sea King	ASW helicopter	3 delivered in 1974; reportedly a further 10 unspecified helicopters have been ordered	Oct 1972	1974–75
		2	Frigate, "Whitby"-class	Displ: 2 560 t	U.c.: $4.7 mn; ex-UK; fitted with radar and electronic equipment	1974	–
	USA	1	Lockheed C-130B Hercules	Transport	Ex-USAF	1973	1974
Far East							
Brunei	Singapore	1	Coastal patrol boat, Vosper Thornycroft type	Displ: 25 t	Improved design; in addition to 3 delivered in 1970–72	May 1973	1974
		2	Fast patrol boat, Vosper Thornycroft "71 ft"-type		Construction started in 1974; Arms Oerlikon (Switz.)	1973	–
	USA	2	Bell 212 Twin Pac	Helicopter	In addition to 2 delivered in 1971	Mid-1973	1974
Indonesia	Australia	4	GAF Nomad	STOL/transport	Military aid	1973	1975
		1	Fast patrol boat, "Attack"-class	Displ: 146 t full load	Military aid; in addition to 1 delivered in 1973	1972	1974

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
		6	Patrol boat		Military aid	1972	1975
	UK	4	Corvette		New construction; tenders invited from British firms; UK government will approve deal	(1975)	–
	USA	16	LTV A-7 Corsair II	Strike aircraft	Delivery started late 1974	1974	1974: 4
		16	Rockwell International OV-10A Bronco	STOL/transport	Purchase of Bronco and LTV A-7 partly funded through US aid programme totalling $25 mn/year; construction to start June 1975	1974	1975–
		100+	Armoured car and personnel carrier		Ex-Viet-Nam	1973	–
Khmer Republic	USA	40	Fairchild C-123 Provider	Transport	MAP fiscal year 1974	1973	1973–74
		14	North American AT-28	Piston-engine bomber	MAP fiscal year 1974; bringing total to 50	1973	1974
Korea, North	USSR	1–2	MiG-21 squads.	Fighter	In addition to previous 130	. .	1974
		. .	Frog -7	S-S missile	Deployed at ~12 sites	. .	1974
Korea, South	UK	2	HS. 748	Transport		1973	April 1974
	USA	70	Northrop F-5E Tiger II	Fighter	MAP; first delivered Dec 1974	Nov 1972	1974–
		3	Fast patrol boat, "PSMM"-class		Under construction	1973	–
Malaysia	Australia	10	GAF Nomad	STOL transport		1974	–
	Netherlands	2	Fokker-VFW F.28 Fellowship	Transport		1974	1975
	UK	1	HS Heron	Aircraft	Converted for military use; in addition to 2 delivered in 1963	. .	1974
	USA	6	Bell 47G	Helicopter		1974	1974
		12	Cessna 402B	Multi-purpose light plane	Incl spares	1974	–
		6	Lockheed C-130H Hercules	Transport	$47 mn; incl spares and support equipment	Oct 1974	1975
		16	Northrop F-5E Tiger II	Fighter	Incl 2 F-5B trainer versions	July 1972	1975–

Papua/New Guinea	Australia	4	Douglas C-47	Aircraft	Ex-Australia; incl in military aid programme to create air force	Jan 1975	1975
		2	Landing craft		Ex-Australia; transferred 14 Nov 1974 to create Navy	1974	Nov 1974
		2	Patrol boat, "Acute"-class				
Philippines	Australia	12	GAF Nomad	STOL transport	$12 mn; 6 for Navy	1974	–
		2	Fast patrol boat		Military aid	1974	–
	Italy	48	SIAI-Marchetti SF.260W Warrior	COIN fighter	Incl 32 SF.260M trainer versions	1973	1973–74
	USA	. .	Lockheed C-130 Hercules	Transport	U.c.: $4.8 mn	1973	1975
		6	Inshore patrol boat, "Sewart"-type	Displ: 33 t		1971	–
Singapore	Israel	. .	Gabriel	S-S missile	Arming 4 fast missile boats; licence-built in Singapore; Lürssen-Vegesack design (FRG)	. .	1975
	Italy	16	SIAI-Marchetti SF.260M	Trainer		1973	1974
	UK	6	Short Skyvan	Transport	$3.6 mn; 3 delivered in 1974; 3 equipped for SAR	Nov 1972	1973–74
		. .	BAC Rapier	S-A missile system		1974	–
	USA	40	McDonnell Douglas A-4 Skyhawk	Fighter	Refurbished in Singapore; 20 delivered by late 1974	Late 1972	1973–75
Taiwan	Israel	. .	Rafael Shafrir	A-A missile		Mid-1973	–
	USA	. .	AIM-9 Sidewinder	A-A missile	Arming F-5E fighters, licence production of which started in 1974	. .	1974–
Thailand	Italy	12	SIAI-Marchetti SF-260M	Trainer		1973	1973–74
	New Zealand	24	AESL CT/4 Airtrainer	Trainer	12 delivered in 1974	July 1972	1973–74
	UK	2	HS. 748	Transport	For Air Force	. .	1974
		. .	Short Seacat	S-S missile	1 quadruple launcher on Yarrow frigate	. .	1974
		1	Frigate, "Yarrow" type	Displ: 1 760 t		Aug 1969	March 1974
	USA	25	Bell UH-1H	Helicopter	Total: Air Force: 50; Army: 20	1973	1974
		20	Fairchild AU-23A Peacemaker	STOL/COIN	$21 mn incl spares, avionics, arms; in addition to 13 delivered in 1973	1974	Oct 1975
		30	McDonnell Douglas A-4 Skyhawk	Fighter	Ex-US Navy; refurbished	May 1973	–

						Date: number of items	
Recipient	Supplier	Number	Item	Description	Comment	Ordered	Delivered
		30	Northrop F-5E Tiger II	Fighter	MAP; Arms: Sidewinder AAM (USA)	May 1972	–
		16	Rockwell International OV-10 Bronco	COIN fighter	In addition to 16 delivered in 1971; 8 delivered in 1974; repeat order for further 16 to be placed in June 1975	Jan 1973	1973–74
		. .	AIM-9 Sidewinder	A-A missile	Arming F-5E fighters (USA)	May 1972	–
Viet-Nam, North	USSR	. .	Tank		Shipment by sea incl military trucks and other equipment	. .	Mid-1974
Viet-Nam, South	USA	126	Northrop F-5E Tiger II	Fighter	Delivery started March 1974– 30 delivered; total may be reduced to 45	Late 1972	1974–
		. .	Hughes TOW	A-T missile		. .	Jan 1974
		500	M-48	Tank/armoured car	Plus 200 pieces of heavy artillery	. .	1974
		2	Gunboat	Displ: 230 t	New construction; fiscal year 1975 funding	1974	–
Africa							
North Africa							
Algeria	Netherlands	6	Fokker-VFW F.27 Friendship	Transport	Government order	1974	Dec 1974; Jan 1976
Libya	France	60	Dassault Mirage 5	Fighter	Last 5 delivered May 1974	Jan 1970	1972–74
		30–50	Dassault Mirage F-1	Fighter	Advanced negotiations	(1975)	1976
		9 batts	Matra R-550 Magic	A-A missile		1972	–
			Matra/Thomson-CSF Crotale	S-A missile	60 displayed in military parade, Sept 1974	Mid-1973	1974
		. .	SS.11/SS.12	A-T missile		1974	–
		. .	Fast patrol boat, SFCN type PR-72	Displ: 475 t	U.c.: advanced negotiations of which 50% for armaments	1974	–
	USA	8	Lockheed C-130H	Transport	$65 mn; repeat order; delivery upheld by US State Dept.	1974	–
	USSR	29	MiG-23 "Flogger" B	Fighter	24 strike, 5 trainers; contract believed signed	(1974)	–
		12	Tu-22 "Blinder"	Bomber	Contract believed signed	(1974)	–

		8 batt	SA-2 SA-3 SA-9	S-A missile	Displayed in military parade, Sept 1974	..	Mid-1974
		200	T-62 BTR-50	Tank APC	Displayed in military parade, Sept 1974	..	1974
Morocco	France	2	Fast patrol boat, SFCN type PR-72	Displ: 370 t	Arms: Exocet SSM (France), 40 mm L 70 Bofors cannon (Sweden), 76 mm Oto Melara gun (Italy)	June 1973	–
	Italy	12	Agusta-Bell 205 Iroquois	Helicopter	In addition to 12 delivered 1968–70; contract re-opened	1973	1974
		6	Fairchild C-119 Packet	Transport	Ex-Canada; ex-IAF; refurbished; in addition to 5 delivered 1973	..	–
		2	SIAI-Marchetti SF.260W Warrior	Trainer	U.c.: $130 000; spares: $20 000–40 000	1973	–
	USA	6	Beechcraft King Air A100	Liaison		1974	–
		6	Lockheed C-130A Hercules	Transport	U.c.: $4.8 mn	1973	1974–75
		25	M-48 Patton	Main battle tank	Order expected for 100 more	..	Oct 1974
Tunisia	France	..	SS.12M	S-S missile	Navalized version of SS.12 ATM arming P-48 patrol boat	1973	1974
		1	ASW Corvette, A-69 type "Aviso"	Displ: 950 t	New construction	1972	–
		1	Missile patrol boat "P 48"-class	Displ: 250 t	Arms: SS.12 SSM (France); in addition to 2 delivered 1970	1973	Nov 1974
	Italy	12	SIAI-Marchetti SF.260W Warrior	Trainer	$2.4 mn, incl spares, training, ground support	Mid-1974	1975
Sub-Saharan Africa							
Cameroon	France	3	Alouette III	Helicopter	Military aid	..	1974
		2	Patrol boat			..	1974
	Gabon	2	Patrol boat, LCVP type			..	1974
Congo	France	1	Patrol boat, "P-48"-class	Displ: 240 t		1974	–
		1	Troop transport ship	Displ: 1 330 t		1974	–
	Netherlands	1	Fokker-VFW F.28 Fellowship	Transport	For VIP transport	1974	–
Ethiopia	FR Germany	2	Dornier Do-28D Skyservant	Transport	Under $3 mn military aid programme 1974–76	1974	–

						Date: number of items	
Recipient	Supplier	Number	Item	Description	Comment	Ordered	Delivered
	Iran	1–2squads.	Northrop F-5A	Fighter	Ex-Iran; to be transferred after US approval	1974	–
		12	Cessna A-37	Light strike trainer	$30 mn; incl in MAP fiscal year 1974; Total delivery awaiting DoD approval	1973	–
		15	Cessna 310	Light trainer	Delivery awaiting DoD approval	1974	–
		12	Northrop F-5E Tiger II	Fighter	Included in MAP fiscal year 1974; delivery awaiting DoD approval	1973	–
		72	M-60	Main battle tank	Included in MAP fiscal year 1974; total number on order unknown	1973	1974
		. .	Armoured personnel carrier		Delivered jointly with M-60s	1973	1974
Gabon	USA	1	Lockheed L 100-30	Transport	Incl spares, support, training	Sept 1973	1975
Ghana	France	4	Aérospatiale Alouette III	Helicopter		1973	1974
	FR Germany	1	Patrol boat	Displ: 160 t	New construction	(1973)	1975
	Netherlands	6	Fokker-VFW F.27 Friendship	Transport	5 Mk 400; 1 Mk 600	Oct 1973	1974
	UK	6	Short Skyvan 3M	Transport	$4.9 mn incl spares	Oct 1973	1974
Guinea-Bissau	USSR	. .	MiG-17	Fighter	Planes reportedly delivered early 1974 to Conakry, Republic of Guinea, prior to independence of Guinea-Bissau; 40 PAIGC pilots trained in USSR	. .	1974
Ivory Coast	France	3	Aérospatiale SA-330 Puma	Helicopter		1973	1974
		1	Patrol boat, "P-48"-class		Orders being finalized	(1975)	–
		1	Transport ship, "Francis Garnier" type				
Kenya	UK	3	HS Hunter FGA.9	Fighter	Refurbished	1973	1974
		3	HS Hunter T.77	Trainer			
		. .	Scottish Aviation Bulldog	Primary trainer	Follow-up order	1974	–
		1	Large patrol boat, Brooke Marine, 39.5 m type	Displ: 130 t	Arms: Bofors 40 mm cannon (Sweden)	1972	Feb 1974

		3	Large patrol boat, Brooke Marine, 32m type	Displ: 120 t	Arms: Bofors 40 mm cannon (Sweden); under construction	May 1973	–
Malaysia	UK	1	Britten-Norman BN Defender	Light strike	Arms: machine gun (UK); option for 1–2 more	1974	1974
	Mexico	1	Transport ship	Displ: 810 t	Completed 1973	. .	1974
Mauritania	France	2	Reims Cessna F-337	STOL light aircraft	Military aid	1973	1974
Nigeria	FR Germany	8	Dornier Do-28D Skyservant	Transport		1973	1974
		4	MBB Bo-105	Helicopter		1973	1974
	UK	20	Scottish Aviation Bulldog 123	Primary trainer	$2 mn; delivered in 1973	May 1973	1973–74
		4	Fast patrol boat, Brooke Marine type	Displ: 105 t	Arms: Bofors 40 mm cannon (Sweden)	1971	1974
		1	Survey ship, "Bulldog"-class	Displ: 800 t	$7 mn	1973	1976
	USA	6	Lockheed C-130H Hercules	Transport	$47 mn incl spares, support equipment, technical assistance, training	Oct 1974	1975
		4	Piper Navajo	Light plane	Incl 2 pressurized Navajos and 1 Navajo Chieftain	1974	1974
Rhodesia	South Africa	. .	Atlas Impala I	Armed trainer/COIN	Ex-Jordan; Tigercat SAM and Chieftain tank expected via South Africa in near future	. .	1974
Rwanda	France	3	Fouga Magister	Jet trainer		. .	1974
	Italy	3	Aermacchi MB 326GB	Jet Trainer		1973	–
Senegal	Singapore	12	Patrol boat, Vosper Thornycroft 45 ft type		Under construction	. .	–
Sierra Leone	China	2	Gunboat			1973	–
	Sweden	4	Saab-MFI 15	Light trainer		1973	1973–74
	USA	1	Hughes Model 500	Helicopter		1973	1974
Somalia	USSR	7	MiG-15 UTI	Trainer	Bringing total to 25	1973	1974
		13	MiG-17	Fighter		1973	1974
		7	MiG-21	Fighter		1973	July 1974
		. .	SAM-2	S-A missile system		. .	1974
		100	T-54	Tank	Follow-up orders expected	1973	1974

9–743191 SIPRI Yearbook

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
Sudan	China	9	Shenyang MiG-17	Fighter	In addition to 8 delivered in 1972	1973	1974
	USSR	4	MiG-21	Fighter		. .	1974
Tanzania	China	8	Shenyang MiG-19	Fighter	In addition to 21 MiG-17s delivered in 1973	1973	1974
		16	Shenyang MiG-21MF	Fighter	Displayed in military parade in July 1974	1973	1974
	UK	2	Patrol boat, Vosper Thornycroft 75 ft type		In addition to 2 delivered in July 1973; new Keith Nelson types; deployed in Zanzibar	1972	1974
		1	HS. 748	Transport	U.c.: $1.6 mn; for VIP	1973	1974
Togo	France	1	Aérospatiale Puma	Helicopter	Incl in programme to Air Force	1974	–
		5	Fouga Magister	Jet trainer	Incl in programme to Air Force	1974	–
		1	Transall	Transport	Incl in programme to Air Force	1974	–
Uganda	France	200	Aérospatiale SS.11	A-T missile	To arm 80+ Savien ACs	1973	1973–74
		80+	Savien	Armoured car	Partly financed by Libya	1973	1973–74
	Libya	12	Dassault Mirage 5	Fighter	Ex-Libya; gift on the occasion of Col. Khadaffi's visit to Uganda in March 1974	March 1974	Sept 1974
	USSR	12	MiG-17	Fighter	Reportedly gift according to General Amin	. .	1974
		. .	SAM-3	S-A missile system		(1973)	1974
		36	BTR-40	Armoured car	In addition to 62 delivered in Nov 1973	1973	1974
Upper Volta	France	2	Aérospatiale Frégate	Troop transport	Second delivered Nov 1974	. .	1974
Zaire	France	30	Aérospatiale/Westland SA 330 Puma	Helicopter	First 7 delivered in 1971	1971	1974
		17	Dassault Mirage 5	Fighter	Option on further 17	Sept 1973	1974–75
	Italy	6	Aermacchi MB 326GB	Jet trainer	In addition to previous 17 delivered in 1969–70	1973	1974
		12	SIAI-Marchetti SF.260MC	Trainer	Delivery completed mid-1974	1973	1973–74

		15	SIAI-Marchetti SF.260 Warrior	Light strike	Incl some SF.260M trainer versions	1974	–
	Japan	2	Mitsubishi MU-2J	Transport	For VIP use	1974	1974
	USA	3	Lockheed C-130H Hercules	Transport	In addition to previous 3	1974	1975
Zambia	Canada	8	DHC-5 Buffalo	STOL transport		1974	–
	France	15	Dassault Mirage 5	Fighter	Follow-up order of 30 expected for total of 3 interceptor squadrons	1974	–
	FR Germay	10	Dornier Do-28 Skyservant	Transport		1973	1974
	Italy	6	Aermacchi MB 326GB	Armed jet trainer		1973	1974
		25	Agusta-Bell AB 205	Armed helicopter	5 delivered in 1973	1973	1973–75
		8	SIAI-Marchetti SF.260M	Trainer		1973	1974
South Africa							
South Africa	France	18	Dassault Mirage III-E	Fighter	Follow-up order	Mid-1972	1974
		. .	Aérospatiale/MBB Milan	Light A-T missile	Confirmed by Aérospatiale	Dec 1973	1974
		. .	Matra R.550 Magic	A-A missile	Arming Mirage F-1; licence-produced in South Africa	1972	1975
		. .	CMN Corvette		Included in 5-year expansion programme; a 750 t corvette design proposed to South Africa in 1974; Arms: 4 Exocet SSM launchers (France)	–	–
		4	Frigate		New construction; advanced negotiations; Arms: Gabriel SSMs (Israel)	(1975)	–
		3	Submarine, "Daphine"-class		Immediate repeat order expected; Arms: Gabriel SSMs (Israel)	(1975)	–
	Israel	. .	Gabriel	S-S missile system	To equip 7 new South African ships	1974	Dec 1974
	Italy	40	Aeritalia AM-3C	General purpose monoplane	For Army Air Corps	1971	Mid-1974
	Jordan	717	Short Tigercat	S-A missile system	$17.4 mn; sale via private company; expected ultimate customer: Rhodesia; incl 162 practice missiles, 555 combat missiles, jeeps, launchers, radar, other support and maintenance equipment	. .	May 1974
		41	Centurion	Battle tank	Incl in Tigercat deal; see above	. .	May 1974
	UK	7	Westland Wasp	ASW helicopter	6 delivered in 1973; 7th embargoed in March 1974	Nov 1971	–

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
Central America							
Barbados	UK	1	Fast patrol boat, Guardian type		Arms: 20 mm Oerlikon cannon (Switz.)	–	1974
Cuba	USSR	~30	MiG-21MF	Fighter	In addition to 80 previously purchased	. .	1974
El Salvador	France	12	AMX-13	Light tank	Purchased secondhand; re-furbished in France with 75 mm cannon	1974	1974
	Israel	25	IAI Arava	STOL transport	U.c.: $650 000; Israeli design; first delivered Dec 1974	Sept 1973	1974–75
	USA	3	Douglas C-47		MAP; ex-USAF surplus	. .	1974
Guatemala	France	8	AMX-13	Light tank	Purchased secondhand; being refurbished in France with 75 mm cannon	1974	1974
Jamaica	UK	1	Britten-Norman BN-2A Islander	Transport	$600 000 incl military vehicles, training	Sept 1973	1974
	USA	3	Patrol boat	Displ: 104 t	New construction; first delivered 1974	(1972)	1974–75
Mexico	USA	20	Beechcraft F33C Bonanza	Trainer	$1.3 mn; 5 delivered Dec 1974; remainder delivered Jan 1975	Mid-1974	1974–75
Nicaragua	Israel	14	IAI Arava	STOL transport	5 delivered in 1974	1973	1974–75
Panama	USA	1	Lockheed Electra	Transport		. .	1974
South America							
Argentina	France	. .	Aérospatiale MM-38 Exocet	S-S missile	Arming 2 type-42 destroyers (UK), one of which is licence-built in Argentina	1974	1975–76

		30	Aérospatiale AS.12	A-S missile	Arming Alouette III helicopters	March 1973	1974
		20	Aérospatiale SS.11	A-T missile			
	FR Germany	1	Submarine, type 209	Displ: 1 000 t	First in service 1974	Jan 1969	1974–75
		2	Fast patrol boat, type S.148	Displ: 240 t	First launched Dec 1973; Arms Oto Melara cannon (Italy); Bofors 40 mm cannon (Sweden)	1973	–
	Israel	. .	Gabriel	S-S missile system		1974	–
	Italy	3	Aeritalia G.222	Transport		1974	1976–77
		6	Aermacchi MB 436GB	Armed jet trainer		1974	–
	Netherlands	5	Fokker-VFW F.28 Fellowship	Transport		1974	1975–76
	UK	2	Westland WG-13 Lynx	ASW helicopter	U.c.: $1.2 mn; up to 12 may be ordered to equip type-42 destroyers	1974	1975–76
	USA	6	Hughes Model 500	Helicopter	For Navy	1972	1974
		2	Lockheed C-130 Hercules	Transport	In addition to 6 previously delivered	1974	1975
		3	Lockheed L-188 Electra	Transport	For Navy; 3.5 mn for re-furbishing by Lockheed; first delivered Nov 1974	1973	1974–75
Bolivia	Brazil	18	Aerotec T-23 Uirapuru	Trainer	Brazilian design	1972	1974
		9	EMB AT-26 Xavante	Armed jet trainer/COIN	Licence built in Brazil; in addition to 9 purchased in 1972	1973	1974
		8	Fokker-VFW S-11	Instructor trainer	Gift	. .	1973–74
	Canada	13	Canadair T-33	Trainer	$4 mn incl spares; refurbished; last 4 delivered in April 1974	Feb 1973	1973–74
	Israel	6	IAI Arava	STOL transport	Israeli design	Late 1974	. .
	USA	2	Lockheed C-130 Hercules	Transport		Late 1974	. .
	Venezuela	3	North American F-86 Sabre	Fighter	Refurbished; ex-Venezuelan AF	Late 1974	. .
Brazil	Australia	. .	GAF Ikara	S-S missile system	Antisubmarine missile arming 4 Vosper "Nitheroi"-class frigates (UK); 2 of which being built in Brazil	Feb 1972	1976–79
	France	20+	Aérospatiale MM-38 Exocet	S-S missile	U.c.: $100 000; arming 6 Vosper "Nitheroi"-class frigates (UK)	Nov 1972	1976–79
		. .	Matra/Oto Melara Otomat	S-S missile	Arming 2 of 6 Vosper "Nitheroi"-class frigates (UK)	May 1972	1976–79
	FR Germany	2	Coastal minesweeper, "Aratu"-class	Displ: 230 t	In addition to 4 delivered 1971–72; 4 more projected	Nov 1973	–
	UK	1	HS. 125	Light jet transport	Brings total to 11	Oct 1973	1974
		6	HS. 748	Transport	$11.5 mn; brings total to 12	Oct 1973	1974

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
		10	Westland/Aérospatiale WG-13 Lynx	ASW helicopter	For Navy; arming 6 Vosper "Nitheroi"-class frigates (UK)	Dec 1974	1976–79
		3	Westland (Sikorsky) Sea King	ASW helicopter		1974	–
		. .	Short Seacat	S-S missile	Arming 6 Vosper "Nitheroi"-class frigates (UK)	Jul 1972	1976–79
		1	Submarine, "Oberon"-class	Displ: 1 610 t	Launched 26 May 1973; in addition to 2 completed 1973	Aug 1972	–
	USA	18	Bell 206B Jet Ranger	Helicopter	For Navy; ordered instead of licensed production of Gazelle (France)	1974	1974
		22	Bell UH-1 Iroquois	Helicopter		May 1973	1973–74
		5	Lockheed C-130 Hercules	Transport		1974	1975
		42	Northrop F-5E Tiger II	Fighter	$72.3 mn; incl 6 F-5B	Late 1974	1975
		8	Torpedo boat		6th delivered June 1974	. .	1974
Chile	France	~300	Aérospatiale AS.11/12	A-S missile	$3 mn; arming helicopters	1974	–
		. .	Aérospatiale MM-38 Exocet	S-S missile	Arming 2 "Leander"-class frigates (UK)	. .	. .
		10	Aérospatiale/Westland SA 330 Puma	Helicopter	For Army	1973	1973–74
	UK	6	Hawker Hunter F6A.9	Fighter		Early 1974	1974
		. .	Short Seacat	S-S missile system	Arming "Leander"-class frigates	. .	. .
		2	Frigate, "Leander"-class	Displ: 2 500 t	$156 mn; Arms: Exocet SSM (France); 1 light helicopter	1969	1974–75
		2	Submarine, "Oberon"-class	Displ: 1 610 t		1969	1974
	USA	8	Cessna T-37	Trainer	Ex-USAF	1973	1974
		34	Cessna A-37 Dragonfly	Ground attack	$12.2 mn; first 16 to be delivered March 1975	Late 1974	1975–
		18	Northrop F-5E Tiger II	Fighter	Incl 3 F-5F trainer versions; $60 mn incl spares and support equipment; terms of contract include $6 mn deposit by Chilean government, with balance to be paid over 8 years, agreed upon shortly after the fall of the Allende government in 1973	Oct 1974	1976
		2	Destroyer, "Allen M. Sumner"-class		MAP; ex-USA; refitted	(1973)	1974

		2	Submarine		Under construction; 300 Navy staff training in USA	. .	. .
Colombia	France	. .	Aérospatiale AS.11/12	A-S missile		1974	–
	FR Germany	2	Patrol submarine, type 209	Displ: 1 000 t		1971	1974
Ecuador	Canada	2	DHC-5 Buffalo	STOL transport		Dec 1974	–
	France	6	Aérospatiale Alouette III	Helicopter		1973	1974
		4	Aérospatiale SA-315 Lama	High-altitude helicopter	$1.25 mn; Arms: machine guns, rocket launchers	1974	–
		. .	Aérospatiale MM-38 mm	S-S missile	Arming 3 "Manta"-class fast patrol boats (FRG)	1974	–
		40	AMX-13	Light tank	Plus 6 self-propelled 155 mm howitzers; in addition to 40 purchased 1971–72	1974	1975–76
	FR Germany	3	Fast attack patrol boat, "Manta"-class	Displ: 119 t	Under construction by Lürssen Werft, Bremen; in addition to 3 completed 1970–71; Arms: Exocet SSM (France)	(1972)	–
	Israel	10	IAI Arava	STOL transport	Israeli design; first 2 delivered to Army Dec 1974	1974	1974–75
	UK	12	BAC/Dassault-Breguet Jaguar International	Strike/trainer	U.c.: $87 mn	Apr 1974	–
		4	BAC 167 Strikemaster	Trainer/strike	$4.8 mn incl spares; in addition to 12 previously purchased	1974	1974
		2	HS. 748	Transport	Repeat order; in addition to 3 delivered 1970–71	1974	–
	USA	24	Cessna 150 Aerobat	Light trainer		1974	1974
		1	Gates Learjet	Transport		1974	–
Guyana	UK	1	Britten-Norman BN Islander	Transport	In addition to 2 delivered 1971	. .	Oct 1974
Paraguay	Brazil	20	Aerotec T-23 Uirapuru	Primary trainer	Brazilian design	Mar 1973	1974–75
Peru	USA	14	Bell 212 Twin Pac	Helicopter	$11.5 mn incl spares	Oct 1973	1973–74
		24	Cessna A-37B Dragonfly	COIN fighter	U.c.: $750 000	1974	–
		40	Cessna T-41D	Trainer		1974	–
		2	Gates Learjet 25B			1974	1974
		24	Northrop F-5E Tiger II	Fighter	$870 mn incl 5 years supply of spares, ground support equipment	1974	–

Recipient	Supplier	Number	Item	Description	Comment	Date: number of items Ordered	Delivered
Uruguay	USSR	6	Mil Mi-8	Medium-lift helicopter	Purchased following gift of 2 in 1973	Dec 1974	–
		. .	. .	S-S missile	Displayed at military parade in July 1974	. .	1974
		175	T-55	Medium tank	U.c.: $100 000; 70 delivered in 1974	1973	1973–74
	USA	2	Beechcraft Queen Air			1973	1974
		2	Bell UH-1H Iroquois	Helicopter		1973	1974
Venezuela	France	15	Mirage III EV	Fighter	Mirage IIID trainer versions	Nov 1971	. .
	FR Germany	2	Patrol submarine, type 209	Displ: 1 000 tons	Completion 1974–75	. .	. .
	Italy	27	Matra/Oto Melara Otomat	S-S missile	Arming 3 of 6 "Constitucion"-class patrol boats (UK)	June 1972	Jan 1975
		13	Matra/Oto Melara Otomat	S-S missile	Arming some of 21 Italian corvettes, partly licence-built in Venezuela	1974	–
	UK	6	Fast patrol boat, Vosper Thornycroft "Constitucion"-class	Displ: 150 t, length, 121 ft	$28 mn+ incl Italian weapon systems, 3 gunboats and 2 missile boats, first 2 delivered in 1974; Arms: Oto Melara 76 mm cannon, Otomat SSM (Italy), Bofors 40 mm cannon (Sweden)	April 1972	1974–75
	USA	1	Cessna Citation			Dec 1973	1974
		2	Lockheed C-130H Hercules	Transport	In addition to 4 previously purchased	1974	1974

9. Sources and methods for world armaments data

Square-bracketed references, thus [1], refer to the list of references on page 254.

This chapter describes the sources and methods used in the preparation of the appendices on military expenditure, arms production and arms trade (appendices 6B, 7A, 8A, 7B and 8B respectively). Only the main points are noted here. The various appendices are updated versions of those which appeared in the SIPRI Yearbook 1974, to which the reader is referred for further details, particularly to appendices 8A and 8B, which appeared for the first time in that volume.

I. *Purpose of the data*

Together, the military expenditure tables and the arms production and trade registers form the nucleus of a comprehensive, quantitative survey of world armaments. The purpose of the military expenditure estimates is to provide an indication of the overall volume of military activity in different countries, and of the resources absorbed by this activity. The arms production and trade registers show the origin, flow, costs and main characteristics of major weapons now being acquired in all countries.

Countries and time period covered

The appendices cover all countries in the world. For the military expenditure data, countries are arranged alphabetically within the following regional groupings: NATO (North Atlantic Treaty Organization), WTO (Warsaw Treaty Organization), Other Europe, Middle East, South Asia, Far East, Oceania, Africa, Central America and South America. The arms production and arms trade registers have been divided into industrialized countries (NATO, WTO, Other Europe and Other Developed (the latter comprising Australia, China, Japan and New Zealand)) and third world countries (most of the world). This division is not based on any rigid economic criteria but rather on broad differences in the nature and purpose of the trade in armaments in particular. The absence of a country, or an entire region, from one or another of the arms production and trade registers means that no activity of the type indicated has been found for that area.

The arms production registers (appendices 7A and 8A) include only items believed to have been actually in production or under development during the calendar year 1974. The arms trade registers (appendices 7B and 8B) cover items on order or delivered in 1974.

In the case of the military expenditure series it should be noted that in this edition of the Yearbook the figure for the most recent year is generally a revised estimate; and the figure for the next preceding year (in the present case, 1973) is, in general, a final figure for actual outlays in that year. The degree of uncertainty relating to figures derives from the fact that contingencies may result in actual expenditures which differ—occasionally very widely—from the budgeted amounts; and government accounting procedures can require a considerable time after the closing of the fiscal year to arrive at a final figure for the total amount paid out during that period.

The military expenditure estimates refer to the calendar year in all cases. For countries where the governmental fiscal year differs from the calendar year, conversion to a calendar-year basis is made on the assumption of an even rate of expenditure throughout the fiscal year.

II. *Sources*

The sources of the data presented in the appendices are of five general types: official national documents; journals; newspapers; books, monographs and annual reference works; and documents issued by international intergovernmental organizations.

The official national documents include budgets; parliamentary or congressional proceedings, reports and hearings; statistics, white papers, annual reports and other documents issued by governments and agencies; and statements by government officials and spokesmen. These and the journals and newspapers contain information relating to both military expenditure and weapon production and trade. Comparatively few books or monographs are used, since the information in such works is generally too dated. An exception is annual reference works, which contain up-to-date information. The main official international documents which are used are those containing information relating to military expenditures. There are no surveys published by international intergovernmental organizations on weapon production or trade.

The following list shows the periodical publications which are perused regularly for relevant data:

Journals

Africa (London)
Africa Diary (New Delhi)
Air et Cosmos (Paris)

Air Force Magazine (Washington)
Arab Report and Record (London)
Armament Data Sheets (London, Aviation Studies Atlantic)
Armed Forces Journal (Washington)
Air International (London)
Armies and Weapons (Genoa)
Asian Recorder (New Delhi)
Aviation Week and Space Technology (New York)
China Report (New Delhi)
Congressional Quarterly Weekly Report (Washington)
Current Scene (Hong Kong)
Defense Monitor (Washington)
Défense Nationale (Paris)
Economist (London)
Far Eastern Economic Review (Hong Kong)
Flight International (London)
Forces Armées Françaises (Paris)
Interavia (Geneva)
Interavia Airletter (Geneva)
Interavia Data (Geneva)
International Affairs (London)
International Defense Business (Washington)
International Defense Review (Geneva)
Keesings Contemporary Archives (Bristol)
Milavnews (Stapleford, England, Aviation Advisory Services)
Nato Review (Brussels)
New Times (Moscow)
News Review on China, Mongolia and the Koreas (New Delhi)
News Review on Japan, South East Asia and Australasia (New Delhi)
News Review on South Asia (New Delhi)
News Review on West Asia (New Delhi)
Official Price List (London, Aviation Studies Atlantic)
Peking Review (Peking)
Soldat und Technik (Frankfurt)
Soviet Military Review (Moscow)
US Naval Institute Proceedings (Annapolis, Md.)
Wehr und Wirtschaft (Munich)
Österreichische Militärische Zeitschrift (Vienna)

Newspapers

Dagens Nyheter (Stockholm)
Daily Telegraph (London)
Financial Times (London)

Hindustan Times (New Delhi)
International Herald Tribune (Paris)
Japan Times (Tokyo)
Krasnaja Zvezda (Moscow)
Le Monde (Paris)
Neue Zürcher Zeitung (Zurich)
New York Times (New York)
Pravda (Moscow)
Standard Tanzania (Dar-es-Salaam)
Sunday Times (London)
Svenska Dagbladet (Stockholm)
Times (London)

Annual publications

For data on military expenditure:

AID Economic Data Book: Africa (Washington, United States Agency for International Development)

AID Economic Data Book: Far East (Washington, United States Agency for International Development)

AID Economic Data Book: Latin America (Washington, United States Agency for International Development)

AID Economic Data Book: Near East and South Asia (Washington, United States Agency for International Development)

Far Eastern Economic Review Yearbook (Hong Kong, Far Eastern Economic Review)

Military Balance (London, International Institute for Strategic Studies)

"NATO defence expenditure", *NATO Review* (Brussels, NATO)

Statesman's Year-Book (London, Macmillan)

Statistical Yearbook (New York, United Nations)[1]

World Military Expenditures and Arms Trade (Washington, United States Arms Control and Disarmament Agency)

For data on gross domestic product or net material product:[2]

Yearbook of National Accounts Statistics (New York, United Nations)[3]

For data on weapon production and trade:

"Forecast and Inventory", *Aviation Week and Space Technology* (New York, McGraw-Hill)

International Air Forces and Military Aircraft Directory (Stapleford, England, Aviation Advisory Services)

[1] This source also contains information on gross domestic product.
[2] In addition to the source listed, two journals, *International Financial Statistics* and *IMF Survey*, both published by the International Monetary Fund (Washington), are used.
[3] This is supplemented by the monthly journal *Monthly Bulletin of Statistics*.

Jane's All the World's Aircraft (London, Sampson Low, Marston & Co.)
Jane's Fighting Ships (London, Sampson Low, Marston & Co.)
Jane's Weapon Systems (London, Sampson Low, Marston & Co.)
"Military Aircraft of the World", *Flight International* (London, IPC Transport Press)
"World Missile Survey", *Flight International* (London, IPC Transport Press)

III. *Definitions and restrictions*

The military expenditure estimates are intended to show the amount of money actually spent (outlays) for military purposes. It should be noted that in many countries there are alternative series for funds budgeted, appropriated (set aside) or obligated (committed to be spent). Since our objective is to show the volume of activity, series for actual expenditures have been chosen in preference to these alternatives. Even with this series, there may be some misrepresentation of the volume of activity— particularly for the United States and to a lesser extent for other major arms producing countries—since payment for arms procurement may lag behind the actual production work. The expenditure series has the advantage, however, of being the only final measure of the actual amount of resources consumed.

Military expenditures are defined to include weapon research and development, to include military aid in the budget of the donor country and to exclude it from the budget of the recipient country, and to exclude war pensions and payments on war debts.

For calculating the ratio of military expenditure to national product, either gross domestic product (GDP) at purchasers' values or net material product (NMP) has been used, following the practice of the individual countries in identifying national product. GDP is defined as "the final expenditure on goods and services, in purchasers' values, less the c.i.f. [cost, insurance, freight] value of imports of goods and services" [1]. NMP is defined as "the net (of depreciation) total amount of goods and productive series produced in a year expressed at realized prices" [2]. The ratio of military expenditure to national product will generally be higher when NMP is used, since this measure excludes a variety of services which are included in GDP.

The three arms production and trade registers all cover what we have referred to as "major weapons"—that is, aircraft, ships, armoured vehicles and missiles. Strictly speaking, all of these except missiles are potential "weapon platforms", while missiles are part of "weapon systems". However, our use of the word "weapon' or "major weapon" by and large conforms with general practice. The great majority of the aircraft, ships and armoured vehicles entered in the registers are armed: as such they constitute either the central component of a weapon system which is generally identified by reference to that platform or else a major unitary fighting system. For production of indigenously designed weapons and for licensed production in developed countries (appendix 7A), only armed ships and armoured vehicles are included. However, all aircraft—including unarmed transports and utility planes—are covered. The reason for the different treatment of aircraft is twofold. First, most aircraft can easily be converted to carry armaments and to form effective fighting platforms. This is not equally true of non-armoured vehicles and support ships. Second, the technology required to produce aircraft of any kind is generally more advanced than that required for vehicles and ships which may not differ significantly from widely produced civilian counterparts. The coverage of arms imports by all countries (appendices 7B and 8B) and licensed production in third world countries (appendix 8A) is extended to include unarmed ships and armoured vehicles as well as unarmed aircraft, the criterion for inclusion simply being delivery to the armed forces of the country concerned. This results in the listing of a very small number of items of the type not included in the indigenous production register.

As a result of the exclusion of small arms, ammunition and artillery, the coverage of weapon production and imports by third world countries is estimated to reflect only about one-half of the total procurement of military equipment in this region. In the case of the developed countries, which are generally equipped with more sophisticated weaponry, the proportion is probably considerably higher. The main aspect of the procurement activity in these countries, which is not reflected in any way in the registers, is that associated with infrastructure and support equipment, such as land-based radar systems, communication networks, data-processing facilities, and so on. The satellite systems produced by the United States and the Soviet Union for the purposes of reconnaissance, navigation and communication constitute the most advanced and expensive type of support equipment not covered by the registers: funds for the development and production of space systems are estimated to account for about 5 per cent of the annual US budget for procurement of weapons and equipment.

IV. *Military expenditure tables (appendix 6B)*

The estimates of the military expenditures of NATO countries are taken from official NATO data, the figures for Warsaw Treaty Organization countries other than the USSR are from national budgets, and the estimates for the remaining countries in the world are in general taken from the United Nations' *Statistical Yearbook*. The figures for the Soviet Union are SIPRI estimates, the methodology of which was explained in appendix 8B of the *SIPRI Yearbook 1974*. For many countries, the estimates for the most recent years are based on budget figures derived from newspapers and journals and other sources described above.

In order to provide time series estimates of total world military expenditure at constant prices, two operations must be performed. First, all national expenditure must be converted into a common currency: the most widely used unit for such a purpose is the US dollar, which SIPRI has also adopted. For this purpose it is necessary to use constant exchange rates, preferably those prevailing in a "normal" year.[4] Second, it is necessary to adjust for the effect of changes in the level of prices.

For most countries we have used the official exchange rate in 1970 or, if this fluctuated during the year, the weighted average rate. For the Warsaw Treaty Organization countries, special purchasing power parities were used because these yielded more reasonable expenditure relationships both within the WTO and between these countries and the rest of the world. For WTO countries other than the USSR, and for Albania, purchasing power parities calculated by Benoit and Lubell were used [3]. For the USSR, SIPRI estimates of the rouble: dollar purchasing power parity have been calculated (see *SIPRI Yearbook 1974*, appendix 8B).

The adjustment for changes in prices was made by applying the consumer price index in each country. In many countries this is the only price index available: as an index of the general movement of prices, it is a reasonable one for showing the trend in the resources absorbed by the military, in constant prices. For further detail on this point, the reader is referred to the *SIPRI Yearbook 1972* [4].

V. *Registers of indigenously designed weapons in development or production (appendices 7A and 8A)*

Arrangement and classification of entries

Within the four broad categories (aircraft, missiles, ships and armoured vehicles), the systems produced by each country are arranged by function. Thus, aircraft are presented as follows: bombers, fighters, strike, other combat aircraft (for example, maritime patrol), reconnaissance aircraft and other electronic equipment platforms, transports, trainers, utility planes, armed helicopters, transport helicopters and utility helicopters. For all of

[4] A year in which most of the major currencies had a fixed parity with the dollar.

these categories, except bombers, other combat aircraft, reconnaissance aircraft and armed helicopters, there is a further subdivision between heavier and lighter types.[5] In the case of missile systems, a set of abbreviated descriptions of the launching platform and target is employed, and entries are listed first by launching platform (fixed land-based, towed, mobile, portable, fixed-wing aircraft, helicopter, ship, submarine) and, within these groups, by target (fixed land-based, tank, missile, fixed-wing aircraft, helicopter, ship, submarine). For ships, the following descriptive categories were evolved on the basis of the nomenclature employed by the majority of countries: strategic submarines (equipped with long-range strategic missiles), hunter-killer (counter-submarine) submarines (fast, nuclear-powered submarines without antiship missiles), antishipping submarines (equipped with antiship missiles), ordinary submarines, coastal submarines, aircraft carriers (over 30 000-tons displacement), cruisers (7 000–25 000 tons), destroyers (3 500–6 999 tons), frigates or escorts (1 350–3 499 tons), corvettes (500–1 300 tons) and patrol boats or missile boats (below 500 tons). In the few cases where national descriptive designations depart radically from this scheme—for example, the US usage of "frigate" for ships displacing 7 000–10 000 tons or the French use of "corvette" for a 3 000-ton ship—these standardized descriptions have been inserted in square brackets in place of the official one.

An attempt has been made to place newer systems first and older ones second, within the various functional groupings.

Aircraft, ship and armoured vehicle armament

No attempt has been made to describe the armaments carried on the combat aircraft since these are generally both too numerous for the space available and variable (that is, most combat aircraft can carry a variety of alternative weapon loads). For armoured vehicles, the main armament is indicated in the first of the columns of standardized data. In the case of ships, symbols indicating the nature and number of all armaments except the limited-capability antisubmarine mortars and rockets launchers are shown directly after the description. The order in which ship armaments are listed is as follows: missiles (ship-to-ship, ship-to-air, ship-to-submarine, submarine-to-submarine, submarine-to-surface), guns, antisubmarine torpedo tubes or torpedo launchers and ordinary torpedo tubes.

[5] In the case of transport aircraft, the following apply: heavy (over 200 000 kg), medium (50 000–200 000 kg), ordinary (10 000–30 000 kg) and light (6 000–10 000 kg). For fighter and strike aircraft, light types are defined as those weighing less than 11 000 kg. Most unarmed helicopters fall into one of the following categories: heavy lift (over 50 000 kg), medium transport (ca. 20 000 kg), transport (ca. 6 000–7 000 kg), utility (2 000–5 000 kg) or light utility (under 2 000 kg).

System specifications

The data on speed, weight and range are maximum values in all cases except for ship displacement, which is standard. In some cases these values are dependent on a number of variables. For example, in the case of aircraft the figure given for speed is the maximum speed under optimal conditions, which generally means that the aircraft carries no external payload and is flying at or near its maximum altitude.

Programme history

The dates given for design, prototype test and production are initial dates only, except for data pertaining to the Soviet Union, where little official data relating to weapon system developments is published. In the case of the USSR, the dates shown in the prototype test column generally refer to the time when a system was first reported to have been observed. In most cases these dates probably postdate initial prototype tests by one to two years.

Numbers to be produced

An attempt has been made to divide the total planned production number of each system, or the number on order, between units to be manufactured for domestic military acquisition and units manufactured for export. When such data was available, the numbers to be procured for domestic acquisition are shown first, followed by a stroke and then the numbers for export. When a figure for total production was available but it was not known whether any of this production was intended for export, or what proportion was intended for export, a single figure neither preceded nor followed by a stroke appears.

In the case of the Soviet Union and many third world countries, it has been impossible to obtain estimates for total planned production. For these countries, the number of units produced to date, if known, is shown, with a note indicating the special nature of the figure.

Financial data

Data on research and development (R&D) costs refer to the total amount of money spent—or planned to be spent—on the development of the system over a period of years. Data on unit prices are average figures for the cost of an equipped item, excluding prorated R&D costs, spares and associated ground equipment.

The financial data should be used with great caution: they are intended to indicate general orders of magnitude only. It has not been possible to obtain standardized information, and in some cases the R&D costs and average unit prices have been calculated on a constant-price basis, with reference to some year in the early 1970s, while in other cases the figures represent actual funds expended over a period of years, with no allowance made for inflation. Projected costs for systems to be produced later in the 1970s have an even greater element of uncertainty added to the noncomparability arising from the fact that some figures are based on price levels in the early 1970s while others are computed on the basis of projected price levels.

Foreign-designed components

The last column of the register shows the use of foreign-designed powerplants (engines), armaments or electronic components, with the exporting country indicated in brackets. The type of imported electronic equipment is indicated by the following code: r=radars, n=navigation systems, f=(armament) fire-control systems, d=data processing equipment, s=sonars.

VII. *Arms trade registers (appendices 7B and 8B)*

The descriptive terminology used in appendices 7B and 8B differs slightly from that employed in appendices 7A and 8A, and generally follows the practice used in previous SIPRI registers of the arms trade with the third world.

It should be noted that a special method for calculating the value of arms supplies to the third world has been devised, since the objective was to measure the total volume of supplies, rather than to aggregate the cash sums paid, the amounts of grant aid received, and so on. The methodology is explained in detail in the *SIPRI Yearbook 1973* and earlier editions.

References

1. *Statistical Yearbook* (New York, United Nations, 1970) p. XIX.
3. Wilczynski, J., "The Economics of Socialism", in C. Charter, ed., *Studies in Economics,* Number 2 (London, George, Allen and Unwin, 1970).
3. Benoit, E. and Lubell, H., "The World of National Defence", in E. Benoit, ed., *Disarmament and World Economic Interdependence* (Oslo, Universitetsförlaget, 1967).
4. *World Armaments and Disarmament, SIPRI Yearbook 1972* (Stockholm, Almqvist & Wiksell, 1972, Stockholm International Peace Research Institute) pp. 78–79.

10. World stock of fighting vessels, 1950–74

Square-bracketed references, thus [1], *refer to the list of references on page 298.*

I. *Introduction*

This chapter analyses major trends in world naval forces since 1950. The discussion is essentially quantitative and is based on a somewhat novel way of measuring aggregate naval power. The traditional measures of naval power, namely numbers and tonnage, both have serious deficiencies.

1. The total number of fighting ships in a particular navy is an obviously unsatisfactory measure. This measure simply treats an aircraft carrier or a destroyer escort, say, as one unit each, and can thus easily give rise to misleading impressions about the relative size and capability of different navies.

2. Tonnage is preferable to number, particularly for comparisons between similar classes of ships in different navies. It is less useful, however, for aggregate comparisons between dissimilar navies; moreover, tonnage figures do not reflect the modernity of a ship and its weapon systems—a critical and rapidly changing factor in the military field. Ships of many of the world's navies are, of course, periodically rebuilt and modernized, but the cost-effectiveness of doing so diminishes rapidly in an environment of fast technical change.

The method used here is based on cost, the basic assumption being that an increase in cost (in real terms) buys an increase in performance or capability. This method (described in detail on page 295) takes account of the size, age and armament of fighting ships and makes allowance for technological improvement.

A purely quantitative analysis of the world's naval stock is useful for answering questions such as: How fast are world stocks of fighting vessels rising? Is the rise accelerating? Where is the rise taking place? What is the state of the arms competition in this field between the USA and the USSR and between NATO and the Warsaw Treaty Organization (WTO)?

Naval forces have, on the other hand, a very wide range of potential functions, and different countries attach different priorities to these functions. Moreover, within a country—particularly a major naval power—priorities often change over time. Since our analysis covers a period of 24 years, it is worthwhile to supplement the data with some discussion of the perceived utility of naval power and—with respect to the United States and the Soviet Union—the evolution of their naval strategies.

Another problem is that of coverage. Ideally, a stock estimate should include a country's total naval system including support ships and naval bases. It has not been possible to include these here. It is reasonable to assume, however, that the number of support ships bears some relationship to the size of the fighting fleet; if they were included, the main propositions in the following analysis would probably still hold good. It is obviously impracticable to attempt estimates of the value of world naval bases. In some of the text comparisons, however, some account is taken of their number.

Finally, the reader should be warned that the peaks and troughs in naval strength recorded in the data below may be in error by one or two years. This is a result of the fact that naval forces were measured at only six points over the period 1950–74. Such inaccuracies would not, however, invalidate any of the conclusions drawn in the text.

II. *The stature of naval forces since World War II*

During the course of World War II naval forces played a large and critically important role for both Japan and Germany as well as for the Allied Powers. The latter, particularly the United States, emerged from that conflict with vast naval forces and indisputable proof that naval superiority was essential in war. This state of affairs changed rapidly, however, as military and political leaders began to assess the consequences of nuclear weapons.

In the early post-war years, when the USA had a monopoly of nuclear weapons, and during most of the 1950s, when it retained a marked nuclear superiority, the nuclear "threshold"—the scale of conflict which Western military and political leaders regarded as conceivable without the use of nuclear weapons—was very low, or at any rate stated to be very low. Western regard for conventional forces declined during this period since it was generally conceded that once nuclear weapons were extensively used, any war would be over before conventional forces could be brought to bear.

As regards naval forces, the statement in the 1957 British White Paper on Defence that "the role of naval forces in total war is somewhat uncertain" summarized what was apparently a widely held view. In the United States this conclusion was reached much earlier, presumably because the impact of nuclear weapons on military planning was far more direct. As early as 1945, the US Navy, foreseeing a bleak future if it did not acquire a nuclear-delivery capability, embarked on a programme to demonstrate that nuclear weapons could be effectively delivered by aircraft deployed on aircraft carriers. The programme was successful despite considerable opposition, and by late 1950 a rudimentary capability for delivering nuclear weapons with carrier-borne aircraft was deployed in the Mediterranean.

During the late 1950s and early 1960s, however, the belief that conventional naval forces had, at best, an uncertain utility began to change. The growing realization that nuclear weapons were essentially unusable, except as a last resort, expanded the range and scale of conflicts that could conceivably occur without recourse to these weapons. This development was double-edged. If there was a readiness to consider "limited" conventional conflicts as more likely, there was also a growing awareness of the urgent need to contain such conflicts, actual or imminent. With the USA and, to an increasing extent, the USSR having global "national interests", virtually any crisis or limited conflict carried within it the seeds of escalation into general nuclear war. Under these conditions of growing awareness of the need for bilateral crisis management and containment of conflict, regard for conventional naval forces flourished.

These developments were reinforced by a number of specific episodes in which naval forces played a key role, in particular the landing of US marines in Lebanon in 1958, and the US naval "quarantine" of Cuba in 1962 to prevent the Soviet Union from shipping additional intermediate-range ballistic missiles to that country and to secure the removal of those that had already been deployed.

A second major fillip for navies—at least for a selected few—came in 1960 with the introduction in the USA of the nuclear-powered submarine capable of launching long-range nuclear missiles while submerged. This brought the most important and prestigious military activity—strategic deterrence—firmly into the naval fold. Even in its infancy the ballistic missile submarine was recognized as a weapon system ideally suited to the task of strategic deterrence, and its relative fitness for this role has continuously grown as technological developments have made land-based missiles and bombers increasingly vulnerable. The USSR, the UK and France have therefore followed the US lead.

The deployment of ballistic missile submarines provided, in turn, a new major naval task for those countries which considered it necessary to attempt a defence against this new threat. Every new weapon system breeds a counterweapon or, in most cases, a number of counterweapons. At the present time the most effective counterweapon to the ballistic missile submarine is considered to be the nuclear-powered attack submarine, often—for this reason—called the hunter-killer submarine. The number of these vessels in the USA, the USSR and the UK is continuously increasing and China is reported to have one undergoing trials. France will soon begin the construction of its first nuclear-powered attack submarine and plans a force of four to six of these vessels.

This is not to suggest, of course, that antisubmarine warfare had been neglected prior to the emergence of the ballistic missile submarine. It is true that another protracted war in which the protection of merchant shipping against submarine attack would assume the importance it had in World War II is considered highly improbable by most observers.

Moreover, the submarine's role in "limited" warfare is difficult to specify. Highly vulnerable when on the surface, the submarine cannot be used for creating a visible impression of naval superiority which, hopefully, might bring about a resolution of a dispute without conflict. On the other hand, the sudden destruction of an opponent's warship or merchant ship by a submarine would be regarded by many as too drastic a step to take in any situation short of war. However, as mentioned above, the very fact that the submarine exists makes it inevitable that efforts will be made to neutralize it. And, of course, there are, or have been, specific situations for which an antisubmarine capability is, or was, considered essential. Thus, during the 1950s, when a significant portion of the US nuclear retaliatory forces were deployed on aircraft carriers, it was essential to be able to ensure the survival of these ships, at least until they could launch their aircraft. As another example, the maximum defence with conventional weapons which NATO is willing to mount in the event of a war in Europe calls for substantial reinforcement of both troops and equipment from the USA. If this reinforcement effort were frustrated by Soviet submarines, it would force NATO either to terminate the conflict and accept whatever losses had been incurred or to make the fateful decision to use nuclear weapons.

If we take it for granted that conventional naval forces are regarded as having a high utility in times of peace—that is, in conditions short of general war—is it possible to be somewhat more specific about the reasons for this? Most naval observers seem to agree that this is a difficult task. In times of peace, the utility of instruments of war is, almost by definition, difficult to characterize. However, this difficulty in no way diminishes the faith which these observers and experts have in the utility of naval power. To paraphrase one expert, the effectiveness of a navy in a situation short of war is difficult to characterize even though it is pervasive and may well compromise the most significant benefit a nation derives from its naval investment [1a].

It is obviously important from the arms control or disarmament point of view to know whether the high regard for navies is a function of it being considered highly probable that naval forces would play a critical role in conflict scenarios, or whether—perhaps in addition—it is a function of a vaguely based belief that naval forces are "effective" in a much wider sense.

Perhaps the best way to proceed is by way of comparison with the other conventional forces—the army and the air force. The most general justification for the maintenance of armed forces in peacetime is that they deter potential enemies and that, in any case, it would take far too long to organize and build up these forces after war had broken out. No further justification is usually attempted for armies and air forces. Only navies are regarded as having, in addition, a significant active peacetime role.

The key to this distinction between navies and the other forces is flexibility. Compared with armies and air forces, naval forces are uniquely flexible. All states have exclusive rights to their territory and the air space above it but, except for a few miles out from the coast, oceans and seas are international. Moreover, the majority of states in the world border on at least one ocean or sea.

Perhaps the best indicator of the flexibility of naval forces is that a very substantial military capability can be deployed in such a way that it can be used in a matter of minutes and yet, at least in a legal sense, remain totally uncommitted. But the range of functions which ocean-going naval ships can perform is far wider than this and it seems worthwhile to describe them briefly.

At the lower end of the scale, naval ships can occasionally be deployed in distant seas to make visits to demonstrate friendship and generate goodwill or to serve as a reminder that a particular country is interested in the affairs of a region. Recent examples of this sort of activity were the visit of two Iranian frigates to Singapore in October 1974 to coincide with the Shah's visit to that country, and the dispatch of a French naval squadron to the Indian Ocean, also in October 1974, with the declared objective of reminding the world—the USA and the USSR in particular—that France was also interested in the affairs of that region.

The next step would be to establish a permanent naval force in a region by continually rotating warships and supply vessels, possibly together with the establishment of a naval base.

Beyond a temporary or permanent presence in a particular ocean or region, the political leadership of a naval power has a wide range of options regarding the reinforcement and manoeuvring of naval forces in a particular area. For example, reinforcement with additional destroyers will create a very different impression from reinforcement with an attack aircraft carrier or a carrier with troops and helicopters.

The steps in the escalation ladder are thus comparatively numerous with naval forces, making them the preferred instruments for supporting political aims in situations short of war. Added to this, of course, is the large number of countries to which the sea provides potential access.

However, the case for the utility of naval power in peacetime rests on far more than the successful application of "gunboat diplomacy". This is made clear in the following quotation which gives an indication of the balance of the arguments:

> There can be little doubt in anyone's mind that Western naval superiority has had a great effect on specific encounters and on the general course of the contest, but the very decisiveness of the margin of Western supremacy has obscured its own significance. Had the margin been narrower, more explicit Sino-Soviet challenges would perhaps have occurred to demonstrate its effectiveness. Not the least important achievement of Western naval superiority may well have been to deter, not only

specific communist adventures, but any attempt to enter into a general naval competition across the board. This possibility is an argument against any effort to calculate the margins of Western naval budgets too finely against the tangible threats that exist at any one time [1b].

Since this observation was made, the naval margin between East and West has indeed narrowed and many observers are convinced that the Soviet Union now also subscribes to the view that naval power is a useful and desirable thing to have for its peacetime utility.

It is entirely possible, therefore, that a new naval arms race will develop and, like the quest for technological superiority, it will not be curbed by any concrete defence needs. If the mere possession of naval power (or superiority in naval power) is considered to yield large dividends—indeed, if actually having to put it to use is tantamount to an admission of inadequacy—the naval arms race will then become extensive and prolonged.

The fact that the Soviet Union has, in the past 25 years, transformed itself from a state of comparative naval insignificance to a naval power rivalled only by the United States is, without doubt, the most important naval development of the post-war period. Moreover, future naval development will depend to a great extent on events in, and relations between, these two countries.

On the other hand, the possibility of a naval arms race between the USA and the USSR is not the only factor of potential significance for naval developments in the foreseeable future. As we shall see below, there appears to have been a widespread surge of interest in navies in recent years and it is of some interest to consider the reasons for this.

In some regions—particularly the Middle East—the primary explanation is obviously the intense state of rivalry between states in the region. The Arab-Israeli military confrontation, for example, has taken on a growing naval dimension after the sinking of the Israeli destroyer, the Eilat, in 1967 by missiles fired from an Egyptian patrol boat.

A more general explanation, however, is probably a growing appreciation of the importance of the oceans. The oceans are already of great importance for the transportation of commodities and as a source of food and it is virtually certain that, in both these respects, their importance will continue to grow.

But the oceans and the ocean floor are also seen as major future sources of raw materials, particularly oil and gas from continental shelves and minerals from the deep-ocean floor. This expectation has produced a great deal of diplomatic activity in the past few years culminating in the Law of the Sea Conference in Caracas, Venezuela, in June–August 1974. At the present time international law defines "territorial seas" as extending just three miles off the coast. The majority of countries, however, have either claimed or would settle for a 12-mile limit. The major problem here concerns a number of heavily used straits which would cease to be international waters if a 12-mile territorial sea were to be accepted. The major maritime powers, notably the USA and the USSR, are anxious to preserve the right of free transit through these channels.

Of greater significance, however, is perhaps the growing support for the concept of an "economic zone" extending as much as 200 miles off the coast, giving coastal nations exclusive rights to the resources of the ocean and the ocean floor in these zones. While it is uncertain to what extent other uses of the oceans within these zones (assuming that they are accepted) will be formally circumscribed, it is probable that disputes and possibly armed clashes will occur, initially at any rate. The unique attributes of naval forces stem directly from the international status of the oceans and the major maritime powers can be expected to emphasize, by the appropriate deployment of naval ships, that "economic zones" do not change the status of the oceans for other uses. The deployment of US naval ships in the Indian Ocean, to give a parallel example, is sometimes justified on the grounds that it illustrates the principle of the freedom of the oceans, potentially threatened by the suggestion that the Indian Ocean be made a "zone of peace" or, specifically, that the naval forces of non-littoral states be excluded from it. The USSR is at least as strong a proponent of the principle of the freedom of the seas as is the USA.

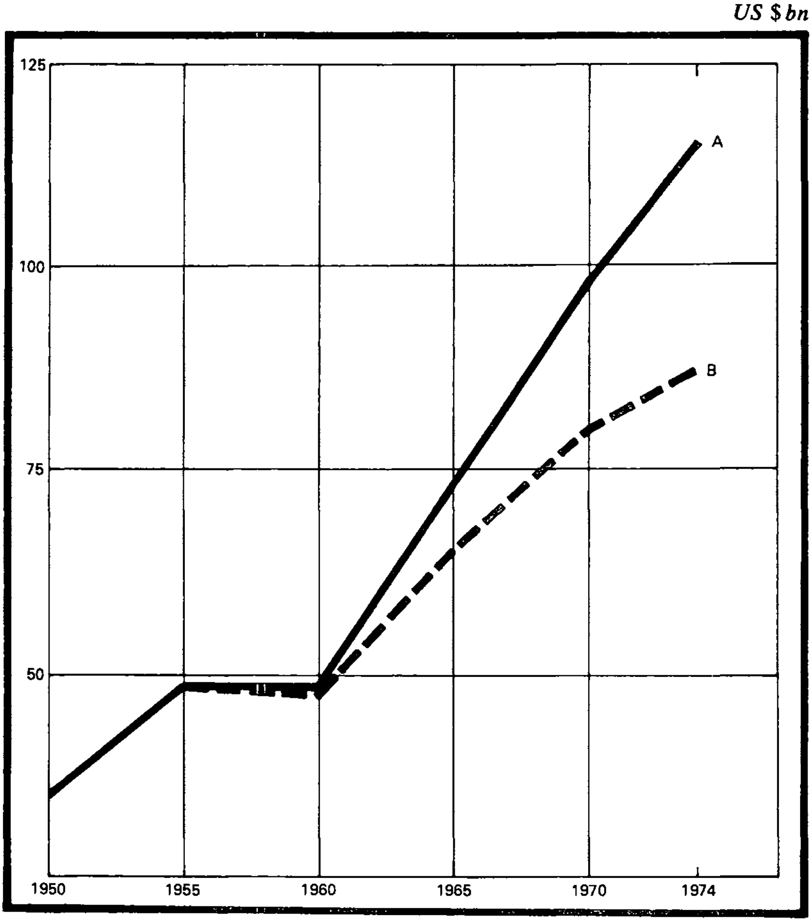
Another development that can be readily foreseen as a result of the growing accessibility of ocean resources is the acquisition by coastal states of naval forces appropriate for the protection and policing of their oceanic interests, whether or not these interests are defined by international law. The difficulty of this task is obviously much lessened by the existence of compact, comparatively inexpensive but nonetheless highly effective naval weapon systems, particularly the missile-armed patrol boat and the coastal submarine.

III. *Trends in the estimated value of world naval stock*[1]

Over the period 1950–74, the estimated value of the world stock of fighting ships increased threefold, roughly the same as total world military expenditure in constant prices. The upward trend was sharply interrupted between 1955 and 1960 (chart 10.1). Between 1960 and 1970, however, there was a marked acceleration in the rate of growth compared with the previous decade (table 10.1). In recent years the rate of growth has moderated somewhat, but the average annual rate of increase of 6.4 per cent since 1960 is still almost double that for the period 1950–60.

[1] The basic data for this section is contained in table 10.6 below.

Chart 10.1. World naval stock, 1950–74



A. Total.
B. Excluding nuclear-powered ballistic missile submarines.

To a large extent, this acceleration in the rate of growth after 1960 is attributable to a single type of ship—the strategic nuclear submarine. The share of the world naval stock accounted for by these vessels increased from 1.8 per cent in 1960 to 24.3 per cent in 1974. However, even if strategic nuclear submarines are excluded, naval stock has more than doubled over the post-war period. Moreover, the average annual rate of increase of 4.5 per cent since 1960 is still somewhat faster than that for the period 1950–60.

It should be borne in mind, however, that the separation of strategic nuclear submarines is somewhat arbitrary. The existence of these submarines has been accompanied by a large increase in the resources devoted to antisubmarine warfare; the primary function of nuclear hunter-killer submarines, for example, is to track down and destroy strategic submarines. In other words, the contribution of strategic submarines to the rise in world

Table 10.1. World stock of fighting ships: estimated growth rates in value of stock

Average annual per cent growth rates

Country/region	Per cent of total world stock in 1974	1950–60	1960–70	1970–74	1950–74
World total	*100*	*3.3*	*7.4*	*4.1*	*5.1*
Total NATO	*52.4*	*1.2*	*6.3*	*0.5*	*3.2*
USA	*37.2*	*1.4*	*6.4*	*−0.7*	*3.1*
Other NATO	*15.2*	*0.5*	*6.1*	*3.9*	*3.4*
Total WTO	35.6	*12.1*	*10.9*	*9.2*	*11.1*
USSR	*34.6*	*11.9*	*11.0*	*9.5*	*11.1*
Other WTO	*1.0*	*17.4*	*9.4*	*1.2*	*11.2*
Other Europe	*1.6*	*5.4*	*2.3*	*2.9*	*3.7*
Other developed	*2.3*	*7.7*	*7.2*	*5.1*	*7.1*
China	*2.7*	*18.3*	*10.9*	*23.0*	*15.9*
Total third world	*5.4*	*5.4*	*5.3*	*6.7*	*5.6*
Far East	*1.6*	*7.2*	*7.7*	*4.9*	*7.0*
Middle East	*0.8*	*8.0*	*9.5*	*7.5*	*8.5*
South Asia	*0.7*	*8.7*	*6.1*	*8.6*	*7.6*
South America	*1.8*	*4.4*	*0.9*	*9.0*	*3.6*
Central America	*0.3*	*−0.1*	*4.9*	*3.6*	*2.6*
Africa	*0.3*	. .	*35.0*	*5.0*	. .

Source: SIPRI worksheets.

naval stock is probably considerably larger than the value of these vessels themselves.

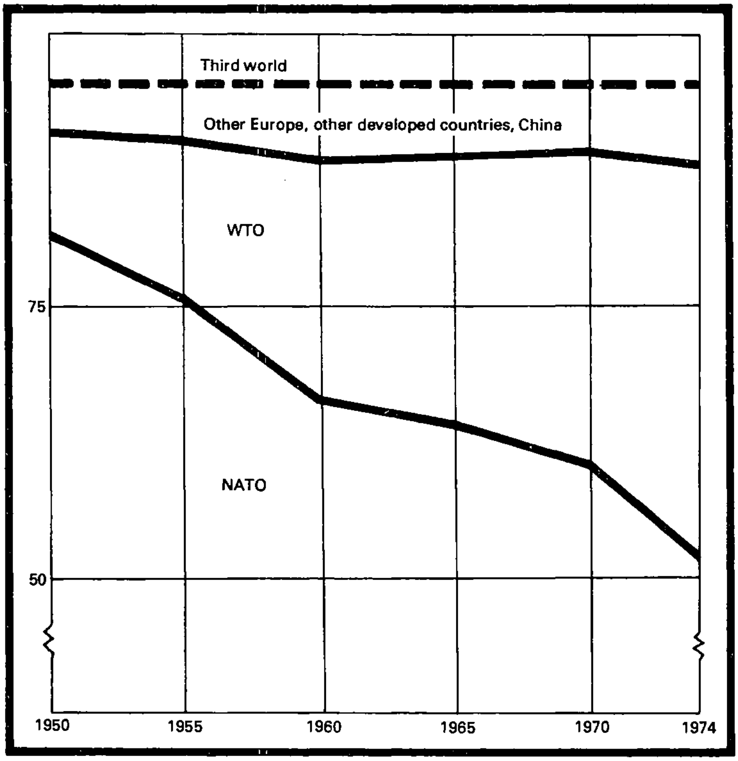
Not only has the rate of growth of world naval stock varied over time but the rates of growth for different countries and regions have varied significantly. As a result there have been marked changes in the distribution of the world naval stock.

By far the most significant of these changes has been the emergence of the WTO—in essence the Soviet Union—as a major naval power. Over the period 1950–74, the WTO's naval stock has, on the average, increased twice as fast as the world total and three times as fast as that of NATO.

In assessing these figures it is important to bear in mind that in 1950 the value of the Soviet naval stocks was very small making it comparatively easy to achieve a high percentage rate of increase. For the same reason all new naval construction in the Soviet Union, until quite recently, meant an equivalent increase in the absolute value of the naval stock. While new naval construction in NATO has, broadly speaking, easily matched that in the Soviet Union, in the first place the existing naval stock was very much larger and, second, new construction has been offset by the disposal of large numbers of old vessels. Nevertheless, the disparate rates of growth have had a marked impact on the distribution of the world's naval stock as is shown in chart 10.2.

Chart 10.2. Distribution of the world stock of fighting ships

Per cent



Regional analysis

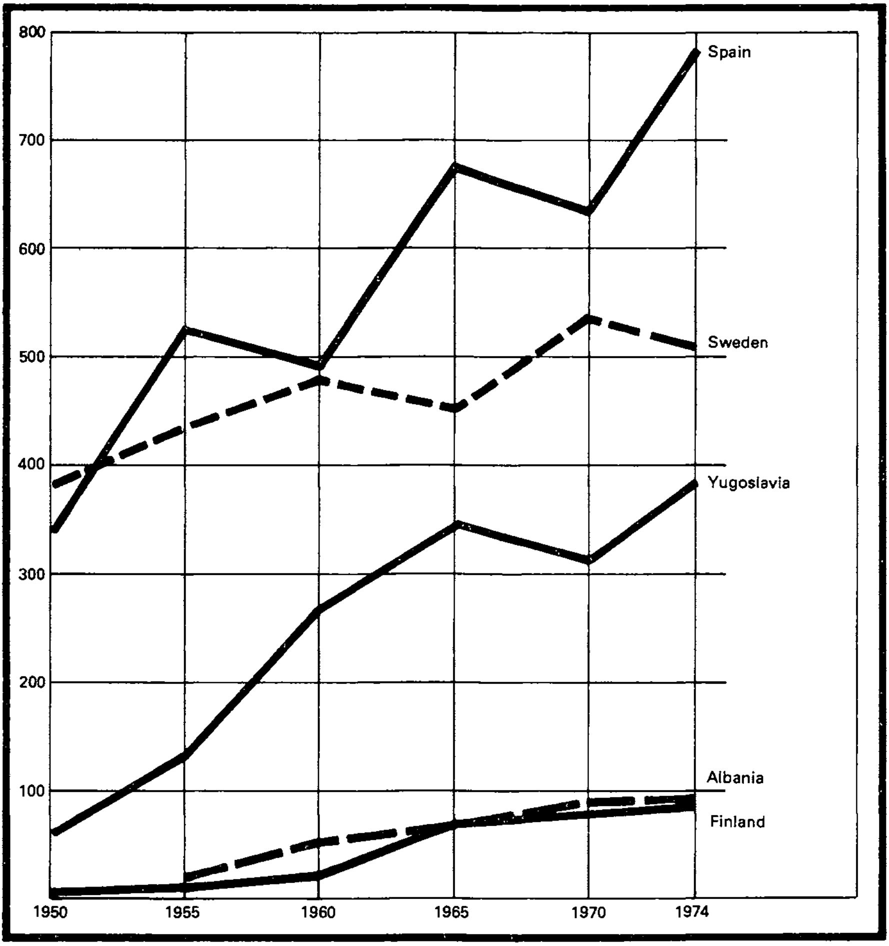
It is apparent from chart 10.2 that what happens in the future to the world's naval stock depends very much on developments in, and relations between NATO and the WTO. Naval developments in these two alliances are therefore discussed in some detail below.

The fact that NATO and the WTO account for nearly 90 per cent of the world naval stock does not mean that naval developments outside these two alliances are of no consequence. Naval power is a relative concept and there are many navies throughout the world which—though miniscule compared with those of the USA or USSR—have an important bearing on the regional military balance.

In the regional analysis which follows, one development is sufficiently common to warrant pointing out in advance. In many regions—and, by implication, many individual countries—the period 1970–74 has been characterized by a marked upward surge in the value of the naval stock. A possible general explanation for this development was advanced in the previous section. A more specific but related explanation, at least in some countries, is that over the past few years the USA has withdrawn hundreds

Chart 10.3. World stock of fighting ships: estimated value, other Europe

US $ mn



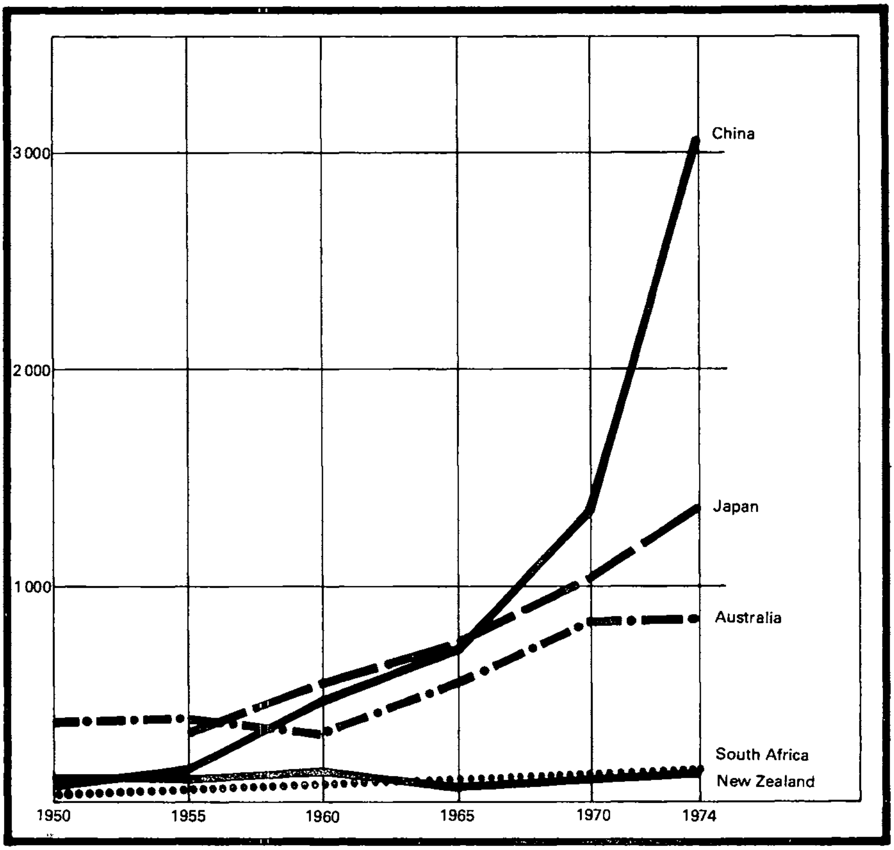
of surface warships and scores of conventional submarines from its fleet. Most of these vessels have been scrapped but a significant number have been transferred to other countries. Given the size of the recipient navies, these transfers have had a significant impact on the size of their naval stock.

In Europe, substantial navies are maintained by Spain, Sweden and Yugoslavia, in descending order. The Spanish naval stock has increased erratically, actually falling between 1955 and 1960 and again between 1965 and 1970. Between 1970 and 1974, however, it increased by 24 per cent with the addition of destroyers and submarines, newly built or secondhand vessels from the United States. Yugoslavia has also increased its naval stock dramatically, although the upward trend was sharply reversed between 1965 and 1970 (see chart 10.3).

In the other developed countries the estimated value of Japan's naval

Chart 10.4. World stock of fighting ships: estimated value, other developed countries and China

US $ mn



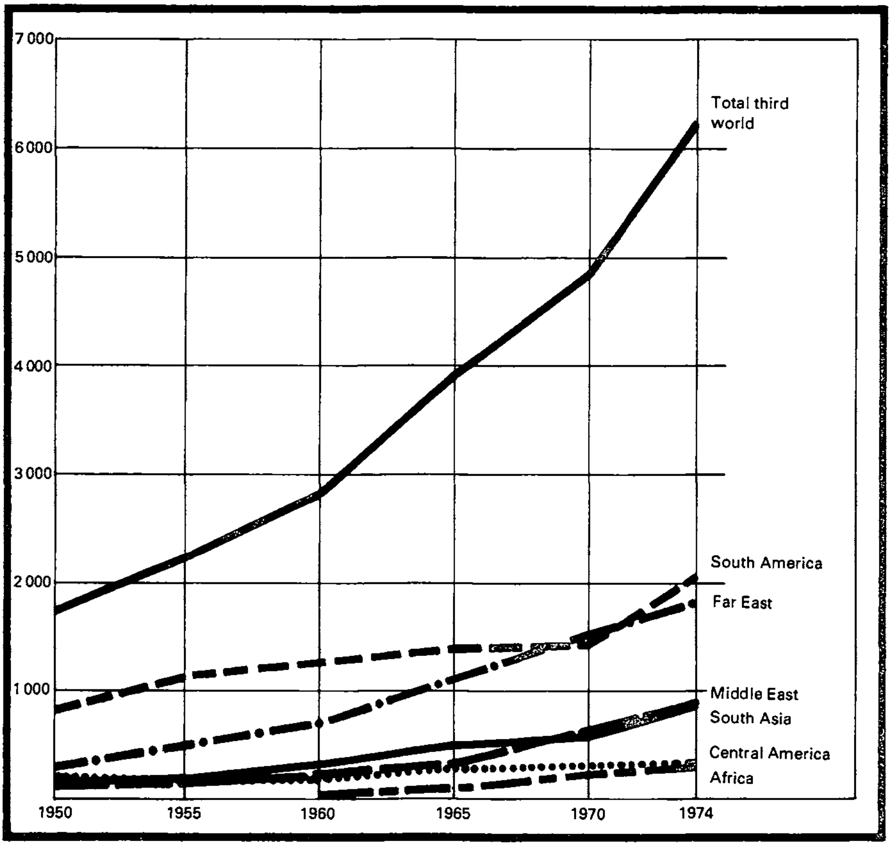
stock has been rising rapidly since 1955 with a noticeable acceleration after 1970. The value of Australia's naval stock levelled off after 1970 with the scrapping of one support aircraft carrier and a number of destroyers. In South Africa the value of the naval stock has trebled since 1960 (see chart 10.4).

The estimated value of China's naval stock is also plotted in chart 10.4 since this seems an appropriate place. It is apparent that the rate of increase in China's naval stock has continuously accelerated over the post-war period. In 1974, China's navy (in terms of its estimated value) ranked fifth in the world behind the USA, the USSR, the UK and France. The bulk of the Chinese naval stock is accounted for by patrol boats but the series production of ocean-going naval ships—patrol submarines and destroyers—was begun around 1970.

The estimated value of the stock of fighting ships in third world countries—taken as a whole—increased only marginally faster than the world

Chart 10.5. World stock of fighting ships: estimated value, third world

US $ mn

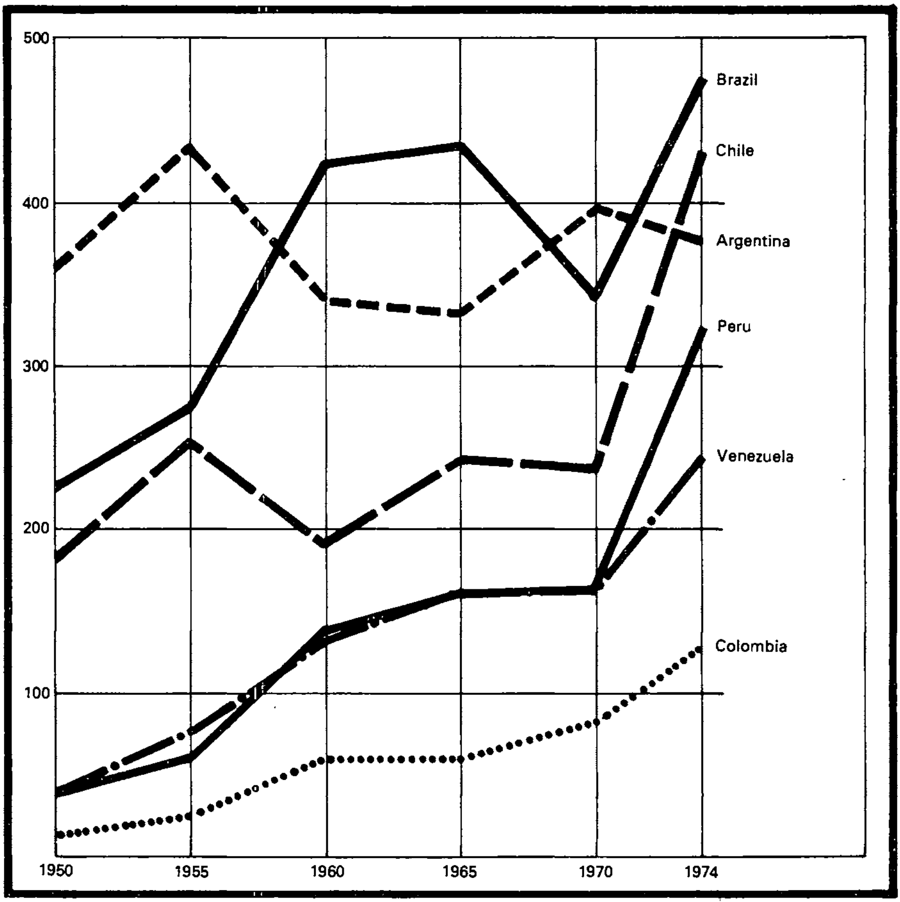


average over the period 1950–74. The third world's naval stock for most of this period has been dominated by South America, and in this region the average annual rate of growth of 3.6 per cent during the stated period was considerably less than the corresponding world average of 5.1 per cent. In the Far East, Middle East and South Asia, on the other hand, the average rate of increase in the naval stock has been considerably faster than the world average (table 10.1 and chart 10.5). The very fast rate of increase in the naval stock in Africa is largely due to the fact that, in 1960, the naval stock was virtually nil.

As already mentioned, the average annual rate of growth in South American naval stock has been comparatively modest. This is true, however, only for the period 1950–70. Since 1970 the value of the stock of fighting ships in this region has increased by 40 per cent. All of the countries in the region, with the single exception of Argentina, have participated in this naval build-up (chart 10.6). It is also worth noting that this expansion is largely the result of the commissioning of newly built ships and submarines

Chart 10.6. World stock of fighting ships: estimated value, selected South American countries

US $ mn



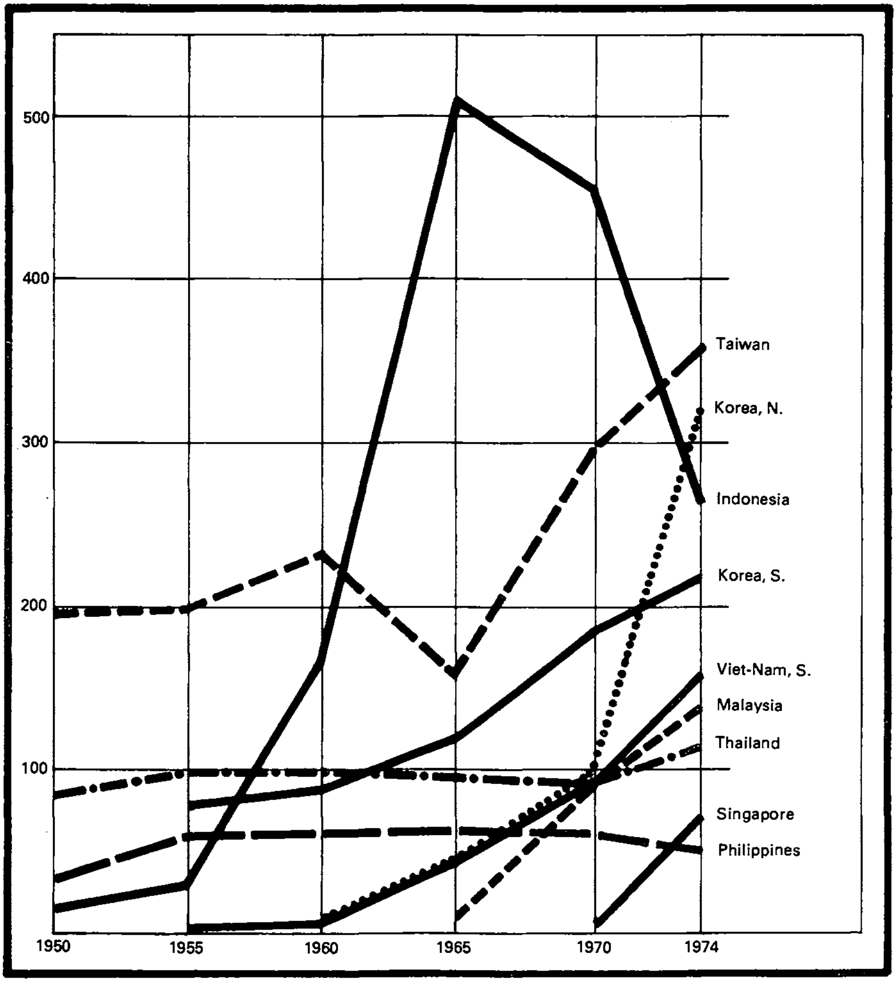
and the modernization (installation of missile armaments, for example) of existing vessels. In addition, Brazil, Argentina, Colombia and Venezuela have received secondhand vessels from the United States.

In the Far East the estimated value of the naval stock has increased rapidly in most countries, particularly since 1965 (chart 10.7). The navies of Taiwan, South Viet-Nam and South Korea consist almost exclusively of secondhand US vessels, the rate of transfer having accelerated after 1965. The same is true of the North Korean Navy, the suppliers in this case being the Soviet Union and China. The large increase in the estimated value of North Korea's naval stock between 1970 and 1974 is mainly due to the acquisition of missile-armed patrol boats.

The most obvious exception to the upward trend is Indonesia which, over the period 1958–65, received a wide range of naval vessels from the Soviet Union and other WTO countries. Indonesian-Soviet relations cooled after

Chart 10.7. World stock of fighting ships: estimated value, the Far East

US $ mn



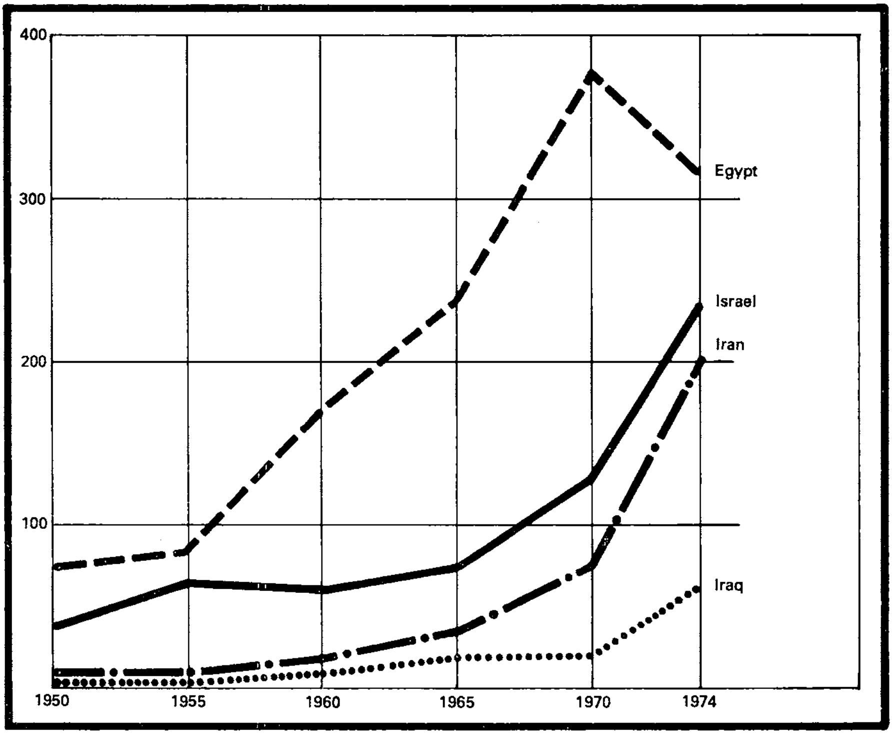
the abortive coup in 1965 and, without an adequate supply of spare parts, the Indonesian fleet deteriorated rapidly.

In most Middle East countries the value of the naval stock has been rising rapidly (chart 10.8). The Arab-Israeli conflict, though primarily a contest between armies and air forces, has increasingly taken on a naval dimension. Numerous clashes between missile-armed patrol boats took place during the war in October 1973 and the fall in Egypt's naval stock between 1970 and 1974 is partly due to the losses suffered in that conflict.

The other focal point in the Middle East is the Persian Gulf. The littoral states of the Gulf—which account for about one-half of the world's proven oil reserves—are engaged in a military build-up of massive proportions, with Iran very much in the vanguard. Since a key con-

Chart 10.8. World stock of fighting ships: estimated value, selected Middle East countries

US $ mn



sideration is the shipment of oil, naval forces have shared in this build-up. Iran, which already has the largest navy of the Gulf States, has on order missile-armed patrol boats, additional hovercraft and six 7 800-ton destroyers. There have also been reports that Iran is interested in acquiring an aircraft carrier similar to the "Through Deck Cruiser" under construction in the UK.

Finally, in South Asia, the value of India's naval stock has increased very rapidly—at an average annual rate of 9.4 per cent over the period 1950–74. Pakistan, in contrast, showed a modest increase during 1950–70, which was followed by a decline due to losses suffered during the war with India in 1971 (chart 10.9).

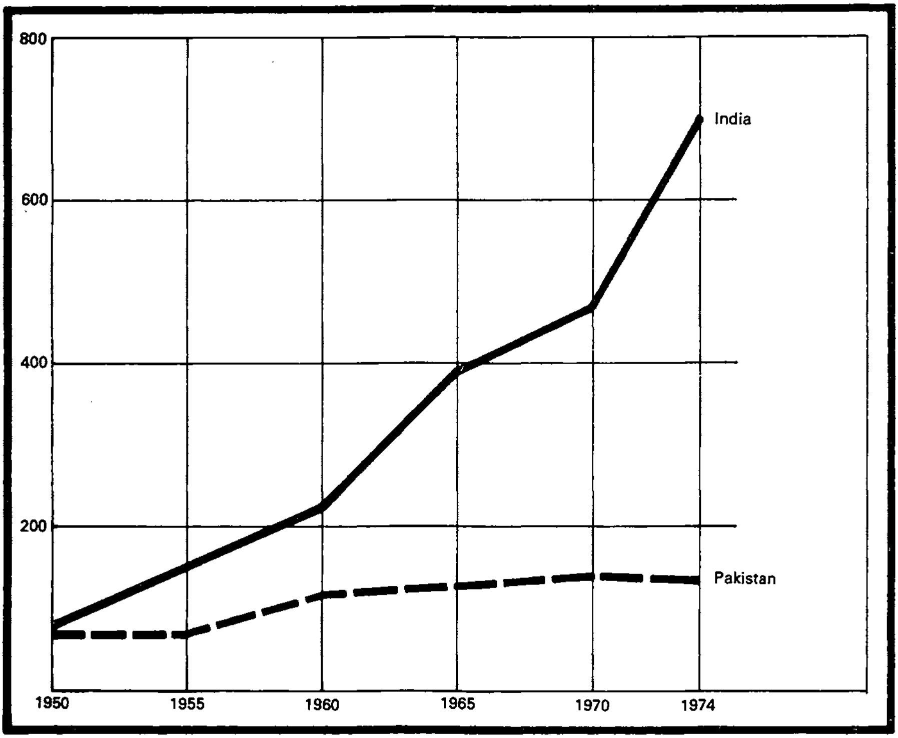
Trends in the major types of warships[2]

The general post-war trend has been away from large vessels and towards small ones. The main reason for this is probably the enormous rise in the cost of weapons and, albeit less dramatic, in the cost of personnel to operate

[2] The basic data for this section is contained in tables 10.8–10.13 at the end of the chapter.

Chart 10.9. World stock of fighting ships: estimated value, South Asia

US $ mn



them. It is also true, of course, that modern technology has made it possible to install highly effective weapon systems on comparatively small platforms.

A brief discussion follows on a number of developments—all part of the stated overall trend—affecting certain types of warships.

Aircraft carriers

The numbers of attack aircraft carriers in operation around the world has fallen steadily over the post-war period from 44 in 1950 to 22 in 1974 (table 10.2). This trend appears to be a fairly clear-cut case of prohibitive costs. The attack aircraft carrier is unquestionably a flexible and immensely powerful weapon system but few nations have been able to sustain the cost of building and operating up-to-date versions of these vessels.[3] Even the US Navy, which sets great store by these ships,

[3] In 1970 the US Navy estimated the acquisition cost of its 15 attack carriers at $6.5 billion. This included the original construction cost of each ship, any subsequent modernization costs and the cost of the embarked aircraft, valuing each aircraft at its unit manufacturing cost. This is a huge sum but it would be very much larger if computed on the basis of the cost of building these 15 ships in 1970 and if the cost of the aircraft included spares and a prorated share of their R&D costs. Similarly the annual operating cost of these 15 ships, including aircraft and personnel, was very high—$1.4 billion [2].

Table 10.2. Attack aircraft carriers

Numbers

Country	1950	1955	1960	1965	1970	1974
USA	27	19	14	16	15	15
UK	12	16	8	5	4	1
France	2	4	3	3	2	2
Australia	1	2	2	1	1	1
Canada	1	1	1	1	–	–
Netherlands	1	1	1	1	–	–
Argentina	–	–	1	1	2	1
Brazil	–	–	1	1	1	1
India	–	–	–	1	1	1
Total	**44**	**43**	**31**	**30**	**26**	**22**

Source: SIPRI worksheets.

plans to reduce their number from 15 to 12 over the next few years. It is worth pointing out, however, that four of the 12 are planned to be nuclear-powered vessels, each with a displacement of some 90 000 tons.

Aircraft—both fixed-wing and helicopters—are still regarded as constituting a highly effective weapon against surface ships and submarines, and a number of navies are building, or plan to build, lower-cost versions of the aircraft carrier. In 1968 the Soviet Union deployed the 18 000-ton antisubmarine warfare (ASW) cruiser, the Moskva, capable of carrying 18 helicopters. This was the first Soviet naval vessel with aircraft as the primary armament. A second vessel, the Leningrad, followed in 1969. In 1974 the Soviet Union was reported to have a 35 000-ton "aircraft carrier" undergoing trials in the Black Sea. In contrast to the Moskva and Leningrad, this vessel has an angled flight deck running about two-thirds the length of the ship and is expected to operate vertical take off (VTOL) fixed-wing aircraft as well as helicopters. A second vessel of this type is reported to be under construction and—in view of the Soviet Union's apparent conviction of the need for seagoing air power for its fleet—many observers anticipate that a considerable number of these ships will eventually be built.

The UK, which plans to retire the last of its attack carriers towards the end of this decade, has the first of three "Through Deck Cruisers" under construction. These 20 000-ton vessels will carry helicopters and, most probably, VTOL aircraft. Similarly, the US Navy is pressing Congress for authorization to build eight 14 000-ton "Sea Control Ships" and is actively developing VTOL aircraft to arm them. Finally, France recently announced plans to construct a relatively small (about 18 000 tons), but nuclear-powered, aircraft carrier.

In other words, although the number of large attack aircraft carriers will probably continue to fall, modified versions of the aircraft-carrier concept are likely to become more numerous.

Table 10.3. Nuclear-powered ballistic missile submarines

Numbers

Country	1960	1965	1970	1974
USA	3	33	41	41
USSR	4	9	24	48
UK	–	–	4	4
France	–	–	1	3
Total	**7**	**42**	**70**	**96**

Source: SIPRI worksheets.

Another noteworthy development in aircraft carriers is the large and essentially self-contained amphibious assault ship. The USA currently has seven of these ships ("Iwo Jima"-class), each capable of landing (by helicopter) about 1 000 troops together with artillery, vehicles and other equipment. Another five vessels are under construction. These will be twice as large as the "Iwo Jima"-class and, in addition to helicopters, are provided with an internal docking well for four landing craft, each of which can transport 170 tons of equipment. The UK, having converted two aircraft carriers for this role, is the only other country with specialized ships of this kind. Obviously, any country with helicopter carriers for antisubmarine warfare can readily transform them into effective assault ships simply by changing the type of helicopter embarked. The primary difference, however, is the length of time for which such a ship—with an embarked amphibious assault force—could be deployed in the vicinity of the potential assault point. Large, specifically designed ships have far greater endurance in this respect, which confers prolonged capability for mounting an effective assault.[4]

Submarines

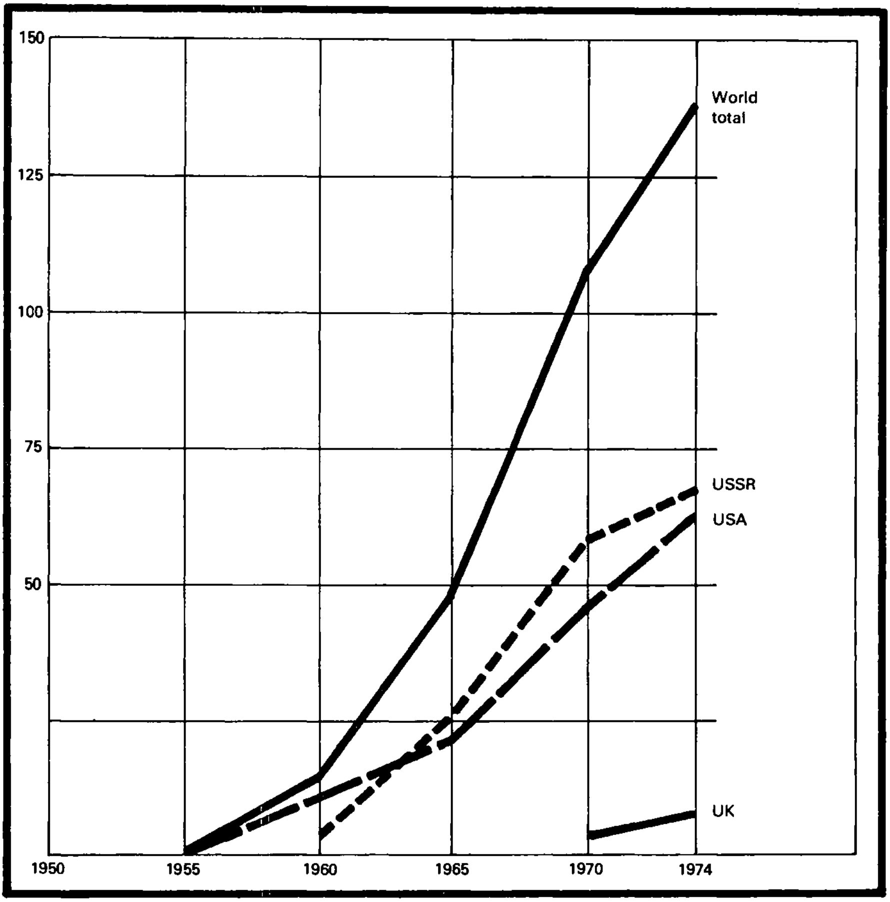
The capabilities of virtually all weapons have dramatically increased over the post-war period, but this is perhaps more true of the submarine than any other. At the end of World War II, antisubmarine weapons and techniques were proving highly effective against the then existing types of submarines, but since then the advantage has swung decisively in favour of the submarine. The key to this change was the advent of nuclear power which obviated the need for the submarine ever to come to the surface and gave it a sustainable underwater speed equal to or greater than that of any surface ship.

The nuclear-powered ballistic missile submarine, because of its invulnerability, is by far the most prized weapon system for strategic deterrence, and in 1974, nearly 100 of these vessels were in operation in four

[4] A large number of navies, of course, have ships and landing craft suitable for more limited amphibious operations. The Turkish invasion of Cyprus in July 1974 demonstrated that, given suitable conditions, vessels of this kind are of great importance.

Chart 10.10. Nuclear-powered attack submarines

Numbers

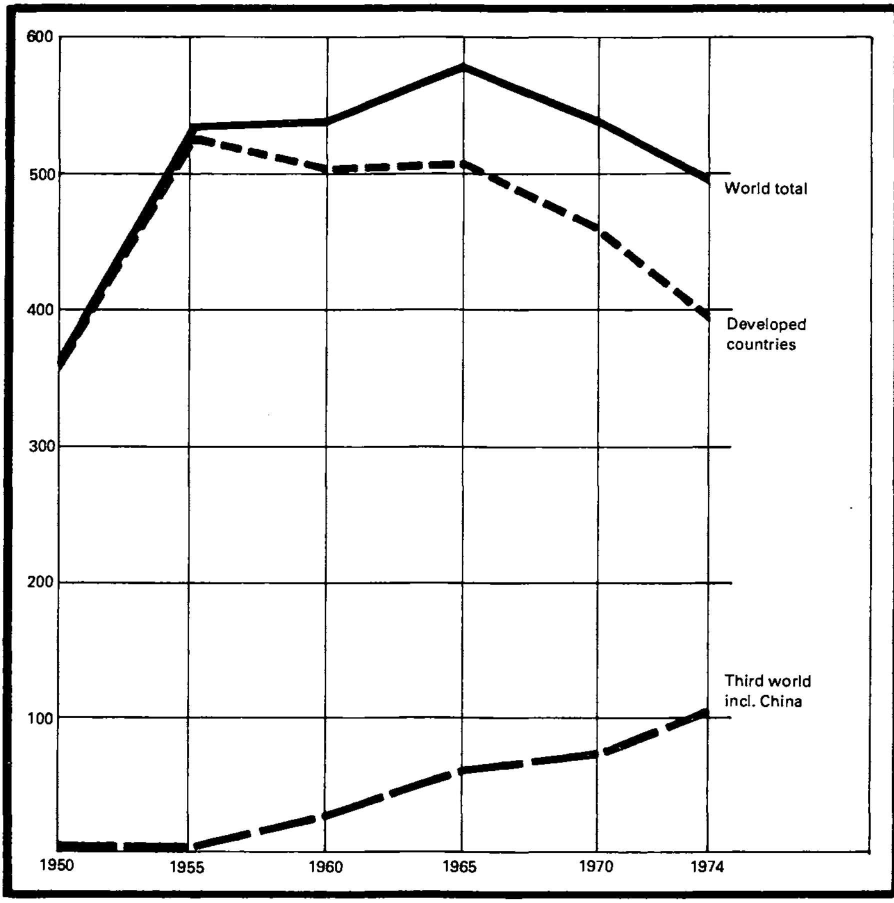


countries (table 10.3). The submarine, particularly when nuclear-powered, has proved to be a most effective antisubmarine as well as antisurface ship weapon. The number of nuclear-powered attack submarines, armed with sophisticated acoustic detection devices, long-range homing torpedoes and—for some Soviet vessels—cruise missiles, is increasing (chart 10.10). The primary task of these submarines is to locate and destroy (it is necessary to add, if possible) the strategic submarines but their antishipping capabilities are also formidable. It is estimated that a force of 30 of these submarines could sink some 50 million tons of shipping a year which is more than three times the maximum US shipbuilding effort during World War II [3].

Similarly, the speed and range of the nuclear-powered submarine, together with developments in the range of weapons that it can carry and in sensor technology, have led some experts to suggest that it should be considered for a wider range of tasks than is presently the case. Specifically,

Chart 10.11. Conventionally powered submarines over 700 tons

Numbers



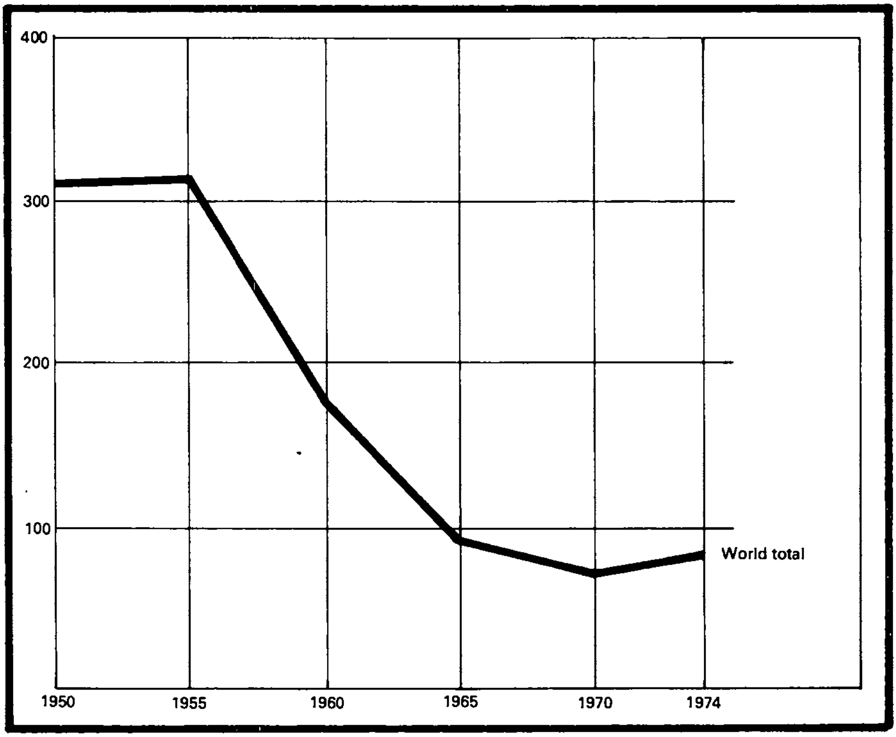
nuclear-powered submarines could be used as escorts for surface-ship task forces (US submarines are already sometimes used to escort carrier task forces) and to protect convoys. It is suggested that smaller and less sophisticated nuclear-powered submarines would be a cost-effective weapon system for the latter task.

Nuclear power has not, however, meant the demise of the conventionally powered submarine. It is true that the number of conventionally powered patrol submarines (defined as those displacing 700 tons or more) has been falling since 1965 but the total number in 1974 was still substantially higher than in 1950 (chart 10.11). Moreover, in the third world and in other Europe the number has continuously increased.

The number of coastal submarines (displacing less than 700 tons) has declined rapidly over the post-war period although again there is an opposite trend in the NATO countries excepting the USA. The increase in the total between 1970 and 1974 is wholly due to FR Germany (chart 10.12).

Chart 10.12. Conventionally powered submarines under 700 tons

Numbers



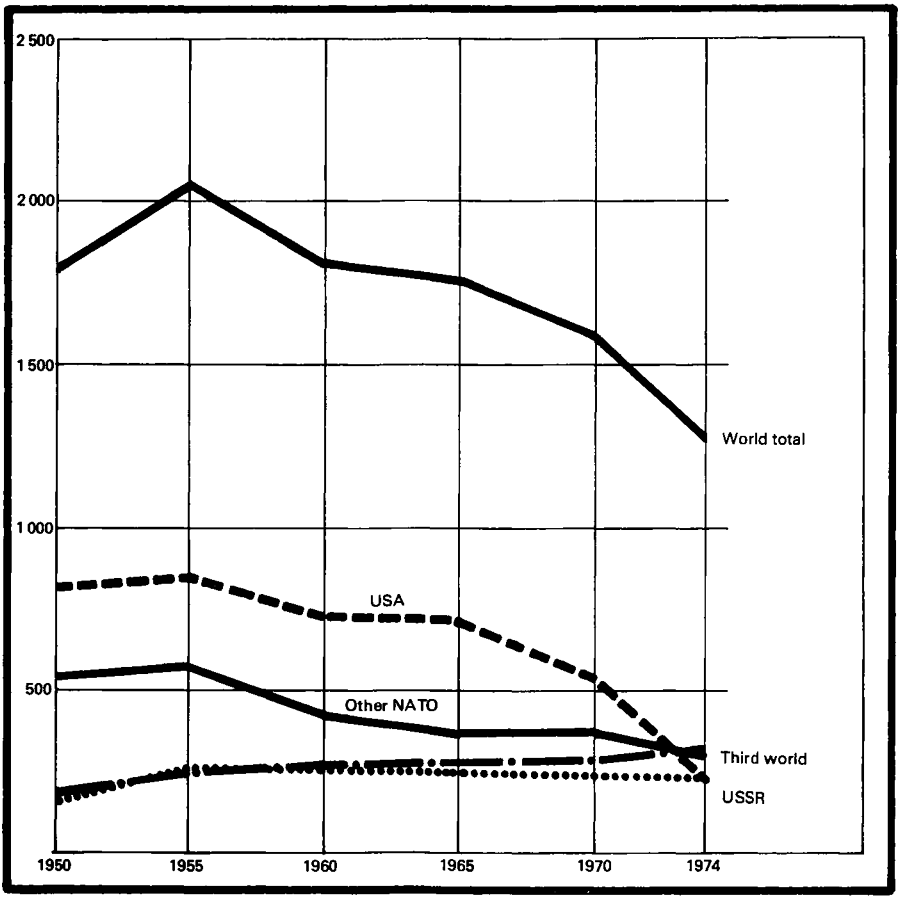
Technological developments have also significantly enhanced the capabilities of the conventionally powered submarine. Current types of these vessels can remain submerged for several days without great difficulty and can achieve submerged speeds of about 20 knots, though only for short periods. They are also comparatively quiet in operation and are designed and constructed so as to reduce the risks of detection by radar when using the periscope or snorkel, or by magnetic detectors in overflying aircraft. In addition, sophisticated weaponry and sensor equipment can, of course, be as readily installed in a conventionally powered vessel as in a nuclear-powered one. It is apparent from the charts in this section and from table 10.7 below that the conventionally powered submarine remains a popular naval weapon system.

Other major surface warships

The number of major surface warships—cruisers, destroyers, frigates and escorts— has declined continuously since 1955. There was a large diminution between 1955 and 1960 when, owing to obsolescence and changing naval requirements, many World War II vessels were removed from the active fleets, particularly in the NATO countries. A second major drop occurred between 1970 and 1974, primarily due to cuts in the US fleet.

Chart 10.13. Major surface warships[a]

Numbers



[a] Cruisers, destroyers, frigates and escorts.

Two constituent opposing trends of this general reduction are worth pointing out. First, the number of vessels armed with missiles for defence against aircraft, missiles and submarines is increasing rapidly—from 16 in 1960 to 290 in 1974. Second, the number of major surface ships in the third world, taken as a whole, has increased steadily (chart 10.13).

It is sometimes suggested that the large surface ship is an obsolescent weapon system. The capabilities of the principal opponents of the surface ship, namely aircraft and submarines, have increased far more than its own defensive capabilities. Moreover, defensive weapon systems have taken up a growing share of the available space, leaving little room for any offensive armament. For a surface ship to be capable of independent operations in the present environment it would require missiles for defence against aircraft, cruise missiles and submarines. Large naval guns have been abandoned in favour of smaller, rapid-fire weapons which can supplement the anti-aircraft missiles. Additional gun systems are regarded as desirable as a second line of defence against cruise missiles. For the ships to have an offensive capability, an additional cruise-missile system would have to be added. Ships of this kind would obviously be large and complex and therefore expensive both in construction and in operation. Nuclear propulsion, so significant for the submarine, provides only a marginal increase in the performance of a surface ship and adds substantially to its acquisition cost. Some observers argue, therefore, that, insofar as fighting capability is concerned, large surface warships are no longer cost-effective.

However, even if the surface ship is at a comparative disadvantage, this does not mean that it is totally helpless. Missiles can engage attacking aircraft at great distances; in 1970 two North Viet-Namese jet fighters were shot down from a distance of 105 km by US Talos shipborne surface-to-air missiles. The range of antisubmarine weapons has also increased. The US ASROC missile transports a torpedo or a nuclear depth charge to a maximum range of 10 km; the Australian Ikara system can be used out to the maximum range of the ship's sonar. The inherent limitations of the surface ship as a sonar platform (because of the noise it generates) have been largely overcome by the use of high-endurance helicopters with dipping sonars and, more recently, by sonar devices towed at an appropriate distance behind the ship.

Nevertheless, the relative vulnerability of the large surface ship is undoubtedly a factor in the decline in the number of these ships in the world's principal navies. But so long as navies are regarded as useful in situations short of war, major surface ships will remain an important component because they are flexible and visible, two important characteristics for the peacetime utilization of naval forces.

Finally, a major technological development is in the offing which would significantly enhance the capabilities of the surface ship. In this development the bulk of the weight of a ship is supported by an artificially created air bubble, permitting speeds three to four times greater than present surface ships. The surface ship would therefore regain a decisive speed advantage over the submarine—even the nuclear-propelled type—and would be less vulnerable to the torpedo, which is still the main armament on most of the world's submarines.

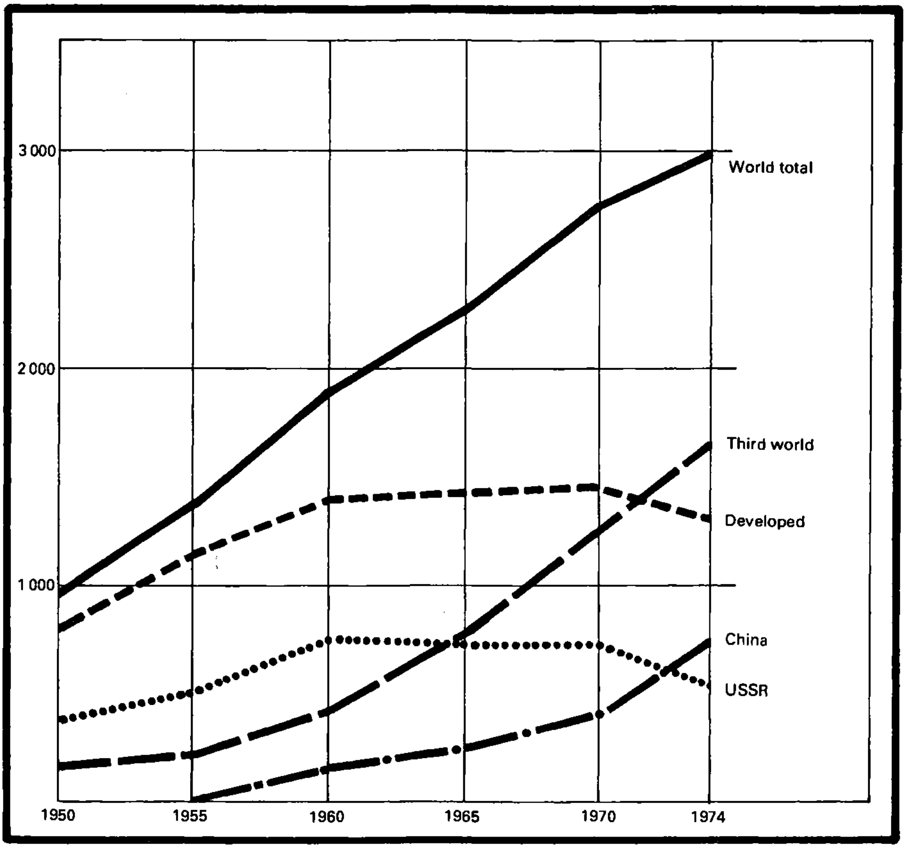
In sum, the world's principal navies continue to regard the major surface ship as a viable weapon system (table 10.7), although the future size, weaponry and ultimately even general appearance of these ships can be expected to change markedly.

Patrol boats, torpedo boats and gunboats

The number of these minor fighting vessels has increased very rapidly over the post-war period. Being relatively cheap and suitable for coastal waters they have proved particularly popular in third world countries (chart 10.14).

Chart 10.14. Patrol boats, torpedo boats and gunboats

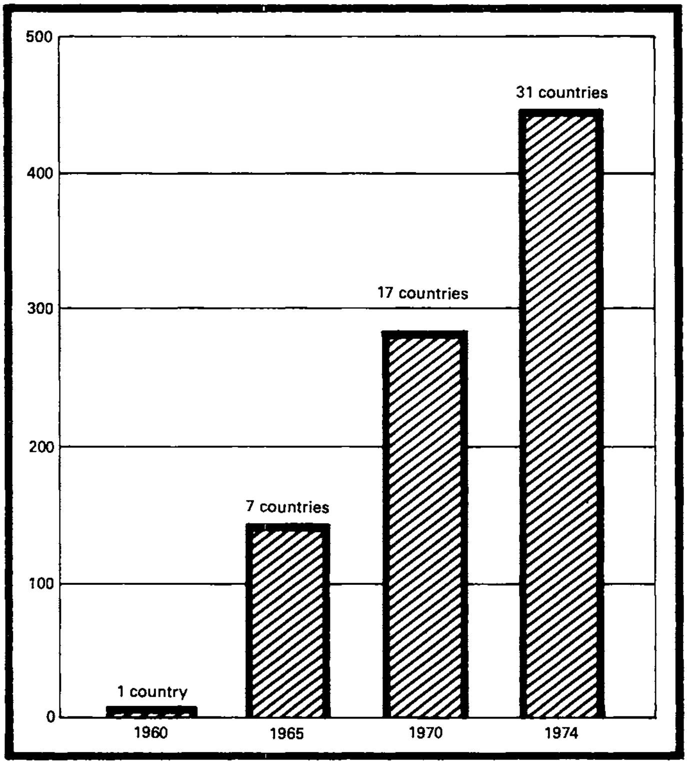
Numbers



The missile-armed patrol boat is perhaps the most fashionable naval weapon system at the present time. The sinking, in 1967, of an Israeli destroyer by surface-to-surface missiles fired from a Soviet-supplied Egyptian patrol boat provoked a number of countries—including the USA, France, Italy and Israel—to develop or to accelerate the development of comparable missile systems. As a result there are now five basic types of antiship missile systems on the market outside the Soviet Union and at least one more in an advanced state of development. These are Exocet (France), Otomat (France/Italy), Sea Killer (Italy), Penguin (Norway) and Gabriel (Israel). The US Harpoon antiship missile is expected to go into service in 1975 or 1976. In addition a number of existing missiles have been "navalized" (for example, the French SS-12) or adapted to provide secondary antiship capability (for example, the US Standard ARM). Most of these missile systems are sufficiently compact to be installed on patrol boats providing these small, fast vessels with a high destructive capacity. Some observers have forecast major changes in naval tactics and in

Chart 10.15. Missile-armed patrol boats

Numbers



the world balance of naval power as a result of the proliferation of missile-armed patrol boats. The possession of these vessels by many countries—and they are cheap enough to be within reach of even the smallest states—". . . can affect the tactical and strategic employment of the seapower of the major navies. Large warships have much to fear from an unexpected attack from these small missile boats. It is an ideal weapon for guerilla warfare at sea" [4]. And the proliferation of these vessels has indeed been rapid. In 1960 only the Soviet Union possessed missile-armed patrol boats, but by 1974 there were nearly 450 of these vessels in 31 countries (chart 10.15).

NATO and the WTO

The countries of these two alliances account for the lion's share of the world's military resources, and naval forces are no exception. The USA and the USSR dominate these respective alliances, each maintaining a navy many times larger than that of any other nation. These two countries will therefore be discussed separately. Aspects of the overall NATO/WTO naval balance will then be discussed.

Table 10.4. Percentage of US and Soviet naval stock in strategic submarines

Per cent

	1960	1965	1970	1974
USA	*2.2*	*18.4*	*24.5*	*28.1*
USSR	*6.6*	*16.0*	*21.7*	*36.6*

Source: SIPRI worksheets.

The USA and the USSR

Until comparatively recently, any joint discussion of the navies of these two countries would have been incongruous. Throughout the 1950s and early 1960s the US Navy was far larger than that of the Soviet Union, although the US advantage, in terms of the estimated value of fighting ships, declined from 6.5:1 in 1960 to 2:1 in 1965. Indeed it was not until 1960 that the Soviet Union replaced the UK as the country with the second largest fleet in the world (in terms of estimated value).

Thus, it is only in the past ten years or so that the Soviet Union has possessed a fleet large enough to be realistically compared with that of the United States. It seems worth pointing out here that the *speed* at which the USA has lost its status as the world's unrivalled naval power is probably in large part responsible for the many alarmist assessments made in recent years of the reasons for, and the consequences of, the expansion of the Soviet Union's naval forces.

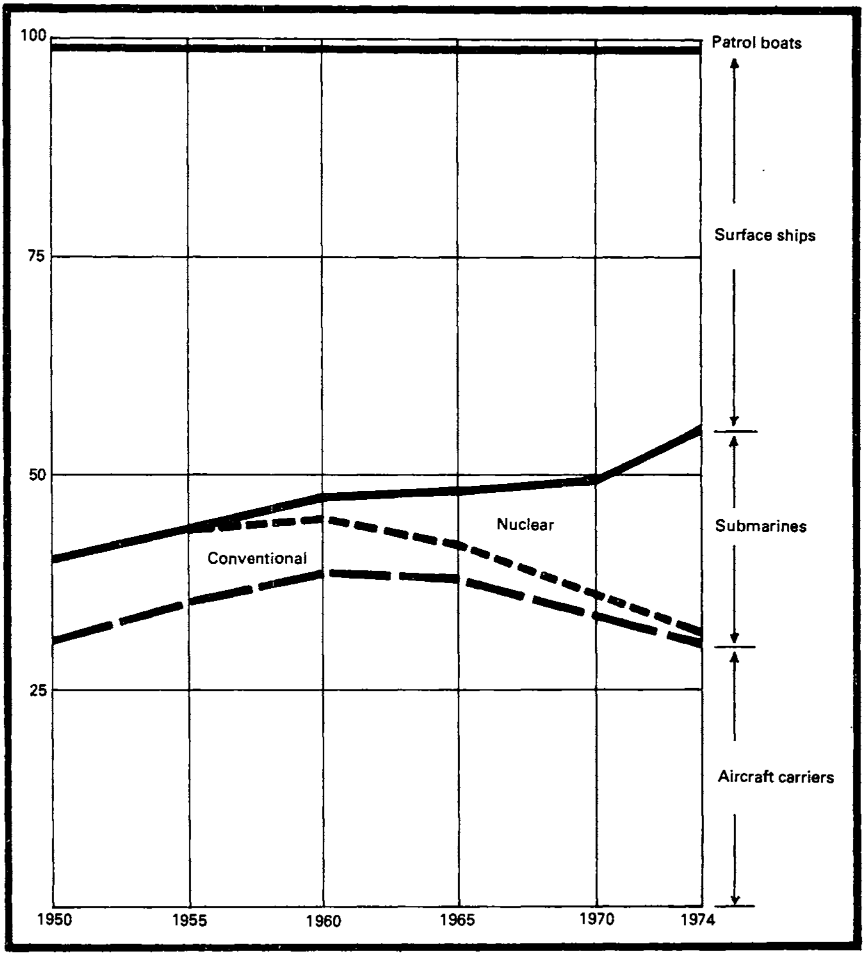
Although the estimated capital values of the US and the Soviet navies were roughly equivalent in 1974, this equivalence disguises quite marked differences in the structure of their naval forces. These differences presumably reflect differences in the functions expected of the navy in each country or, more generally, in naval strategies. Since it takes a considerable period of time to design and build ships, the existing structure of a navy may reflect past rather than current naval strategy. However, this is only a concern if there is reason to believe that a country has fundamentally changed its naval strategy.

The navies of the United States and the Soviet Union have at least one function in common—strategic deterrence. In both countries, nuclear-powered ballistic missile submarines constitute a major part of the strategic nuclear forces. And in both countries these vessels account for a large share of the estimated value of the naval stock, 28 and 36 per cent for the USA and the USSR respectively in 1974 (table 10.4).

The significance of the Soviet lead in numbers (and value) of strategic submarines (48 against 41 in 1974) is minimal at the present time. If one accepts that the purpose of these boats (together with land-based missiles and bombers) is to deter nuclear attack, then both countries have more than enough already, so that a numerical inequality means very little except, it

Chart 10.16. Structure of US naval stock (excluding strategic submarines)

Per cent



seems, in political terms. If the index used is the number of targets that the missiles in these submarines can threaten, then the advantage is sharply reversed with the USA having a lead of over 7:1 in 1974. By the end of 1974 about 26 of the 41 US boats carried the Poseidon missile with ten individually-targetable warheads while none of the Soviet submarine-launched missiles had this capability. On this basis, therefore, the US vessels should be assigned a much higher value than those of the Soviet Union. To estimate an appropriate value differential based on the number of deliverable warheads and other factors, such as missile accuracy and quietness of the submarines, would, however, be a complex exercise even if the data were available. Moreover, it would not be particularly meaningful.

For these reasons and because these vessels have a unique function and cannot be readily adapted to another role, all subsequent comparisons of the naval forces in these two countries, both in terms of numbers and value, will exclude them. Indeed, some observers argue that any country which employs sea-based offensive strategic nuclear forces or considers it necessary to employ sea-based weapon systems for defence against nuclear attack really needs two navies. The reason for this is that strategic forces, whether offensive or defensive, are sophisticated and specialized and must continually remain at a high state of readiness. These units cannot, therefore, be used for the wide range of other peacetime activities for which naval forces are considered useful.

Apart from strategic deterrence, the principal elements of US naval strategy have remained fairly stable over the post-war period. After strategic deterrence, the greatest importance is attached to control of the sea. Experts argue at great length about the precise meaning of this phrase, but the following is probably an acceptable definition for the layman. Control of the sea means that one's own shipping—primarily merchant shipping—can use the oceans in time of war without incurring unacceptable losses and that this flexibility is denied the enemy. Next comes the projection of military power overseas, which essentially means the ability to bring military power to bear in distant countries. Even today the USA possesses by far the most powerful and sophisticated capability for this function with 15 attack aircraft carriers and a 200 000-man Marine Corps with its own specialized equipment for amphibious operations, particularly seven 18 000-ton amphibious assault ships. The final element is an overseas presence, that is, the ability to deploy naval vessels periodically or continuously in distant oceans. As mentioned above, the objectives of this activity are difficult to characterize, but it is nonetheless considered to yield substantial dividends.

To support this naval strategy, the USA maintains a fleet of aircraft carriers, surface ships (the majority of which are oriented towards antisubmarine warfare) and submarines. The structure of the US fleet, based on the estimated value—excluding strategic submarines—is shown in chart 10.16.

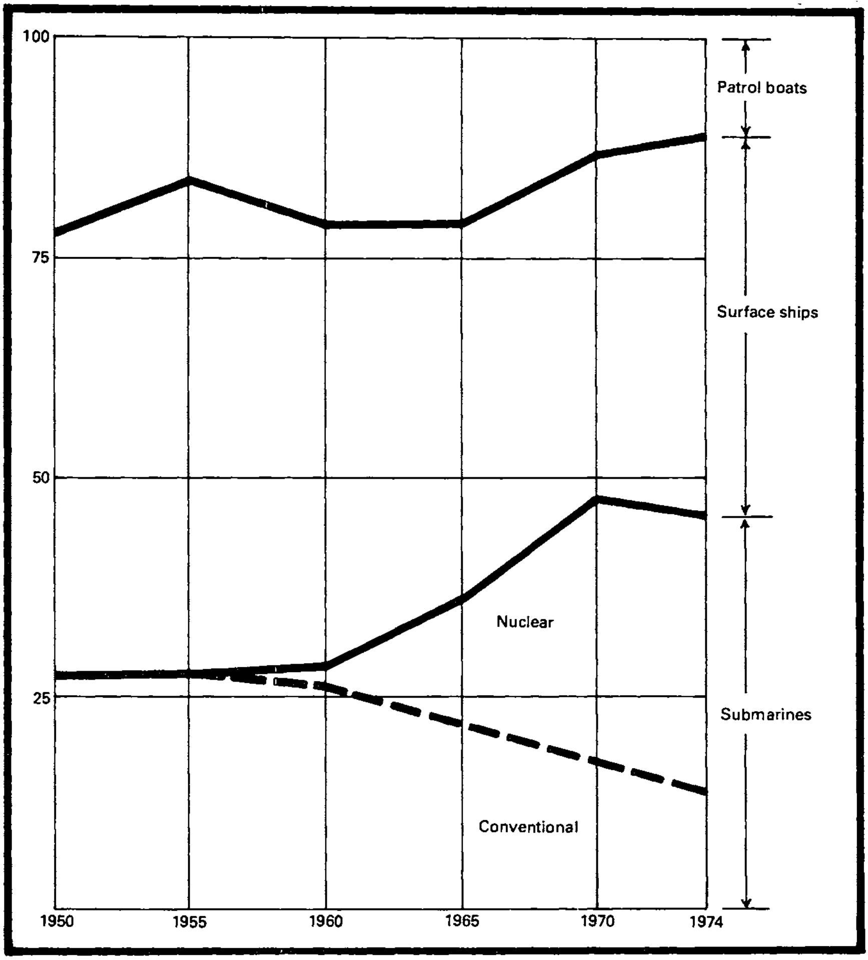
The structure of the Soviet naval stock, shown in chart 10.17, is significantly different. This is to be expected from the absence of aircraft carriers from the Soviet fleet but there are also other significant differences, notably the emphasis on submarines.

There are two basic schools of thought on Soviet naval strategy, one arguing that it has remained essentially unchanged throughout the post-war period and the other claiming that fundamental changes have occurred. Both schools agree that in the early post-war years the primary function of the Soviet Navy was to defend the Soviet Union against attack from the sea, the large numbers of patrol boats and coastal submarines providing clear evidence that this was the case.

The "stability" school argues that all subsequent naval developments in

Chart 10.17. Structure of Soviet naval stock (excluding strategic submarines)

Per cent



the Soviet Union are consistent with a basically defensive naval strategy, being essentially reactions to changes in the nature of the military threat from the sea. Thus MccGwire, a major exponent of the stability school, argues that as the range of offensive naval weapons (aircraft and missiles) increased, the Soviet Navy had to go further out to sea to provide an effective defence [5]. This entailed the construction of large vessels capable of sustained operations in the open sea and their deployment in ever more distant seas. Herrick, another exponent of this school, places more stress on the absence of aircraft carriers, arguing that air cover is indispensable for sustained operations in the open sea; a navy without aircraft carriers is only capable of surviving if it operates within the range of land-based aircraft [6].

The large Soviet submarine force—about 200 ocean-going conventionally powered submarines were built during the 1950s alone—was also considered to have a defensive function, namely the sinking of NATO convoys carrying military supplies in the event of a land war in Europe.

The opposing school of thought argues that while defence remains an important function of the Soviet Navy, it has gradually assumed more positive functions, such as the protection of Soviet fishing vessels and merchant ships in distant oceans and more important, albeit less specific, the protection and promotion of Soviet interests around the world. Exponents of this view direct a number of specific criticisms at the stability school. In the first place they argue that if the Soviet Navy were primarily concerned with defence against nuclear attack from aircraft carriers, it would have deployed defensive naval forces in the Mediterranean much earlier than it did. The continuous deployment of Soviet naval forces in this sea began in 1964, 14 years after the appearance of US aircraft carriers with nuclear weapons and one year after the deployment of US strategic submarines in this area.

The deployment of Soviet naval forces in the Mediterranean, it is suggested, correlates more with the Cyprus crisis in 1964, just as the substantial reinforcement of these forces in 1967 was related to the Arab-Israeli War in that year. Similarly, the more recent deployment of Soviet naval forces in the Indian Ocean is considered by this school to be a response to the reduction of British naval forces and the creation of a "vacuum" in this area, not a move dictated by the deployment of US strategic submarines in this ocean. Whether or not US strategic submarines are regularly deployed in the Indian Ocean has not been firmly established. It is worth noting, however, that in March 1974 the then US Chief of Naval Operations, Admiral Zumwalt, in response to the suggestion that one of the Soviet naval missions in the Indian Ocean was to "counter US Polaris activity" stated: "They would not have that opportunity under any plans we now have with regard to Polaris submarines . . . We won't have them there" [7].

In other words, this school argues that, starting in the early 1960s, the Soviet Union began to use its navy for political purposes. Admiral Zumwalt supports this view and asserts that the landing of US marines in Lebanon in 1958 and the Cuban "missile crisis" in 1962 were turning points in the Soviet perception of the utility of naval power. Zumwalt further states that the Soviet Union is currently developing the capability to project military power overseas [8]. If this is the case, then in the not-too-distant future, the Soviet Navy will at least have a range of capabilities comparable to that of the US Navy.

There is no simple yardstick that can be used to resolve this ambiguity on Soviet naval strategy. The reasons behind the deployment of naval forces in distant areas can always be disputed if only because the large, well-armed ships required will appear to be suitable for a number of roles. Even if the Soviet Navy has entered the Mediterranean and the Indian Ocean for reasons of defence, the partial utilization of these ships for political purposes is a cost-free dividend. Some observers argue that the mere ability to exert a "presence" has favourable political repercussions, even if the fighting ability of the ships, in terms of armament and near-at-hand logistical support, is limited. From this standpoint the attribution of "defensive" or "offensive" motivation to the activities of a fleet is only of academic interest. Thus, even if the ships are of highly sophisticated variety intended for defence against strategic submarines, they still constitute a naval "presence" which supposedly provides a degree of political leverage in the littoral states.

Whatever the intrinsic merits of the argument that a naval presence has beneficial political repercussions, it is an argument with a great deal of support. The US Department of Defense considers that the presence of Soviet naval ships in the Indian Ocean requires an offsetting US deployment. In the words of Secretary of Defense Schlesinger: ". . . a perception of clear deficiencies in the US military capabilities in the region could cause us to lose political and diplomatic influence to the Soviets by default" [8]. After an extensive debate, Congress authorized funds for the expansion of Diego Garcia to provide support facilities for US ships deployed in the Indian Ocean. Diego Garcia, a small British-owned island located almost in the middle of the Indian Ocean, is now a US naval communications station; the expansion plans include the construction of oil storage facilities, deepening the anchorage and lengthening the runway.

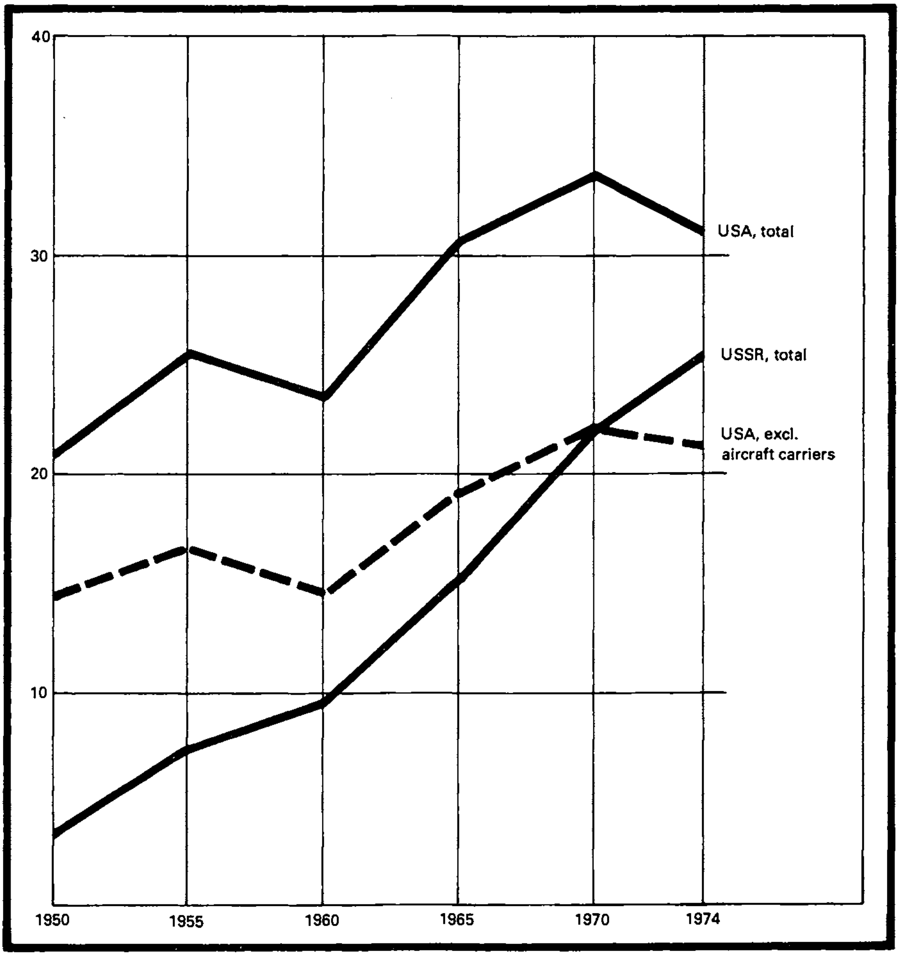
IV. *Aggregate naval strength*

In terms of the estimated value of naval ships, excluding strategic submarines, the United States and the Soviet Union were essentially in parity in 1974 (chart 10.18) compared with a 6.5:1 advantage in favour of the USA in 1950. There were, however, offsetting differences. In 1974 the USA retained a 1.4:1 advantage in major surface ships (excluding aircraft carriers because there are no comparable units in the Soviet Union) and the Soviet Union had a 1.8:1 advantage in non-strategic submarines (charts 10.19 and 10.20 respectively).

A full discussion of the major weapon systems of these two navies would take us too far afield. There is, however, an essential difference in the offensive weaponry of these two navies, that has been the subject of considerable debate and discussion. In the US Navy the principal tactical offensive weapon is the carrier-borne aircraft. The 15 attack aircraft carriers currently operated by the USA carry about 800 aircraft with an air-to-surface strike capability using bombs and a variety of air-to-surface missiles. The Soviet Union, on the other hand, has concentrated on surface-to-surface cruise missiles. In 1974 the Soviet Union had 48 major surface ships and 69 submarines armed with a total of 148 and 424 launchers respectively

Chart 10.18. Estimated value of US and Soviet naval stocks (excluding strategic submarines)

US $ bn

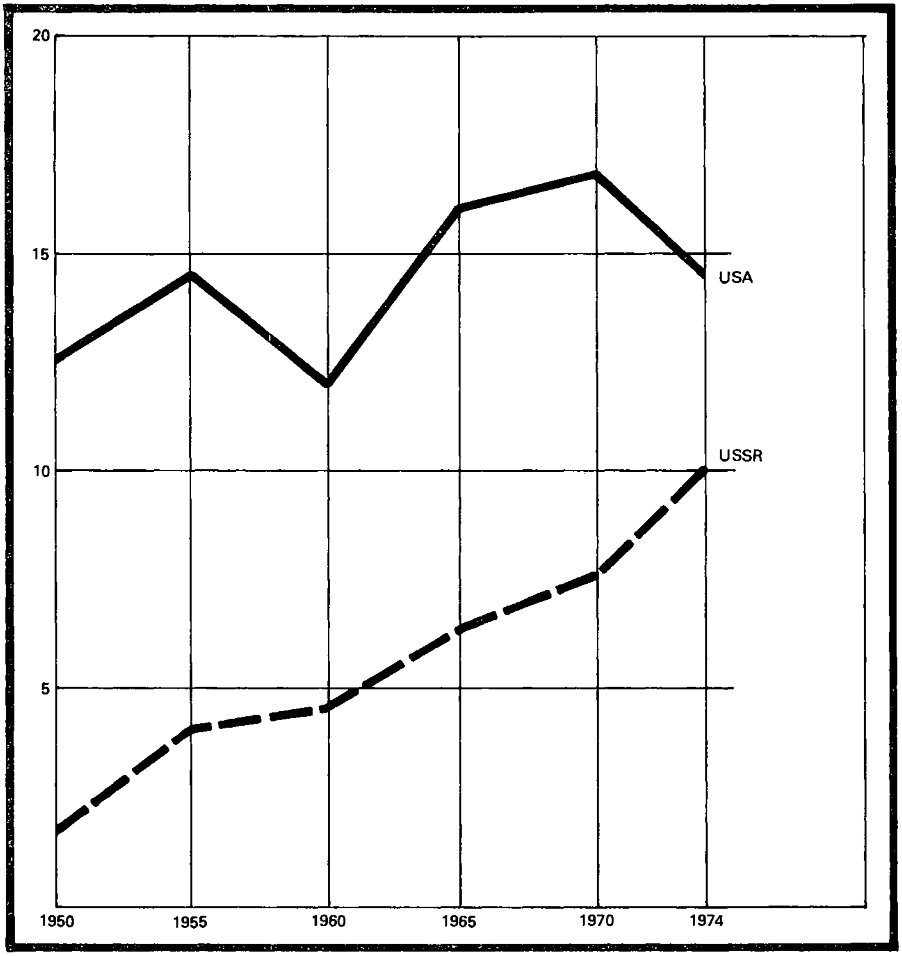


for surface-to-surface missiles. Of these submarines, 59 were nuclear-powered and 11 were equipped with the SS-N-7 missile which can be launched while the submarine is submerged; most of the others carried the older but longer-range SS-N-3 missile which can only be launched while the submarine is on the surface.

Thus, the US Navy has a large number of offensive aircraft but these are concentrated on only 15 ships while the Soviet Union has 117 ships and submarines with an offensive capability against surface ships. This imbalance has been the subject of much criticism within the US Navy but it is expected that this will be remedied in the near future. The US Harpoon surface-to-surface missile due to become operational in 1975 or 1976, will be installed on most surface ships and a version is also being developed that

Chart 10.19. Estimated value of US and Soviet major surface ships (excluding aircraft carriers)

US $ bn



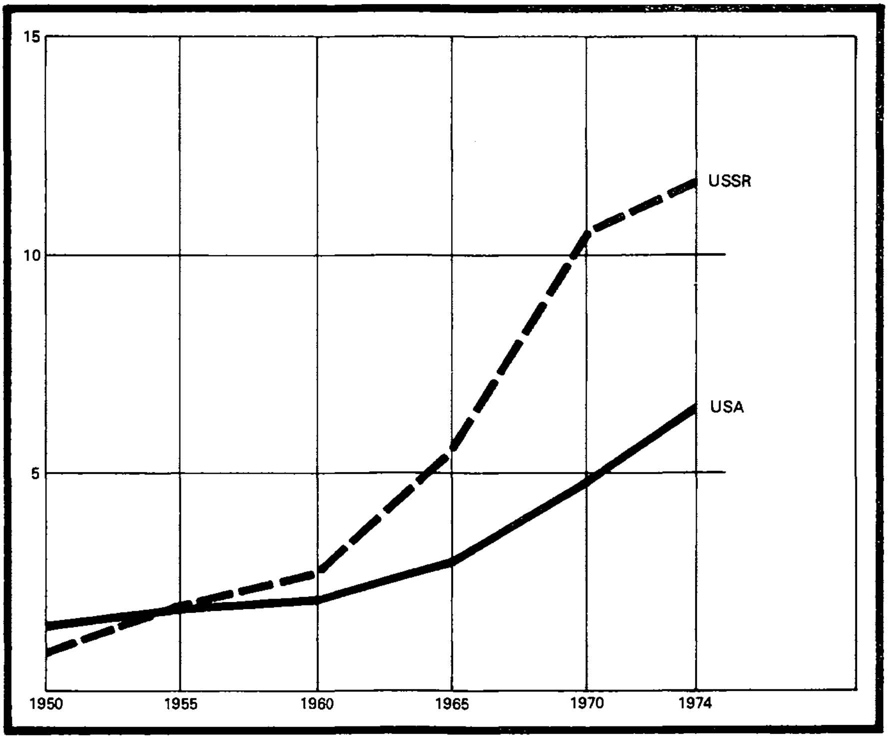
can be fired from submerged submarines. At the present time, over 70 US ships are armed with the Standard 1 surface-to-air missile and all of these have been slightly modified to provide a horizon-limited surface-to-surface capability [9]. In addition, the defence budget for fiscal year 1975 requested funds to equip 24 destroyers and destroyer escorts with the Standard SSM (ARM) RGM-66D/F, two further refinements of the Standard missile which provide an over-the-horizon surface-to-surface capability.

NATO and the WTO

If we now widen the comparison to include all the countries in NATO and the WTO respectively, the margin of superiority widens significantly in

Chart 10.20. Estimated value of US and Soviet non-strategic submarines

US $ bn



favour of NATO (chart 10.21). In terms of the estimated value of naval ships, NATO had a superiority of 1.5:1 in 1974. If strategic submarines are excluded, the margin widens to 1.7:1.

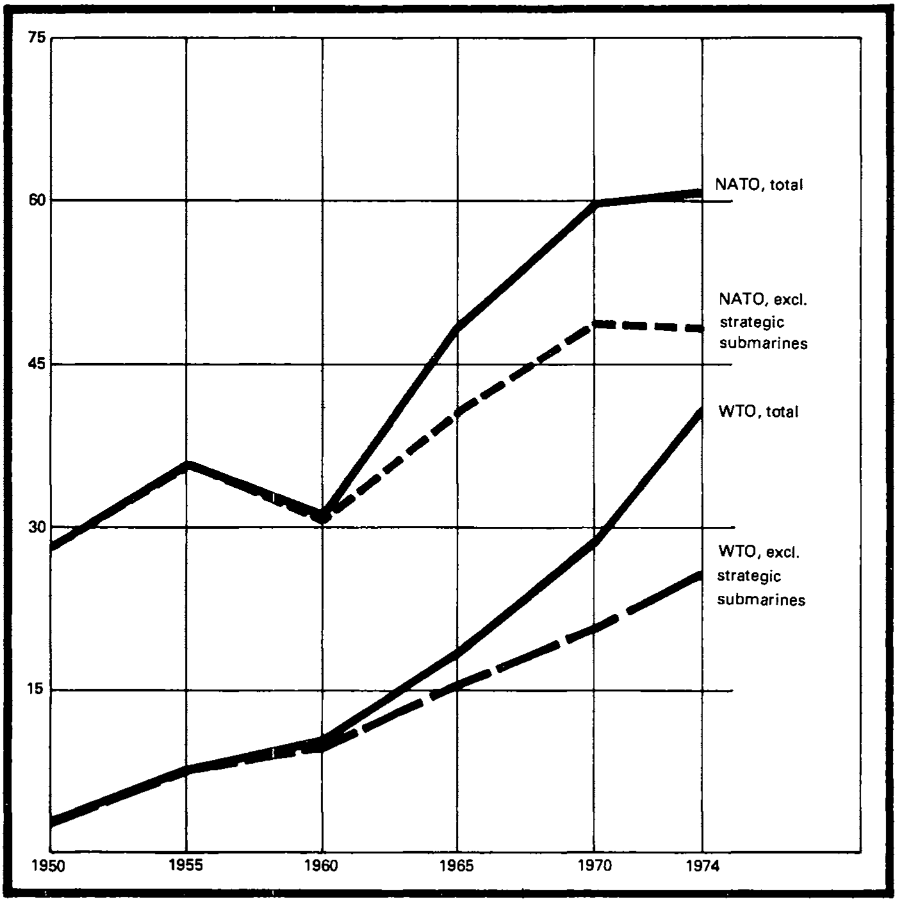
The members of NATO (excluding the USA) include the third- and fourth-ranking navies in the world (the UK and France respectively) and a number of other countries with comparatively large navies (chart 10.22). In 1974 these countries accounted for 29 per cent of the estimated value of NATO's naval stock. The non-Soviet countries of the WTO, on the other hand, accounted for less than 3 per cent of the estimated value of the WTO's naval stock.

This imbalance is possibly of great significance. If the WTO were to try to match NATO's naval strength, this would require a Soviet fleet considerably larger than that of the USA and it is unlikely that the latter would permit this to happen.

As mentioned in the introduction, the stock of fighting ships possessed by a particular country is a rather narrow indicator of that country's naval capacity. Apart from fighting ships, support ships, naval bases and geographic location make important contributions to naval capability, but the assessment of these factors is probably even more complex than the capabilities of fighting ships.

Chart 10.21. World stock of fighting ships: estimated value, NATO and the WTO

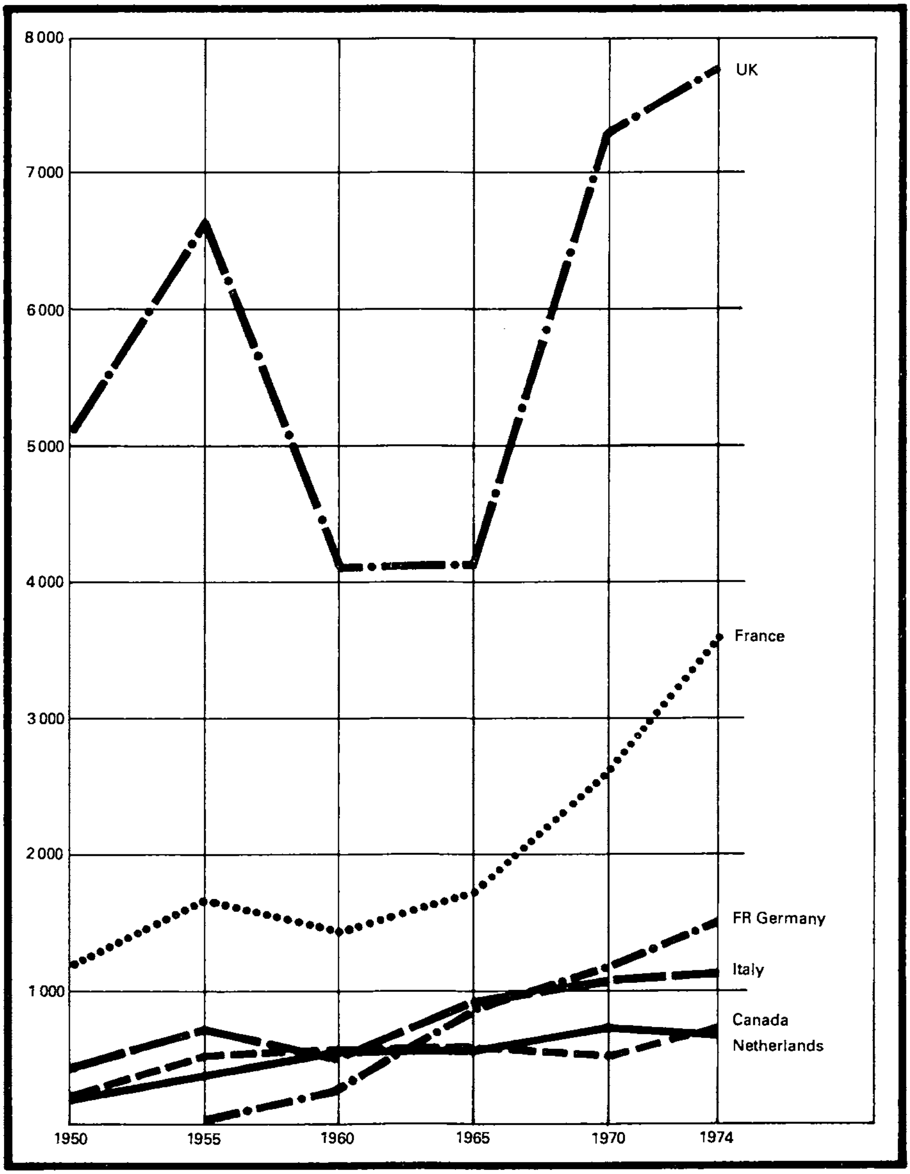
US $ bn



The one point on which all observers agree is that Soviet naval flexibility is severely handicapped by geographical factors. The Soviet Union maintains four geographically separate fleets. Two of these, the Baltic and Black Sea fleets are almost totally blocked in. But even the egress routes for its Northern and Far Eastern fleets are, with modern detection devices, considered relatively narrow. These limitations, together with the Soviet Union's enormous geographic size and comparative self-sufficiency, contribute to the atmosphere of alarm surrounding its naval expansion. Some observers feel that it is both unnecessary and extremely difficult for the Soviet Union to be a strong naval power. The fact that it has become one, therefore, gives rise to considerable suspicion as to its motives. Added to this is the fact that the Western powers, primarily the United States, have lost what was previously a virtual monopoly of naval power. It seems fairly clear, however, that the Soviet

Chart 10.22. World stock of fighting ships: estimated value, other NATO

US $ mn



Union probably regards the breaking up of a Western monopoly, particularly a military one, as a sufficiently attractive objective in itself to warrant great effort and expense.

Regarding support ships—tankers, replenishment ships, repair ships and so on—the number of these will obviously bear a close relation to the size and deployment of the fighting fleet. Admiral Zumwalt claims that the Soviet Union has overtaken the USA in replenishment capability underway although this statement does not seem to be borne out by the information in *Jane's Fighting Ships* [9]. Indeed, the US Navy has more support ships than the Soviet Navy and, on average, the US ships are much larger. In general, it seems reasonable to suppose that the factor of support ships will not radically change an assessment based on the relative capabilities of the fighting fleets, at least not for the major naval powers.

Finally, if any assessment could be made of the value of foreign naval bases and facilities this would add far more to the US than the Soviet stock. In 1974 the US Navy had 22 major naval bases and home ports outside the USA [10]. The Soviet Navy, in contrast, had only berthing rights and limited facilities in a few ports (for example, Alexandria (Egypt), Cienfuegos (Cuba) and Berbera (Somalia)). So far as can be determined, the Soviet Union had no major extra-territorial naval bases or facilities.

V. *Conclusions*

There can be little doubt that a major naval build-up is under way around the world and will persist if present construction programmes maintain their momentum. For the foreseeable future, however, naval developments will largely depend on events in, and relations between, the USA and the USSR; in 1974 these two countries accounted for more than 70 per cent of the estimated value of the world naval stock.

There is every indication that the USA and the USSR are on the verge of a naval arms race if, indeed, it has not already begun. This study (and most others) concludes that the USA is still the world's strongest and certainly the most flexible naval power. But for the first time in the post-war period there is now a serious rival. Soviet naval strength has now reached the point at which it is possible to argue that further (unmatched) expansion will threaten US naval superiority. In other words, a necessary condition for a naval arms race, previously lacking, now exists. Moreover, the USA and other NATO powers have shown themselves to be acutely sensitive to the emergence of a rival naval power and so far the evidence suggests that they propose to accept the challenge. Table 10.7 gives some indication of this intention. In the USA, the value of new naval construction under way or planned for the rest of this decade has been estimated at $21.4 billion [10] and US Navy officials are confident that if these plans and those for the conversion and modernization of existing ships are carried through, a clear US naval superiority will be retained. However, it is only to be expected that the Soviet Union will match, in a general sense, any further US build-up. Herrick, writing in 1968, hypothesized that the Soviet Union would not enter into a naval arms race because of the cost involved and because it knows that the USA has a far greater economic ability to support such a race [6]. In a similar vein, Martin states that an overwhelming predominance of naval power will either deter or challenge and implies that, at least up until the mid-1960s, Western naval superiority has deterred the Soviet Union from undertaking the difficult task of offering a viable challenge [1].

It can safely be said that these propositions have not stood the test of time. The Soviet Union is clearly determined if not to achieve naval superiority over the West—a truly Herculean task—then certainly to break the monopoly which has permitted the West to use its sea power with relative impunity during most of the post-war period.

It is clear, however, that any attempt by the Western powers to increase their present preponderance of naval power—or by the Soviet Union to further increase its relative naval strength—would be a wasteful and dangerous exercise. What is at issue is not so much the outcome of a prolonged general war—most observers regard such a conflict as highly improbable—but the freedom to employ naval power as a diplomatic and military tool in all situations short of general war. The Western powers have lost this freedom. In the absence of war, no amount of naval expansion by the USA (or NATO in general) can prevent the Soviet Union from deploying warships in the Indian Ocean or indeed in any ocean. The same, of course, is true the other way round.

> When both parties are present, and as long as either one avoids a military clash, the relative strength of naval forces do not play the same role as in war, for there is no fighting. Any fighting ship capable of reacting to a first shot in a way that sets in motion the spiral of escalation, is enough to prevent an attack . . . The role which mastering of the sea plays in war could be given to presence in non-war [11].

A naval arms race between these two countries that has the objective of securing some freedom to exploit their seapower for diplomatic and political ends would be highly dangerous. Because the USA and the USSR each possess nuclear arsenals capable of destroying the other many times over, and much of the rest of the world besides, the greatest stress has been placed on preventing any confrontation anywhere between the armed forces of these two countries. Unless immediate steps are taken to defuse the impending naval arms race between these two countries, such confrontations can be expected to occur with increasing frequency. The Soviet Union may be tempted to put its newly acquired status as a major naval power to the test and the USA will doubtless be tempted to reassert its authority. It has been suggested that the Soviet Union is engaging in such a test over the issue of basing or servicing submarines at Cienfuegos in Cuba. In 1970, the USA and the USSR reached an understanding on what the USSR could and could not do with regard to the basing of naval vessels in Cuba. The details of this understanding are secret but two analysts from the Brookings Institution argue that the Soviet Union is ". . . gradually but deliberately encroaching upon the agreement" [12]. So far, this activity has not elicited any response from the USA but the Brookings analysts consider that the USA should insist on the letter and the spirit of the agreement. Added to this is the fact that the next few years will see quite fundamental changes in the international laws of the sea and a rapid expansion in the amount of surface and undersea economic activity. An atmosphere of naval competition between East and West, and between the USA and the USSR in particular, would greatly exacerbate what will certainly be a period of uncertainty and adjustment concerning the uses of the oceans.

It is therefore urgent that negotiations begin between—to start with, at any rate—the USA and the USSR on the limitation of conventional naval armaments. There is, fortunately, a considerable historical precedent for such negotiations providing guidance both on how and how not to construct naval limitation agreements. The nuclear arms race has demonstrated the futility of the quest for superiority. Such superiority as is achieved is usually limited, temporary and unexploitable either for military or for political ends. The nuclear arms race has also demonstrated that the greater the proliferation, the harder it is to stop the process. The initiation of naval arms limitation negotiations would save both countries enormous expense and would forestall a contest that involves a high risk of confrontation.

VI. *Sources and methods*

The primary source used was *Jane's Fighting Ships*—various editions from 1950/51 to 1974/75. For the USSR, other WTO countries, China, Egypt, Cuba and some other small countries, the information given in successive editions of *Jane's* was frequently revised; the latest available information was assumed to be more reliable. SIPRI's arms trade files provided up-to-date information on the acquisition of naval vessels by some countries in the third world.

For the construction of the estimates of world stock, ships were divided into 11 categories. Only fighting ships, strictly defined, were included.

Aircraft carriers	– Attack
	– ASW, amphibious/commando
	– Other
Submarines	– Strategic
	– Nuclear
	– Conventional
Cruisers, destroyers, frigates, escorts	– Missile-armed
	– Conventionally armed
Patrol boats, gunboats and so on	– Missile-armed
	– Conventionally armed
Battleships	

The years of commissioning were noted at six points: 1950, 1955, 1960, 1965, 1970 and 1974. Ships were included if commissioned in the fleet in the year concerned. The numbers include both active vessels and ships in reserve. The five-year interval between observation points was necessary to make the number of calculations manageable.

The classification of destroyers and cruisers between missile-armed and conventionally armed was based on the cost or (where cost was not known) the complexity of the missile system. The criterion was that the missile system should account for a substantial part of the total cost of the vessel.

Cruisers, destroyers, frigates and escorts are combined because these classifications appear to be losing much of their traditional validity. For example, a 5 000-ton vessel is labelled a cruiser in the USSR and a 10 000-ton vessel a frigate in the USA.

The countries or regions shown separately are as follows:

Developed countries:

- USA
- Other NATO countries
- USSR
- Other Warsaw Treaty Organization countries
- Other European countries: Albania, Finland, Spain, Sweden and Yugoslavia
- Other developed countries: Australia, Japan, New Zealand and South Africa

Underdeveloped countries:

- Middle East: Cyprus, Egypt, Iran, Iraq, Israel, Kuwait, Lebanon, Saudi Arabia and Syria
- South Asia: India, Pakistan and Sri Lanka
- Far East (excluding Japan): Burma, China, Indonesia, Khmer Republic, Malaysia, Singapore, North Korea, South Korea, Taiwan, Thailand, the Philippines, North Viet-Nam and South Viet-Nam
- Sub-Saharan Africa: Cameroon, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Malagasy, Mauritania, Nigeria, Senegal, Sudan and Tanzania
- North Africa: Algeria, Libya, Morocco and Tunisia
- Central America: Cuba, Dominican Republic and Mexico
- South America: Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay and Venezuela

Countries with negligible navies were generally omitted, the main exception being those in Sub-Saharan Africa, where some very small navies were included to enable something to be said about trends in that region.

The weighting system used for the construction of the aggregate figures was based on cost. Basic 1973 value-per-ton figures were taken for the main categories. The same values were used for Soviet and indeed all vessels,

Table 10.5. Ship values: basic value-per-ton[a]

US $ mn, at constant (1973) prices

	1950	1955	1960	1965	1970	1974
Aircraft carriers						
Attack	2 640	3 160	3 770	4 510	5 565	6 190
Antisubmarine/amphibious assault	2 315	2 760	3 300	3 945	4 870	5 415
Escort/utility[b]	2 340	2 340	2 340	2 340	2 340	2 340
Submarines						
Strategic nuclear (12–16 missiles)	–	–	25 285	30 210	37 280	41 460
Strategic nuclear (3 missiles)	–	–	19 460	23 265	27 785	30 940
Strategic conventional	–	–	9 730	11 635	13 890	15 470
Nuclear cruise missile	–	–	18 870	22 560	26 940	30 000
Nuclear, other	–	13 860	16 555	19 760	24 415	27 150
Conventional cruise missile	–	–	8 995	10 755	12 840	14 300
Conventional, other	5 085	6 080	7 240	8 685	10 710	11 915
Cruisers						
Missile-armed	–	9 710	11 600	13 870	17 110	18 800
Conventionally armed	3 835	4 575	5 475	6 540	8 075	8 970
Destroyers/frigates/escorts						
Missile-armed	–	12 030	14 380	17 180	21 205	23 575
Conventionally armed	4 760	5 680	6 790	8 110	10 015	11 140
Patrol boats/torpedo boats/gunboats						
Missile-armed	–	–	37 740	45 120	53 880	60 000
Torpedo boat	14 875	18 445	22 015	26 320	31 430	35 000
Other	10 630	12 700	15 160	18 125	21 640	24 100
Battleships[b]	4 550	4 550	4 550	4 550	4 550	4 550

[a] All nuclear-powered surface ships were valued separately. Only the USA has such ships and in each case construction costs are available.

[b] No technical improvement was incorporated in these calculations.

except for the earlier Soviet strategic submarines.[5] For those, lower value-per-ton estimates were taken than for US strategic submarines, since the Soviet submarines commissioned up to 1968 carry fewer missiles with a shorter range than US submarines. For similar reasons, the Soviet submarines armed with cruise missiles were given a somewhat higher value than submarines without this armament. The calculations need to allow for a rapid process of technical improvement: a typical destroyer in commission in 1970 in one of the major navies has considerably more sophisticated equipment than one in commission in 1960. A 3.5 per cent a year "improvement factor" was taken on naval advice.

This method provided a set of comparable value-per-ton figures for the

[5] This is a potentially serious though—with the available data—unavoidable limitation. Two ostensibly similar weapon systems can have markedly different capabilities depending on their relative modernity and who makes them.

Table 10.6. World stock of fighting ships: estimated values[a]

US $ bn

	1950	1955	1960	1965	1970	1974
World total	**35 092**	**48 748**	**48 215**	**74 131**	**98 251**	**115 483**
Developed	33 299	46 313	44 857	69 504	92 057	106 132
USA	20 755	25 717	23 859	37 779	44 285	42 970
Other NATO	7 976	11 049	8 348	9 985	15 071	17 571
Total NATO	**28 731**	**36 766**	**32 207**	**47 764**	**59 356**	**60 541**
USSR	3 186	7 369	9 801	17 890	27 783	39 938
Other WTO	92	150	458	735	1 127	1 179
Total WTO	**3 278**	**7 519**	**10 259**	**18 623**	**28 910**	**41 117**
Other Europe	779	1 121	1 314	1 608	1 645	1 845
Other developed	511	907	1 076	1 509	2 146	2 629
Total third world	**1 793**	**2 435**	**3 358**	**4 627**	**6 194**	**9 351**
Middle East	124	171	269	375	666	889
South Asia	147	215	339	506	611	849
Far East	358	505	718	1 157	1 508	1 828
Sub-Saharan Africa	–	–	9	63	99	141
North Africa	–	–	4	25	175	192
Central America	207	208	205	318	331	381
South America	867	1 175	1 333	1 460	1 452	2 045
China	89	162	481	722	1 352	3 067

[a] Figures may not add up to totals due to rounding.

six years selected (table 10.5). These value-per-ton figures were then combined with tonnages. All separate categories and subclasses within categories of ships were calculated at their respective displacement.

It was assumed that, in the major navies, naval authorities insist on exacting standards of performance for ships included in the active fleet: this would be particularly true for the frontline ships included here. Technical improvements are incorporated in the programmes of modernization and refitting. In the first ten years of its life, a ship is thus assumed to benefit fully from the incorporation of new technology: that is, its value will rise by 3.5 per cent a year for ten years as a result of the "improvement factor". After ten years the ageing of the ship offsets any incorporation of further technical improvements.[6] It is assumed that ships held in reserve do not benefit from technical improvements.

The assumption about modernization and refitting in the first ten years was made for developed countries only. For underdeveloped countries, it was assumed that ships were not regularly modernized and refitted in

[6] If there is a major conversion to missile armaments, then the value of the vessel is raised to the appropriate value-per-ton for missile-equipped vessels, and it is treated as a new vessel from the date of its major conversion. The old destroyers converted under the Fleet Rehabilitation and Modernization Program in the United States were treated as a special case. They were valued at 1955 values-per-ton before conversion; after conversion the values were raised to 1960 values-per-ton, and were kept at those figures in subsequent years.

this way. These ships therefore remained fixed at their date-of-birth valuation unless there was specific evidence to the contrary.

The resulting figures of capital stock are shown in table 10.6. The method of valuation gives an indication of the efficiency of the stock of ships if they were all put to use at the specified date. It does not measure the secondhand value of the stock, which will tend to diminish with age as the expected life of a ship becomes shorter.

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Table 10.7. Warship construction under way or firmly planned in 1974[a]

		Displ *Tons*	Numbers in 1974 Com-pleted	Under const.	Planned total	Country of construction
Aircraft carriers						
NATO						
USA	"Nimitz"-class, N	91 400	–	2	3	USA
	"Tarawa"-class, amph. assault	39 300	–	5	5	USA
	Sea Control Ship	14 000	–	–	8	USA
UK	Through Deck Cruiser	20 000	–	1	3	UK
France	Aircraft carrier, N	(18 000)	–	–	1	France
WTO						
USSR	"Kuril"-class	35 000	–	2	. .	USSR
Submarines						
NATO						
USA	Trident strategic, N, M	(10 000)	–	1	10	USA
	"Los Angeles"-class, N	5 500	–	10	26	USA
UK	"Swiftsure"-class, N	3 500	1	4	5	UK
France	"Redoutable"-class, strategic, N, M	7 500	3	2	5	France
	Submarine, N	. .	–	–	(6)	France
	"Agosta"-class, diesel	1 200	–	4	4	France
Norway	Type 210, diesel	370	–	–	(15)	FR Germany
FR Germany	Type 210, diesel	370	–	–	(6)	FR Germany
Turkey	Type 209, diesel	990	–	2	2	FR Germany
Italy	"Sauro"-class, diesel	1 300	–	2	2	Italy
WTO						
USSR	"Delta II"-class, strategic, N, M	(8 000+)	(1)	. .	(12)	USSR
	"Delta I"-class, strategic, N, M	8 000	(5)	(13)	(18)	USSR
	"Papa"-class, N	. .	(1)	. .	. .	USSR
	"Charlie"-class, N, M	4 300	11	. .	. .	USSR
	"Victor"-class, N	3 600	14	. .	. .	USSR
	"Tango"-class, diesel	(1 500)	1	. .	. .	USSR
Other Europe						
Sweden	"A 14"-class, diesel	980	–	1	5	Sweden
Spain	"Agosta"-class	1 200	–	2	2	Spain
Other developed						
Australia	"Oberon"-class, diesel	1 610	4	2	6	UK
Japan	"Uzushio"-class	1 850	4	2	8	Japan
South Asia						
India	"A 14"-class, diesel	980	–	–	. .	Sweden
Middle East						
Israel	"500-ton"-class, diesel	500	–	2	3	UK
South America						
Brazil	"Oberon"-class, diesel	1 610	2	1	3	UK
Peru	Type 209, diesel	990	–	2	2	FR Germany
Venezuela	Type 209, diesel	990	(1)	(1)	2	FR Germany
China	"Han"-class, N	. .	–	1	. .	China
	"Ming"-class, diesel	(1 500)	–	1	. .	China

		Displ *Tons*	Numbers in 1974 Com- pleted	Under const.	Planned total	Country of construction
Major surface ships						
NATO						
USA	Frigate, N, M	10 000	–	2	4	USA
	"Spruance"-class, M	7 800	1	9	30	USA
	Patrol frigate	3 500	–	1	50	USA
UK	Type 42, M	3 500	1	5	6	UK
	Type 22, M	3 800	–	1	. .	UK
	Type 21, M	2 500	1	5	8	UK
France	F-67 destroyer, M	4 580	1	2	3	France
	C-70 destroyer, M	3 800	–	1	23	France
	A-69 frigate	950	–	5	12	France
	A-70 frigate, M	(950)	–	–	. .	France
Netherlands	"Tromp"-class, M	4 300	–	2	2	Netherlands
	Frigate, M	3 600	–	–	8	Netherlands
Belgium	Frigate, M	1 500	–	2	4	Belgium
Portugal	Frigate	1 200	–	4	4	Spain
FR Germany	Frigate, M	(2 500)	–	–	10	FR Germany
Italy	Frigate, M	2 500	–	–	4	Italy
WTO						
USSR	"Kara"-class, M	10 000	2	1	. .	USSR
	"Kresta II"-class, M	6 000	6	. .	. .	USSR
	"Krivak"-class, M	4 800	7	. .	. .	USSR
	"Nanuchka"-class, M	800	9	. .	. .	USSR
	"Grisha"-class, M	750	14	. .	. .	USSR
Other Europe						
Spain	Destroyer, M	. .	–	–	3	. .
	Frigate, M	3 000	4	1	5	Spain
	Frigate	(1 200)	–	(3)	(10)	Spain
Sweden	Corvette	(1 000)	–	–	2	Sweden
Other developed						
Australia	Patrol frigate	3 500	–	–	2	USA
Japan	"Haruna"-class, M	4 700	2	1	3	Japan
	Destroyer	3 850	–	2	2	Japan
	Frigate, M	1 470	7	3	12	Japan
South Africa	Frigate, M	. .	–	–	(4)	(France)
Middle East						
Iran	"Spruance"-class, destroyer, M	7 800	–	–	2	USA
Other Europe						
Spain	"La Combattante"-class	180	–	(3)	12 5	France FR Germany
Sweden	"Jägaren"-class	140	1	–	17	Norway
Middle East						
Iran	"La Combattante"-class	234	–	(6)	12	France
Israel	"SAAR IV"-class	415	2	4	6	Israel
Far East						
Singapore	. .	230	4	2	6	FR Germany/ Singapore

		Displ *Tons*	Numbers in 1974 Com-pleted	Under const.	Planned total	Country of construction
Africa						
Morocco	PR 72 type	370	–	(2)	2	France
South America						
Venezuela	. .	150	1	2	3	UK
Ecuador	TNC 45	250	. .	. .	. .	FR Germany
China	"Hola"-class	165	(1)	. .	. .	China
	"Hoku"-class	70	(1)	. .	. .	China
South Asia						
India	"Leander"-class, M	2 450	2	(1)	6	India
	A 69	950	. .	. .	. .	India
Africa						
Tunisia	A 69	950	–	1	1	France
South America						
Argéntina	Type 42, M	(2 800)	–	2	2	UK
Brazil	"Nitheroi"-class, M	3 300	–	6	6	UK/Brazil
Chile	"Leander"-class, M	2 450	1	1	2	UK
Peru	Frigate, M	2 500	–	–	4	Italy/Peru
China	"Luta"-class, M	3 250	5	(2)	. .	China
	Corvette	500	10	(4)	. .	China
Missile-armed patrol boats						
NATO						
USA	PHM (hydrofoil)	220	–	2	30	USA
FR Germany	PHM (hydrofoil)	220	–	–	10	USA
	Type 143	295	(1)	(5)	10	FR Germany
	Type 148	234	(15)	(5)	20	France/FR Germany
France	. .	115	–	2	2	France
Italy	PHM (hydrofoil)	220	–	–	(6)	Italy/USA
Turkey	. .	(400)		. .	4	FR Germany/Turkey
Denmark	. .	220	–	8	8	Denmark

[a] N=nuclear propulsion; M=missile armament.

Table 10.8. World stock of aircraft carriers

Numbers

	1950	1955	1960	1965	1970	1974
World total						
Attack	**44**	**43**	**31**	**30**	**26**	**22**
ASW/amph.[a]	**–**	**10**	**15**	**25**	**23**	**13**
Other[b]	**75**	**73**	**26**	**17**	**6**	**1**
USA						
Attack	27	19	14	16	15	15
ASW/amph.	–	10	14	22	18	9
Other	75	73	26	17	6	1
UK						
Attack	12	16	8	5	4	1
ASW/amph.	–	–	1	2	2	2
France						
Attack	2	4	3	3	2	2
ASW/amph.	–	–	–	–	1	1
Australia						
Attack	1	2	2	1	1	1
ASW/amph.	–	–	–	1	1	–
Canada						
Attack	1	1	1	1	–	–
ASW/amph.	–	–	–	–	–	–
Netherlands						
Attack	1	1	1	1	–	–
ASW/amph.	–	–	–	–	–	–
Spain						
Attack	–	–	–	–	–	–
ASW/amph.	–	–	–	–	1	1
Argentina						
Attack	–	–	1	1	2	1
ASW/amph.	–	–	–	–	–	–
Brazil						
Attack	–	–	1	1	1	1
ASW/amph.	–	–	–	–	–	–
India						
Attack	–	–	–	1	1	1
ASW/amph.	–	–	–	–	–	–

[a] ASW=antisubmarine warfare; amph.=amphibious assault.
[b] Escort and utility.

Table 10.9. World stock of strategic submarines[a, b]

Numbers

	1950	1955	1960	1965	1970	1974
World total						
Nucl.	**–**	**–**	**7**	**42**	**70**	**96**
Conv.	**–**	**–**	**10**	**32**	**26**	**23**
Developed						
Nucl.	–	–	7	42	70	96
Conv.	–	–	10	32	26	23
USA						
Nucl.	–	–	3	33	41	41
Conv.	–	–	–	–	–	–
Other NATO						
Nucl.	–	–	–	–	5	7
Conv.	–	–	–	–	1	1
Total NATO						
Nucl.	**–**	**–**	**3**	**33**	**46**	**48**
Conv.	**–**	**–**	**–**	**–**	**1**	**1**
USSR						
Nucl.	–	–	4	9	24	48
Conv.	–	–	10	32	25	22
Other WTO						
Nucl.	–	–	–	–	–	–
Conv.	–	–	–	–	–	–
Total WTO						
Nucl.	**–**	**–**	**4**	**9**	**24**	**48**
Conv.	**–**	**–**	**10**	**32**	**25**	**22**
Other Europe						
Nucl.	–	–	–	–	–	–
Conv.	–	–	–	–	–	–
Other developed						
Nucl.	–	–	–	–	–	–
Conv.	–	–	–	–	–	–

[a] Submarines equipped with medium- or long-range ballistic missiles.
[b] Nucl.=nuclear-powered; Conv.=conventionally powered.

Table 10.10. World stock of patrol submarines[a]

Numbers

	1950	1955	1960	1965	1970	1974
World total						
Nucl.	**–**	**1**	**15**	**48**	**108**	**138**
Conv.	**355**	**532**	**535**	**576**	**535**	**498**
Developed						
Nucl.	–	1	15	48	108	138
Conv.	351	527	502	516	459	395
USA						
Nucl.	–	1	11	22	46	63
Conv.	194	190	158	139	52	17
Other NATO						
Nucl.	–	–	–	–	4	8
Conv.	105	109	89	78	75	80
Total NATO						
Nucl.	**–**	**1**	**11**	**22**	**50**	**71**
Conv.	**299**	**299**	**247**	**217**	**127**	**97**
USSR						
Nucl.	–	–	4	26	58	67
Conv.	46	215	238	274	283	237
Other WTO						
Nucl.	–	–	–	–	–	–
Conv.	–	–	–	–	7	8
Total WTO						
Nucl.	**–**	**–**	**4**	**26**	**58**	**67**
Conv.	**46**	**215**	**238**	**274**	**290**	**245**
Other Europe						
Nucl.	–	–	–	–	–	–
Conv.	3	9	12	18	27	32
Other developed						
Nucl.	–	–	–	–	–	–
Conv.	3	4	5	7	15	21
Total third world[b]	**4**	**5**	**33**	**60**	**76**	**103**
Middle East	–	–	10	12	16	14
South Asia	–	–	–	1	8	9
Far East	–	–	2	12	14	16
Sub-Saharan Africa	–	–	–	–	–	–
North Africa	–	–	–	–	–	–
Central America	–	–	–	–	–	–
South America	4	5	9	13	11	18
China	–	–	12	22	27	46

[a] Post-World War II submarines displacing 700 tons or more.
[b] All conventionally powered.

Table 10.11. World stock of coastal submarines[a,b]

Numbers

	1950	1955	1960	1965	1970	1974
World total	**313**	**317**	**179**	**93**	**72**	**85**
Developed	299	295	162	85	64	81
Third world	14	22	17	8	8	4
USA	–	–	–	–	–	–
Other NATO	–	3	20	33	34	52
Total NATO	**–**	**3**	**20**	**3**	**34**	**52**
USSR	273	269	127	40	22	22
Other WTO	–	–	–	–	–	–
Total WTO	**273**	**269**	**127**	**40**	**22**	**22**
Other Europe	26	23	15	12	8	7
Other developed	–	–	–	–	–	

[a] Submarines displacing less than 700 tons.
[b] All conventionally powered.

Table 10.12. World stock of major surface warships[a,b]

	1950	1955	1960	1965	1970	1974
World total						
Miss.	**–**	**2**	**16**	**105**	**185**	**267**
Conv.	**1 783**	**2 042**	**1 789**	**1 650**	**1 414**	**1 013**
Developed						
Miss.	–	2	16	105	183	244
Conv.	1 600	1 811	1 520	1 374	1 128	726
USA						
Miss.	–	2	15	58	77	77
Conv.	817	835	704	654	478	183
Other NATO						
Miss.	–	–	–	19	57	93
Conv.	520	582	402	330	294	222
Total NATO						
Miss.	**–**	**2**	**15**	**77**	**134**	**170**
Conv.	**1 337**	**1 417**	**1 106**	**984**	**772**	**405**
USSR						
Miss.	–	–	1	23	39	60
Conv.	150	256	260	228	206	186
Other WTO						
Miss.	–	–	–	–	1	1
Conv.	5	7	14	14	9	7
Total WTO						
Miss.	**–**	**–**	**1**	**23**	**40**	**61**
Conv.	**155**	**263**	**274**	**242**	**215**	**193**
Other Europe						
Miss.	–	–	–	–	–	–
Conv.	67	70	77	75	77	66

	1950	1955	1960	1965	1970	1974
Other developed						
Miss.	–	–	–	5	9	13
Conv.	41	61	63	73	64	62
Total third world						
Miss.	**–**	**–**	**–**	**–**	**2**	**23**
Conv.	**183**	**231**	**269**	**276**	**286**	**287**
Middle East						
Miss.	–	–	–	–	1	5
Conv.	18	20	15	18	21	14
South Asia						
Miss.	–	–	–	–	–	2
Conv.	16	18	26	27	32	33
Far East						
Miss.	–	–	–	–	1	1
Conv.	50	53	71	76	109	109
Sub-Sahran Africa						
Miss.	–	–	–	–	–	–
Conv.	–	–	–	1	1	1
North Africa						
Miss.	–	–	–	–	–	–
Conv.	–	–	–	2	2	2
Central America						
Miss.	–	–	–	–	–	–
Conv.	30	30	29	29	22	35
South America						
Miss.	–	–	–	–	–	8
Conv.	65	94	105	91	78	79
China						
Miss.	–	–	–	–	–	7
Conv.	4	16	23	22	21	13

[a] Cruisers, destroyers, frigates and escorts.
[b] Miss.=missile- armed; Conv.=conventionally armed.

Table 10.13. World stock of patrol boats, torpedo boats and gunboats[a, b]

Numbers

	1950	1955	1960	1965	1970	1974
World total						
Miss.	**–**	**–**	**5**	**141**	**282**	**445**
Conv.	**987**	**1 380**	**1 849**	**2 092**	**2 431**	**2 525**
Developed						
Miss.	–	–	5	112	189	242
Conv.	822	1 142	1 422	1 340	1 290	1 069
USA						
Miss.	–	–	–	–	2	5
Conv.	147	120	35	18	35	27
Other NATO						
Miss.	–	–	–	–	1	48
Conv.	190	267	230	233	241	214
Total NATO						
Miss.	**–**	**–**	**–**	**–**	**3**	**53**
Conv.	**337**	**387**	**265**	**251**	**276**	**241**
USSR						
Miss.	–	–	5	110	150	145
Conv.	395	516	769	653	600	395
Other WTO						
Miss.	–	–	–	2	28	33
Conv.	16	54	141	191	164	200
Total WTO						
Miss.	**–**	**–**	**5**	**112**	**178**	**178**
Conv.	**411**	**570**	**910**	**844**	**764**	**595**
Other Europe						
Miss.	–	–	–	–	8	11
Conv.	60	117	180	194	196	181
Other developed						
Miss.	–	–	–	–	–	–
Conv.	14	68	67	51	54	52
Total third world						
Miss.	**–**	**–**	**–**	**29**	**93**	**203**
Conv.	**156**	**238**	**427**	**752**	**1 141**	**1 456**
Middle East						
Miss.	–	–	–	3	32	37
Conv.	11	17	77	86	140	128
South Asia						
Miss.	–	–	–	–	–	8
Conv.	–	–	1	9	7	22
Far East						
Miss.	–	–	–	12	12	42
Conv.	55	120	149	260	403	401
Sub-Saharan Africa						
Miss.	–	–	–	–	–	–
Conv.	–	–	5	20	54	63
North Africa						
Miss.	–	–	–	–	16	14
Conv.	–	–	2	2	45	47
Central America						
Miss.	–	–	–	12	18	20
Conv.	16	16	18	49	46	48
South America						
Miss.	–	–	–	–	–	2
Conv.	42	32	26	47	38	50
China						
Miss.	–	–	–	2	15	80
Conv.	–	–	150	279	408	697

[a] Miss.=missile-armed; Conv.=conventionally armed. [b] Excluding riverine craft.

Part III. Advances in weapon technology

Chapter 11. Long-range cruise missiles

Introduction / The emerging technologies / Air-launched and submarine-launched long-range cruise missiles / Implications of precision missile guidance / Conclusions

Chapter 12. Drones and remotely piloted vehicles

Introduction / Design criteria / Application of RPVs and drones / Present and future development of drones and RPVs / Cost of unmanned vehicles / Some national development programmes / Conclusions

Chapter 13. Reconnaissance satellites

Introduction / Satellite orbital characteristics / Ground tracks of some recent reconnaissance satellites / Image quality of space photographs / Some applications of reconnaissance satellites / Conclusions / Tables

11. Long-range cruise missiles

Square-bracketed references, thus [1], *refer to the list of references on page 338.*

I. *Introduction*

During the past 30 years, advances in technology have played a key role in accelerating the evolution of weapon systems and methods of warfare. Nuclear warheads, the jet engine, ballistic missiles, the small nuclear power reactor and inertial guidance have formed the technological basis of currently deployed major weapon systems. Each of these new systems introduced a new dimension into warfare, and with it a host not only of economic, but also of political, military and arms limitation implications.

Because these technologically advanced systems were highly attractive in terms of military cost-effectiveness, they were soon adopted by the techno-bureaucracies of the world's defence establishments. However, their significance for political decision-making and arms control was given little attention *ab initio*. Only after many of the weapon systems based on these new technologies were deployed did strategists, politicians and arms controllers begin to perceive the often substantial disadvantages inherent in many of these systems. In fact, the rush to adopt seemingly efficient new technologies for their own sake, without examining their implications, has often trapped many countries into situations where at most, their national security has been compromised, and at least where their military and political options have been severely limited. The present costly strategic impasse between the United States and the Soviet Union, and the proliferation of nuclear weapons to new nations, to mention only two examples, are results of the too hasty adoption of new weapon technologies without the benefit of *a priori* extensive, careful analysis of their inexorable implications.

The world is now faced with a new set of technological advances already being exploited in weapon applications, which could drastically alter the conduct of both tactical and strategic warfare. An entirely new class of weapon systems is now emerging as the direct result of recent developments in the micro-miniaturization of electronic components and sensors of electromagnetic radiation. Progress in nuclear warhead technology combined with advances in remotely piloted vehicles (RPVs) and cruise missiles appear to be putting such weapons at the vanguard of a profound change in the means of conventional and nuclear warfare.

This chapter attempts to describe these emerging weapon systems, the technologies underlying them, and some far-reaching implications of their deployment, by focusing on a new weapon now under joint development by the US Navy and Air Force, the long-range cruise missile. In section II the technological infrastructure is described in general terms. Section III discusses specific new weapons and their projected performance characteristics and anticipated uses. The fourth section examines in some detail both the immediate impact of these weapons and the broader military, strategic, technological and arms control implications of the anticipated widespread application of the new technology to additional weapon systems. Finlly, section V attempts to draw some conclusions based on section IV and outlines a number of recommendations for the containment of the undesirable aspects of these new technologies.

II. *The emerging technologies*

Constitutive factors of accuracy

The destruction of a target, either tactical or strategic, whether by means of a conventional or a nuclear explosive requires: (*a*) knowledge of the location of the target in space as a function of time; (*b*) the ability to resolve the target from its surroundings (recognition); and (*c*) the ability to deliver the destructive munition against it with a spatial error smaller than the destructive radius of the explosive charge.

A significant exception to the first condition is the destruction of vehicles by the emplacement of mines. This is essentially a statistical process which is applied to the non-specific destruction of moving targets. It does not, therefore, require prior or real-time knowledge of the location and motion of the target. In the case of stationary or quasi-stationary targets such as cities, factories, missiles in their silos, aircraft on their landing fields, transportation facilities, and so on—cases in which the location of the target does not change in time (or changes sporadically)—the first requirement can be fulfilled by *a priori* knowledge of the target coordinates. In the case of mobile targets, however, such as tanks or transport vehicles on the ground, ships, aircraft in flight or satellites and ballistic missiles, knowledge of the exact location of the target at the instant of the weapon launch must be acquired in real-time, by continuous observation either visually or by instruments such as radar, sonar and infrared detectors. In the first case, the location information can be stored to be subsequently retrieved and utilized in recognizing the target and launching the weapon against it; in the second case the weapon must be launched according to the latest information as to the continuously changing location and state of motion of the already recognized target.

A World War II bombardier, for example, instructed to destroy a bridge would be provided with information determining the location of the bridge either on a map or a photograph or both. He would then proceed to the approximate location of the bridge making use of the information already stored on the map, identify the bridge by comparing its visual appearance with the picture in the photograph and if correlating what he observed with what was on the photograph made him decide that what he was seeing was indeed the bridge he was supposed to destroy, he would proceed to release the explosive munitions against it.

On the other hand, if he were instructed to destroy a tank on a battlefield, he would have previous knowledge of the exact location or velocity of the tank. He would thus proceed to the battlefield, visually detect a tank, and after ascertaining its location, speed and direction, he would decide the appropriate point in space and time for releasing the weapon against that target. What was required in the former instance were: (*a*) *a priori* obtained information about the locality, (*b*) a device to store this information so that it could be quickly accessed and retrieved (the photograph); (*c*) a sensor to detect the target (the pilot's eyes) and (*d*) a decision-making device, to recognize the target and decide on the proper release of the munitions (the pilot's brain). In the latter instance, the requirements consisted of (*a*) the ability of the pilot to make and maintain visual contact with the target (the pilot's eyes), and (*b*) a decision-making device to establish the location and velocity of the vehicle and launch the munition based on this information (again the pilot's brain).

The probability of destruction of the target increases, either by decreasing the error in delivery of the weapon (that is, increasing its accuracy), by increasing its destructive radius, or by delivering many weapons against the target, thereby increasing statistically the kill probability. Of course any two or all three of these measures can be used simultaneously, but their effectiveness varies. (For a detailed analysis of the effects of yield, accuracy, and number of weapons on the kill probability, see reference [1].) Thus, especially in the case of tactical weapons with conventional explosives, increasing the accuracy is overwhelmingly preferable to increasing the kill-radius of the weapon or the number of weapons delivered upon a target. Increasing the kill-radius, that is, the yield of a conventional weapon, almost certainly implies more than proportional increase of its mass and of the unnecessary collateral damage that it causes. Increasing the number of weapons delivered against a target requires a larger number of delivery vehicles, personnel to control and service these vehicles, elaborate facilities for repair, transportation systems to deliver supplies and large amounts of these relatively inaccurate munitions to the theatre of operations. It also implies commensurate attrition rates of all these support facilities caused by enemy action. It is evident, then, that a weapon with a small destructive radius, delivered with great accuracy against a target, either stationary or mobile, would in most cases be both more cost-effective and always less randomly destructive than relatively inaccurate but high-yield weapons delivered in larger numbers. Again the mine must be excluded from this conclusion because of its very special properties.

Accurate delivery of a weapon to a target is most effectively achieved by continuous guidance of the weapon from the instant of its launch to the time of arrival at the target. Such guidance can be either automatic, in which case the missile is itself capable of seeking, recognizing and homing on the target or it can be effected by human remote control of the missile. In this case, the human operator must be in visual or instrumental contact with the target and guide the missile remotely to it. Laser-guided bombs or radar-guided and infrared-seeking surface-to-air anti-aircraft missiles are deployed examples of the first type of weapon, whilst the wire-guided antitank missile or the "Maverick" missile which employs a TV camera mounted on its nose that permits a human operator to guide it on to target, are examples of the second type.

The complex, logical and sensing operations a missile must perform —either self-guided or remotely guided—require the employment of elaborate sensing, communication and control electronic devices. Thus high accuracy in the delivery of explosives on to a target is immediately dependent on the development of reliable, light, miniature, relatively inexpensive electronic devices that can be mounted on a missile (which typically would be less than one metre in diameter and not longer than six metres) and that would typically occupy less than 20 per cent of the volume and about the same proportion of the useful payload. The complexity and size of the electronic equipment needed for the guidance of a missile usually increases with the operational range of the weapon, since the opportunity for error increases with the distance between launch and target points. Even more elaborate sensing and guiding equipment is needed if the target is not visually or instrumentally accessible from the point of launch since recognition becomes much more difficult.

Until recently, available electronics technology did not provide the means for long-range missile guidance. Deployed guided weapons, such as the Soviet surface-to-surface naval cruise missiles, generally have ranges of under 50 km and are usually of the remotely guided type requiring line-of-sight contact between the target and the human operator or the guidance radar. Such weapons have to be carried by man-driven vehicles (planes, ships and ground vehicles) to the proximity of their targets and then fired. An exception of course is the intercontinental ballistic missile which is guided by an inertial guidance system during the powered first few minutes of its flight and then follows a ballistic trajectory completely determined by the local gravitational field and the initial powered portion of its flight.

On the other hand, cruise missiles that are often required to follow complicated trajectories and to travel continuously powered within the atmosphere must be continuously guided, since both the magnitude and direction of their velocity vector can be unpredictably altered by local weather conditions, changes in the performance of the propulsion system and winds. The cumulative deviation from a pre-assigned track due to such external factors as well as to the intrinsic imperfections of guidance systems can be quite large over a trajectory of thousands of kilometres. Thus accurate arrival on target requires continuous guidance and updating of location information. To obtain this updated location information and ultimately recognize the target, a self-guided missile designed for use against fixed targets requires a device that can command the guidance of the missile by correlating information about the terrain obtained by a sensor on the missile, with information *a priori* stored in an on-board memory. On the other hand, remotely guided vehicles carrying missiles intended to destroy fixed or moving targets require a data-link of broad band width, that is, a device that can gather and transmit over large distances and in real-time, visual information about the terrain over which the vehicle flies, and which in addition can receive and execute commands to launch and subsequently guide the missiles on to target.

Both correlators and data-links are complex, elaborate electronic devices and until recently they have been too bulky to carry on a missile or even a remotely piloted vehicle.

New technologies

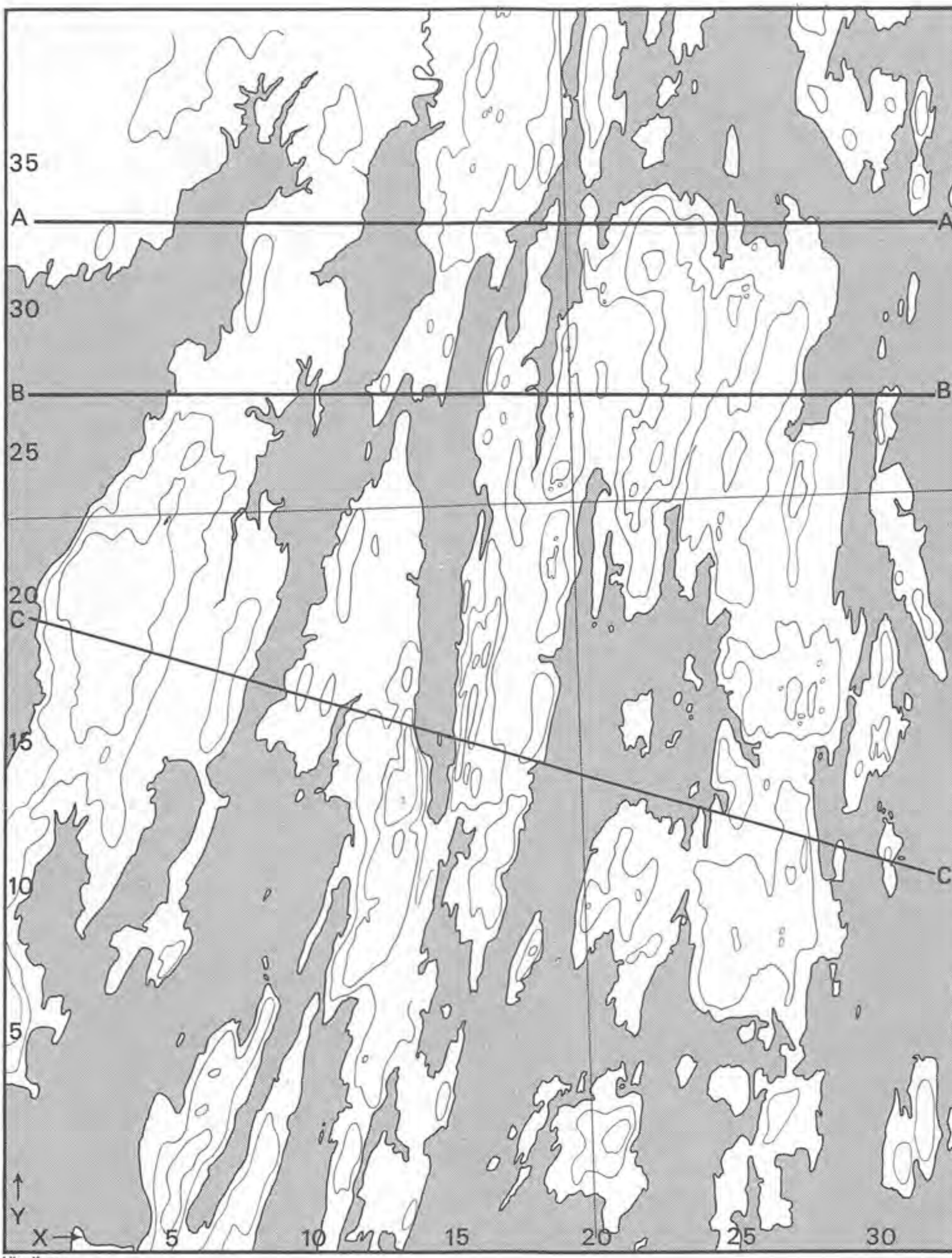
Recent advances in large-array microcircuitry have made possible an entirely new set of microminiaturized electronic devices and sensors of electromagnetic radiation. In turn, these techniques make possible the construction of guidance systems for long-range self-guided missiles and unmanned delivery vehicles with ranges that are now independent of guidance considerations, can extend to several thousand miles and are limited at the present time mainly by the efficiency of existing small tubofan engines and the energy content of available jet fuel.

Large array microcircuits are electronic circuits fabricated on very thin substrates that contain on a few square centimetres the equivalent of many thousands of electronic logic circuits. Densities of a million devices (such as a photo-sensitive diode or a bipolar transistor) per square centimetre of a substrate material that is 250 microns thick, are commonly achieved. Allowing for airspace and so on, one can conceive of practical devices that can store 10^8 bits of serially read-out information per cubic centimetre of printed-circuit electronic memory. Sensing, communication and guidance electronics needed for the guidance and control of a missile consist essentially of logic circuits and memory banks. The new technology has made possible their microminiaturization and therefore the construction of elaborate correlators and data-links that can be used to guide weapons, either automatically, or remotely by human operators. Comparable advances have been made in the construction of light, small sensors of electromagnetic radiation, multimode radars, microwave radiometers and lasers that require lower electrical power consumption compared with existing equipment.

These developments have made possible what is essentially a new method for the accurate delivery of tactical or strategic weapons (conventional or nuclear) over long ranges, since cruise missiles can now be fitted with terminal guidance based on terrain matching and recognition, and remotely piloted vehicles with wide-band jam-proof communication links. Thus, although both cruise missiles and RPVs are "old" weapons, commonly thought of as inaccurate and useful at best for short-range tactical applications, they are now emerging as a new class of very accurate long-range weapon systems with far-reaching future implications. The same basic electronic advances have also made feasible the deployment of a satellite-based global positioning system that would allow a missile to determine its position while in flight with an accuracy of seven to ten metres anywhere on the surface of the Earth independently of the relative positions of the launching and target points. Such a system which could be ready by 1980, would make possible the delivery of warheads over intercontinental ranges with an accuracy of ten metres.

Terrain-matching and terminal guidance based on pattern recognition utilizes the fact that the numerical values of certain measurable time-independent terrain variables, such as altitude above sea level or ground reflectivity at a given wavelength, vary as a function of location on the Earth. Consider as an example map 11.1. It shows a portion of Casco Bay in Maine, USA, a particularly rugged and picturesque coastline dotted with islands, coves and promontories. If one divides this map into a grid that corresponds to an area on the ground of 0.1 nautical mile (nm) and records in each square on the map the average ground elevation in units of 10 feet, the result will be the array of numbers shown in map 11.2. (For purposes of clarity the rough outline of the coastline is superimposed.) This array of numbers represents in digital form the variation of elevation on the Sebacodegan Islands and the northern part of the Harpswell Neck. The unit cells are too large (0.1 nm on the side) to show such details as man-made structures, but if the elevation of the terrain were determined and recorded with a finer resolution, say ten feet square, then the array of numbers would show the presence of such structures as houses, water towers, lighthouses and so on. Radar altimeters now in commercial use have horizontal resolutions better than ten feet square from an altitude of several thousand feet while their vertical resolution can be as good as one foot from the same altitude. Laser altimeters have much better resolutions: from 5 000 feet altitude they can achieve resolutions of 5–10 cm in the vertical plane and under 20

Map 11.1. Casco Bay in Maine, USA, showing the ground elevation



LiberKartor

cm in the horizontal plane. Similar equipment can now determine the variation of elevation as a function of position over any terrain with comparable resolutions from an overflying reconnaissance satellite.

Map 11.2. Digital map of Casco Bay superimposed on the conventional map

LiberKartor

One could compile similar "digital maps", that is, arrays of numbers, that record the reflectivity of the ground at various microwave wavelengths: the Earth receives radiation from space and reflects it differentially as a func-

Chart 11.1. Digital map of Casco Bay

```
5 4 4 2 1 1 1 1 5 7 3 2 0 1 5 7 3 0 2 1 0 0 0 0 0
4 3 3 2 1 0 0 0 5 6 2 0 1 3 6 5 2 0 2 0 0 0 0 0 0 0
3 3 3 3 1 00 0 4 3 0 0 3 10 7 6 3 0 0 0 0 0 0 0 0 0 0
3 2 1 0 0 0 1 2 2 1 0 0 2 9 6 3 0 0 0 3 7 3 0 1 0 1 0
2 2 1 0 0 0 3 4 2 1 0 0 2 7 2 0 0 0 1 5 10 7 5 1 0 3 0 0
1 1 00 0 0 10 5 2 0 0 0 3 4 1 0 1 0 7 12 16 8 1 1 1 1 1 0
0 0 00 0 0 11 7 1 0 0 0 1 1 0 0 1 0 9 11 12 9 6 7 2 2 1 0
0 0 0 0 0 7 9 5 4 0 0 2 0 0 0 0 2 2 1 9 8 9 11 3 4 1 0
0 0 0 1 0 1 1 2 2 0 1 1 0 0 1 0 3 2 1 8 7 7 9 5 1 0 0
0 0 0 1 1 1 1 1 1 0 1 2 1 0 5 4 0 4 2 2 7 11 7 5 4 3 0 0
0 0 0 3 2 1 1 0 0 0 1 0 0 0 4 3 0 9 2 1 9 13 8 9 6 2 0 1
0 0 4 6 5 2 0 0 0 0 0 1 0 0 2 3 3 11 1 8 10 9 8 10 7 1 1 1
0 0 7 13 5 3 0 0 0 0 0 1 0 0 2 5 8 14 1 7 16 8 9 11 8 5 3 0
0 6 5 6 4 2 0 0 0 0 1 1 0 0 2 6 7 9 0 12 11 8 7 7 9 13 2 0
7 5 6 7 5 2 1 0 0 2 2 1 0 0 2 5 6 7 1 13 10 7 6 8 10 12 2 0
11 10 9 5 3 1 1 0 0 5 2 1 0 0 1 4 11 1 1 11 9 5 5 5 4 7 1 0
12 17 14 12 6 3 2 1 0 3 6 3 2 0 1 5 4 13 1 1 5 7 1 1 6 4 5 1 0 0
15 19 20 13 5 2 2 1 0 2 5 3 2 0 2 6 3 8 1 1 5 6 0 1 6 4 2 1 0 0
11 18 17 13 4 3 5 1 0 1 4 3 3 0 7 11 3 7 0 0 0 0 0 0 1 1 1 1 1 1
7 13 11 5 3 3 7 0 0 1 2 4 5 0 11 16 2 2 0 0 0 0 0 0 5 5 5 6 3 5
8 14 12 5 2 6 4 0 5 5 1 3 6 0 11 10 2 4 0 0 0 0 0 0 5 7 11 9 2 4
8 13 11 5 2 5 2 0 5 4 3 4 5 0 7 10 2 5 0 0 2 0 0 0 7 8 13 10 2 3
9 12 10 4 3 7 0 2 2 3 3 5 7 0 6 11 3 4 0 0 3 0 0 1 1 3 4 2 1 2
8 9 7 1 1 1 0 0 1 1 4 8 9 0 11 12 7 0 0 0 0 0 0 2 4 3 2 0 5 3
3 7 5 0 0 1 0 0 0 1 2 7 15 3 14 13 6 0 0 0 0 0 0 2 5 3 5 0 1 0
1 5 4 0 1 0 0 0 0 0 12 14 7 6 8 7 0 0 1 1 1 1 2 4 4 6 0 0 1
0 3 5 0 1 1 0 0 0 0 1 10 9 3 0 6 1 0 0 2 4 3 2 3 3 2 7 3 0 2
0 3 0 1 0 0 0 0 0 1 7 5 0 4 6 0 0 1 10 11 3 2 8 9 12 11 1 0 1
0 1 0 0 1 0 0 0 0 1 0 2 3 0 3 7 0 0 1 9 10 8 1 8 8 11 7 1 0 0
0 0 1 2 1 0 0 0 0 1 0 5 0 1 0 1 1 0 1 9 7 3 8 13 11 6 1 0 0
0 0 1 1 1 0 0 0 1 0 3 11 3 1 0 0 1 0 0 0 5 3 0 7 9 8 6 0 0 0
0 0 0 0 0 0 0 0 7 6 4 0 0 0 2 0 0 0 1 0 0 5 7 4 5 0 0 0
0 0 0 0 0 0 0 4 7 5 0 0 0 0 0 0 1 0 0 0 1 1 1 0 0 0
0 0 0 0 0 0 5 9 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 5 8 2 3 1 0 0 0 0 3 1 0 1 1 2 1 1 1 0 0
0 0 0 0 5 0 4 7 1 0 0 1 3 7 6 0 0 0 2 3 5 1 0 0
0 0 0 0 0 7 0 2 2 0 0 2 18 11 13 0 0 0 5 4 1 0 0
```

tion of the structure of the material at different locations on the surface. A forest will reflect radio frequency waves differently from a road or an airfield in exactly the same way that velvet reflects visible light differently from a mirror or a piece of paper. By recording the reflectivity of the ground as a function of location, one can construct a digital map of the reflectivity of an area similar to the elevation digital map shown in chart 11.1. Such maps can be easily stored in computer memories as sequences of numbers that are functions of x and y, and the actual coordinates of the terrain.

Given the value of an elevation, it is usually impossible to determine uniquely the x, y point to which it corresponds; for example, an elevation equal to 13 on the map (map 11.2) corresponds to many points (x=5, y=25), (x=4, y=20), (x=21, y=1), (x=25, y=8) and others. It is therefore not possible to instruct the computer to guide the missile to such a point with the autopilot mechanism alone. Neither is it possible for the computer to decide over which point of the x–y plane the missile is, if it is given only one altimeter reading. A trajectory, however, that is, a sequence of numbers, each corresponding to an elevation of an x–y point on the terrain can be uniquely determined. Consider, for example, the following hypothetical algorithm that could be used to guide a cruise missile. As the missile proceeds from west to east, and the altimeter reads the sequence 0, 0, 0, 3, 2, 1, 1, 0, 0, 0, 1, 0, 0, 0, 4, 3, 0, 9, 2, 1, 9 . . ., the computer quickly scans all the possible sequences of numbers that can be formed by moving from left to right of the digital map and correlates each one with the sequence read by the altimeter of the missile. This way the computer identifies the line on the ground that corresponds to the altimeter readings. For the sequence above then, the computer would decide that the missile is overflying line $B-B'$. If this is the trajectory the missile has been programmed to follow, then the computer instructs the autopilot to maintain the missile in that course.

Suppose, however, that the missile was programmed to overfly line $A-A'$ rather than $B-B'$ while over Casco Bay: then the readings of the altimeter do not match the stored sequence of numbers that corresponds to the correct trajectory. In that case, after the computer has determined that the missile is overflying trajectory $B-B'$ by the procedure outlined above, it scans sequences of numbers that represent trajectories adjacent to $B-B'$, finds the sequence 2, 2, 1, 0, 0, 0, 3, 4, 2, 1, 0, 0, . . ., which represents the correct missile trajectory, calculates the distance between $B-B'$ and $A-A'$, and instructs the autopilot to perform an S-shaped manoeuvre which puts the missile over the correct trajectory. Of course it is possible that the missile is on some trajectory like $C-C'$ which is wrong not only in location but in direction as well. Then the computer would receive the altimeter readings 11, 18, 5, 3, 4, 0, 5, 3, 4 . . ., determine that the missile is not on the pre-arranged track for that part of its journey, and by forming all possible combinations of number sequences moving from left to right would eventually form one that matches the altimeter readings. It would thereby determine that the missile is actually following trajectory $C-C'$, and direct the autopilot to change the direction of flight and manoeuvre the missile until it flies along trajectory $A-A'$, that is, until the altimeter readings match the sequence of numbers that corresponds to the line $A-A'$. Thus the ability of the on-board computer to store, address and scan rapidly a large number of numerical sequences and compare them with a sequence of numbers read out by the on-board radar altimeter permits the accurate guidance (in the case of this example to within 0.1 nm), of the missile.

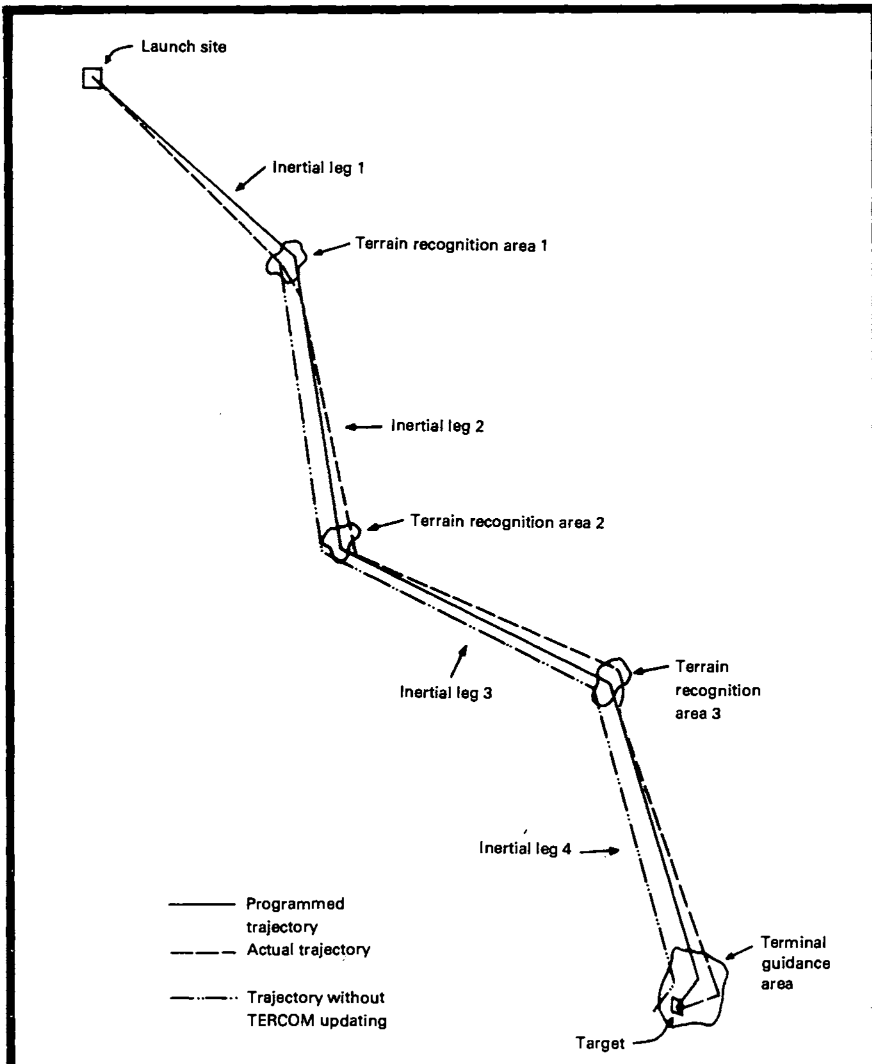
Another, perhaps more realistic, algorithm that could be used to guide the missile by using the altitude information stored on the digital map, is worth mentioning here. The on-board altimeter reads out altitude values that can be expressed as continuous function F (x, y) that has a distinct value for each point x, y on the earth. The correct pre-assigned trajectory that the missile must follow can also be expressed as a continuous function G (x, y) whose value also varies with x and y. Thus if at a given instant of time during the flight the quantity $[F(x,y) - G(x,y)]^2$ is zero, it means that the missile is where it should be, while if this quantity is not zero, then the actual and pre-assigned trajectories are not the same, that is, the missile has strayed off course. To keep the missile on course the computer is programmed to calculate the function

$$\varsigma = \left[\frac{d}{dt}\left\{[F(x,y) - G(x,y)]\right\}\right]^2$$

and to minimize it with respect to x and y continuously in time. Actually it would be easier to use not the functions F and G but their Fourier transforms (mathematical representations of F and G in terms of the frequency components of the continuous waveforms that represent these functions) so that the computer can guide the missile more efficiently by using the low-frequency components of these functions when ς is large and switching to the high-frequency components as ς approaches zero.

It is not necessary to use terrain-matching guidance continuously from the moment of launch to the arrival of the missile at the target. Such an approach would be both unnecessary and cumbersome since it would require a very large memory storage capability. Instead the terrain-matching processes described above could be used periodically to correct during the flight, trajectory errors of a missile which is basically guided inertially, as shown in chart 11.2. In this guidance mode, the total flight path of the missile from launch to target consists of several legs during which the missile is guided inertially, interspersed by particularly suitable areas in which the terrain-matching method is used to correct any errors generated by the guidance system during the preceding leg of the flight, by updating the location information in the inertial guidance system. During inertial flight the direction of the trajectory is determined on the basis of a reference orientation axis defined by the gyroscopes on board the missile; the location of the missile along the trajectory is computed

Chart 11.2. Correction of the trajectory errors of an inertially guided missile by the terrain-matching process



with the help of an accurate clock on the basis of the precise determination of the instantaneous speed of the vehicle by means of a Doppler-shift radar. The distance the missile has travelled is the time integral of its velocity over the period of time which has elapsed since its launch. Since the distance between the launching site and a pre-selected terrain-matching area is known (see chart 11.2), the computer can determine exactly the instant of time the missile is over that area, and therefore the instant it should start using the terrain-matching algorithm. If, as shown in the drawing, a drift of the gyroscopes has changed the original direction of the reference orientation axis and thereby introduced an error in the direction the missile has followed, the computer instructs the autopilot to change the direction of the missile and corrects the drift in the gyroscopes. The same procedure can be repeated several times during the flight of the missile as chart 12.2 shows. If the terrain-recognition areas have been judiciously selected to include salient features, the sequence of numbers that can uniquely determine a trajectory can obviously be made quite brief, and therefore the necessary memory storage space can be minimized and the number of operations the computer has to perform to determine the position of the missile can be relatively few. Furthermore, the corrections are also useful in estimating gyroscope errors and thereby reducing the magnitude of future information needed.

The terrain in which the target is located can be quite uniform and featureless and it may therefore not be possible to recognize the exact location of the target by taking altimeter readings while approaching it. Terminal guidance may then have to be based on some property of the terrain other than elevation that varies as a function of location. Ground reflectivity at one or more radio wavelengths can be used in this instance to construct digital maps of the area and designate the target. When this method is used to guide the missile on to the target, the computer receives the output of the microwave radiometers, which is a sequence of digits, and by means of an algorithm similar to those already described, lands the missile on target rather than returning it to any predetermined trajectory. The positional resolution afforded by such a method can be made arbitrarily small provided that enough memory is available to store a large number of long sequences of digits, and that the radiometer has a high intrinsic resolution. The combination of moderately accurate inertial guidance updated and periodically corrected by terrain-matching and terminal guidance can thus result in cruise missile accuracies of a few tens of metres over ranges of two to three thousand kilometres. Even better accuracies can be achieved by future systems that utilize the satellite-based global positioning systems.

III. *Air-launched and submarine-launched long-range cruise missiles*

Technical characteristics

The US Department of Defense is now funding a project for the development of a long-range cruise missile based on the operating principles and technologies described in the previous section. This missile is designed to be launched either from the torpedo tubes of a submarine or from an aircraft; it can be adapted either to tactical or strategic use by a mere modular change of warhead (conventional to nuclear), arming and fusing mechanisms, guidance package, engine and fuel tanks. The missile is 246 inches long by 21 inches in diameter which enables it to fit in a standard torpedo tube. Thus a hunter-killer submarine could in addition to its other armaments, carry a few such missiles, a converted Polaris submarine several dozen and a commercial 747 jet up to 100 of them. It is expected to be powered by a turbofan jet engine of about 600 pounds thrust. Although very large turbofan jet engines like those used in the commercial wide body jets have efficiencies of 0.3 pounds of fuel per hour or maximum power per pounds of thrust, smaller engines such as those to be used in missiles are much less efficient. At the present time perhaps as much as one pound of fuel per hour of operation per pound of thrust is needed, but nothing but cost would prevent research into and development of a small engine of efficiency approaching that of the larger engines. At subsonic speeds a cruise missile will consume fuel in proportion to its weight and inversely proportional to its lift-to-drag ratio. Therefore the fuel it will consume over the time T it takes to fly from launch to target is

$$\int \frac{dM}{dt} = \frac{M}{L/D} \cdot (\mathrm{SFC}) \qquad (1)$$

where SFC is the amount of fuel per hour of operation per pound of engine thrust the missile requires. Integrating over time (1) becomes

$$M_{\mathrm{fuel}} = \frac{M}{L/D} (\mathrm{SFC}) \cdot T \qquad (2)$$

but if the range of the missile is R and its velocity V

$$T = R/V \qquad (3)$$

Substituting (3) into (2) and rearranging the equation we have

$$\frac{M_{\mathrm{fuel}}}{M} = \frac{R \cdot (\mathrm{SFC})}{L/D \cdot V}$$

For a missile of $L/D = 10$, $V = 0.8$ Mach and SFC$=1$ pound of fuel per pound of engine thrust per hour

$$\frac{M_{\mathrm{fuel}}}{M} = \frac{R \cdot 1}{10 \cdot 691}$$

$$\frac{M_{\mathrm{fuel}}}{M} = 1.4 \cdot 10^{-4} R$$

Table 11.1. The ratio of fuel to total missile mass for various ranges

R (Km)	10^3	$2 \cdot 10^3$	$3 \cdot 10^3$	$4 \cdot 10^3$	$5 \cdot 10^3$	$6 \cdot 10^3$	$7 \cdot 10^3$	10^4
M_{fuel}/M	.14	.28	.42	.56	.7	.84	.98	1.14

where R is expressed in kilometres. Table 11.1 indicates the ratio of fuel to total missile mass for various ranges.

As can be seen from the table a range of 5 000 km requires that the fuel is 30 per cent of the total wight of the missile. A 3 000-pound (1 363-kg) missile will therefore require 900 pounds (410 kg) of fuel for a flight of 3 000 km at Mach 0.8 (691 kph). This leaves about 2 000 pounds. A typical airframe takes up about 20 per cent and the engine about 25 per cent of the total weight of the missile. This leaves about 1 000 pounds of payload available for the warhead and the guidance system electronics. Current nuclear warhead technology permits the manufacture of small warheads with about one kiloton TNT equivalent yield per pound of warhead weight. Thus a 200-kt warhead (such as, or similar to those carried by the MIRVed Minuteman III) will weigh about 200 pounds. This leaves 800 pounds payload for the electronics of the guidance system, which is more than enough for an elaborate sensor and correlator system. These calculations have been made on the basis of ordinary kerosene as the anticipated fuel. If improved hydrocarbon fuels were used, the range with the same payload could probably be increased by 10–20 per cent, whilst if the missile were powered by more exotic fuels (boron-hydride mixtures) the range could be increased by up to 50 per cent at the present engine efficiency.

The missile under development is designed with two guidance systems: an inertial navigation system aided by mid-course updating derived from terrain matching, and a secondary microwave radiometry guidance system. This combination of guidance systems can guide the missile to the target, recognize and land on it. TERCOM (the terrain-matching device) utilizes an ordinary altimeter radar (Honeywell APN-194) as its sensor. It was tested successfully on a ballistic missile several years ago and has undergone a series of further successful tests on continuously powered endoatmospheric vehicles more recently. The inertial guidance platform to be used is the Singer Kearfott AN-90 platform, with an expanded computer memory to accommodate data for low-altitude flight. The terrain-matching mode mainly requires low-frequency information and apparently the available memory is actually larger than is needed. Further improvements are planned in all the guidance components when the missile enters the testing stage some time in 1977. The terminal portion of the guidance will be performed by the radiometer which will operate passively, probably sensing terrain reflectivity at one or more wavelengths. The combination of TERCOM-aided inertial guidance and pattern-recognition terminal guidance permits accuracies of under 30 metres at a range of 1 500 nm. Terminal guidance is insensitive to the range of the missile, so that one can anticipate that with further improvements in engine and fuel efficiencies the same accuracies can be attained at considerably larger (50–100 per cent) ranges.

Weather conditions are not expected to affect the functioning of TERCOM or the terminal guidance radiometer, but disturbances caused by nuclear weapon explosions in the vicinity of the target shortly before the arrival of the missile may affect the terminal guidance. Both TERCOM and terrain-recognition terminal guidance cannot be jammed effectively or cheaply by electronic countermeasures. Although one could imagine methods for jamming the terminal guidance of the missile, these would be too costly and elaborate to be considered feasible. One could also imagine "spoofing" countermeasures, but they too would be rather expensive to deploy and could therefore be easily defeated by the deployment of large numbers of missiles. It is thus expected that the performance of these missiles will not be subject to deterioration by electronic interference.

It is not improbable that in future versions of these missiles the inertial platforms will utilize strapped-down laser gyroscopes. In an inertial measuring unit that uses gimballed components, the sensitive axes of gyroscopes and accelerometers are maintained fixed in space by their stabilized platform, and the motion of the vehicle that is guided by the platform is determined with respect to the space coordinates defined by these axes. In a strapped-down system the gyroscopes and accelerometers are rigidly attached to the vehicle and as the vehicle moves, a fast electronic computer measures the motion of the vehicle with respect to these fixed original coordinates, keeps track of the changes of the axes of the gyroscopes and accelerometers, "remembers" their original orientation, and converts the real-time gyroscope and accelerometer outputs to the reference frame defined by the fixed, original coordinates that it "remembers". This technique requires an extensive on-board calculational capability and essentially exchanges a delicate and elaborate mechanical system, the gimballed stabilization platform, with a more elaborate on-board computer. But since the computer is much less labour-intensive than the delicate gimballed platforms, the strapped-down system is cheaper in addition to being lighter, smaller and more rugged. Laser gyroscopes are well suited for use in strapped-down systems. These gyroscopes utilize two laser beams confined to circulate in opposite directions around an optical path which is perpendicular to the sensitive axis of the gyroscope. The two beams are at slightly different frequencies, thus creating "beats". Rotation about the sensitive axis changes the path length each beam has to travel (for one beam it is made shorter and for the other longer) and thereby, changes the relative phase of the two beams in proportion to this rotation. This difference affects the "beats" and can thus be detected and read out in digital form. To increase the accuracy of such a gyroscope one need only increase the effective length of the optical path the beams follow. At present, these gyroscopes are not as accurate as gimballed systems, but they are particularly suited for strapped-down, inertial-guidance-cum-TERCOM-updating applications.

Reasons for development and anticipated uses

Because the initial stages of development of the submarine launched cruise missiles (SLCMs) and air launched cruise missiles (ALCMs) have required modest sums of money (about $100 million to date) the programme has so far invoked little debate in the US Congress. In testimony before the Senate Armed Services Committee the then Secretary of Defense Melvin Laird presented the SLBM as equivalent to the cruise missiles deployed on "G"-class Soviet submarines; this was a somewhat inaccurate comparison since these latter missiles have tactical rather than strategic ranges [2]. Later on in the same hearings Mr Laird further justified the necessity to develop and deploy SLCMs by stating that "the development of the SLCM is necessary to *assure availability* of *future* U.S. *options* for *additional* U.S. strength, if *needed*." This rather hypothetical condition (known as "the Laird hexahedge"!) indicates that in the summer of 1972 there was no tangible need for the development of this weapon. But since then it has been cited together with the development of the Trident submarine as a hedge against "worse than expected" developments in the Soviet Union and as a weapon that would increase stability. For example, Admiral Zumwalt said on 21 July 1972, during the same hearings that "the deployment of SLCM will make possible a more stabilizing atmosphere in countering the Soviet *potential* strategic cruise missile capability", but he then went on to state that the Soviet Union had placed its sea-launched cruise missile on some of the *oldest* submarines, an indication that the Soviet cruise-missile capability is not an immediate threat that requires a deterring counterdeployment of the same type of weapon.

There thus appears to be little pragmatic need to develop and deploy these weapons as a response to Soviet initiatives. But as is often the case with weapon systems, the actual reasons for the deployment of SLCMs and ALCMs are not exclusively grounded on a rationally derived need of the military security of the country that requires their development. A wide spectrum of political, bureaucratic and technological factors more or less related to actual or perceived security needs, frequently influences the process of developing a new weapon system. Thus the reasons for the development and deployment of SLCMs and ALCMs should not be sought exclusively among the results of a rational cost-benefit evaluation of the defence needs of the United States since the SALT I agreements.

For example, a very important, yet unspoken factor in the development of SLCMs and ALCMs may be the continuing rivalry over future missions and roles between the air force and the navy, the two technology intensive and conscious services; until now one of the arguments that the air force has been offering in favour of its strategic bombers is that they are the only members of the US strategic Triad capable of a dual conventional and nuclear role. The air force, for example, points with a degree of satisfaction to the conventional support of tactical ground operations that the B-52 performed during the war in Viet-Nam. Development of the SLCM will provide the navy with a similar capability, and this may be one factor that prompted the decision to develop that weapon.

Yet another factor in this decision was, no doubt, the fact that strategic SLCMs were not prohibited by SALT I (or SALT II as it turns out). In fact, in the same hearings quoted above, Admiral Zumwalt made this explicit: "As a result of the SALT agreements and the resulting constraints on our sea-based ballistic missile system, the cruise missile *remains the only viable concept* by which we can strengthen and diversify our sea-based deterrent." Admiral Zumwalt did not elaborate on why this further diversification and strengthening were necessary. At the time of the SALT I agreements the US Navy may have had yet another reason to develop the SLCM. According to SALT I, the USA was allowed a total of 710 sea-based launchers, a number that could be achieved only if the air force would agree to decommission the 54 Titan land-based missiles, since the navy already had 656 launchers deployed on 41 Polaris submarines. Thus the navy would have to withdraw some of its Polaris submarines if the planned ten Trident submarines with 24 launchers each were to be deployed without violating the agreement. The development of the SLCM would thus enable the navy to refit the withdrawn Polaris with the new long-range cruise missile instead of consigning them to the junk yard. Thus the navy could increase its strategic role without violating the SALT I agreements. In retrospect, this was an unnecessary concern since the Vladivostok agreement allows for all 41 Polaris and 12 Trident submarines, all equipped with ballistic missiles!

A second broad class of reasons for the development of the long-range cruise missile system is the mere presence of the technological advances that have made it possible. For many aerospace and electronic industrial firms, to develop new technologies and apply each innovation in as many separate products as possible is a matter of economic imperative. Now that the technology of large-array microcircuitry has been made available, it is expected that the US industrial complex will attempt to use this new technology in as many new products as possible, weapons among them. Thus the application of the new electronic devices to realize the new weapon discussed here makes financial sense for many defence-oriented companies, a fact that may have had a powerful impetus in the decision to develop the long-range cruise missile.

But the long-range cruise missile makes financial sense not only for the supplier but also for the armed forces. A Minuteman III missile has a ten-year cost of approximately $10 million and a countersilo lethality of K=5 per re-entry vehicle. (K is a function of the yield and accuracy of a warhead and thus a measure of its destructiveness. For a full explanation, see reference [1].) The kill probability P_k of this weapon against a hardened silo is under 40 per cent. In comparison, a strategic cruise missile with 30 metres accuracy and 150-kt warhead has a K of about one thousand and a kill probability of one even against a superhardened missile. The procurement and ten-year deployment cost of such a missile will probably be an order of magnitude less than a Minuteman III or a Poseidon missile. At a time of tight military budgets and escalating weapon costs, cheap effective weapons may find a ready customer in the defence establishments, despite the traditional reluctance to accept innovation so characteristic of entrenched bureaucracies.

Yet another combination of technological and financial considerations has contributed to the development of this weapon system and provided the effective link for the joint air force-navy development effort. Over the years the air force has attempted the development of air-launched cruise missiles that would extend the efficacy of strategic bombers and increase their survivability. "Skybolt", SCUD and SCAD were programmes that were initiated, funded but eventually, for a variety of reasons, abandoned. Although no new system emerged from these programmes, a small techno-bureaucracy occupied with cruise missiles was established and a certain amount of basic cruise missile technology was accumulated such as a small, efficient turbofan jet engine and airframe improvements. From the navy side, the successful development of the short-range tactical surface-to-surface antiship missile, the "Harpoon", generated a parallel technical group and a considerable number of new developments in guidance and sensor systems. Thus it was technologically, financially and bureaucratically attractive to merge the two groups, as was in effect done, for the development of a new long-range cruise missile. Technologically because artifacts and processes developed in the past can be usefully applied; financially because such a move diminishes the research and development funds necessary for the first stages of the weapon system and therefore minimizes its vulnerability in Congressional committees conscious of escalating military budgets.

Bureaucratically the joint effort to develop not only a strategic but also a tactical version of the missile makes eminent sense. The navy is undoubtedly aware of the arms limitation disadvantages of the strategic version of the SLCM but it is equally aware of the attractiveness of the ALCM version and of the tactical SLCM. Thus by joining the three weapons in one development, it minimizes the chances that the strategic SLCM would not be funded by the Congress.

IV. *Implications of precision missile guidance*

The visible advantages

The weapons described in the previous section are undoubtedly only the first examples of future consecutive generations of increasingly sophisticated guided cruise missiles. The new electronics technology incorporated in these systems will certainly advance and with it will come new applications in weapon systems. (There have been reports of new microcircuits in which the linear dimensions of electronic elements are 50–100 Ångstroms.) There are no technical obstacles to new versions of guided cruise missiles with longer ranges and supersonic speeds, that may be re-targetable while in flight and will incorporate elaborate countermeasures to frustrate countermissile defences. A cruise missile is inherently a much more efficient device than a ballistic missile to carry large payloads since it possesses aerodynamic surfaces; given the ability to guide these vehicles precisely to their target, it can be expected that their intrinsic advantages will prove attractive to the military and that their development will be pursued vigorously, even though weapons are not always developed because of their intrinsic advantages.

From the military point of view the long-range cruise missile is a very attractive new weapon system. New guidance systems which are either self-reliant or dependent on satellite-derived position information can improve accuracies and in theory shrink the CEP to zero; in practice, even at the present state of technology, they can achieve CEPs of under 30 metres. Since high accuracy and large payload make the lethality K of the cruise missile quite high (probably in the K=1 000 region for missiles armed with a nuclear warhead), the kill probability of this weapon against any target will be virtually 100 per cent. That has great advantages from the viewpoint of the military planners because it reduces drastically the number of men, vehicles and support facilities (the so-called logistics train) necessary to destroy a target. Especially for the United States, wishing to maintain military capabilities around the world at the smallest possible cost and the minimum presence of military personnel abroad, long-range cruise missiles or RPVs offer enormous attraction. These inexpensive, highly accurate weapons will be capable of striking both tactical and strategic targets from seaborne platforms or a few judiciously located bases. In addition, the mobility, multiple basing, ease of handling and guidance, and the low cost of maintaining these weapons in a high state of operational preparedness make them almost completely invulnerable from a surprise attack.

But perhaps the greatest advantage of these new weapon systems from the military viewpoint is their initial low cost of acquisition and operation. Assuming that the probability for a cruise missile to reach its strategic target is only 50 per cent (a very conservative figure), the ten-year cost per unit of K delivered on target will be about $3 000. The equivalent current figure for a Minuteman III, the most cost-effective US strategic weapon, is about $700 000. Higher accuracy of Minuteman III warheads may cut this figure somewhat, but even then the cruise missile will be considerably more cost-effective. Since economic and political lobbies will tend to apply pressure to diminish the military budget of the United States, it is quite probable that the cruise missile will find favour both with military and Congressional leaders. It is therefore reasonable to expect that decision-makers both in the military techno-bureaucracy and the Congress would display little reluctance in approving large programmes for the development and deployment of these weapons. Thoughtful and judicious deployment of inexpensive high accuracy systems for a variety of tactical applications could make warfare less randomly destructive and result in smaller allocations of resources to national security. This would serve the aims of both arms limitation, by minimizing the destruction and squandering of resources for war material, and of those who are directly responsible for national security.

Non-trivial disadvantages

The total cost of a new weapon system should not be calculated only on the basis of the monies expended for its development, procurement and maintenance in operational readiness, but must be extended to include the overall economic, political and security costs induced by its deployment. One must ask not only how much the system costs to buy, but also what future opportunities it precludes; not only what it can do to an opponent, but what it can make an opponent do; whether the owner of this system wants the opponent to do these things, and how much it will cost to counter the things that the opponent has decided to do, coerced by the deployment of the weapon system under consideration. When this broader balance sheet is drawn up for the high accuracy long-range cruise missile, it is seen that its development and procurement cost is only a small fraction of what the United States or any other nation would have to pay for its deployment.

If the past behaviour of nations is a guide to their future reactions, the deployment of long-range cruise missiles by the United States will signal efforts towards the same goal in the Soviet Union. The same escalatory cycles that we have seen with the ballistic missile arsenals will be duplicated with cruise missiles. In this case, however, the escalation will be much more widespread. The UK, France, Japan, India, Sweden, FR Germany and perhaps Italy and Israel all have the technological infrastructure in electronics, airframes and jet engines to produce long-range cruise missiles. Perhaps not all these countries have the will or the financial capacity to enter the field, but the attractive features of this weapon system and its low initial cost will undoubtedly lure military establishments to pressure their governments to acquire it. And as is the case with most weapons, this emulative process will diminish the security not only of the countries which do not have this weapon, but also the national security of the USA, the USSR and all other countries which do. In effect when a country acquires a weapon it induces forces in the military establishments of its adversaries also to acquire the same weapon to redress the balance of military strength. But once these adversaries have in fact deployed the weapon, the first country has, by a process of self-induced security diminution, found itself in a higher state of military expenditure but in a lower state of security, since it is now faced with adversaries possessing a new weapon against which it has no developed defences. The question, of course, whether the adversaries would have opted to deploy the weapon anyway, once it became technologically available, is circular since the phenomenon of self-induced security diminution would obtain in their case as well. Once this diminution is realized by the defence establishments of these countries, the need to counter the long-range cruise missile will be declared as an essential step to redress the state of national security that the countries enjoyed before the advent of this weapon. New defence programmes then will be advocated for counter-cruise missile defences such as programmable guns or elaborate down-looking radar systems. The cost for the development and deployment of *these* systems must be added to the cost of deploying the long-range cruise missile, because without the latter the former may not have been necessary. At the end of the cycle of deploying cruise missiles and then procuring defensive weapons to counter them, the national security of the countries that have gone through that process may be the same as it was before the deployment of the cruise missiles.

But it may also be much worse for several reasons. First of all, any qualitatively new weapon system introduces a new element of uncertainty in a country's defence calculus. The number of things one has to worry about has increased by one. Since the new weapon is qualitatively different, it has performance characteristics that are different from those of the already deployed weapons. Because of this, new contingencies arise, new factors have to be integrated into national security arrangements and new restrictions are imposed upon the operational degrees of freedom of a military establishment. For example, in a tight military budget regimen funds may have to be taken from existing weapons or programmes to finance not only the new weapon, but also countermeasures to it.

In the specific case of the long-range cruise missile the uncertainty will be particularly large. Its introduction will contribute both to the vertical and horizontal proliferation of nuclear weapons since additional nuclear warheads will be deployed in the arsenals of the United States, the Soviet Union and other nuclear countries, and the availability of an inexpensive delivery vehicle may encourage several near-nuclear countries, that now are impeded by the prohibitive costs of intercontinental bombers or ballistic systems, to proceed with the development of nuclear weapons. Thus future military planners will be faced with the increasingly complex problem of defending a country from the augmented and efficient nuclear arsenals of a dozen other nations.

Another complication in defence planning will arise from the erosion of the barrier between nuclear and conventional warfare, and the elimination of the distinction between strategic and tactical weapons. Cruise missiles do not have the psychological barrier of ballistic missiles. ICBMs and SLBMs have become the symbols of nuclear war and global extermination; their use is therefore constrained by their image, in the minds of political and military leaders, as the vehicles of ultimate folly and catastrophe. Cruise missiles, on the other hand, are thought of in a more casual and benign manner. A decision to use them would appear much less forbidding. This lowering of psychological inhibitions coupled with the fact that the same cruise missile can have a tactical mission with a conventional warhead or a strategic mission with a nuclear warhead could make their potential use seem much less threatening.

The fact that this new weapon may provide the military planners with an enlarged spectrum of offensive options and thereby increase the uncertainty of other countries' national security has yet another side effect: the military planner in possession of long-range cruise missiles can propose to his political leadership a number of alternative courses of action, many of which would otherwise be forbiddingly expensive militarily, politically and financially. A political leadership, for example, could be more easily persuaded to intervene in a distant country by a military planner that promises the parsimonious destruction of a number of targets with a few cruise missiles launched from thousands of miles away than if they had to approve an operation that, to destroy the same number of targets, involved a large number of manned aircraft, with the necessary supporting logistic train, and the possibility of casualties, prisoners of war and the unpalatable political repercussions. Thus long-range cruise missiles have the potential to make war more casual and less politically responsible; they greatly increase the possibility of war as well as its quick transmutation from a conventional tactical encounter to a nuclear confrontation.

Another example of the more subtle complications that the long-range cruise missile will introduce in the balance of security, at least for the USA and the USSR, is the re-coupling of tactical and strategic antisubmarine warfare (ASW) by the submarine-launched cruise missile. At the present time the roles of the SSN and SSBN are almost completely distinct from each other, and thereby lies a cornerstone of the invulnerability of the SSBN, since strategic ASW is inhibited not only by technical difficulties but also by political sobriety; to attack the adversary's SSBN would be tantamount to a declaration of nuclear war. Thus tactical and strategic ASW have tended to remain naturally de-coupled, although some interraction between the two has been expected (see, for example, reference [3]). Furthermore the long ranges of SLBMs will soon permit SSBNs to remain in the coastal waters of their respective countries, further ensuring the invulnerability of this most stable component of deterrence and diminishing tension. The fitting of nuclear weapons on accurate long-range SLCMs, however, changes all that. First of all, it eliminates the distinction between tactical and strategic ASW since SSNs will also carry strategic nuclear weapons. Although SSBNs will remain relatively invulnerable, the threat presented by SSNs carrying long-range accurate cruise missiles will further intensify ASW efforts, the cost of which should also be added to the "total price" of the long-range cruise missiles. This intensification will undoubtedly increase the erosion of each country's SSBN force by what has been called "incidental attrition during war". (See references [3–4].) Both the new threat from nuclear SLCMs and the increased intensity of ASW will heighten tensions in the already uncertain arena of undersea warfare. The deployment of strategic nuclear weapons on SLCMs carried by SSNs will aggravate what is perhaps the only chronic problem of the sea-based deterrent—its command and control. The proliferation of nuclear weapons on SSNs will complicate further the operational control of these weapons and could increase the probability of accidental launches or action caused by over-response to the presence of SSNs in one's homewaters.

The overall vulnerability of the sea-based component of deterrence will perhaps remain invariant; the increased dangers of attrition will be balanced out by the increased number of weapons available on station, but the uncertainty and the resulting international tensions that this will cause will drastically increase. The presence of a few SSNs near the coast of an adversary nation will be a reason for major alarm whereas it is now treated as a tactical situation that does not jeopardize any inland targets. The resultant effect of all these interdependent uncertainties that the SLCM will tend to introduce is a substantial increase in the probability of accidental nuclear war. In the present environment of détente, accidental nuclear war is actually the gravest threat to world stability, since a deliberate surprise nuclear attack on one nuclear power by another is tantamount to an act of national suicide. Thus deployment of strategic SLCMs will further enlarge the opportunities for that set of circumstances to arise that already has the largest probability for inducing a nuclear war.

The long-range cruise missile with its high accuracy guaranteeing the destruction of a ballistic missile in its silo, and its long flight time, provides both an incentive and an opportunity for launch on warning. With ballistic missile threatening ballistic missile it is profitable, if the adversary's missiles are not very accurate or MIRVed, to wait out an attack, because on average the adversary will use up more of his own missiles than he will destroy of the other side. This incentive to wait is eliminated by the high accuracy of the cruise missile which will destroy the silo with 100 per cent probability if it reaches it. It is possible to conceive of point-defence arrangements involving radar and either guns or short-range anti-aircraft missiles that could destroy a cruise missile as it approached a silo. But even this approach could not guarantee the security of a very expensive ballistic missile against the low-cost, but very effective cruise missile. It is therefore quite probable that a launch-on-warning policy, that would avoid the expense of defending the silo, would be preferred. In addition, the long travel time of the subsonic cruise missile gives ample time for military and political leaders to consult and make decisions. The end result may very well be that a country is more prone to assume a launch-on-warning policy if faced with cruise missiles than with ballistic missiles.

By far the most serious disadvantage of the long-range cruise missile, and especially the submarine-launched version, is its impact on arms limitation efforts. The obvious pre-requisite of any international agreement limiting one or more weapon systems is that the agreement can be verified. It has become customary practice to require that the verification can be carried out without onsite inspection, a practice enforced by the easily understood reluctance of the military of one country to permit their colleagues from another nation to inspect their installations and weapons. The theorem, then, that governs arms limitations is that an agreement on limiting a weapon is possible only if complicance to it can be verified by non-intrusive means, that is, by observation satellites or remote detection of electromagnetic or nuclear radiation. The SLCM now being developed includes two versions, one strategic with a nuclear warhead and one tactical with a conventional warhead, which are externally identical. In addition, since both weapons will be encapsulated in a canister for firing from a torpedo tube, it will be physically impossible to distinguish between the two versions without literally dismantling the weapon. Since this constitutes highly intrusive inspection, it will be unacceptable to both the US and Soviet military establishments. It will thus be impossible to control with an arms limitation agreement the proliferation (in numbers and in possessor countries) of long-range submarine-launched cruise missiles once deployed. This has long-range implications as to the value and effectiveness of the current efforts to limit strategic ballistic missiles, and as to the total number of deployed nuclear weapons in the next two decades. Since the SLCM and ALCM now under development have a 1 500-nm range, they cannot replace any of the deployed strategic nuclear weapons; they will merely multiply the number of nuclear warheads deployed and the number of launching platforms.

In the future, the failure of the Vladivostok SALT II agreement to control the deployment of long-range strategic cruise missiles by the United States will have the most profound effect on the security of the two countries involved and the rest of the world. This is because (*a*) an uncontrolled deployment of nuclear-tipped cruise missiles by the United States will render the proposed ceiling of 2 400 ballistic launchers completely meaningless, and (*b*) because the continuing development of this weapon by the USA will further damage the chances of the NPT conference in May 1975 to arrest the spread of nuclear weapons, since many near-nuclear states will see in the SLCM not only a threat against their security, but an opportunity as well. The accurate inexpensive cruise missile may prove to be the great equalizer among nations, but it may also prove to be the ultimate leveller of their cities.

V. *Conclusions*

The long-range cruise missile is an entirely new type of weapon system. Its development was made possible by certain technological advances in the field of electronics, and they in turn were direct outgrowths of fundamental research in such fields as solid state physics, metallurgy, and chemistry. This genealogy of the weapon permits two predictions: (*a*) that it would be utopian to attempt to arrest the further development of this and other similar systems; and (*b*) that the long-range cruise missile now being developed for the US Navy and Air Force is the forerunner of an entire class of new weapons that opens a new channel to the arms race.

Up to 1974, the proliferation of evermore costly strategic weapons has proceeded along these lines, taking either of two forms: (*a*) improvements in one's own existing system; or (*b*) countermeasures to an adversary's existing, or putative system.

Long-range bombers, the first line, gave rise to anti-aircraft defence systems, both in the United States and the Soviet Union, which in turn were cited as reasons for the necessity to upgrade the performance of the bombers. This process generated a series of very expensive systems, the latest of which is the B-1 and the "Backfire".

Land-based ICBMs, the second line of the arms race, displays similar dynamic behaviour; ballistic missiles were the justification for ABMs, and when these were proved ineffectual, improved versions of ICBMs were posited as necessary to maintain the appearance of superiority. The result has been a continuous process of improvement and replacement that has cost to date about $150 billion and shows no signs of abatement.

The third line, the submarine-launched ballistic missile system, invulnerable as it is to hostile action, may have been thought to be exempt from the arms escalation phenomenon that characterizes the other two. Yet this was not the case; once again efforts to pre-empt possible real or imaginary threats to the system, and the pressures for improvements of one's own systems and degradation of the opponent's have caused the development of Trident and the expenditure of four to five billion dollars annually for ASW operations and hardware in the USA alone.

The deployment of the long-range cruise missile will open a fourth line with dynamic properties similar to those of the existing three. In military terms it could result in the accumulation of several thousand additional nuclear weapons deployed on land, in the air and both on and under the sea. In financial terms it will have dimensions similar to the existing three lines, which would mean a 30 per cent increase in strategic weapon expenses. This has in fact been anticipated by the Senate Armed Services Committee which has labelled the strategic cruise missile "another multi-billion dollar program" [5].

In the more immediate future, the deployment of the SLCM and ALCM will further increase unnecessarily the number of nuclear weapons without enhancing the security of any nation; on the contrary, in the political and military ambience that will be generated by that deployment, the relative ease and low initial cost of its production will almost certainly induce several near-nuclear states to attempt acquisition of long-range cruise missiles. It may prove technically difficult for them to arm these missiles with thermonuclear devices, but it is already well within the technological capacity of several countries to develop fission devices small enough to be carried thousands of kilometres by a cruise missile. Such a proliferation of deliverable nuclear weapons will erode even deeper, perhaps irrevocably, the chances for meaningful arms limitation agreements.

We believe that the strategic long-range cruise missile should not be deployed for two reasons:

1. There is no military need to deploy yet a fourth strategic weapon in an arsenal that contains super-numerary nuclear warheads.

2. The immediately predictable results of such deployment are undesirable for economic and national security reasons. Nuclear weapons on long-range delivery vehicles can have three conceivable, albeit not all realistic, strategic missions: (*a*) to deter an adversary from attacking one's own country with nuclear weapons; (*b*) to coerce an adversary, without resorting to war, into making certain political concessions; and (*c*) to defeat an adversary in case of nuclear war.

Although we believe that only the first mission is realistically attainable with strategic nuclear weapons, it is a fact that the United States and perhaps to a lesser extent the Soviet Union have configured their strategic forces with the other two missions at least partly in mind. The US strategic arsenal is therefore already capable of fulfilling the first essential mission, and if desired can be modified to fulfil the other two within the existing

Triad. Thus, the deployment of strategic cruise missiles is completely unnecessary, and as this chapter has attempted to point out, detrimental to the economic welfare and security of the United States, the Soviet Union, and, in the long run, any other country.

Since development of the SLCM and ALCM appears impossible to arrest, although it could be constructive to do so, we believe that the United States and the Soviet Union could negotiate within the framework of the Vladivostok guidelines a "no first deployment" agreement to cover all cruise missiles with ranges of above 500 km. Such an agreement would not impede the development and deployment of tactical, that is, shorter-range, cruise missiles. Verification of adherence to the agreement may be technically difficult, but it may not be essential for two reasons.

1. In the presence of the existing Triad on both sides, the appearance of a fourth strategic weapon will not destabilize the strategic balance even if several thousand of these new weapons are deployed unilaterally.

2. A violation of such magnitude can certainly be detected by the existing means of inspection. Since the technology will have been already developed, it will require, in view of the simplicity of the weapon, little time for the wronged party to manufacture and deploy the weapon.

In any case it is very difficult to construct and deploy significant numbers of these weapons clandestinely unless elaborate precautions similar to those practised during the "Manhattan" project were deployed. Such an initiative, however, appears improbable both in the United States and the Soviet Union, especially in the present climate of dètente. An example of an agreement banning the deployment of an already developed weapon could show the way for reaching a proper balance between the responsibility of defence establishments to safeguard the security of their nations, and the immediate need to arrest and reverse the arms race.

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12. Drones and remotely piloted vehicles

Square-bracketed references, thus [1], *refer to the list of references on pages 366–67.*

I. *Introduction*

A drone is an unmanned aircraft which, after launch, flies a programmed course, all the instructions for the flight being stored in the electronic equipment on board the aircraft. Only a few basic commands, such as switching the autopilot from one programme to another, switching off the engine or issuing orders for self-destruction can be transmitted to a drone from a control station. The flight of a remotely piloted vehicle (RPV), on the other hand, is completely controlled by a human operator from a distance. All the information on the flight of an RPV gathered by sensors on board the aircraft is transmitted to a control station from where a series of commands are transmitted back to the vehicle. The RPV thus follows the commands of a distant operator as if the latter were sitting in the aircraft.

A wide variety of applications for such aircraft have been envisaged. These range from their use as a research and development tool in flight-testing new manned aircraft by simulating accurately the aerodynamics of full-scale aircraft, to air-sampling the effluents produced by aerospace vehicles. They also have a number of military applications, and it is these that will be discussed in this chapter.

Many factors have contributed to the rapid development of drones and RPVs. One such factor is that the increased sophistication and efficiency of modern ground defences coupled with the rising costs of conventional manned aircraft make drones and RPVs a more economic weapon option than manned aircraft. The loss of an RPV or a drone is cheaper both in terms of the actual cost of the aircraft and in terms of saving man-power. Perhaps even more important, however, are the advances in guidance and control systems and the fact that few constraints remain to aircraft design when one no longer has to consider the safety of the pilot. A drone or an RPV can be designed to tolerate acceleration stresses of 12 g or more,[1] nearly double the gravity pull an experienced fighter-pilot can withstand even for short periods. Without the pilot, considerable savings in design can be achieved since the vehicle can be built without man-rated components, inspection panels, elaborate landing equipment or flight restrictions and can be constructed from simpler and cheaper materials such as cardboard, inflated materials and plastics. The cost of operation

[1] Stresses on bodies undergoing acceleration are measured in g, 1 g being equal to the force exerted by the Earth's gravitational field on a body at sea level.

and maintenance of such vehicles is also low compared with manned aircraft. For example, in a combat situation, a typical squadron of 12 manned fighter-bombers may require as many as 20 other support aircraft whereas a similar RPV force would need only two to five aircraft, one of which may be the launch and recovery vehicle.

The simplest example of an RPV is the radio-controlled plane operated by amateur model aircraft enthusiasts. With advances in electronics, the potential of such model aircraft was realized by the military, and the first drones were used as targets in the mid-1930s when radio-controlled unmanned Tiger Moths were used in Europe for target practice. The potentials of drones for electronic intelligence and reconnaissance missions were developed in the 1950s and in recent years drones have carried out a major part of the photographic reconnaissance activities in South East Asia. These aircraft fly over territories which are so heavily defended that a conventionally flown mission would expose the pilot to exceptionally high risks.

By 1970 developments in electronic and guidance systems had enabled drone technology to reach a stage when the construction of RPVs capable of being controlled over long distances was possible, and since then rapid advances have been made. This new field of aeronautics has immense and far-reaching military possibilities. Drones which were initially used only as targets are now being developed for battlefield intelligence gathering, electronic countermeasures (ECM), electronic intelligence (Elint), and even for delivering air-to-ground weapons. In addition, RPVs are to be used as reconnaissance vehicles, as tactical decoys against missiles and as weapon delivery systems.

In the following sections, the design characteristics of these aircraft, the equipment carried by them and their military potentials and uses are described. An outline of their development programmes underway in various countries is given in section VI. Some future developments and their implications are also considered.

II. *Design criteria*

The design of a drone or an RPV depends largely on the mission for which it is used. Thus a vehicle used for low-altitude reconnaissance will have different physical characteristics from those of a high-altitude reconnaissance vehicle and similarly, remotely controlled aircraft used as decoys against missiles will be very different from those used for reconnaissance missions or for delivering weapons. The design of drones and RPVs performing the same type of mission is similar. The only difference between them is that an RPV is equipped with a wide-band-width data-link system and TV sensors to enable a ground operator to fly it remotely. Much of the flight of a modern RPV is programmed and the remote operator is able to interrogate the RPV to determine such parameters as its position, height and speed so as to exert control over it for certain phases of the mission. Most of the design features described below thus apply equally to drones and RPVs.

The three basic factors which influence the design of a drone or an RPV are the launch and recovery method, the survivability of the vehicle and the guidance and control of the vehicle.

Launch and recovery

Launch techniques

A drone or an RPV is usually powered either by a turbojet or by a piston engine. The vehicle can either be ground-launched or launched from an aircraft. Among ground-launched methods, the conventional runway technique for taking off is currently favoured because of the large size of the vehicles. With the development of drones and RPVs of speeds of between Mach 0.5 and Mach 1.0 and at altitudes as low as 20 metres, the vehicle's wing span tends to be considerably larger than that of a conventional aircraft. Such extended wings also enable the vehicle to take off with greater loads. In addition to the conventional runway launching technique, the vehicle can also be mounted on a trolley, which can run along the ground or on an inclined ramp. The combination is accelerated by boosters, either on the trolley or on the vehicle itself, and the vehicle separates from the trolley at take off.

In the United States, drones and RPVs are launched from aircraft such as the Lockheed DC-130 and the Lockheed C-130. The latter aircraft can carry four vehicles with a overall length of 8.5 metres and a wing span of about three metres. Others such as the DP-2E can only carry two drones or RPVs, one under each wing. The use of Boeing-747 aircraft to launch and recover remotely controlled vehicles has also been under consideration. Studies indicate that the Boeing can carry up to six drones or RPVs seven metres long with a wing span of about four metres [1].

Recovery techniques

One of the major shortcomings of RPVs and drones has been the attrition rate in recovery operations resulting from a complete loss of the vehicle or damage during recovery. Several recovery concepts for the safe and accurate landing of drones and RPVs have therefore been investigated. These include the use of parachute and air-cushion landing systems (ACLS) for recovery on land or sea, the use of skids, the mid-air retrieval system (MARS), vertical take off and landing (VTOL) and the use of conventional-aircraft-type undercarriages.

Two designs are being considered for air-cushion landing systems. The first involves the use of a parachute housed in the vehicle's nose, and landing cushions mounted in the front and rear of the vehicle. In the event of an engine, electrical power system, or command link-failure, the parachute recovery sequence is activated automatically. The vehicle is usually inverted in its descent flight and the forward and rear landing cushions are automatically inflated and deployed to absorb the landing shock.

In the second design, an air bag is stowed under the fuselage of the vehicle. Air escapes from the inflated air cushion through a number of small holes around the ground contact area providing lift to support the vehicle and air lubrication allowing it to remain just clear of the ground. A number of braking pillows attached to the underside of the air cushion are inflated when the brakes of the vehicle are applied. An Australian Jindivik target drone is being fitted with such a Texton Bell designed air-cushion landing system due for flight tests in 1975. Studies carried out by the US Air Force indicate that an air-cushion system could permit the efficient recovery of a vehicle weighing about 5 000 kg using presently available materials and technology.

Some drones are fitted with skids which on the approach run, together with the wing flaps, are positioned down for landing. On touching the ground, a "sting" extended below the main skid rotates on impact and initiates rapid retraction of the flaps.

Like the air-launch system, the mid-air retrieval system (MARS) using helicopters has been increasingly used in the United States since a well performed air operation usually prevents much of the damage caused to RPVs and drones recovered by any of the above methods. In a typical recovery mission, the vehicle is directed into a specified rendez-vous area to be picked up by a helicopter, usually a modified version of the CH-3 or CH-53. Such helicopters have provisions for hooking on to a remotely controlled vehicle and storing it in a lower fuselage bay. Sometimes the recovered vehicle is carried hanging from under the helicopter. As the remotely controlled vehicle approaches the recovery area, a small engagement parachute is deployed first, followed by a larger main parachute. The helicopter approaches the descending vehicle and captures the smaller parachute, the larger one detaching itself automatically. The helicopter then winds up the parachute cord to pull in the vehicle.

Although the United States has been giving priority to air-launch and mid-air recovery methods for drones and RPVs, these have certain economic disadvantages. The US Air Force's experiences indicate that the Lockheed DC-130 launch aircraft and the mid-air recovery helicopters account for something like one-half the costs of unmanned remotely controlled vehicle operations and maintenance.

Recently there has been a tendency to increase the range and endurance of remotely controlled vehicles beyond those achieved by the high-altitude drones used to monitor North Viet-Namese communications which had an endurance of about 60 minutes. Vehicles have been developed with endurances of 24 hours[2] which is roughly two to three times more than those of some of the currently available reconnaissance drones [2]. With such long endurances, air recovery becomes difficult because of the weather changes that can take place over longer periods. Because of such problems, considerable attention is now being paid to designing a vehicle with a conventional runway take-off and landing capability. Some of the newly designed vehicles, therefore, have conventional-aircraft-type undercarriages and incorporate a retractable tricycle landing system. Fixed undercarriages have also been used on the so-called "mini-RPVs" which are being developed for short-range reconnaissance and laser target illumination missions over battlefield areas.

The development of a suitable method of recovery which reduces the attrition rate of an unmanned vehicle is one attempt to increase the survivability of such vehicles. However, survivability of a drone or an RPV on a mission in a hostile environment poses very different kinds of problems. Some of these problems and their solutions are discussed below.

Survivability

The survivability of an RPV or a drone depends very much on whether it can be detected or not by optical methods—both in the visible and infrared range—or by radar. It is important that the more sophisticated vehicles designed to fulfil complex long-range, high- and low-altitude long-endurance missions such as photographic and electronic reconnaissance are recovered, since the cost of the complex systems aboard rules out one-time use. Short-range, low-altitude vehicles used for photographic reconnaissance and for battlefield surveillance and laser target designations for strike aircraft also fall into the group of vehicles which need to be recovered. There are, however, vehicles—mainly drones carrying chaff-dispenser pods, electronic jammers, mines or remote sensors—which also act as decoys with sufficient radar augmentation to appear as fast tactical fighter squadron or bomber sorties on an enemy radar screen. These are expendable and no care is taken in their design to minimize their detection.

The size of an unmanned remotely controlled aircraft is small (the largest RPV manufactured by Teledyne Ryan in the United States is 11 metres long with a wing span of about 25 metres and a body diameter of 0.8 metres) so that its detection by optical (in the visible range) or radar means is difficult. In addition, its engine is designed to prevent detection by infrared means. In

[2] Such vehicles are designed to fly at altitudes of between 15 km and 20 km. The lift-to-drag force ratio for these vehicles is 30:1 and the normal cruising speed is between Mach 0.5 and 0.6.

order to shield the engine exhaust and, therefore, prevent the detection of the vehicle by a ground detector, the jet engine is placed on top of the aircraft at the junction of the wings and the fuselage. This technique makes it more difficult for infrared tracking devices to detect the hot exhaust. Moreover, the engine and its fuel are treated to minimize infrared emissions in the spectral band where the enemy's electro-optical detectors operate. It is possible to burn the fuel at very high temperatures so that the infrared region is avoided and the detection of infrared radiation emitted by the engine wall when it cools can be minimized by shielding the latter with insulating sleeves consisting of layers of stainless steel [3]. Once the vehicle is detected by visual means, it is vulnerable both to a heat-seeking air-to-air missile launched from above the vehicle or to a ground-launched heat-seeking missile. A further advantage of mounting the jet engine above the vehicle is that the engine's air-intake system is masked from the hostile radar. The detection of drones and RPVs by radar can be further hindered by a suitable choice of construction material. For example, plastics have an advantage over metals since they are transparent to radar. However, the problem is rather more complicated since the equipment within the vehicle would be seen by radar detectors and this would appear to the detector considerably larger than it is. The tendency, therefore, is to compromise and use as little metal as possible. Where metal is used, it is carefully shaped to give minimum radar signature. Thus the surfaces of the vehicle are made as smooth as possible so that they do not act like corner reflectors returning radar energy to a ground detector. The base of the fuselage is usually made flat so that only radars illuminating the fuselage from directly beneath it are likely to see it. Ground surveillance radar would have to be searching the sky directly above itself when the vehicle is in level flight to detect it. However, by this time, the aircraft would be travelling away from the radar at high angular velocity thereby complicating tracking and delaying counteraction.

Wings made from plastic or other non-metallic materials such as fibreglass are often used to make them transparent to radar. Where metal is used, it is coated with non-ferrite radar-absorbing material to minimize the radar signature. Epoxy resins and fibres with high-strength metal alloys may also be used because of their inherently low radar signature. Current development programmes are under way using a variety of approaches in the construction of RPV and drone airframes based on new materials such as boron and graphite composite structures. The more exotic airframes being studied include the use of cardboard honeycomb and even an inflatable structure.

Guidance systems

In order for a drone or an RPV to perform its reconnaissance or weapons-delivery task satisfactorily, it is essential that it is guided accurately. The position and velocity of an RPV or a drone, with respect to a target, as a function of time, are the basic parameters required for their guidance. Systems which generate this information are called guidance systems and fall into two groups, those which operate from within the vehicle, such as an inertial guidance system and those which need instruments both on board the vehicle as well as in either a ground station or a satellite. In the latter case, systems such as a television camera or a radio guidance system are used.

These systems can either be used separately or in some combination depending on the type of drone or RPV and its particular application. The basic principles of some types of these guidance systems are briefly discussed below.

Inertial guidance systems

One advantage of the inertial guidance system is that it is entirely self-contained and mounted within the vehicle. There are none of the line-of-sight limitations or propagation disturbances found in radar guidance nor is the system dependent on clear weather for star sightings. No radiation to or from the vehicle is needed so that it is free from jamming[3] and other interferences. The basic elements of an inertial guidance system are a device for attitude reference, an accelerometer, a clock and a computer.

The attitude reference system is usually a mechanical device carried within the vehicle whose function is to establish a frame of reference to determine the vehicle's direction. At the beginning of the flight the device is set at some known orientation and during the flight it either maintains this orientation or is rotated in a known manner relative to it. The heart of such an attitude reference system is a gyroscope which usually consists of a spinning mass such as a wheel or a sphere. It utilizes the angular momentum of the spinning mass to sense angular motion of its base about one or two axes orthogonal to the spin axes.

Several types of gyroscopes are currently used. In its simplest form, a single-degree-of-freedom gyroscope consists of a spinning wheel mounted in a single gimbal. The problem with such a design, however, is the drift caused by the torque imparted to the suspended wheel by the gimbal bearings. Errors due to drifts are considerably reduced in improved designs in which a spinning sphere is supported either by an electrostatic or a magnetic field. In another design, lasers are used instead of the conventional spinning mass. Such a gyroscope was first demonstrated in 1963. The lack of rotating and other moving mechanical parts gives a laser gyroscope considerably longer life than the conventional gyroscope. One of the latest Honeywell models, designated GG-1300, has been in operation more than 6 000 hours without failure or degradation [4]. This laser gyroscope has two

[3] Jamming is defined as the generation of high-power broad-band noise to interfere with the electronic system of the drone or RPV.

neon laser beams which circulate in opposite directions along a triangular path [5]. As long as the ring remains stationary, both contra-rotating beams travel identical path lengths. But if the ring is mounted on a platform which is rotated about an axis perpendicular to the plane containing the laser beams, the beam rotating in one direction will have a slightly greater distance to travel before returning to its point of origin and the beam travelling in the opposite direction will have a slightly shorter distance to travel. This results in the Doppler frequency shift. For any given laser gyroscope configuration, this frequency shift is proportional to the rate of its rotation. Although laser gyroscopes have many advantages, they are relatively inaccurate since they have a drift rate of 0.05–0.10 deg/hr compared with the drift of about 0.002 deg/hr for accurate mechanical gyroscopes.

Recently it has been suggested that instead of using lasers in a gyroscope of the above design, sound waves could be used. Such an instrument is being developed by the Air Force Cambridge Research Laboratory in the United States [6]. The device would use contra-rotating acoustic waves operating at a frequency of about three GHz. The advantages of such an instrument would be that it could be made much smaller and at much lower cost than a ring-laser gyroscope.

Gyroscopes are used in inertial guidance and navigation systems to establish a stable platform or measuring point within a drone or an RPV. Three gyroscopes are mounted on the platform with their axes at right angles to each other so that each can measure movement in one of the three directions of movement of the aircraft—roll, pitch (up and down) or yaw (left and right). All motion can be measured in one or a number of combinations of these directions.

The second component of an inertial guidance system, the accelerometer, measures, with the aid of a clock, the velocity and position of the vehicle. The velocity is measured by integrating the measured acceleration by the accelerometer and, with the aid of the clock, the position of the vehicle is then calculated.

The last of the components of an inertial guidance system, the computer, has several functions. Once the inertial system is activated, the platform is aligned precisely to a predetermined plane and held to it by the combined action of the three gyroscopes, irrespective of the movements of the vehicle. The changes in the alignment of the platform are detected by the gyroscopes which activate gimbal motors which in turn exert corrective forces to return the platform to its stable position. Measurements of these corrective forces are calculated by a high-speed digital computer, thereby keeping a precise account of the vehicle's direction of flight and altitude. The output from the accelerometer is also fed into the computer which can combine all the data on changes in direction, speed and time with the known starting point, so that the state of the aircraft is known precisely at all times.

Optical guidance systems

Two types of optical systems are envisaged: one in the visible range using a television (TV) camera and the other in the infrared (IR) region using IR detectors. The latter system could be most effectively used either for night-time flying or for flying over heavily camouflaged target areas. Such systems are mainly confined to reconnaissance work rather than to the guidance purposes discussed here.

Concentrated efforts have been made to develop small TV cameras and communication systems free from enemy interferences. One development, near completion, is a return-beam video camera capable of producing high resolution images (of a resolution which is better than the conventional domestic television set by a factor of ten). Together with such a camera, the system consists of an ordinary TV camera for guidance and—perhaps the most important part of the system—the radio data link which provides two-way communication on a broad-band width so that detailed visual information can be transmitted from the vehicle to the ground station without being jammed by the enemy. Guidance instructions to the vehicle can be given over radio channels. Such a system, installed particularly on vehicles carrying weapons, would allow the remotely situated pilot to assess the combat situation and the target visually and to guide the vehicle accordingly. Accurate pinpoint bombing would become possible under almost all weather conditions and if low-light-level TV cameras were used, attacks even during moonlit nights would be feasible.

A more ambitious RPV project is to use the vehicles in the air-to-air combat role. The remote pilot in the ground control station would fly the vehicle with a TV screen as his primary source of information. The transmission of TV signals without interference is already difficult, but its extensive use in a combat RPV would demand even greater sophistication. If a system requires exchange of information between the RPV and the ground controller, a wide-band data link to handle video, infrared or radar information would be necessary, whereas for command and control functions a narrow band link could be used. The latter is more easily protected from jamming and other interferences but for a wide-band data link, anti-jamming devices become necessary. If increasing numbers of such devices are used, the system becomes very expensive. The question then arises: does a man need to fly the RPV continually or does he simply supervise a largely self-contained capability to reach the target? At present it is possible that during the major part of an RPV's flight the navigation is carried out by a self-contained on-board inertial system while TV can be used to bring the RPV precisely over the target. The landing and take off may also be carried out using the TV guidance system.

Radio guidance and navigation systems

For long flights, a small error in the flight at the beginning may become quite large by the time the vehicle nears its destination. With most inertial guidance systems, such errors are introduced because of the so-called gyroscope drifts. Radio guidance techniques do not suffer from such problems so that they are well suited for applications where long flights are involved. However, for a radio guidance system to generate correct steering signals, the spatial altitude of the vehicle must be known. The data for altitude control are usually generated by gyroscopes mounted on board the vehicle.

The basic measurements that can be made with a radio guidance station are three, namely, range, velocity and direction of the vehicle relative to the guidance station. These measurements are made when the vehicle radiates an appropriate signal either by carrying a radio transmitter or, in the case of a radar system, by reradiating a part of the incident energy as a reflected signal.

For measurements of range, the basic principle used is that the distance to and from the vehicle is proportional to the phase lag of the waveform as received with respect to the transmitted waveform. For a drone or an RPV this technique depends upon a transponder (a combined receiver and transmitter) on board the vehicle which will amplify the received transmission, usually doubling its frequency, and reradiate it to the ground station where it is compared with twice the original transmitted frequency.

Velocity is measured by the rate of change of the phase shift of the received signal, that is by the equivalent Doppler frequency shift. Therefore, range measurements separated in time provide the basis for velocity determinations.

Two methods are available for the measurement of the direction of a vehicle, both based on the direct radio frequency measurement techniques. The first method uses a scanning process similar to radar tracking with directional antennae. Alternatively a triangulation method using multiple radio receivers can be used. An advantage of this latter method is that the vehicle need only carry a radio beacon, thus avoiding the necessity of interrogation from the ground station. The amount of pay load necessary is also reduced. Major disadvantages of such systems are (*a*) that at least two receiving stations are needed to give a unique fix, and (*b*) that the accuracy depends on the relative positions of the receiving stations.

Several radio navigation systems are available which include LORAN (LOng-RAnge-Navigation), LORAN C, Decca, Omega and VLF (Very-Low-Frequency). Although these systems have basic differences, each can be classified as either hyperbolic or rho-rho. In a hyperbolic navigation system, the difference in the distances to two transmitting stations are obtained by measuring the phase difference between the signals from two stations. In a rho-rho system the distance or change in distance to two stations is obtained by measuring the phase difference between the transmitted signal and an on-board frequency standard.

The US Air Force is currently attempting to improve the navigational accuracies particularly of the Strategic Air Command's low-altitude photographic reconnaissance vehicles. This is in order to reduce the chances of missing ground targets falling outside the narrow field of view of the vehicle's cameras during low-altitude missions due to navigational inaccuracies. Radio navigation systems, which include hyperbolic systems such as LORAN and LORAN C are therefore used to guide and navigate RPVs. Such systems permit navigation over a range of several hundred miles with accuracies of less than one hundred feet [7]. Of the disadvantages of the LORAN system, perhaps the most serious are its vulnerability to homing missiles and the risks of jamming of its signals. The use of on-board computers reduces the necessity of data links en route to the target area but this does not eliminate completely the risks of jamming. To reduce such risks, use of very narrow widths for data link is made.

III. *Application of RPVs and drones*

Once the guidance and control technology for use with drones and RPVs has been perfected, and this technology has already reached a degree of considerable sophistication, the number of applications to which such aircraft will be put will also increase. The present state of the development of these vehicles is such that they can now probably be used in almost the complete spectrum of military missions. The potentials of drones and RPVs have already been demonstrated in Viet-Nam where they were used extensively for photographic reconnaissance and electronic warfare missions. A broad spectrum of missions, ranging from reconnaissance and electronic warfare to aerial defence and tactical strikes is being envisaged. In the following sections some of these applications of drones and RPVs and their present capabilities are briefly described.

Reconnaissance and surveillance

The use of drones for reconnaissance missions was prompted by the desire to avoid the problems confronting manned flights. One of the problems with such missions, whether airborne or seaborne, was, of course, the interception and capture or destruction of aircraft by the enemy resulting in international incidents. The political impact of operating and even losing an unmanned reconnaissance drone is considerably less than the involvement of a manned aircraft.

The RPV study carried out by the US Air Force System Command and

RAND Corporation in 1970 envisaged the use of drones and RPVs for reconnaissance, battlefield and ocean surveillance missions. Such missions began with the use of drones, but as RPV avionic systems are developed, these aircraft will be increasingly used for reconnaissance missions. One of the first incidences of the actual use of reconnaissance drones was in early 1965 when the People's Republic of China displayed wreckages of three drones which were shot down over its territory. It claimed to have destroyed eight such vehicles by mid-1965. These reconnaissance drones, type 147, were manufactured by the US company Teledyne Ryan and they were operated by the US Strategic Air Command Unit at Bien Hoa in South Viet-Nam [8]. The use of drones to monitor military activities on the mainland of China and North Viet-Nam began as early as 1964. Although flights over China have been stopped, they are still continuing over North Viet-Nam.

Reconnaissance missions include low-altitude (450 metres), medium-altitude and high-altitude (18 000 metres) photographic reconnaissance as well as TV monitoring. Sensors on a vehicle may consist of photographic cameras with focal lengths of from 76–610 mm depending on the altitude at which the camera is used. Television equipment is also used to obtain information in real-time by transmitting reconnaissance pictures to an airborne receiving station over a range of at least 240 km. The aircraft also carries infrared sensors, radar-equipment and low-light-level TV cameras for night operations.

Infrared energy has been used extensively for reconnaissance. The technique is based both on passive and active infrared detection methods. A passive system utilises the fact that different objects at different temperatures emit characteristic infrared radiation—the temperature of the object determining the wavelength of the emitted infrared radiation. The active infrared system is based on the fact that surfaces of objects vary in their response to electro-magnetic radiation. Each object has a characteristic reflectance for infrared radiation. Specially sensitized films capable of responding to infrared radiation are used to record information which is not normally visible to the human eye. Infrared film used in aerial cameras is produced in both black-and-white and colour, the latter being known as false colour film. With such infrared colour film techniques, the detection of, for example, objects which are camouflaged, is simplified.

As well as using conventional cameras to take infrared photographs, line-scanning systems are also installed in drones and RPVs. An infrared detector views the ground through a system of rotating mirrors and by scanning small strips of the ground in succession, it builds up a picture of the terrain over which the vehicle is flying. Such a line-scanning system produces high definition pictures but it is used primarily at low altitudes to observe small areas in detail since the area of the ground scanned is small. An advantage of the system is that its output can be transmitted to the ground in real-time. Since the use of such infrared scanning systems depends on the detection of radiation emitted by different objects, it is important that the objects of interest have different temperatures from each other and from the surroundings, otherwise they would be indistinguishable.

A radar system, on the other hand, is an active sensor system since its operation depends on it emitting radiation and detecting part of the radiation which is reflected back from the objects on the ground. Because of this, an enemy can obtain prior warning of the presence of the reconnaissance vehicle carrying a radar sensor system. Considerable effort has been devoted to the development of so-called side-looking radars which scan to the side and directly beneath the vehicle. Side-looking radar produces a high definition radar image at both high and low altitudes and can be used effectively by day and night. Such systems can be operated under almost all weather conditions, the only constraints being extremely heavy rain which can attenuate the reflected radiation, particularly if short wavelengths are used for maximum resolution.

A number of other applications, for example, signal intelligence and ocean-surveillance missions, have been envisaged for drones and RPVs. If the high-altitude long-endurance unmanned vehicles become available at low cost, the US Navy has shown an interest in the use of such aircraft for sea surveillance, particularly in the Mediterranean where the possibility of using RPVs fitted with radar for maintaining fleet surveillance has been investigated [9]. A drone could carry a side-looking radar which combined with high altitude would permit the vehicle to perform reconnaissance along the periphery of sensitive areas without having to penetrate.

It is also envisaged that drones will be used for the detection and location of electronic signals from a foreign territory. The US Air Force, for example, plans to substitute high-altitude drones for Boeing RC-135 aircraft for signal intelligence over the Artic Ocean area near the Soviet Union's northern missile test site [10]. The detected signals, which are transmitted to a ground station to be analysed, are often communication signals. The location of signal emitters would be determined by using three drones as a long baseline airborne system. The times of arrival of signals from various emitters are measured at different points. By locating the aircraft precisely with respect to one another and measuring their distances to a ground computer terminal, the emitters could be located with extreme accuracy. The time-of-arrival drone could then direct strike aircraft or stand-off weapons against these targets by using distance-measuring techniques [9].

An important role of drones in battlefield reconnaissance is as tactical communications relay systems. Long-duration drones could, for example, be used to relay communications from ground forces to improve command and control functions. Larger manned aircraft used for this role are not only costly, limiting the numbers available, but they usually require the protection of fighter aircraft.

Use in electronic warfare and as decoys

Highly sophisticated and costly RPVs will essentially be used for aerial reconnaissance, interdiction and air-to-air combat. It is, however, envisaged that the low-cost drones could be used for missions which require low-level penetration of high-threat areas for chaff seeding, electronic jamming and for planting sensors on enemy territories.

Chaff is the simplest and cheapest of the electronic countermeasures and consists of a large number of fine metal strips. These, when released from a drone, fall in a cloud which, when illuminated by a radar beam, appears on a radar screen as an echo since some of the radar energy is reflected back by the metal strips. If a large number of such metal strips are used, they appear on the radar screen as a solid object. This is particularly useful against tracking radars associated with guns or missiles because a suitable chaff bundle can have a greater echo area which could attract the enemy radar beam from a strike aircraft.

With radar augmentation, drones could themselves be used as decoys. These could be ground-launched in numbers to appear as a speeding tactical fighter squadron or bomber sorties on a hostile radar screen. The chances of the enemy committing his aerial defence missiles on the unmanned drones would be substantial, allowing, after exhaustion of the enemy's defences, a strike force to penetrate the defences and hit primary targets.

Electronic jamming devices carried on board a drone could be dropped near enemy radar sites so that such jamming devices would degrade an enemy's early warning and acquisition radar and radar-directed anti-aircraft weapons. Moreover, drones could carry target markers and homing beacons. Sensors could be dropped covertly to monitor activities along, for example, a road or potential missile sites so as to increase the strike effectiveness of manned fighter aircraft.

Such missions as RPV or drone decoys and some electronic warfare require the use of a large number of vehicles. At present, missions are confined to using single vehicles since the command and control techniques needed for operating multiple drones or RPVs simultaneously are not yet fully developed.

Strike and air combat drones and RPVs

One of the missions for which the development of RPVs is being pursued with considerable enthusiasm is the air strike and combat mission. In 1971, the US Air Force demonstrated the capability of an RPV when, in a test flight, the RPV outflew a manned fighter aircraft. In another test, an RPV successfully engaged in dogfights with the US Navy's F-4 Phantom aircraft and escaped two types of air-to-air weapons. The RPV was able to execute 6-g turns with minimum loss in its altitude and in fact was eventually in a position to attack the manned aircraft [11]. Furthermore, in 1973, an RPV penetrated the Terrier missile defence of the frigate, the Wainwright [12]. The strike capability of such vehicles was first demonstrated in 1971, when DC-130-launched strike drones fired single weapons such as Maverick or Shrike air-to-surface missiles [13]. These tests showed that the air-to-surface missiles launched from an RPV can acquire and destroy such targets as radars, control vans and bunkers. This one weapon delivery per flight, is achieved by releasing an inert weight from beneath one wing as the strike weapon is fired from the other wing to forestall asymmetrical wing loading.

The next development for RPVs is to acquire a multiple weapons capability. This is to be achieved by increasing the surface areas of the control surfaces so that the vehicle can carry asymmetrical payloads. Such an improvement would enable the remote pilot to release the weapon against a target and, by means of a TV camera on board the vehicle, the destruction of the target can be checked. If this attempt to destroy the target is unsuccessful, the RPV can be directed back to the target for another attack.

The second mission for which RPVs are being developed is the air-to-air combat mission. The vehicle would be equipped with an interceptor sensor system and television camera to enable a remote pilot, situated either in an aircraft or on the ground, to seek out and engage the enemy aircraft in battle [14]. In such a vehicle, the use of missiles as well as aerial guns have been considered [15].

It is also planned to equip strike drones and RPVs with target-acquisition as well as target-designation equipment. Target acquisition is achieved with TV cameras, whereas a laser beam aligned with the stabilized line-of-sight of the TV camera designates targets for self-launched laser-guided weapons or those released from other aircraft or fired from the ground. Stabilization permits the field of view of the camera to be narrowed and magnification increased so that the target acquisition is improved [16].

IV. *Present and future development of drones and RPVs*

The present state of drone/RPV technology is such that they are capable of performing such key missions as low- and high-altitude photographic reconnaissance, electronic reconnaissance and electronic warfare missions. Strike and combat capabilities have also been demonstrated. There are three directions in which actual development is either in progress or plans for development exist despite current restraints on funding, particularly in the United States. Some of these include development of high-altitude, long-endurance surveillance RPVs, the development of a new avionics system such as accurate navigation aids and eventually the development of low-altitude multipurpose RPVs capable of performing any of the three tactical RPV missions, namely weapon delivery, electronic warfare and photographic reconnaissance.

Vehicles used for high-altitude long-endurance surveillance are expected to carry 318 kg of sensitive electronic receiving and recording equipment on missions of up to about 30 hours duration. The speed and the altitude of such vehicles are expected to be about Mach 0.5–0.6 and 15–21 km respectively [17]. A prototype RPV made its maiden flight for just under two hours at a maximum altitude of about 7.5 km and at a speed of about Mach 0.3 and a 24-hour endurance test flight at an altitude of about 17 km [2, 18]. The vehicle is designed to take off and land using conventional runway techniques.

The purpose behind the development of a new avionics system is to increase the navigational accuracy of the existing low-altitude photographic reconnaissance drones as well as to meet the needs of the future. The present system uses a LORAN prime navigational system with a digital processor. An alternative system is also developed as a back-up system known as TERCOM (TERrain COntour Mapping). This technique involves a comparison of terrain profile data observed by the RPV with profile information stored in the vehicle's computer memory in order to determine the vehicle's position. The application of such a guidance technique is not confined to RPVs but can also be used in cruise missiles and ballistic missile re-entry vehicles. The technique can be used either as a means of updating, from time to time, an inertial or Doppler navigation system, or to provide continuous guidance on its own.

TERCOM requires previous knowledge of the terrain contour characteristics for the area over which the RPV flies. This can be obtained from stereo aerial photographs of the terrain using presently available techniques. During the vehicles' flight, the TERCOM system measures the vertical contours of the terrain, using, for example, a radar altimeter to measure clearance above terrain and a barometric altimeter to provide a reference. By subtracting the instantaneous radar-measured altitude from barometric altimeter readings, TERCOM determines the terrain contours. The comparison of these values with the computer-stored values fixes the vehicle's position. In a typical magnetic tape storage, the terrain contours of 40 000 square miles of land mass can be stored. This means that coverage of a ten-mile-wide swath of land extending for 4 000 miles is possible. For guidance over water, a similar technique (MAGCOM) based on matching the Earth's magnetic field contours is used [19].

As regards the third development, the multipurpose RPV, it is planned to design the vehicle so that it would be possible to change an engine readily, replace avionics or reconfigure the vehicle from one type of mission to the other by substituting the appropriate avionics and sensors. It is expected that the payload for the RPV would be about 110 kg—sufficient, for example, for either day or night target acquisition sensor, laser designator, real-time wide-band data link and related avionics required for strike missions. This presumably means that it is possible to reduce the weight of the equipment carried by multipurpose RPVs since the Teledyne Ryan BGM-34B RPV contains a low-light-level TV camera and a stabilized laser designator/receiver system which weighs 113 kg. A typical strike drone may consist of a day-time-TV camera or night-time forward-looking infrared sensor and laser equipment. For an electronic warfare mission, the payload may consist of electronic countermeasures, jammers and on its two wings, chaff pods.

For survivability, such RPVs would rely on a low-altitude, relatively high speed as well as their low detection by visual, radar and infrared means. To reduce detection even further, particularly in battlefield surveillance and target designation missions, it is planned to use electric motors to power the RPVs. These are clean, leaving little visible signature and they produce very little noise (only 74 db at about 3 metres) so as not to betray the vehicle's presence at low altitudes [20].

One of the more significant new developments in RPV technology is multiple-RPV control avionics. It is often argued that in a hostile environment, it is necessary to deploy large numbers of such vehicles at a time. In such circumstances it is necessary to have a very sophisticated avionics system so that the vehicles do not interfere with each other. At present, a single pilot directs only one RPV. Currently, in the United States, the development of a multiple RPV Control System, designated CDRS (Control and Data Retrieval System), is underway and one company has already developed a system coded MRCS (Multiple RPV Control System). In such a system eight remotely located pilots would handle some 20–25 RPVs as they fly to a target area. Except for the attack phase, an en-route controller would direct up to six RPVs. Once the target is reached, an individual pilot would take over terminal guidance for each vehicle. During this phase, the other RPVs would loiter. After completing the mission, the RPVs would be regrouped and guided back to base.

One of the main problems in realizing such a system is the transmission of all the information to and from RPVs, jam-free and antispoof.[4] Two methods have been developed to minimize jamming. In one, the pseudo-random noise method, a noise pattern is generated across the whole frequency band which hides an elaborate waveform that is known only to the transmitter and the receiver. The latter knows how to extract the signal from what appears as only noise to an enemy. The second method, fast-frequency-hopping, also uses a wide-band width but instead of generating a considerable noise across the whole band, intense spikes are created that jump in patterns across the band. In order to counter such transmissions,

[4] Spoofing is defined as copying the signals from the attacking RPV and sending them back to confuse the attacker.

the enemy must jam across the whole spectrum. These methods appear to be quite effective in getting commands to vehicles without interference [7].

Finally, another development which is very important is that of the so-called Mini-RPVs which have a wing span of about three metres. Mini-RPV programmes have explored the technical feasibility of using small RPVs for missions such as battlefield photographic and electronic reconnaissance, laser designation of targets for attack by other weapons and also possible Kamikaze-type attack missions. The use of such vehicles for delivering weapons has also been investigated.

Prototype vehicles fitted out for two different types of missions, day and night, have been built and are being evaluated [21, 22]. Such vehicles would be launched from rails by compressed air and recovered in a net or by conventional landing methods. The gross weight of such vehicles is no greater than about 60 kg with a sensor payload of at least 15 kg. The aircraft will have an endurance of at least one-and-a-half hours with a range of about 15–20 km.

Among various equipment, the mini-RPVs would carry TV cameras with remotely selectable field-of-view (from narrow field-of-view of three to five degrees to 12–30 degrees) and laser target designators and range finders. The field-of-view of the TV cameras and the line of sight of the laser designator and range finder will be attitude-stabilized. For night missions, forward-looking infrared (FLIR) type sensors would also be included in such vehicles. To assist the remotely situated pilot in keeping the narrow-field-of-view TV sensor and laser designator aimed at the selected target, the system would be provided with automatic target-tracking capability.

V. *Cost of unmanned vehicles*

Excluding target vehicles, two basic types of military drones and RPVs exist today. These are (*a*) short-range, inexpensive, low-altitude vehicles for battlefield surveillance and laser target designators for aircraft, and (*b*) high-altitude, long-range vehicles. The cost of these vehicles will depend considerably on whether the vehicle is air- or ground-launched, whether it is designed for long- or short-range, high- or low-altitude missions. Another factor which influences the cost of such vehicles is whether the vehicle is recoverable and therefore used several times or whether it is expendable and therefore used only once. The cost of the expendable type of vehicle is not expected to exceed $50 000. The concept of the expendable vehicles was evolved for missions such as those performed by tactical forces to penetrate heavily defended areas. These missions require large numbers of aircraft. The technology to build such expendable remotely controlled vehicles is available at present. The cost of such vehicles is low because, for example, less expensive engines which would last for only few hours, can now be built for about $12 000. Moreover, the cost of the avionics is no more than $15 000 per vehicle. The avionics required for such vehicles is simplified because they would not be used to deliver weapons but would only carry electronic jammers and serve as decoys [23].

The long-range, low- or high-altitude vehicles, on the other hand, require complex guidance systems as well as sophisticated and expensive sensors for various missions. This makes recovery of the vehicles necessary if the system is to be economical. The cost is also further reduced if the vehicles are launched using the conventional runway technique rather than air-launched since the latter involves other aircraft and aircrews. The cost, for example, of an RPV on a surveillance mission with a DC-130 launch aircraft and a CH-3 pick-up helicopter is about $14 000 per hour. The cost, on the other hand, of a runway-based RPV can be as low as $1 000 per hour [24]. The present trend is to construct long-range RPVs, which can be ground-launched and recovered. It is hoped that the cost of a low-altitude strike reconnaissance RPV will be kept to about $300 000–500 000 per aircraft [25–26].

The average cost of a modern multi-sensor reconnaissance aircraft, such as the RF-4E, is about $4 million. If an attrition rate of 1 per cent is assumed, for every 1 000 sorties, $40 million are lost. For an RPV costing $500 000, for the same loss, an attrition rate of 8 per cent is obtained. A much higher attrition rate could presumably be tolerated, if the costs of training pilots and manned-aircraft maintenance are taken into account. In terms of the cost to human lives, of course, manned aircraft cannot compete with RPVs.

The cost of the mini-RPVs is even lower. The price of such vehicles when produced in large numbers, is expected to be about $10 000. This includes the avionics payload consisting of a forward-looking infrared sensor, a laser designator in a gyro-stabilized platform and a TV camera [27].

VI. *Some national development programmes*

The construction of short-range controlled drones poses little problem to modern technology. The step from drones to RPVs is short and its execution is only dependent on available electronic engineering. Several countries are engaged in this field. A country with major programmes is the United States. No information is available on the Soviet Union's interest in these weapons. Most countries in Western Europe have concerned themselves mainly with the development of battlefield reconnaissance drones.

In the following sections, the present development and production programmes of drones other than the target drones and RPVs in various countries are considered. These are summarized in tables 12.1 and 12.2.

Belgium

Belgium has developed and built a battlefield reconnaissance system (the Epervier) which consists of a drone with its sensors, a short ramp launcher and a drone control centre. The drone, X-5, is one of a series of X-1 to X-4 drones. The system was initially developed to meet NATO specifications. In early 1971 a cooperation agreement between the Belgian Ministry of Defence and a Belgian company, Manufacture Belge de Lampes et de Matériel Electronique (MBLE) was signed and development continued to a more advanced stage on behalf of the Belgian Army. Production for the Belgian Army was expected to begin in 1973; the initial order is expected to equip one or two platoons, each with 20 X-5s and two launchers.

The drone, with its photographic equipment, is capable of photographing an area of about 150 sq km on average in a single flight. The drone has real-time transmission equipment. The automatic guidance system can be programmed for any of several different surveillance or target acquisition missions including wide area coverage, small area coverage with repeated passes over a single small area or a narrow strip coverage with multiple passes over a selected strip on the ground. The system is limited to ten different commands including altitude changes, camera on and off orders and 90- or 180-degree turns [28].

Canada

The development of the Canadian CL-89 airborne surveillance drone system began in 1961 by Canadair Ltd to provide the forward area field commander with fast, up-to-date visual information on territory within some 70 km radius. In its early stages of development the project was funded on a short-term basis (month-to-month) by Canada and the United Kingdom. In 1965 FR Germany joined in the development of the system, operation of which was carried out under simulated tactical conditions by the tripartite military unit in 1969. With a very high probability of survival against a sophisticated air defence system, the CL-89 can acquire accurate battlefield intelligence using its photographic and infrared line-scanning systems.

The three participating nations shared in the initial production order for 282 CL-89 drones; additional quantities were subsequently ordered by the United Kingdom and FR Germany bringing the total number ordered by early 1972 to more than 400. Production for the Canadian armed forces has ended.

The CL-89 drone system has been evaluated and accepted by Canada, the

United Kingdom, FR Germany and Italy. In 1973 an Italian Army order for the drones worth more than $10 million was announced. These drones will be produced jointly by Canadair and Meteor of Italy.

France

The Aérospatiale R-20 battlefield reconnaissance drone is developed from the CT-20 target drone. The drone carries standard NATO cameras or other surveillance equipment in its nose and in interchangeable wingtip containers. The drone can photograph more than 200 sq km of territory during a single low-altitude flight and the data can be sent back during flight by radio link. Initial testing of the drone was carried out in 1963, and by early 1973 production had reached a total of about 50 drones and was continuing to fulfil an additional order of 33 by the French Army.

A night infrared detection capability is being developed for the R-20 reconnaissance drone used by the French Army. All branches of the French military services appear to be interested in expanding their application of unmanned aircraft. Aérospatiale are interested in high-altitude, long-endurance surveillance RPVs [29].

Federal Republic of Germany

In the Federal Republic of Germany, three projects have been under consideration. One, the so-called Korps-Aufklärungs-Drone (KAD), had reached construction stage but it was cancelled in 1971. What could have been achieved in this project is worth considering briefly since it indicates the state of the art in the country. The reconnaissance drone was designed to be launched from a standard truck and the recovery method consisted of a tip-driven rotor to allow pinpoint landing in a space of only 50 square metres. The range of the drone would have been about 400 km. The KAD would have carried a side-looking radar as well as optical and infrared sensors with real-time transmission facilities [30].

The second project, conducted also mainly by Dornier System GmbH, is the development of a novel, wingless, VTOL unmanned reconnaissance aircraft. The prototype radio-controlled drone, known as the Aerodyne E1, was built in 1971 and made its first flight in 1972. In 1971, Dornier Systems and Hawker Siddeley Dynamics Ltd in the United Kingdom concluded an agreement for the joint development of an unmanned wingless VTOL reconnaissance system.

The Federal Ministry of Defence has shown interest in a recent study proposal by Messerschmitt-Boelkow-Blohm and Dornier on advanced research on RPVs. The proposed study, the third programme, includes items such as target acquisition and weapon delivery systems with the main emphasis on sensors and the development of secure data transmission systems for the control of RPVs. The latter involves anti-jamming technology. The plans include the adaptation of existing manned aircraft to unmanned remotely-piloted applications [31].

While new programmes are still being worked out for the design and production of their own drones and RPVs, agreements with Teledyne Ryan of the United States to produce Firebee drones have been concluded.

Israel

Israel, as far as is known, does not have a production programme for drones and RPVs, but in 1971 they received about a dozen vehicles from Teledyne Ryan in the United States. The drones received are designated 124 I and they are modified versions of the high-altitude drones in the 147 Teledyne Ryan series similar to the vehicles employed by the US Air Force in its electronic intelligence missions. The 124 I drones have been flown in high-altitude reconnaissance missions over Egyptian territory [32].

Recently it has been reported that Israel may acquire mini-RPVs for a number of military missions. The Israelis will order the RPV equipment from at least three or even five US manufacturers. During the Middle East War of 1973 unmanned drones were used as decoys by the Israeli Air Force [33]. There have been unconfirmed press reports that Israel has used drones to deliver air-to-ground missiles against Egyptian missile sites [17].

Italy

In Italy, only one company, Meteor SpA Costruzioni Aeronautiche et Elettroniche, is involved in any significant work on drones. Meteor is developing and producing for all three Italian forces several types of radio-controlled drones in the speed range from Mach 0.5 up to Mach 3 and altitudes from 15 km to 21 km. It is also collaborating with Aérospatiale of France, with Northrop, Beech and Teledyne Ryan in the United States and with Canadair in Canada in the co-production of several types of target drones and reconnaissance drones (USD-1 and AM/USD-501).

Four types of drones are produced by Meteor, namely P.1/R, Meteor P.2, Guyone (Owl) and Guyetto. The first two of these reconnaissance drones are based on Meteor's target drones P.1. The P.1/R was first displayed in 1966. The P.2 drone is larger and is intended primarily for out-of-sight flying but a TV camera and a transmitter can be mounted into P.2 for battlefield surveillance missions. The design of the Guyone (Owl) is based on the US Northrop Ventura Chukar target drone. The drone is modified by Meteor so that it carries new guidance equipment and sensors as well as inflatable bags to cushion the landing shock. Guyetto is a low-cost version of Guyone intended for short-penetration operational use and for training.

Sweden

It has been reported that some development is being carried out by Sweden on a small reconnaissance drone. A prototype, with a speed of about 80 km/hr and containing a small camera, has been tested. The range of the vehicle is limited by how far the operator can see. Some type of automatic guidance system is planned for but no details are available. The drone is designed for battlefield surveillance [34].

The United Kingdom

In the United Kingdom several very small and short-range radio-controlled RPVs are being produced. The applications of these, however, are limited by their payload capabilities (up to about 14 kg) and a visual control range of about 5 km. In order to control the RPV the pilot has to be able to see the vehicle. In 1973, the Ministry of Defence received some proposals for consideration from some British manufacturers for battlefield reconnaissance drones and RPVs. The drone proposed by the British Aircraft Corporation is based on the Teledyne Ryan Firebee drone for which the company has a marketing and manufacturing licence. Hawker Siddeley Dynamics' drone is based on the Dornier System's Aerodyne. The details of the design of the vehicle proposed by Westland Aircraft Ltd are not available.

The fourth design was proposed by Short Brothers and Harland. This design is very different from the normal ones which are based on configurations derived from piloted aircrafts. The RPV is known as the Skyspy. The vehicle basically consists of a central body carrying the engine, fan and fuel tank and a circular duct connected to the central body by support arms from the engine mounting. Small wings protruding down from the duct and a tail-plane connected across the duct provide lift and stability. The wing/tail piece assembly provides pitch control. The major part of the RPV is constructed from fibreglass and reinforced plastic. First announced in 1972, this VTOL RPV was initially conceived for military surveillance missions but now several applications are envisaged. Among the important ones are visual battlefield surveillance, artillery observation, passive and active communications interference, submarine detection, use as a guidance link for surface-to-surface and air-to-surface guided missiles and target designation.

It is envisaged that with use of re-usable and expendable payloads, the range of applications could be extended to include electromagnetic countermeasures, sonar, radar and infrared detection, communications relay and deployment of sensors and decoys, and antipersonnel bomblets and mines. An equipment and payload pod is located on the outer surface of the duct [35].

The United States

In the United States there has been a very extensive programme for the use of drones and at present there is a large programme for the development of new drones and RPVs. [7] Very little has been said about the extent to which drones and RPVs have been and are being used in South East Asia. It is known, however, that over the past nine or ten years, reconnaissance drones have carried out a major part of the photographic reconnaissance missions in that region. Many electronic intelligence missions have also been performed by such aircraft. Some of the major US programmes are described briefly here.

Several operational systems consisting basically of target drones and reconnaissance drones exist in the United States. For a number of years military spending on the production of such vehicles and RPVs and on modification and operation of these vehicles has accounted for as much as $250 million annually. The majority of the funding has, up to now, been spent on the Firebee family produced by Teledyne Ryan, the largest manufacturer of the unmanned aircraft in the country. Ryan's model 147 has been modified to produce a number of RPVs. The designation given by the US Air Force to the Firebee is AQM-34 with different configurations noted by a letter or letters. For example the AQM-34L (SC) is a low-altitude reconnaissance aircraft and the AQM-34R (TF) is a medium-altitude surveillance model; the letters in brackets are from the manufacturer's designation.

The second company after Teledyne Ryan is Northrop Corporation-Ventura Division but this is mainly concerned with the development of target drones. Recently, however, other firms have taken considerable interest in the development and production of unmanned aircraft and these firms include Northrop, Boeing, Lear Siegler, E-Systems, RCA, Martin-Marietta, Philco-Ford and Fairchild Industries. Since Teledyne Ryan remains the main vehicle manufacturer, many of the above-mentioned firms are involved in the development and production of the increasingly complex avionics required for the unmanned vehicles. For example the aim of a programme known as the "Update" is to improve the performance of the Strategic Air Command's reconnaissance system and also add such capabilities as sensor seeding. Lear Siegler is the prime contractor for this and they make use of six stripped airframes and engines of the AQM-34L (SC) vehicles supplied by the US Air Force's Strategic Air Command as test beds. The Update programme also includes the development of a modular system so that the same vehicle can be used for several different missions. Among the important new developments under this programme is one to increase the accuracy of the navigation system so as to improve the low-altitude controllability of vehicles for underflying enemy radars. Under the Update improved LORAN navigational system, the TERCOM system and digital computers are being developed.

Other systems in the improved electronics packages include a modified Teledyne Ryan 523 Dopplar radar, a Honeywell AN/APN-194 radar altimeter, a two platform altitude and wading reference system and a Sperry Univac Command Guidance system which is to be used mainly during the recovery phase.

The Update programme is mainly concerned with the development of low-altitude vehicles with mid-subsonic speeds. At the other end of the spectrum are two programmes, the "Compass Cope" and supersonic strike drone. In the Compass Cope programme, the development of a very high-altitude long-endurance reconnaissance vehicle is undertaken. The US Air Force launched the Compass Cope programme allocating $25 million to two firms, Boeing and Teledyne Ryan to build two prototype vehicles. Teledyne Ryan's RPV has already made a successful test flight. The goal of the Compass Cope is to increase the range, endurance and electronic monitoring capability of RPVs beyond that achieved by the high-altitude drones in the earlier "Comsat Dawn" programme. The vehicles in the Compass Cope in both the Teledyne Ryan configuration (US Air Force designation YQM-98A, Ryan model 235) and the Boeing design (YQM-94A) are built using mainly fibreglass.

The Compass Cope is one of several programmes under the Compass designation used by the air force. Other drone programmes are "Compass Arrow," "Compass Bin" and "Compass Dwell". The first study dealt with a high-altitude photographic reconnaissance drone, the AQM-91A built by Teledyne Ryan and the second (Bin) led to the development of the low-altitude AQM-34L system. The third programme (Dwell) is an evaluation programme of possible medium-altitude reconnaissance vehicles for operation in Europe for which two prototypes were contracted, the Martin-Marietta 845A and the E-Systems L450F.

In the programme for a strike drone, the Teledyne Ryan's supersonic BGM-34 drone is used. The airframe is that of a Firebee 2 capable of Mach 1.8. The Ryan's designation for BGM-34 is model 234 and the latest version of this is the BGM-34B. The vehicle has demonstrated its capability for delivering a Maverick missile.

An extension of this is the use of several RPVs at a time. The command and control electronics are essential to the success of such missions. A programme to develop a multiple-RPV control system designated CDRs (Control and Data Retrieval System) is already underway. The contract has been awarded to RCA with Northrop as a major associate contractor, Huge Aircraft with Teledyne Ryan and Sperry Rand Univac division with Boeing and Raytheon. RCA has already developed a Multiple RPV Control System (MRCS) which would use eight remotely located pilots to handle from 20 to 25 RPVs as they fly to a target. Only during the attack phase would an individual controller take over terminal guidance for each plane. During this phase, the other RPVs would loiter.

Another US Air Force programme is the "Constant Angel". This consists of electronic warfare systems involving two types of ground-launched RPVs: a high-altitude Tactical Expendable Drone System (TEDS) which acts as a decoy, and an electronic jamming vehicle. The programme is on a study basis. The most important programme is the Low-Altitude Multi-Purpose System (LAMPS) in which a low-altitude long-range RPV is to be developed.

The US Army's programme is more modest. Its main interest is for short-range, low-speed, long-endurance vehicles to provide battlefield observations and target designation. A number of firms, including Philco-Ford and Northrop are studying very small RPVs (mini-RPVs) for army applications. The range of the gross weights of such vehicles could be as low as 18–115 kg. Northrop, for example, is considering an electrically driven design for an RPV of 20 kg which could carry a 6.8 kg payload. On the other end of the scale, again for army battlefield surveillance use, Northrop is also working on a full-size RPV, the design of which is based on a modified MQM-74 target drone presently being produced by Northrop-Ventura Division.

The US Navy has a programme known as "Project Lookout" under which a low-powered sailing-type RPV for sea surveillance missions is being developed. Fairchild Industries is among the contenders for this ship-launched and -recovered RPV. Also it is expected that more general types of RPVs currently under development for the air force will be used as a part of the navy's sea control weapon system. In this concept a sea control ship will launch several RPVs which will perform surveillance from high altitudes (3 050–15 250 m) several hundred kilometres away from the ship. When a target is identified as hostile, one or more warhead delivery missiles will be launched by the sea control ship. The missile strike will be observed and controlled through the RPVs. The target identification may necessitate moving the RPV closer to the target.

VII. *Conclusions*

There is no doubt that a considerable amount of effort is being put into the development of drones and RPVs. This development was greatly accelerated by the availability of inexpensive and increasingly small, guidance systems. The development of miniature TV cameras has enhanced the ability of a remotely situated pilot to pinpoint the target accurately for bombing. In addition, low-light-level TV cameras have made possible night time combat missions. Apart from such visual guidance aids, constant efforts to improve the accuracies of inertial guidance systems and radio guidance systems have produced systems such as the Singer-Kearfott AN/ASN-90 and the LORAN and OMEGA radio systems. The AN/ASN-90 is a combination of the Doppler and an inertial guidance system which serves navigational as well as attack purposes. It has been reported that the accuracy of the AN/ASN-90 inertial system is such that under test conditions in a civilian aircraft, at the end of a 4 300-km flight, the aircraft was only 8 km off its destination [36].

As far as radio navigation systems are concerned, they are not without their problems. LORAN is vulnerable to missiles whereas systems like OMEGA are not accurate enough [7]. In any case with the combination of inertial systems and satellite and radio navigational techniques, very accurate guidance systems are available.

The result of such accurate guidance and navigation systems no doubt increases the number of applications for which the unmanned vehicles can be used. Among recent and future developments are strike RPVs, carrying multiple weapons, multipurpose RPVs, RPVs for air-to-air combat missions and mini-RPVs. The idea of using an unmanned aircraft to deliver weapons is not a new one, since in 1952 the US Navy had actually employed pilotless radio-controlled aircraft which were equipped with a TV guidance system and which were used against selected bridges in regions of Korea [37]. The development of a multiple RPV control system is already under way. The detection of such vehicles has been made more difficult by reducing the size of the vehicle. Such mini-RPVs are to be used not only for reconnaissance purposes but also for Kamikaze-type attack missions and also for delivering weapons.

The cost of unmanned vehicles depends largely on whether the vehicle is air- or ground-launched, whether it is designed for long- or short-range, high- or low-altitude missions. In order to minimize the cost of operation of such vehicles, current research is directed at designing improved runway launch and recovery techniques. While the long-endurance high-performance RPVs can be relatively expensive, the price of expendable vehicles under consideration is expected to be as low as 10 per cent of the cost of the high-performance RPVs. The cost of the mini-RPV is expected to be even smaller, about 2 per cent that of the high-performance vehicle.

It is sometimes argued that, over the past 25 years or so, the attrition rate in launch and recovery has been more like 10 per cent. If this is true, and it is disputed by some who claim that the attrition rate for drones is less than 1 per cent, then it is argued that such vehicles may not be developed for procurement in any quantity, at least in the near future. However, it was indicated above that with the attrition rate of 8 per cent, the cost of unmanned vehicles is the same as that of manned aircraft. In fact the unmanned vehicle becomes even more attractive when the cost is counted in terms of the life of a pilot.

The applications of drones and RPVs will increase rapidly particularly when the remotely-manned system can perform missions which are too dangerous for a man to perform. A more serious aspect of such weapons systems is that the political constraints imposed on a manned flight outside his own territory are removed. A country can wage a war a considerable distance away without risking the lives of its citizens. Furthermore, military assistance to foreign nations becomes relatively easy since a country's own human fighting force is not involved.

By their nature, drones and RPVs are obvious candidates for use in the automated battlefield [39]. A fully automated battlefield is, however, a concept unlikely to be realized for a very long time to come. In the meantime, as we have seen, RPVs will probably be used in tactical warfare for such purposes as the saturation of air defence systems and so on. Although, at first sight, these uses may appear to have humanitarian advantages, the most likely consequence of the employment of any automated weapons would be to considerably increase the level of violence. The 1973 Middle East War was an example of how violent modern technological warfare has become. The prospect of the use of a very large number of RPVs made possible by their low unit cost, is, therefore a cause for considerable concern.

One positive potential application of RPVs however, would be for verifying arms control and disarmament treaties by national technical means. The advantage of RPVs for this purpose is that their low cost and ready availability could make them suitable for countries unable to afford satellites.

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Table 12.1. Drones[a]

Country	Prime contractor	Designation[b]	Agency	Guidance: Manufacturer	Guidance: Type	Number and type of engine
Belgium	Manufacture Belge de Lampes et de Matériel Electronique Sa (MBLE)	X-5	NATO, Belgian Army	MBLE	Programmed	One St Lucas Type TJ 125 turbojet
Canada	Canadair Ltd	CL-89 (AN/USD-501)	Canadian Armed Forces, British Army, Federal German Army and Italian Army	Canadair	Programmed	One St Williams Research WR2-6 turbojet engine
France	Société Nationale Industrielle Aérospatiale	R-20	French Army	Aérospatiale	At very short ranges, radio-controlled but for long ranges automatically controlled by a gyroscopic platform and an electronic programmer	One Marboré II turbojet engine
FR Germany	Dornier System GmbH	Aerodyne E 1	Federal Ministry of Defence	Dornier	Radio-controlled	One MTV 6022A-3 turboshaft engine
Italy	Meteor SpA Costruzioni Aeronautiche Ed Elettroniche	Meteor P. 1/R	Italian Army, Air Force and Navy	Meteor	For short-range radio command signals and for longer-range pre-programmed guidance system	One Meteor Alfa I engine
	Meteor SpA Costruzioni Aeronautiche Ed Elettroniche	Meteor P.2	Italian Army, Air Force and Navy	Meteor	Radio command	*a*) Meteor Alf[illegible] 3 AQ 4-cylin[illegible] x-type two-stroke air-cooled engin[illegible] or *b*) Alfa 5 8-cylinder two-stroke engine
	Meteor SpA Costruzioni Aeronautiche Ed Elettroniche	Meteor GUFO Gufone (Owl)	Italian Army, Air Force and Navy	Meteor	Radio command and pre-programmed	. .

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eed	Endurance	Altitude	Mission	Types of sensors carried	Status	Launch/ recovery
) km/h	More than 25 min At least 70 km range	305–1 830 m	Battlefield reconnaissance	Omera 130 mm or Omera or Oude-Delft 70 mm day or night camera and SAT Cyclope infrared line-scanner	Evaluation	Ground-launched from a short orientable ramp; booster motor used/ recovery by parachute
proach- g Mach 1	11.5 min	. .	Surveillance and target acquisition	Carl Zeiss KRb 8/24 camera system and Hawker Siddeley Dynamics Type 201 infrared line-scanner	Evaluated	Ground launched from a short ramp/recovery by parachute: a ground homing beacon used to position drone for accurate landing
ıch 0.65	Operating radius at low altitude 160 km	1 000 m (average)	Battlefield reconnaissance	Three synchronized Omera 114×114 mm cameral and a SAT Cyclope 120° field infrared detector	Operational	Ground launched from a short ramp aided by two solid-propellant booster rockets/recovery by parachute
	. .	. .	Reconnaissance	. .	Experimental drone	Vertical take-off and landing
ıximum vel speed 500 km/h	60 min operational radius 100 km	Service ceiling 9 150 m	Reconnaissance	Reconnaissance camera which can be recovered by its own parachute, TV camera	Operational	Launched from zero-length ramp aided by a Meteor 8785/Z solid-propellant booster rocket/recovery by conventional parachute system
	Combat radius of 100 km	13 000 m with engine *a*) or 8 000 m with engine *b*)	Battlefield reconnaissance	TV camera and transmitter	Operational	Launched from zero-length ramp aided by a Meteor 8785/Z solid-propellant booster rocket/recovery by conventional parachute system
km/h ıaximum)	Range up to 200 km 60 min	10 670 m	Tactical reconaissance	Variety of infrared sensors and cameras using 50, 70 or 75 mm film	Operational	Take off supplemented by two Meteor 8785/CNS solid-propellant boosters/ recovery by conventional parachute

Country	Prime contractor	Designation[b]	Agency	Guidance: Manufacturer	Guidance: Type	Number and type of engine
	Meteor SpA Costruzioni Aeronautiche Ed Elettroniche	Meteor GUFO Gufetto	Italian Army, Air Force and Navy	Meteor	Pre-programmed and radio-command	. .
USA	Bendix Co. (Aerospace Systems Division)	Bendix LAST (XBQM-8D and XBQM-8F)	US Army and Navy	Bendix	Radio command/radar altimeter	One Bendix ramjet
	Gyrodyne Co. of America	Gyrodyne QH-50D (helicopter)	Navy/Army	. .	Radio command	One Boeing T50-Bo-12
	Teledyne Ryan Aeronautical	Model 147 NA [AQM-34G (NA)]	USAF/TAC	TRA	Programmed and command	One CAE J69-T29
	Teledyne Ryan Aeronautical	Model 147 NC [AQM-34H (NC)]	USAF/TAC	TRA	Programmed and command	One CAE J69-T29 turbojet engine
	Teledyne Ryan Aeronautical	Model 147 SRE [AQM-34K (SRE)]	USAF/SAC	TRA	Programmed and command	One CAE J69-T41A turbojet engine
	Teledyne Ryan Aeronautical	Model 147 TE [AQM-34Q (TE)]	USAF/SAC	TRA	Programmed and command	One CAE J100-CA-100 turbojet engine
	Teledyne Ryan Aeronautical	Model 147 TF [AQM-34R (TF)]	USAF/SAC	TRA	Programmed and command	One CAE J100-CA-100 turbojet engine

[a] Data which are not available are indicated by . . [b] Military designations are shown in brackets.
Source: See references [17, 38].

rformance						
eed	Endurance	Altitude	Mission	Types of sensors carried	Status	Launch/ recovery
	About 60 min	. .	Tactical reconnaissance	. .	. .	Take off supplemented by two Meteor 8785/ CNS solid-propellant boosters/recovery by conventional parachute
ıch 2.5	46 km range	Minimum 61 m and more than 1 575 m	Chaff or flare dispensers and ECM jammers	. .	. .	Surface launched with the aid of two-stage solid-propellant booster/mid-air recovery by parachute (for XBQM-8F) and helicopter
3 km/h	103 min	4 875 m	Antisubmarine warfare, communication and reconnaissance	Cohu TV and film camera Korad laser target designator and range-finder	Evaluation	
	. .	. .	Low-altitude reconnaissance, radar jamming with ALE-2 chaff dispenser	. .	Operational	Air launched from DC-130 Hercules/ parachute recovery by CH-3 helicopter
	. .	. .	Medium-altitude combat Angel chaff dispenser, noise jammer and alternatively low-altitude photo-reconnaissance	. .	Operational	Air-launched from DC-130 Hercules/ parachute recovery by CH-3 helicopter
	. .	. .	Low-altitude photo-reconnaissance with day/night capability	. .	Operational	Air-launched from DC-130 Hercules/ parachute recovery by CH-3 helicopter
	. .	. .	Medium-altitude *Combat Dawn* signals and electronic intelligence collection (SIGINT and ELINT)	. .	Operational	Air-launched from DC-130 Hercules/ parachute recovery by CH-3 helicopter
0 km/h	. .	More than 18 300 m	Improved high-altitude *Combat-Dawn* SIGINT and ELINT	. .	Operational	Air-launched from DC-130 Hercules/ parachute recovery by CH-3 helicopter

Table 12.2. Remotely piloted vehicles[a]

Country	Prime contractor	Designation[b]	Agency	Guidance: Manufacturer	Guidance: Type	Number and type of engine
UK	Short Brothers and Harland	Short Skyspy	Ministry of Defence	Short Brothers and Harland	Pre-programmed and radio-controlled	One small two-cylinder horizontally-opposed Hirth engine
USA	Boeing Aerospace Co.	Boeing *Compass Cope B* (YQM-94A)	USAF	Sperry Flight Systems and Univac Division of Sperry Rand	Radio-controlled and redundant	General Electric J97-GE-100 turbojet engine
	Developmental Sciences Inc. (Aerospace Technology Division)	DSI RPA-12 Sky Eye	. .	DSI	Radio-controlled	One 101A McCulloch
	Developmental Sciences Inc. (Aerospace Technology Division)	RPMB (Remotely piloted mini blimp)	. .	DSI	Radio command	One Kohler
	E-System Inc.	L450F (XQM-93)	Army	. .	Programmed/ radio controlled	One Pratt & Whitney PTGA-34 turboprop engine
	Fairchild Space and Electronics Co.	Black Fly	USAF	Babcock	Radio command	One McCullock Mc 101
	Fairchild Space and Electronics Co.	Dragon Fly	DOD	Kraft	Radio command	One McCullock Mc 101
	Fairchild Space and Electronics Co.	Look-Out	Navy	Kraft	Radio command	One McCullock Mc 101
	Fairchild Space and Electronics Co.	RPAODS	Army	Vega	Radio command	One McCullock Mc 101-AA
	Lockheed Missiles & Space Co.	Aequare	USAF/ARPA	Lockheed	Radio command	One Hirth two-stroke piston engine

rformance						
eed	Endur-ance	Altitude	Mission	Types of sensors carried	Status	Launch/ recovery
) km/h naximum)	1.5 h	1 825 m with the small engine (60 hp) but 6 100 m with a bigger engine (110 hp)	Battlefield reconnaiss-ance and surveillance and general-purpose mili-tary vehicle	TV camera, optical camera etc.	Prototype built	Vertical take-off and landing
ıch .5 to 0.6	30 h	21 340 m	Very high al-titude long range photo-graphic and electronic surveillance	TV camera, details of other operational equipment classified	Prototype	Conventional runway tech-nique
7 m/h ıaximum vel peed	6 h at 102 km/h	3 962 m	Surveillance	. .	First test flight in April 1973	Conventional runway tech-nique
4 m/h	24 h	. .	Surveillance	. .	. .	. .
) km/h	Over 24 h	Over 15 240 m	Medium-al-titude SIGINT in Europe. Possibly as part of *Pave Nickel* program	. .	Evaluated 1972	Conventional runway tech-nique
4 km/h	852 km range	. .	Electronic warfare	. .	Study/ evaluation	Conventional runway tech-nique
9 km/h	463 km range	. .	Surveillance	. .	. .	. .
4 km/h	115 km range	. .	Sea surveill-ance	. .	Under study	Conventional ship runway technique
	. .	. .	Small-size low-cost RPVs for battlefield reconnaissance and laser target designation for tactical weapons	TV cameras	Study/ evaluation	Conventional runway tech-nique
l km/h	Approxi-mately 60 min	610 m	Long range interdiction target de-signation	. .	Development	Ground or air launched/ ground or air recovered

Country	Prime contractor	Designation[b]	Agency	Guidance: Manufacturer	Guidance: Type	Number and type of engine
	Martin-Marietta Aerospace	Model 845 A	USAF	. .	Remote guidance by APW-26 radio command control unit. Sperry Rand 3-axis autopilot with airspeed, pitch attitude and roll angle commands and heading hold function	Lycoming T10-360-A3B6 four cylinder air cooled turbocharged engine
	McDonnell Douglas Astronautics Co.	Mark 2 (Mini-RPV)	ARPA	Motorola	Radio command	Ross
	Northrop Co.	Electric Mini-RPV	USAF/ARPA	. .	. .	. .
	Philco-Ford Co. Aeronutronic Division	Praeire 1	ARPA/USAF	Philco-Ford	Radio command	One K&B, SR-245
	Philco-Ford Co. Aeronutronic Division	Praeire 2	ARPA/USAF	Vega	Radio command with auto piloting	One Kolbo Korp distributed by Sakert Riggo, D-238
	Philco-Ford Co. Aeronutronic Division	Calere	ARPA/USAF	Philco-Ford	Radio command	One K&B, SR-245
	Teledyne Ryan Aeronautical	Model 147 H [AQM-34N (H)]	USAF/SAC	TRA	Radio command	One CAE J69-T41A
	Teledyne Ryan Aeronautical	Model 147 NC (M-1) [AQM-34 J (NC-1)]	USAF/TAC/SAC	TRA	Programme and command	One CAE J69–T29

rformance						
eed	Endur- ance	Altitude	Mission	Types of sensors carried	Status	Launch/ recovery
ximum ving speed 0 km/h ıd stalling eed km/h	Less than 24 h	12 200 m	*Compass Dwell* medium-altitude SIGINT in Europe (possibly as part of *Pave Nickel* program)	. .	Evaluated 1972	Conventional runway technique
ı/h	7 h	. .	Small, low-cost battlefield reconnaissance and laser target designation	TV camera and electro-optical image tracker	Study planned	. .
	. .	. .	Surveillance, attack	. .	R&D to investigate electric power mini-RPV	. .
km/h ıximum km/h ıise	. .	. .	Man-portable mini-RPV for real-time reconnaissance and laser target designation	Wide-angle miniature TV camera; stabilised narrow angle TV camera	Testing began early 1973	Conventional runway technique
km/h ıximum km/h ıise	. .	. .	Reconnaissance and targeting	Wide-angle miniature TV camera stabilised narrow angle TV camera	Testing began early 1973	Conventional runway technique
km/h ıximum km/h ıise	..	. .	Reconnaissance and targeting with night capability	Same as above but instead of the narrow-angle TV camera, forward-looking infrared detector is used	Testing began early 1973	Conventional runway technique
	. .	. .	Medium-altitude reconnaissance	. .	Became operational in about 1968	Air-launched and air-recovered by DC-130A or E Hercules aircraft
	. .	. .	Low-altitude photographic reconnaissance RPV training vehicle	. .	Operational	Air-launched from DC-130 and recovered by CH-3 helicopter

Country	Prime contractor	Designation[b]	Agency	Guidance: Manufacturer	Guidance: Type	Number and type of engine
	Teledyne Ryan Aeronautical	Model 147 SC [AQM-34L (SC)]	USAF/SAC	TRA	Pre-programmed navigation using Doppler navigator and digital programmes and also radio command	One CAE J69–T41A
	Teledyne Ryan Aeronautical	Model 147 SD [AQM-34M (SD)]	USAF/SAC	TRA	Command navigation and programme. Some fitted with Teledyne Systems Co. LORAN receivers-RPV in this case is designated AQM-34M (L)	One CAE J69–T41A
	Teledyne Ryan Aeronautical	Model 147 T [AQM-34P (T)]	USAF/SAC	TRA	Programmed and command	One CAE J100-CA-100
	Teledyne Ryan Aeronautical	Model 154 [AQM-91A]	USAF/SAC	TRA	Programmed navigation and command	One GE J97-GE-3
	Teledyne Ryan Aeronautical	Model 234 [BGM-34A]	USAF	Sperry Univac	Radio command	One CAE J69-T29
	Teledyne Ryan Aeronautical	Model 234 [BGM-34B]	USAF	Sperry Univac	Radio command	One CAE J69-T41A
	Teledyne Ryan Aeronautical	Model 235 [YQM-98A]	USAF	TRA	Radio command	One Garrett ATF-3

[a] Data which are not available are indicated by . .

[b] Military designations are shown in brackets.

Source: See references [17, 38].

...formance						
...ed	Endurance	Altitude	Mission	Types of sensors carried	Status	Launch/ recovery
...ising ...eed ...–1 035 ...l/h at ...w-altitude	Range between 285–1 205 km	550 m to over 15 250 m	*Compass Bin* low-altitude photographic reconnaissance but also carries ECM chaff pods	Fairchild F415Y camera with a focal length of 76 m and TV equipment which can transmit over a range of at least 240 km	Operational	Air-launched from DC-130/ recovery by CH-3 helicopter
	. .	. .	Low-altitude ELINT, with Rockwell International "implant" sensor system or radar jamming with ALE-2 chaff dispensers and/or ALQ-71 noise jammers or low-altitude photographic reconnaissance	. .	Operational	Air-launched from DC-130/ recovery by CH-3 helicopter
	. .	. .	High-altitude *Combat Dawn* communication intelligence	. .	. .	Air-launched from DC-130/ recovery by CH-3 helicopter
	. .	. .	*Compass Arrow* high-altitude photographic reconnaissance plus IR and ELINT surveillance	. .	In storage	Air-launched from DC-130/ recovery by CH-3 helicopter
	. .	. .	Weapon delivery (conventional bombs, TV-guided HOBOS and Maverick ASMs) daylight only	. .	Test and evaluation complete	Air-launched from DC-130/ recovery by CH-3 helicopter
	. .	. .	Day/night weapon delivery	Philco-Ford stabilized, laser designator, low-light TV and/or Hughes FLIR	Field evaluation	Air-launched from DC-130/recovery by CH-3 helicopter
...ch ...5 to 0.6	30 h	15 240 m to 21 340 m	*Compass Cope*, very high-altitude long range photographic and electronic surveillance	TV camera	Suspended due to lack of funding	Conventional runway technique

13. Reconnaissance satellites

Square-bracketed references, thus [1], *refer to the list of references on page 401.*

I. *Introduction*

An indication of the potentials of reconnaissance satellites is obtained by considering the manner in which they are used and the extent of their uses. Until 1972, the United States had three types of photographic reconnaissance satellites: area-surveillance, "close-look" and the large "Big Bird". The first of these carried a wide-angle, low-resolution camera for searching a large area of a particular country for objects or events of potential interest. Since the SALT I agreements were signed in May 1972, no area-surveillance satellite has been launched by the United States. The "close-look" satellite carries a high-resolution camera which has a very long focal length lens and a relatively narrow field of view. The "Big Bird" satellite is designed to perform both the area-surveillance and the close-look type of mission. Satellites which carry photographic equipment with high resolution are usually manoeuvrable.

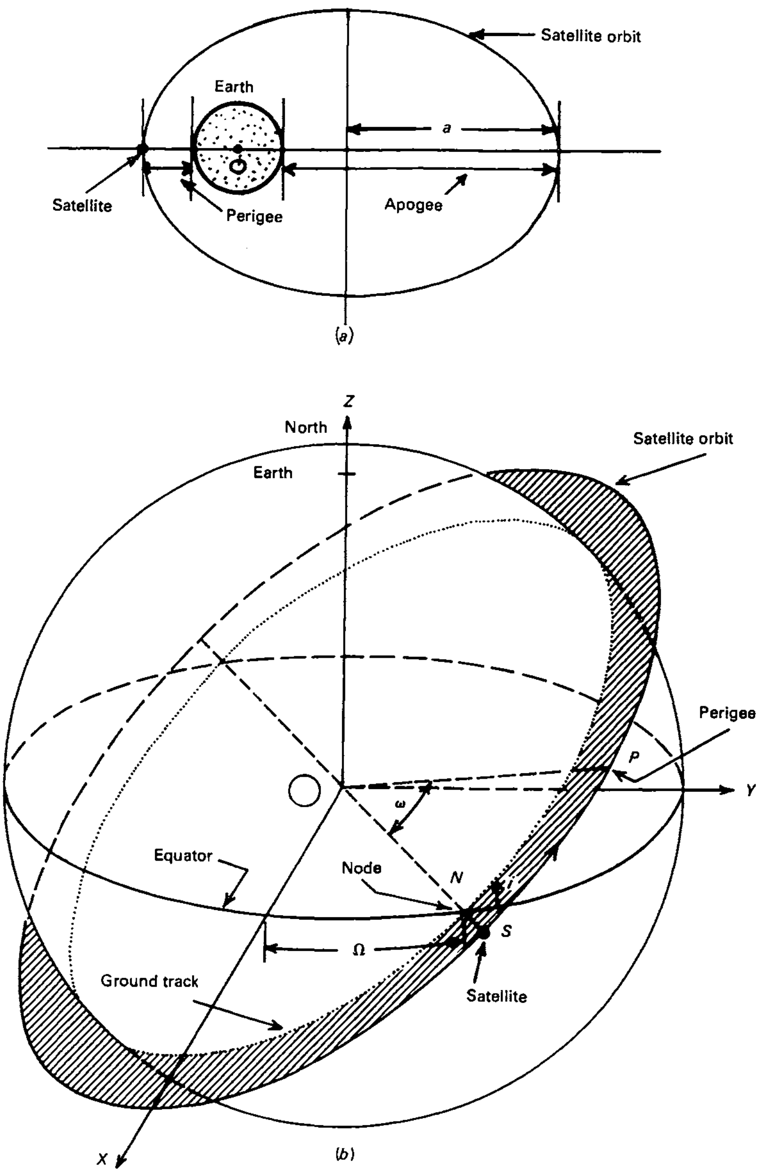
In order to appreciate the manner in which a reconnaissance satellite is used, it is necessary to understand some of the characteristics of its orbit. These are discussed briefly in this chapter. Some of the reconnaissance satellites launched during 1974 are used to illustrate the orbital characteristics discussed.

Since 1972, the number of reconnaissance satellites launched per year by the United States and the Soviet Union has been steady at about five and 35 respectively. A study of satellite launches during the past two or three years suggests that they are not being used solely to verify the implementation of the SALT I agreements. It is, therefore, useful to take another look at what satellite cameras are able to record and their resolution: this will also be considered briefly in this chapter.

II. *Satellite orbital characteristics*

A satellite usually describes an elliptical orbit. In chart 13.1 such an orbit round the Earth is shown with the centre of the Earth at one of the foci of the ellipse. The semi-major axis, a, of the ellipse is shown in chart 13.1 (a). There are six basic parameters, called the orbital elements, which define such an orbit in space. The size and shape of the ellipse

Chart 13.1. Geometry of a satellite orbit



are determined by its semi-major axis and its eccentricity, e. These are two of the six orbital elements. During the lifetime of a satellite, most of the orbital elements are continuously changing, so that the values of all the elements must be given for a particular time. Often this time is chosen to be the passage time of the satellite through the ascending node. The perigee, the shortest distance between the satellite and the Earth, and the apogee, the longest distance, are shown in chart 13.1 (b).

The passage time, T, of the satellite at the perigee is the third orbital element and together with a and e, defines the ellipse in a plane.

The position of the orbital plane in space is usually given in a terrestrial-sidereal rectangular coordinate system. The axes of such a system are shown in chart 13.1 (b). The origin, O, of the coordinate system is the centre of the Earth; the Z-axis is oriented toward the North Pole and the Earth's equatorial plane is in the XY plane. The X-axis is oriented toward the Vernal equinox or the first point of Aries.[1] The points of intersection of the satellite orbit with the celestial equator are known as the nodes. For example, in chart 13.1 (b), N is the ascending node. The angle Ω between the X-axis and the line ON then defines the fourth orbital element and it is called the right ascension of the ascending node. The longitude of a satellite's ground track[2] at a particular time is given by the value of Ω.

The fifth and perhaps the most important of the orbital elements is the orbital inclination, an angle i between the orbital plane (shaded area in chart 13.1 (b)) of the satellite and the equatorial plane of the Earth. Together with Ω, i specifies the position of the orbital plane relative to the co-ordinate system considered. The orientation of the ellipse within the orbital plane is given by the sixth orbital element, the angle between the line ON in the equatorial plane and the line OP, where P is the perigee. The line OP lies along the major axis of the ellipse. This angle, usually denoted by ω, is called the argument of the perigee.

Of these orbital elements, i is the only element which remains practically constant during the lifetime of a satellite; others change because of, for example, the Earth's gravitational field and atmosphere. They can also be changed artificially. Such changes and the choice of a particular value of i determine the regions on the Earth over which a satellite flies. The coverage of the Earth by a satellite is best studied by calculating its ground tracks. The theory behind the calculation of ground tracks is lengthy and complex so that, in the following section, only the results of calculations for some of the satellites launched in 1974 are given and discussed.

III. *Ground tracks of some recent reconnaissance satellites*

A satellite's motion round the Earth is complicated by the rotation and the shape of the planet. However, these complicating phenomena have been

[1] The equatorial plane of the Earth is inclined to the plane of the Earth's orbit about the sun. The line of intersection of these two planes is called the line of the Vernal equinox leading to the first point of Aries.

[2] The ground track is defined as the projected path traced out by a satellite over the surface of the Earth.

used effectively to make observations from space. For example, the Earth rotates round its axis approximately once every 1 440 minutes. If the period[3] of a satellite is chosen carefully then the ground tracks will repeat each day. On the other hand, the period could be chosen to result in a gradual shift of the ground tracks each day and a complete coverage of an area of interest could be made. Over a particular area the shift of ground tracks will occur at every 16th orbit if the period is close to 90 minutes.

A suitable choice of a satellite's period makes it possible to observe an area on the Earth at least once a day during daylight, and, depending on the satellite's latitude, possibly more than once. From chart 13.1 (b), it can be seen that the orbital inclination determines the range of latitudes over which the satellite flies on each revolution. For observations of an area situated at high latitudes, a near-90° inclination orbit produces two or more daylight passes per day over the area whereas an area near the equator needs a low-inclination orbit. Therefore, the choice of a particular i depends on where the area of interest is and how closely it is to be observed.

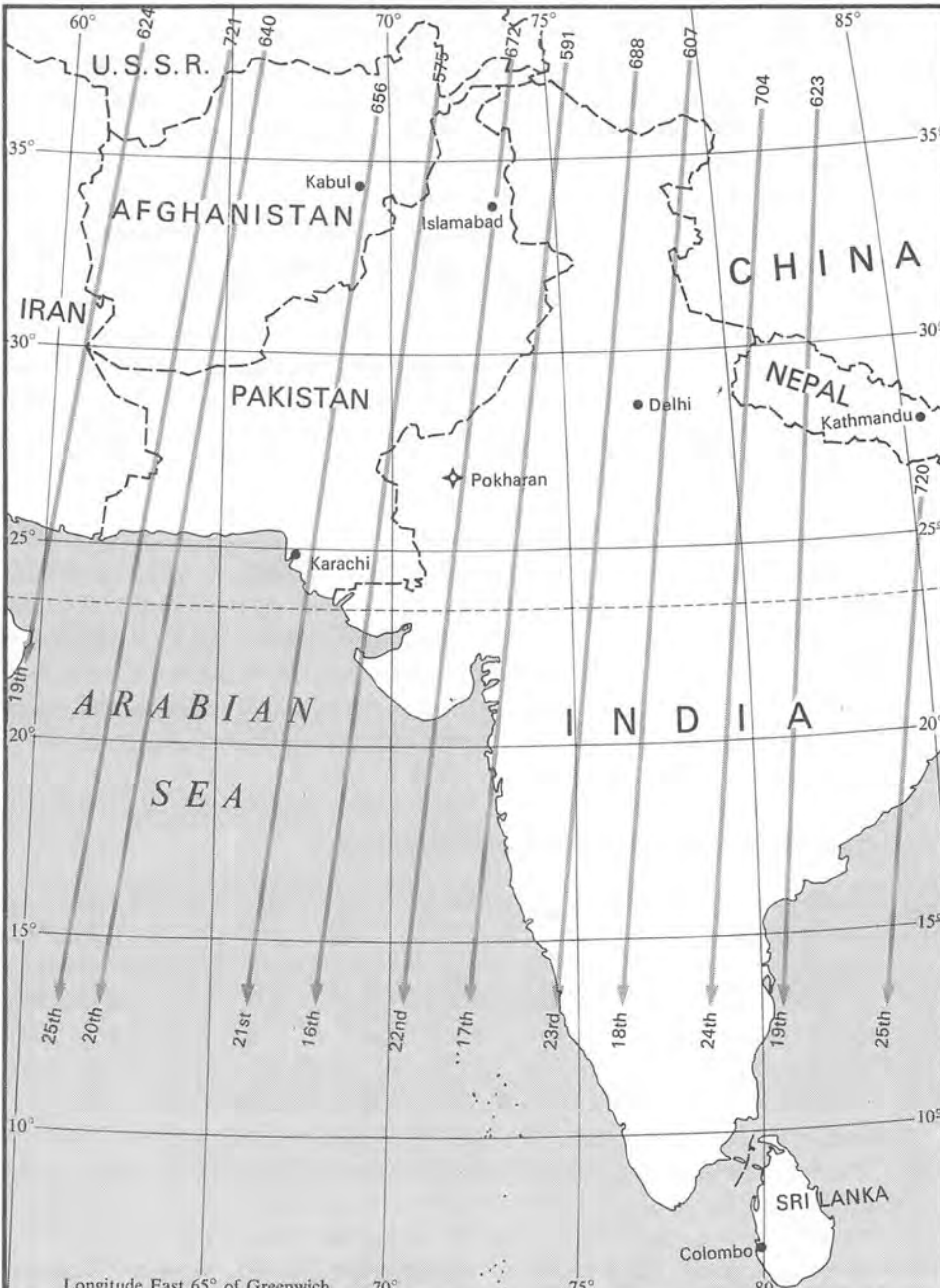
A second factor that might influence the choice of i is economics. If a satellite is launched eastwards from any place along the equator, it already has an initial velocity of 1 700 km/hour because of the Earth's rotation. Therefore, less power would be needed from a rocket to put a satellite in orbit with an i of considerably smaller value than 90°. A further advantage of a small i is that for a given latitude (except at the equator) the ground tracks are closer together than those obtained with the orbital inclination of 90°.

Observation of an underground nuclear explosion

Consider two satellites, launched in 1974, one by the United States at an orbital inclination of 94.52° ("Big Bird" satellite 1974–20A) and the other launched by the Soviet Union at an orbital inclination of 62.81° (Cosmos-653). The initial orbital characteristics of these and other photographic reconnaissance satellites are given in tables 13.1 and 13.3 respectively. The ground tracks over India of the two satellites are shown in charts 13.2 (the US satellite) and 13.3 (the Soviet satellite). It can be seen that, on consecutive days, the distances between the ground tracks of the US satellite with an orbital inclination of 94.52° are greater than those for the Soviet satellite which was launched in an orbit with a smaller orbital inclination (62.81°). Although the former satellite, because of its high value for i, can observe the areas of the Earth between latitudes 85.08° North and 85.08° South, the latter satellite has the advantage of being able to observe an area between the latitudes 62.81°

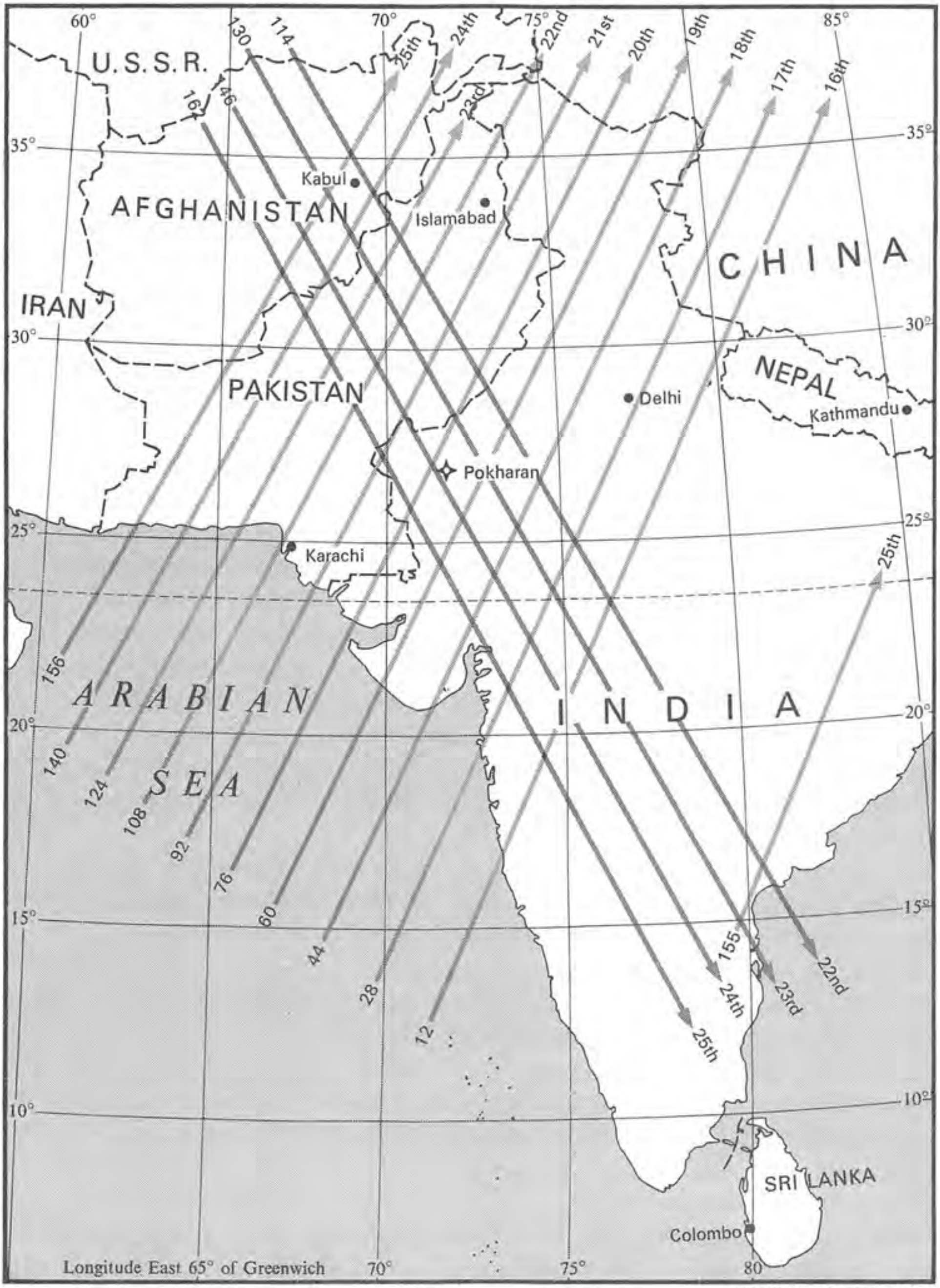
[3] The time required for a satellite to go round the Earth once is called its period.

Chart 13.2. Ground tracks over India of the US 1974-20A "Big Bird" satellite, launched on 10 April 1974 at an orbital inclination of 94.52°, 16–25 May[a]



[a] The date and orbit number are indicated for each gound track. Note the site of the nuclear test.

Chart 13.3. Ground tracks over India of the Soviet Cosmos-653 satellite, launched on 15 May 1974 at an orbital inclination of 62.81°, 16–25 May[a]



[a] The date and orbit number are indicated for each ground track. Note the site of the nuclear test. Northbound passages were made during the morning and southbound during the afternoon.

North and 62.81° South in greater detail since the ground tracks are much closer together. This also means that the satellite covers the area in a much shorter time as indicated by the ground tracks on 16, 17 and 22 May for the US satellite (chart 13.2) and by the ground tracks on 17, 18, 19 and 20 May for the Soviet satellite (chart 13.3).

It is interesting to note that around the time of the explosion of a peaceful nuclear device by India on 18 May 1974 near the town of Pokharan (about 26°57′ North and 71°42′ East), these two satellites flew over the Rajasthan region. Athough the "Big Bird" was not over the test area on 18 May it passed over the test region on 22 May when it could have observed the crater made by the nuclear explosion. The ground measurements made in the early morning at about 0500 hours on the cloud conditions over the area suggests that between 50 and 63 per cent of the sky was free of clouds. The satellite was over the region at about 1130 hours local time when the sun was high in the sky at 75° providing good light.

Cosmos-653, on the other hand, although not over the test area on 18 May, was not far from it. On 19 May it came closer to the region but on 20 May it was above the test area at about 0850 hours local time when the sun was at 39° in the sky. In fact, this area-surveillance type satellite covered the whole of the Rajasthan area (chart 13.3) between 18 and 21 May making one pass each morning at about 0900 hours local time. The satellite flew over Rajasthan again between 21 and 25 May, on each day in the evening. On 24 May it was over the test region at about 1700 hours local time with the sun low in the sky at 19° casting long shadows in the desert area. The cloud coverage varied from completely clear sky on the 18th, 20th and 23rd to between 25 and 40 per cent of the sky clear on the 19th and 24th.

So far, the gradual shift of the ground tracks each day because of the satellite's period not being an exact multiple of the Earth's period of rotation round its axis has been considered. There is a second effect which causes shifts in the satellite ground tracks caused by the changes in other orbital elements. Basically there are three orbital elements which change their values, causing further shifts in the ground tracks. First, the satellites' orbital period varies because of, for example, the Earth's atmosphere. The changes in the other two orbital elements, Ω and ω are caused by the Earth's uneven gravitational field. Because of the rotation of the Earth round its axis, it bulges out at the equator and its poles are flattened. This deviation of the Earth's shape from a perfect sphere causes the plane of the satellite orbit to rotate around the Earth's axis, so that the value of Ω changes with time. This change can amount to as much as 10° per day. The Earth's uneven gravitational field causes the ellipse to rotate in its own plane so that ω changes with time. This change can amount to as much as 5° per day. From chart 13.1 (b) it can be seen that ω determines the latitudes in which the perigee and apogee are situated. Apart from the effects of these changing orbital elements, the Earth's period of rotation also causes a small shift in the ground tracks. The Earth's period is not exactly 24 hours but 23.93447 hours.

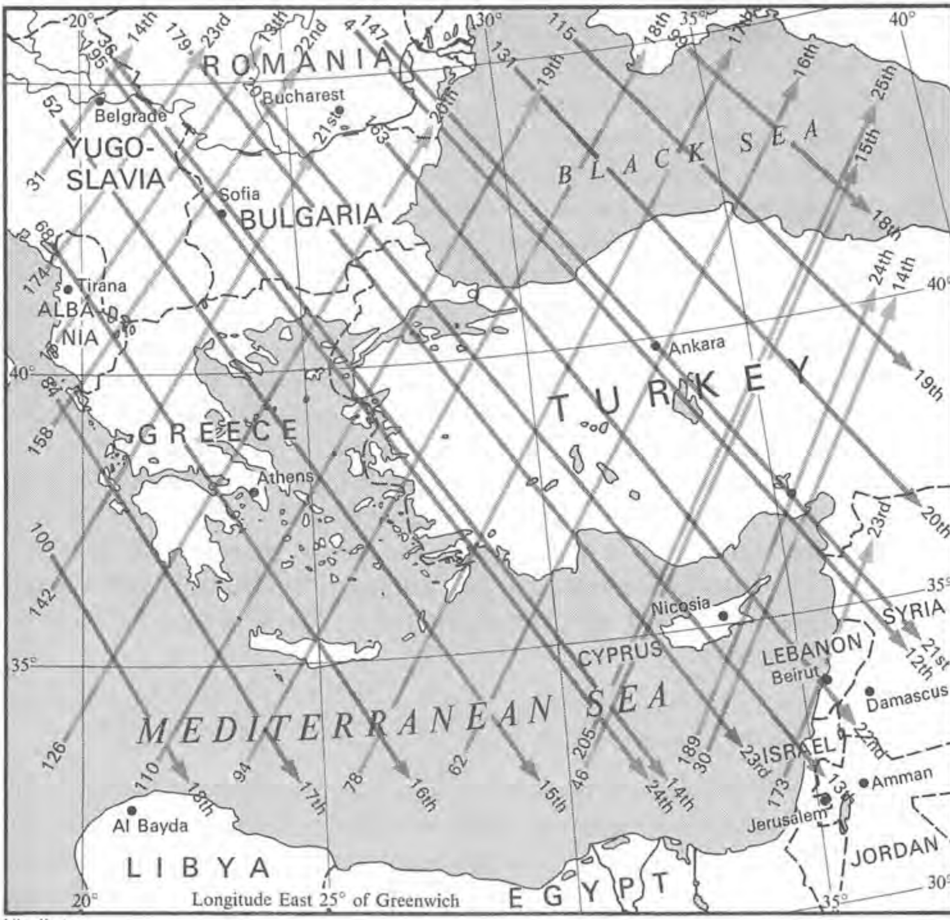
For reconnaissance satellites the change in Ω is used so that the sun is always high in the sky in order to be able to achieve good photography. This is done by placing a satellite in a sun-synchronous orbit in which the satellite is orbited with an inclination of almost 90°. The plane of the satellite orbit contains both the Earth and the sun. Under this condition the satellite crosses the equator at just about local noon on the sunlit side of the Earth and local midnight on the dark side. The Earth rotates under the satellite orbit, which is fixed in space, at the rate of 15° per hour, so that the equatorial and temperate zones of the Earth can be photographed with the sun always high in the sky. However, the Earth rotates around the sun and since the satellite orbital angle i is fixed, a quarter of a year later the satellite orbital plane will be perpendicular to the plane containing the Earth and the sun. To maintain the sun-synchronous orbit, the plane of the satellite orbit has to be rotated 360/365 or 0.986 degrees per day. If the satellite is in just the right orbit, the Earth's equatorial bulge will deflect Ω and therefore the satellite orbit by this amount. The US 1974-20A satellite over India described above was orbited in just this type of sun-synchronous orbit.

Observing the Cyprus conflict

The use of the sun-synchronous orbit is a deliberate use of the changing character of Ω. However, the combined effect of the Earth's rotation and the changing orbital elements causing shifts in ground tracks can also be used to advantage. Examples of this type of use include a Soviet Cosmos-666 satellite launched on 12 July 1974 at an orbital inclination of 62.81° and a close-look type of satellite (1974-65A) launched by the United States on 14 August 1974 at an orbital inclination of 110.51°. The ground tracks of these satellites are shown in charts 13.4 and 13.5 respectively. The ground tracks (chart 13.4) made by the Cosmos satellite on 14 July and 24 July might have coincided but because of the shift in the ground tracks, the latter track just managed to come over eastern Cyprus. There are several other such closely located pairs of ground tracks covering various parts of Turkey. Again, it can be seen in chart 13.5 that a number of such pairs of ground tracks have been made by the US satellite over Greece and Turkey. Another interesting point about this satellite is that passes were made twice a day over most of the area shown in chart 13.5.

The dates when these satellites orbited over Cyprus, Greece and Turkey are interesting, particularly for the Cosmos-666. On 15 July 1974 there was

Chart 13.4. Ground tracks over Cyprus, Greece and Turkey of the Soviet Cosmos-666 satellite, launched on 12 July 1974 at an orbital inclination of 62.81°, 13–25 July[a]

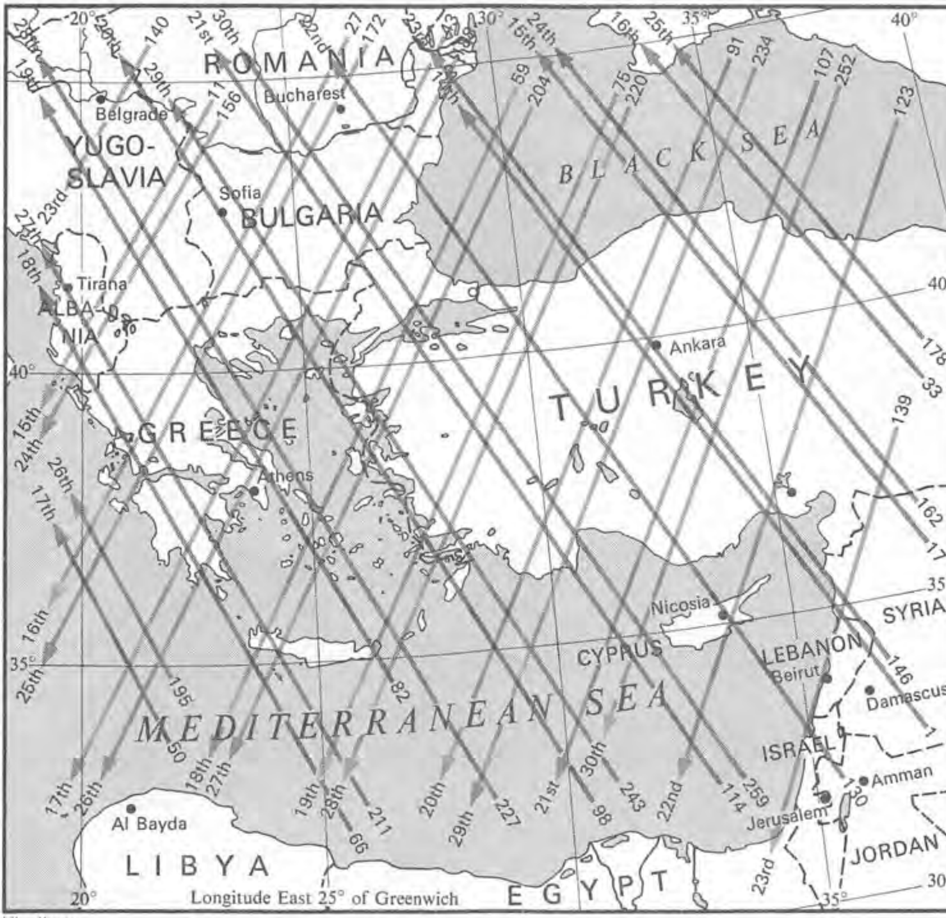


LiberKartor

[a] Northbound passages were made during the morning and southbound passages during the afternoon. The date and orbit number are indicated for each ground track.

an army coup in Cyprus and between 20 and 22 July Turkey invaded Cyprus. The Cosmos satellite was near western Cyprus on the morning of 15 July (around 1000 hours local time) and over the eastern region on the afternoon of 22 July (about 1620 hours local time). The following day, 23 July, the satellite was over western Cyprus (at about 1600 hours local time). On 24 July, the satellite passed over eastern Cyprus (at about 0700 hours local time). Although telemetry [1] from the Cosmos-666 suggested that it had a manoeuvring capability, no manoeuvre was detectable. The US 1974-65A satellite made only two passes over Cyprus on 22 August, which was after the Turkish invasion but not very long after the occupation of northern and northeastern Cyprus. Reports on the cloud coverage based on

Chart 13.5. Ground tracks over Cyprus, Greece and Turkey of the US 1974-65A satellite, launched on 14 August 1974 at an orbital inclination of 110.51°, 15–30 August[a]

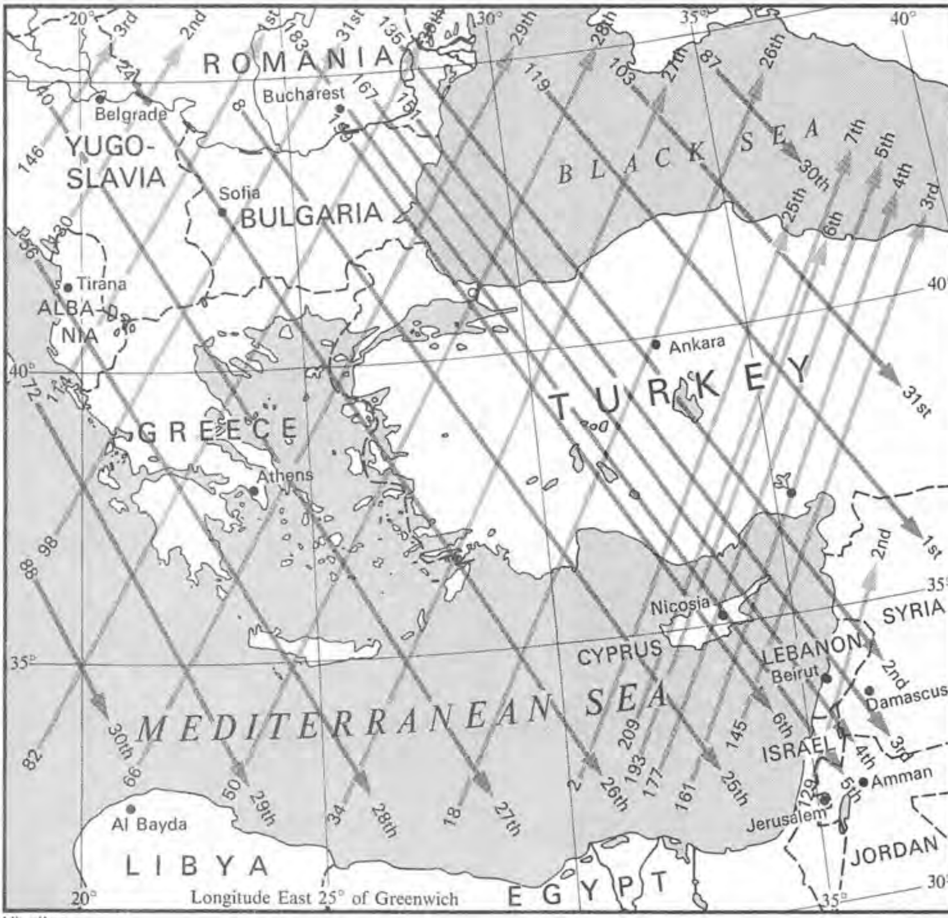


[a] Southbound passages were made during the morning and northbound passages during late afternoon. The date and orbit number are indicated for each ground track.

observations made both from meteorological satellites and from ground stations indicated that throughout these periods in July and August, the sky over Cyprus was free of clouds. During these periods the sky over Greece and Turkey was also mostly clear.

So far the changes in ground tracks due to natural causes have been considered. However, these changes are slow and it often takes a long time before a satellite is correctly positioned over an area of interest. Satellites are therefore often manoeuvred from a ground station on Earth in order to bring them over a specific region [2]. Such manoeuvring is best illustrated by a Soviet satellite, Cosmos-667, which was launched on 25

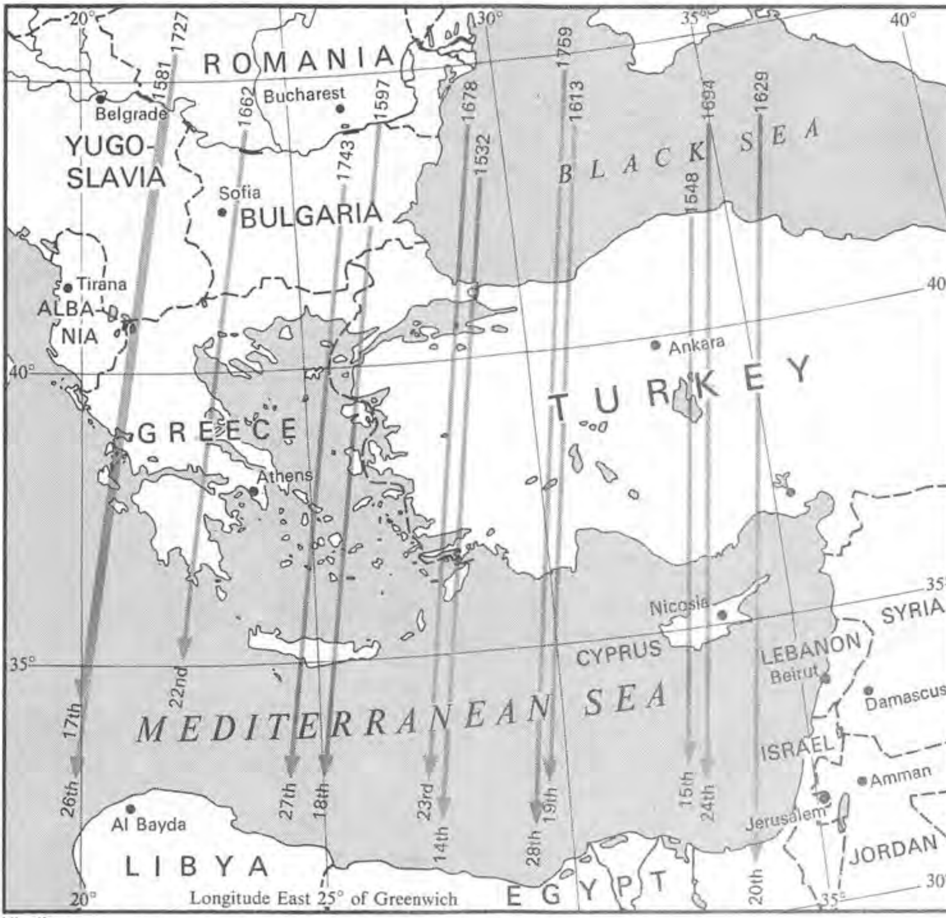
Chart 13.6. Ground tracks over Cyprus, Greece and Turkey of the Soviet Cosmos-667 satellite, launched on 25 July 1974 at an orbital inclination of 64.98°, 25 July – 7 August[a]



[a] The ground tracks show that the satellite was manoeuvred after 2 August. The northbound passages were made during the morning and southbound passages during the afternoon. The date and orbit number are indicated for each ground track.

July 1974. The ground tracks of this satellite are shown in chart 13.6. It can be seen that, until 2 August, the satellite's ground tracks were relatively widely spaced (compare chart 13.4), covering Cyprus, Greece and Turkey. But after 2 August the satellite was manoeuvred in order to change some of its orbital elements so that its ground tracks became very narrow and concentrated over Cyprus. The satellite made two passes per day during daytime (about 0730 hours and 1630 hours local time) each day for four days between 3 and 7 August (chart 13.6). The satellite was probably recovered on 7 August. Again, weather reports

Chart 13.7. Ground tracks over Cyprus, Greece and Turkey of the US 1974-20A satellite, launched on 10 April 1974 at an orbital inclination of 94.52°, 14–28 July[a]



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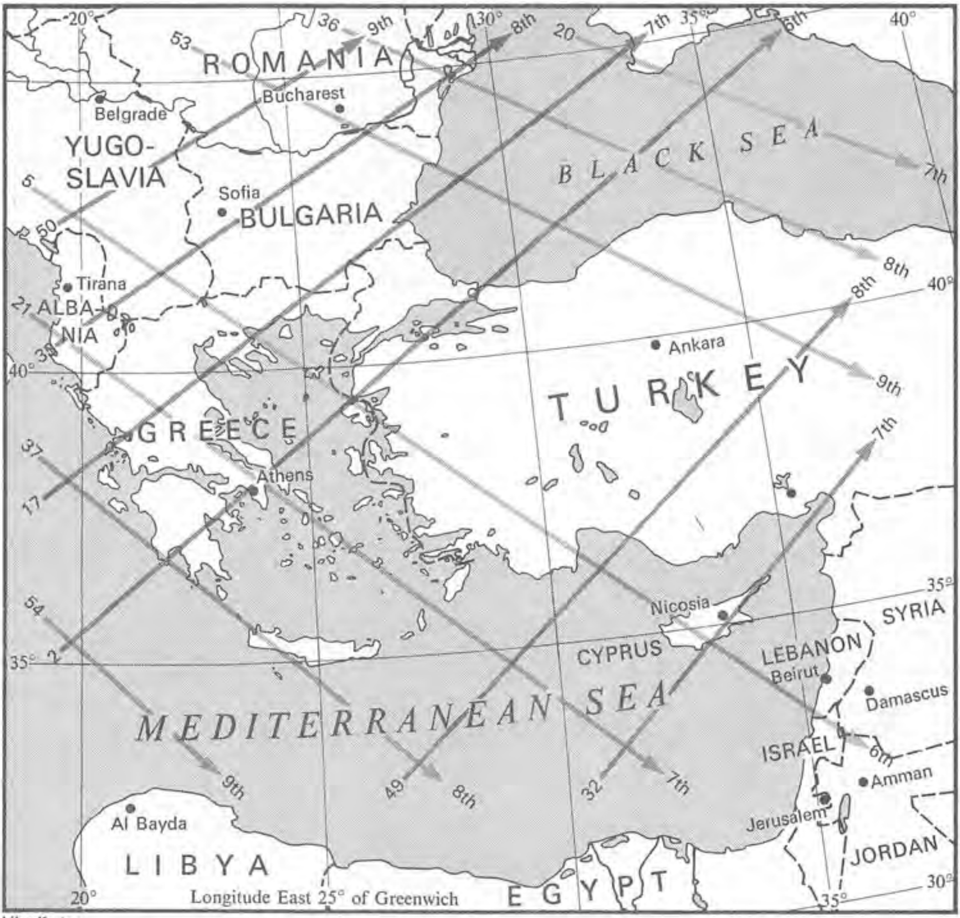
[a] The date and orbit number are indicated for each ground track.

from meteorological satellites and ground stations indicated that the sky over Cyprus during these five days was very clear.

It is interesting to note that on 15 July when the army coup occurred in Cyprus, the US satellite 1974-20A (the "Big Bird") flew over Cyprus (chart 13.7) in the morning at about 1025 hours local time. The satellite made two more passes over Cyprus, one on 20 July when the Turkish invasion began and another on 24 July. On both these occasions the satellite orbited over Cyprus in the morning at just after 1000 hours local time. On these occasions the sun was at about 60° in the sky which was mostly free of clouds. These passes over Cyprus were probably made by maneouvring the satellite. However, it is not easy to determine this from the study of the orbital elements since the pro-

Chart 13.8. Ground tracks over Cyprus, Greece and Turkey of the Soviet Cosmos-670 satellite, launched on 6 August 1974 at an orbital inclination of 50.57°[a], 6–9 August



[a] Northbound passages were made during the night and southbound passages during the day. The date and orbit number are indicated for each ground track.

longed life of "Big Bird" satellites is normally obtained by changing the orbital elements artificially.

It has been reported that the Cosmos-670 satellite monitored military manoeuvres preceding the Turkish invasion of Cyprus [3]. (However, this is demonstrably untrue.) This satellite was launched on 6 August 1974, some two weeks after the invasion. Ground tracks of this satellite are shown in chart 13.8. It can be seen that the satellite orbited over Cyprus only on two occasions, once on 6 August and the second time on 7 August. On the former occasion, it was at about 0930 hours local time with the sun at an inclination of about 52°. The second pass was made at about 0150 hours local time when it was dark. However, on 8 and 9 August it made one pass each day in the early morning over northern Turkey; the other passes were at night.

During the past four years, the use of satellites in this way has been observed on several occasions indicating that satellites may well be used for such observations as a routine matter. It is perhaps appropriate at this stage to look at the resolution of photographic images obtained from such satellites.

IV. *Image quality of space photographs*

The details of what can be seen by reconnaissance satellites is still a very closely guarded secret, but some estimates can be made from the study of recently published photographs taken from the ERTS-1 (Earth Resources Technology Satellite) and the Skylab satellites. In order to estimate the quality of an image, an important basic parameter is resolution. The concept of resolution is derived from the optical criterion which defines it as how close two point-sources of light can be to each other and still be distinguished as two points. Resolution, in photography, is defined as the minimum observable spacing between black and white lines in a standard pattern. Therefore, a photographic resolution of 10 lines per millimetre means that black and white lines, both 0.1 mm wide are just resolvable. A more common term of resolution used in connection with reconnaissance photographs is the ground resolution. This is defined as the ground dimension equivalent to one line at the limit of resolution.

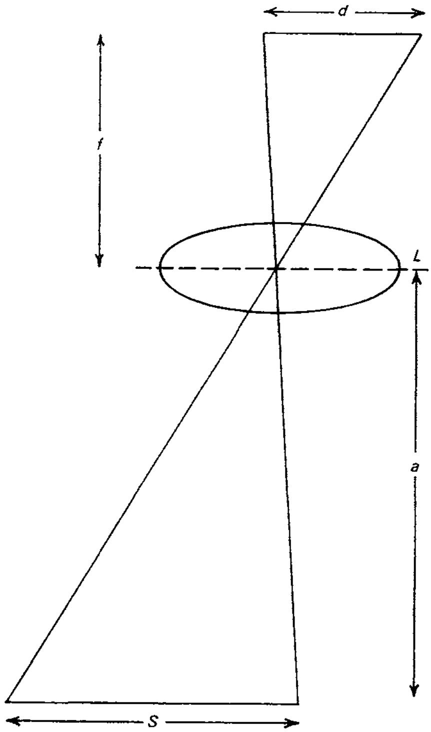
The theoretical treatment of ground resolution is complicated since it involves not only the properties of the lens system of a camera but also the characteristics of the film used. An approximate expression for the ground resolution can be derived as follows. Consider chart 13.9 in which L represents the camera lens system with a focal length f metres placed on a satellite at an altitude of a kilometres. The object on the ground is represented by S metres so that its image in the image plane of L is d metres. If d is the smallest size image that can be resolved, then, by definition, S is the ground resolution. By simple geometry, the ground resolution is then given by

$$S=\frac{a}{f}\cdot d$$

It is usual to use the reciprocal of d and call it the limiting resolution, R, of the system. R is the combined resolution in lines per millimetre of the camera lens system and the film. The ground resolution is then given by

$$S=\frac{a}{fR}$$

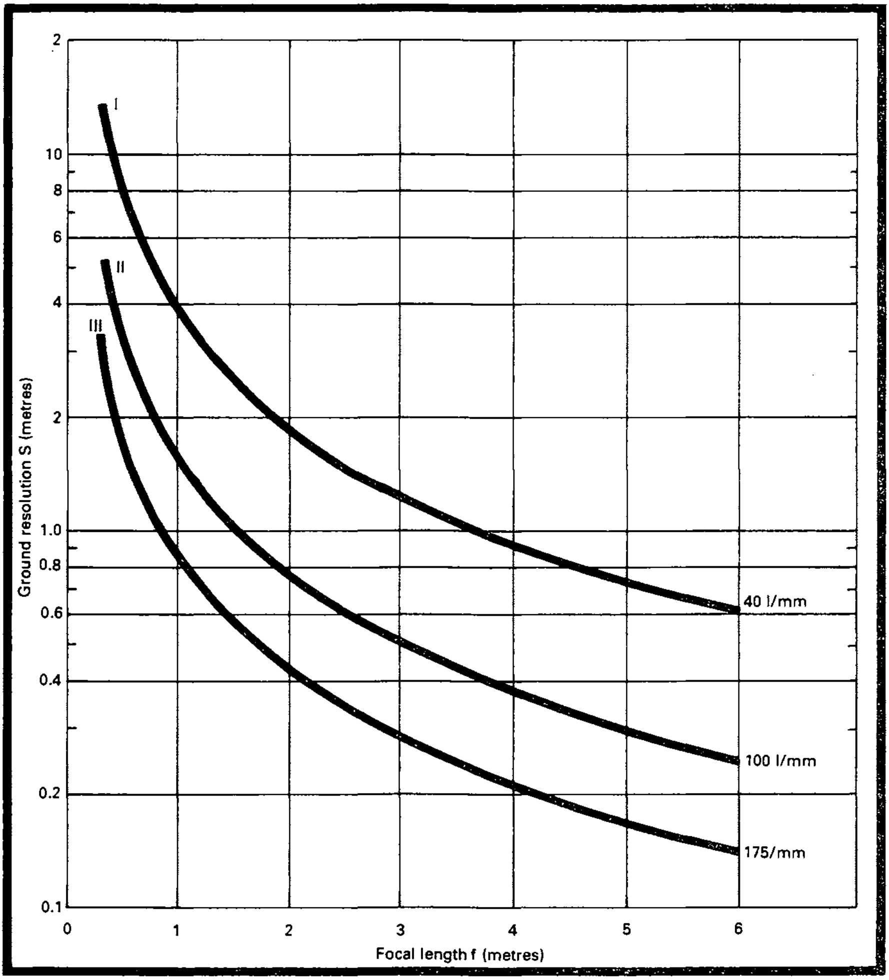
Chart 13.9. Simple geometry of the satellite camera system



For various values of R, ground resolutions for a number of focal lengths are calculated and these are plotted in chart 13.10. The satellite altitude of 150 km was used for these calculations since the average perigee of the US reconnaissance satellites is about 150 km.

Plate 1 shows a photograph of the Chicago area in the United States taken from the Skylab satellite. The photograph was taken with a 46-cm focal length lens. In this photograph details such as the clover-leaf intersections on highways and the jetties along the waterfront of Lake Michigan are clearly seen. Intersections marked 2a and 2b are between Illinois Route 51 and I80, very near LaSalle and Perie, and between I80 and I55 west of Jobet respectively. Amongst the landmarks, Lakeport and Mergs field (3), McCormick Place (4), Midway Airport (5), Chicago river (6), Jobet area (7) and Kankakee area (8) can be identified. At the top centre of the photograph the O'Hare International Airport (1) and its runways can be seen in detail. The pair of runways labelled A are about 45 metres wide and 100 metres apart. These runways are resolved very clearly. It is estimated from the photograph that the runways could be resolved even if they were 25 metres apart so that the ground resolution in this case is about 25 metres. The photograph was taken from an

Chart 13.10. Ground resolution as a function of focal length (satellite altitude = 150 km)



altitude of about 440 km but most US reconnaissance satellites orbit at an altitude of about 150 km so that the ground resolution at this altitude for the Skylab system would be 25×150/440 or about 8.5 m.

From chart 13.10 it can be seen (curve I) that the ground resolution of 8.5 metres could be obtained from a camera with a focal length of 46 cm if the total resolution (that is, the lens plus the film) is 40 lines per millimetre. But modern film materials have resolutions considerably higher than 40 lines per millimetre. This is illustrated by plate 2 which shows the US MacDill Air Force Base. Four aircraft standing off the main runway can be seen encircled. This is an enlargement of a small section (about 5 mm square) of a photograph taken from NASA's Skylab satellite; the complete frame (about 9 cm square) shows Tampa Bay, Florida. With cameras equipped with lenses of long focal length, it is not unreasonable to envisage an image resolution of at least 100 lines per millimetre. With a resolution of this order and with a focal length of 600 cm, it is possible to get a ground resolution of 25 cm (curve II in chart 13.10). It has even been suggested that an image definition of 175 lines per millimetre is possible [4], in which case a ground resolution of about 15 cm can be obtained with a camera of focal length of 600 cm (curve III in chart 13.10).

It would seem from chart 13.10 that the ground resolution could be improved considerably if the focal length of the camera were to be increased. However, the diameter of the optical system increases with increased focal length. Furthermore, the length of the diameter is limited by the diffraction effect within the optical system. But even taking this into account, the diameter required to achieve a focal length of 600 cm is not outside the bounds of practicability. Atmospheric effects also cause a deterioration in the resolution but with advanced technology it is possible to make up for such losses in resolution by using computers.

With the possibility of such high ground resolutions as 15 cm it is not surprising to find the use of reconnaissance satellites extended to activities other than merely providing assurances of compliance to arms control treaties. Recently there have been some reports of violations of the interim SALT I agreement and the ABM (anti-ballistic missile) Treaty [5–7].

In the case of the Soviet Union, such reports are based on the photographs taken by ERTS-1. It would be interesting to examine what kind of details could be observed from the ERTS-1 satellite. The ground resolution of a Skylab camera is about 25 metres from an altitude of 440 km, or about 50 metres (25×910/440) at an altitude of 910 km, the normal altitude of the ERTS-1 satellite. The ground resolution in the green and red part of the visible spectrum for an ERTS-1 RBV (return-beam-vidicon) television camera is about 150 metres [8]. This is worse than the ground resolution of the Skylab camera by a factor of three which means that the two runways of the O'Hara International Airport discussed above and shown in plate 1 could not be resolved by the ERTS-1 camera but would appear as a single runway. However, in an ERTS-1 photograph, major roads, airports and to some extent their runways could be identified, and image quality could be improved considerably with the aid of computer image enhancement techniques.

The characteristics of the US and Soviet photographic reconnaissance satellites launched during 1974 are given in tables 13.1 and 13.4 respectively.

V. *Some applications of reconnaissance satellites*

Electronic reconnaissance

The function of electronic reconnaissance satellites is to record radar signals and other sources of electromagnetic radiation as they pass over areas of interest. The recorded signals are then transmitted to ground receiving stations and deciphered. At the end of the mission the satellites re-enter the Earth's atmosphere and burn up.

It was thought that the United States had stopped orbiting such satellites at the end of 1972. But a closer examination of the parameters of satellites launched since 1972 shows that this is not the case. The US electronic satellites are launched into orbits with perigee heights of 300 km and more and have very long orbital lives—of the order of a few months to hundreds of years rather than days. The satellites are usually octagonal in shape and weigh about 60 kg [10].

Since 1967 and until about mid-1972, the electronic reconnaissance satellites had been launched using Thrust-Augmented-Thor (TAT)/Agena boosters. From October 1972, these boosters were no longer used to orbit the electronic satellites; instead the "Big Bird" satellites carried them into orbit. At a later stage the satellites were ejected from the "Big Bird" into their own independent orbits with much greater perigee heights. These satellites are listed in table 13.2.

The Soviet Union has continued to launch electronic reconnaissance satellites, the orbital characteristics of which are given in table 13.4.

Ocean surveillance

Another development in reconnaissance satellite technology which has attracted some attention recently is the development of satellites for ocean surveillance. It is not possible to identify US satellites used only for this purpose although "close-look" satellites (in spite of being outlived by the "Big Bird" satellites) may be performing ocean surveillance missions among other tasks [2].

It has recently been suggested that satellites are being increasingly used by the Soviet Navy for ocean surveillance [11]. Recent reports suggest that in addition to the satellites with orbital inclinations of about 81° (such as Cosmos-541), there now exist other satellites in the Cosmos series which perform ocean surveillance missions [12]. Initially, these satellites are in orbits with low perigee heights (about 250 km) but after about two months, the perigee heights are increased to about 900 km. There have been three such satellites, namely, Cosmos-626 launched on 27 December 1973, Cosmos-651 launched on 15 May 1974 and Cosmos-654 launched on 17 May

1974; the orbital inclination of each of these has been about 65°. It is suggested that these satellites not only monitor locations and movements of ships using radars but also perform electronic reconnaissance.

VI. *Conclusions*

The number of photographic reconnaissance satellites launched during 1974 by the United States and the Soviet Union was about the same as during 1973. Reconnaissance satellites carry photographic cameras as well as a number of other sensors performing a variety of tasks [10]. The above analysis of the image quality of photographs taken from space suggests that a ground resolution of 15 cm is feasible. The possibility of obtaining such high resolutions is perhaps not surprising because of the improvements in lenses which have benefited from computer designs, and in photographic films with a fine grain and high sensitivity. Theoretically, higher resolutions are possible but it may not be easy to reach the theoretical limits of resolution because of certain constraints. For example, the resolution of a film depends on the fineness of the grain but unfortunately the finer the grain, the slower is the speed of the film. Usually a compromise is achieved by making the lens diameter large but not so large that it becomes difficult to achieve abberation-free lens surfaces.

Another factor which may limit the achievement of the theoretically optimum resolution is the Earth's atmospheric conditions such as air turbulence and clouds. Clouds are an insurmountable problem since military weather satellites can usually predict with accuracy the time when a particular area is free of clouds for reconnaissance photography. Other atmospheric conditions may reduce the ground resolution somewhat but curve III in chart 13.10 suggests that it is possible to achieve a ground resolution approaching 15 cm. With such a resolution it should not be difficult to observe and identify such objects as anti-ballistic missile launchers, large radar installations and intercontinental ballistic missiles as well as ballistic missile submarines which have temporarily surfaced. The restrictions on the number of strategic bombers under the recent tentative arms accord reached by the United States and the Soviet Union could also be verified by satellites.

It is interesting to note that while military reconnaissance satellites appear to be used now, as a matter of routine, to monitor such conflict areas as the Middle East and Cyprus, civil satellites such as the ERTS-1 appear to be potentially suitable for checking the compliance of some arms control agreements. The only difference is that in one case the data obtained is a very closely guarded secret while in the case of the ERTS satellites the data is freely distributed.

Plate 1. Chicago area photographed from the Skylab satellite at a height of about 440 km showing how clearly the O'Hare International Airport and its extensive runways (1) can be seen.

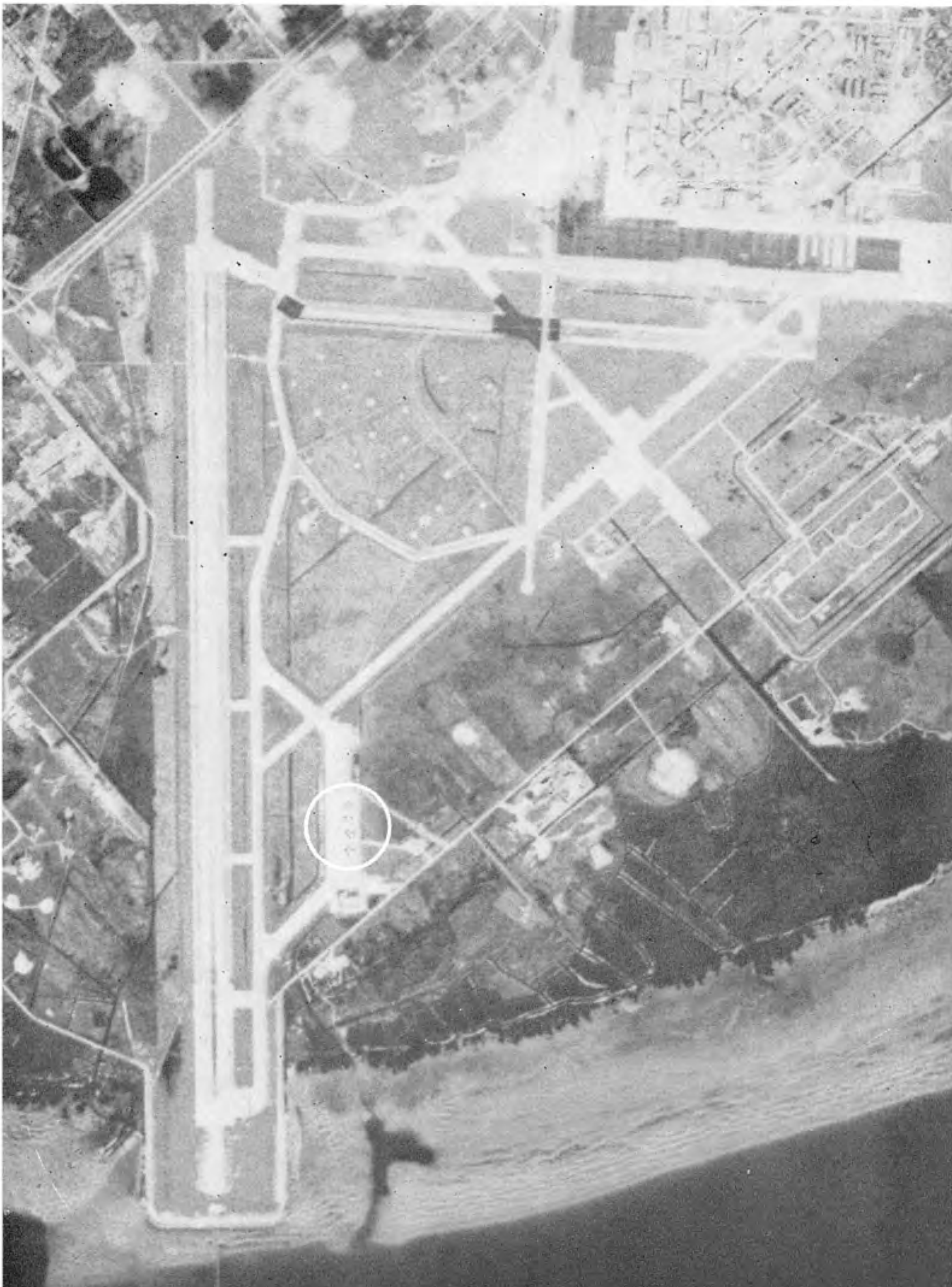


Plate 2. An enlarged section of a photograph taken from the Skylab satellite showing the MacDill Air Force Base; the four aircraft standing off the main runway can be seen within the circle.

VII. *Tables of US and Soviet reconnaissance satellites*

Conventions

A-2	Vostok up-rated second stage
B-1	Modified Sandal intermediate-range missile with an added upper stage
C-1	Skean intermediate-range missile plus upper stage
PL	Plesetsk
T-3D	Titan-3D
T-3B/A–D	Titan-3B Agena D
TT	Tyuratam
Van	Vandenberg

Table 13.1. US photographic reconnaissance satellites launched in 1974

Satellite name and designation[a]	Launch site and vehicle	Launch date and time *GMT*	Orbital inclination *deg*	Period *min*	Perigee height *km*	Apogee height *km*	Life time *days*	Whether capsule recovered[b]
USAF[c] (1974-07A)	Van T-3B/A–D	13 Feb 1800	110.44	89.75	134	393	32	?
USAF[d] (1974-20A)	Van T-3D	10 Apr 0824	94.52	88.91	153	285	109	?
USAF[c] (1974-42A)	Van T-3B/A–D	6 June 1634	110.49	89.81	136	394	47	?
USAF[c] (1974-65A)	Van T-3B/A–D	14 Aug 1550	110.51	89.89	135	402	46	?
USAF[d] (1974-85A)	Van T-3D	29 Oct 1926	96.69	88.86	162	271	About 124	?

[a] The designation of each satellite is recognized internationally and is given by the World Warning Agency on behalf of the Committee on Space Research.
[b] Uncertainty about the data and recovery of satellites is indicated by questions marks.
[c] Close-look satellite.
[d] "Big Bird" satellite.

Table 13.2. US electronic or ferret reconnaissance satellites

Satellite name and designation[a]	Launch site and vehicle	Launch date and time *GMT*	Orbital inclination *deg*	Period *min*	Perigee height *km*	Apogee height *km*	Lifetime *years*
		1972					
USAF (1972-79C)	Van T-3D	10 Oct 1800	95.62	114.79	1 423	1 469	10 000
		1973					
USAF (1973-88B)	Van T-3D	10 Nov 2010	96.33	94.59	486	508	3
USAF (1973-88D)	Van T-3D	10 Nov 2010	96.93	114.64	1 419	1 458	10 000
		1974					
USAF (1974-20B)	Van T-3D	10 Apr 0824	94.61	101.07	786	830	90
USAF (1974-20C)	Van T-3D	10Apr 0824	94.00	95.01	503	531	6
USAF (1974-85C)	Van T-3D	29 Oct 1926	96.06	95.22	520	535	6

[a] See footnote *a*, to table 13.1.

Table 13.3. Soviet photographic reconnaissance satellites launched in 1974

Satellite name and designation[a]	Launch site and vehicle	Launch date and time *GMT*	Orbital inclination *deg*	Period *min*	Perigee height *km*	Apogee height *km*	Lifetime *days*	Whether recovered[b]
Cosmos-629[a] (1974-03A)	PL A-2	24 Jan 1507	62.81	89.35	197	289	11.66	Yes
Cosmos-630[d] (1974-04A)	PL A-2	30 Jan 1102	72.84	90.02	203	346	13.7	?
Cosmos-632[e] (1974-06A)	TT A-2	12 Feb 0907	65.00	89.29	176	303	13.9	?
Cosmos-635[c] (1974-14A)	PL A-2	14 Mar 1033	72.83	89.82	204	326	11.79	Yes
Cosmos-636[d] (1974-16A)	TT A-2	20 Mar 0838	65.02	90.02	165	386	13.9	?
Cosmos-639[d] (1974-19A)	PL A-2	4 Apr 0838	81.31	88.85	206	226	10.8	?
Cosmos-640[f] (1974-21A)	PL A-2	11 Apr 1229	81.32	88.78	201	225	11.83	Yes
Cosmos-649[d] (1974-27A)	PL A-2	29 Apr 1326	62.81	89.28	181	299	11.6	?
Cosmos-652[d] (1974-30A)	TT A-2	15 May 0838	51.76	89.61	173	343	7.9	?
Cosmos-653[f] (1974-31A)	PL A-2	15 May 1229	62.81	89.27	192	287	11.65	Yes
Cosmos-657[d] (1974-38A)	PL A-2	30 May 1243	62.79	89.21	177	296	13.64	Yes

Satellite name and designation[a]	Launch site and vehicle	Launch date and time *GMT*	Orbital inclination *deg*	Period *min*	Perigee height *km*	Apogee height *km*	Lifetime *days*	Whether recovered[b]
Cosmos-658[f] (1974-41A)	TT A-2	6 Jun 0629	64.97	89.39	204	286	11.85	Yes
Cosmos-659[d] (1974-43A)	PL A-2	13 Jun 1229	62.81	89.30	153	329	12.66	Yes
Cosmos-664[d] (1974-49A)	PL A-2	29 Jun 1258	72.85	89.98	205	341	11.8	Yes
Cosmos-666[d] (1974-53A)	PL A-2	12 Jul 1258	62.81	89.59	181	328	12.7	?
Cosmos-667[g] (1974-57A)	TT A-2	25 Jul 0658	64.98	89.46	176	320	12.9	?
Cosmos-669[c] (1974-59A)	PL A-2	26 Jul 0658	81.32	88.91	209	230	12.83	?
Cosmos-671[d] (1974-62A)	PL A-2	7 Aug 1258	62.84	89.77	182	345	12.7	?
Cosmos-674[d] (1974-68A)	TT A-2	29 Aug 0735	64.99	89.48	175	323	8.9	?
Cosmos-685[f] (1974-73A)	TT A-2	20 Sep 0936	64.98	89.39	205	285	11.9	Yes
Cosmos-688[d] (1974-78A)	PL A-2	18 Oct 1507	62.82	89.77	179	349	11.66	Yes
Cosmos-691[d] (1974-82A)	TT A-2	25 Oct 0936	65.04	89.50	173	328	11.86	Yes
Cosmos-692[c] (1974-87A)	PL A-2	1 Nov 1424	62.82	89.41	197	295	11.7	?
Cosmos-693[d] (1974-88A)	PL A-2	4 Nov 1048	81.33	89.14	219	243	11.8	?
Cosmos-694[d] (1974-90A)	PL A-2	16 Nov 1146	72.83	89.37	173	313	11.8	?
Cosmos-696[c] (1974-95A)	PL A-2	27 Nov 1146	72.85	89.77	205	321	12.8	Yes
Cosmos-697[g] (1974-98A)	PL A-2	13 Dec 1341	62.80	90.16	174	392	11.6	?
Cosmos-701[d] (1974-106A)	TT A-2	27 Dec 0907	71.39	89.77	205	319	12.88	Yes

[a] See footnote [a] to table 13.1.
[b] See footnote [b] to table 13.1. Yes indicates that recovery beacon signals were monitored by the group at Kettering Grammar School, UK.
[c] Non-manoeuvrable satellites—pulse duration modulation—also scientific missions.
[d] Manoeuvrable satellites—two tone, no telemetry.
[e] Manoeuvrable satellites—Morse code.
[f] Non-manoeuvrable satellites—pulse duration modulation.
[g] Unclassified satellites.

Table 13.4. Possible Soviet electronic reconnaissance satellites launched in 1974

Satellite name and designation[a]	Launch site and vehicle	Launch date and time *GMT*	Orbital inclination *deg*	Period *min*	Perigee height *km*	Apogee height *km*	Lifetime
Cosmos-631 (1974-05A)	PL C-1	6 Feb 0043	74.04	95.31	521	545	10 years
Cosmos-633 (1974-10A)	PL B-1	27 Feb 1117	70.99	92.17	271	491	219 days
Cosmos-634 (1974-12A)	PL B-1	5 Mar 1605	70.92	92.18	271	491	218 days
Cosmos-655 (1974-35A)	PL C-1	21 May 0614	74.06	95.30	523	542	10 years
Cosmos-661 (1974-45A)	PL C-1	21 Jun 0907	74.04	95.24	511	548	10 years
Cosmos-662 (1974-47A)	PL B-1	26 Jun 1229	70.92	95.49	271	812	18 months
Cosmos-668 (1974-58A)	PL B-1	25 Jul 1200	70.95	92.20	270	492	211 days
Cosmos-686 (1974-74A)	PL B-1	26 Sep 1634	71.00	92.18	273	489	7 months
Cosmos-695 (1974-91A)	PL B-1	20 Nov 1200	71.00	91.96	273	468	6 months
Cosmos-698 (1974-100A)	PL C-1	18 Dec 1410	74.04	95.32	515	552	8 years

[a] See footnote [a] to table 13.1.

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Part IV. Developments in arms control and disarmament

Chapter 14. Disarmament negotiations in 1974

The Threshold Test Ban Treaty / Strategic arms limitation / Chemical disarmament / Prohibition of environmental means of warfare / The Indian Ocean as a zone of peace / Nuclear-weapon-free zones / The disarmament negotiating machinery / Definition of aggression / Treaty between the United States of America and the Union of Soviet Socialist Republics on the limitation of underground nuclear weapon tests / Estimated yields of underground explosions in the USA and the USSR, 1969–73 / Protocol to the treaty between the United States of America and the Union of Soviet Socialist Republics on the limitation of anti-ballistic missile systems / Joint US-Soviet statement of 24 November 1974 / Working papers on the prohibition of chemical weapons, presented at the Conference of the Committee on Disarmament (CCD) in 1974 / Definition of aggression / UN General Assembly resolutions on disarmament and related matters / Record of the nuclear-weapon powers' votes on the main resolutions concerning disarmament at the UN General Assembly in 1974

Chapter 15. The implementation of agreements related to disarmament

Strategic arms limitation agreements / The Antarctic Treaty / The Partial Test Ban Treaty / The Outer Space Treaty / The Treaty of Tlatelolco / The Non-Proliferation Treaty / The Sea-Bed Treaty / The BW Convention / Announced and presumed nuclear explosions in 1972–74 / Nuclear explosions, 1945–74 (announced and presumed) / Convention on registration of objects launched into outer space / Official reactions to the first Indian nuclear explosion / Status of NPT safeguards agreements with non-nuclear-weapon states, as of 31 January 1975 / Agreements providing for IAEA safeguards other than those in connection with the NPT, approved by the IAEA Board, as of 31 January 1975 / Memorandum B attached to the letters from supplier countries, addressed in 1974 to the Director-General of the IAEA / List of states which have signed, ratified, acceded or succeeded to the Geneva Protocol of 17 June 1925, for the prohibition of the use in war of asphyxiating, poisonous and other gases, and of bacteriological methods of warfare, as of 31 December 1974 / List of parties to the 1949 Geneva Conventions for the protection of war victims, as of 31 December 1974 / Bilateral arms control agreements between the USA and the USSR, as of 31 December 1974 / Multilateral agreements related to disarmament, as of 31 December 1974.

Chapter 16. Security aspects in the Law of the Sea debate

Chapter 17. Chronology of major events concerning disarmament and related issues

14. Disarmament negotiations in 1974

Square-bracketed references, thus [1], *refer to the list of references on pages 449–52.*

I. *The Threshold Test Ban Treaty*

As a result of the summit meeting of US and Soviet leaders, which lasted from 27 June to 3 July 1974, a Threshold Test Ban Treaty (TTBT) was signed imposing limitations on the two powers' underground nuclear weapon tests. The parties undertook not to exceed in their military testing an agreed threshold for explosion yield, and a protocol signed simultaneously with the treaty set out the requirements for verifying compliance with the above obligation. (For the texts of the treaty and the protocol, see appendix 14A.)

The Soviet Union characterized the agreement as a measure limiting the strategic arms race and as an important step towards complete discontinuation of underground tests [1]. The United States spokesman said that the agreement would have a significant moderating effect on US-Soviet nuclear arms competition [2].

The threshold approach

The 1963 Partial Test Ban Treaty (PTBT) prohibiting nuclear tests in the atmosphere, outer space and under water, left underground weapon tests unrestricted except for explosions causing radioactive debris to cross international borders. In the preamble to the PTBT the parties pledged to seek the discontinuance of all test explosions of nuclear weapons and expressed their determination to continue negotiations to this end. Indeed, talks on a comprehensive test ban were resumed after the entry into force of the PTBT, but they could hardly be described as real negotiations. Provisions of a new agreement were not discussed in a meaningful, systematic way, and on the question of verification, where the differences of opinion were the greatest, the positions of the main testing powers, the USA and the USSR, remained essentially unchanged. These difficulties gave rise to various proposals for a partial or gradual approach to a ban on underground testing.

As early as 1965, in the course of the debate at the Conference of the Eighteen-Nation Committee on Disarmament (ENDC), Egypt suggested a prohibition on underground nuclear tests of seismic magnitude 4.75 (which, according to the present state of the art of detection, would correspond, roughly speaking, to a 15-kiloton explosion in hard rock) and above, coupled with a moratorium on tests below that threshold, and an exchange of scientific information needed to improve verification techniques. The duration of the moratorium was not specified. The USSR and other socialist states supported this suggestion, while the USA and the UK were opposed to it, mainly because of the uncontrolled nature of the moratorium [3–5]. Reference was made to the sudden resumption of tests by the USSR in 1961, in spite of the previously agreed moratorium which, in the opinion of the Western powers, was then still in force.

During the 1966 ENDC session, India put forward a proposal for a treaty prohibiting underground tests above 4.75 or 4.80 seismic magnitude, and asked for continued research concerning identification of seismic events, so that the threshold could be lowered and eventually eliminated; all tests would have to be suspended pending the conclusion of the treaty [6]. Mexico was prepared to examine the feasibility of extending the prohibitions under the PTBT to underground tests known to lie beyond the threshold of uncertainty, that is, fully detectable and identifiable by national seismological means, and providing for a gradual lowering of the seismic magnitude permitted. It did not insist on a moratorium [7]. In subsequent discussions, the United Kingdom suggested that an annual quota of underground nuclear weapon tests should be agreed, and then phased out over a period of four to five years [8].

In 1969 Japan proposed a ban on tests above 4.75 magnitude as a first step, to be followed by international cooperation in devising, within a certain period of time, a system capable of monitoring tests above 4.0 magnitude; the improvements in the verification system would make it possible to reach an agreement prohibiting all tests [9]. At the twenty-fourth (1969) session of the UN General Assembly, several countries, including Cyprus, Finland, Japan, Nepal, New Zealand and Pakistan, specifically supported an immediate threshold treaty banning tests above 4.75 magnitude.

At the twenty-fifth (1970) and twenty-sixth (1971) sessions of the UN General Assembly, a number of delegations recommended a ban on underground tests above an agreed threshold, pending negotiation of a comprehensive ban, while the UK and the Netherlands recalled the earlier British proposal for a quota of tests per year on a scale descending to zero. The latter idea was becoming increasingly popular, and in September 1971 Sweden suggested a treaty banning underground nuclear weapon tests, which would be fully operative for each nuclear-weapon state after a specified number of months from its entry into force, during which period nuclear weapon test explosions would be phased out in accordance with a separate protocol annexed to the treaty [10–11]. Canada, Japan and Italy expressed the view that, pending a total ban, transitional steps should be taken by testing states, either unilaterally or jointly, to slow down the pace of nuclear testing and guard against the environmental risks of such testing. Proposals were made to reduce the number, as well as the size of tests. High-yield explosions, easily detectable and identifiable by extra-territorial means, were emphasized in this context.

The supporters of the idea of transitional steps, including the UN Secretary-General, claimed that restraints could help to reduce the dangers inherent in continued testing, generate confidence and facilitate the conclusion of a formal, comprehensive agreement. The opponents, including the USA and the USSR, asserted that a partial approach would not remove the existing obstacles because restraints were "tied in closely" with both understanding and resolving the problem of verification (the US view); and also because observance of a quota commitment or the establishment of a threshold magnitude for tests would pose problems identical to those involved in a total ban and would not put a stop to the building up of nuclear arsenals (the Soviet view) [15–22].

Nevertheless, at the twenty-sixth (1971) session of the UN General Assembly the majority of UN members called for unilateral or negotiated measures of restraint that would suspend nuclear weapon testing or limit or reduce the size and number of nuclear weapon tests, pending the entry into force of a comprehensive ban on "all nuclear weapon tests in all environments by all states" [23]. The USA and the USSR abstained on this resolution. The Japanese proposal, made in 1972, for a threshold as high as 5.25 [24], also met with a negative reaction on the part of the great powers.

Subsequently, when the pressure for restraint on nuclear testing was building up, the USA stated that, contrary to the opinion of other states, even weak tests could be of significant value in so far as the improvement of nuclear weapon design was concerned, and again stressed the need for adequate verification which, in its view, required on-site inspection in addition to national methods of detection and identification of seismic events. The USSR reaffirmed its opposition to any partial prohibition of underground nuclear testing, even of a transitional nature, or to any unilateral commitments, seeing the solution of the testing problem only as a whole. These opinions reiterated by the two powers at the twenty-seventh (1972) and the twenty-eighth (1973) UN General Assemblies in response to renewed recommendations for reducing testing or declaring unilateral or agreed moratoria on underground tests [25–26] were taken as a definitive rejection of the concept of a gradual approach, including the threshold approach. Against this background, the reversal of US and Soviet positions in 1974 came as a complete surprise to world public opinion. In explaining the reversal, the representative of the USSR at the Conference of the Committee on Disarmament (CCD) said that while in the past a threshold ban carried a certain "political risk", recent changes in the international situation had made it possible to conclude such an agreement [27].

A threshold solution to the problem of the cessation of underground tests never enjoyed wide international support. To most countries it appeared to be neither desirable nor practicable. They considered it a half-measure which may give the impression of legitimizing a certain category of tests, and result in promoting the improvement of smaller nuclear warheads and the development of new, more sophisticated weapons. In addition, it was argued that a threshold agreement, defined in terms of seismic magnitude, could pose technical problems leading to disputes over whether the agreed limitations were being observed [12, 16, 28–32]. Indeed, depending on the geological conditions of the testing sites, the location of seismological stations and the quality of their instruments, explosions of the same strength can produce quite different recordings, unless the magnitude threshold is determined on the basis of data from selected seismic stations, and unless testing is restricted to previously used sites.

Scope of the TTBT limitations

Instead of establishing a seismic magnitude threshold, the USA and the USSR chose to set a limit for the yield of permitted explosions. Each party has undertaken to prohibit, to prevent, and not to carry out any underground nuclear weapon test having a yield which exceeds 150 kilotons at any place under its jurisdiction or control, beginning 31 March 1976 (Article I).

Three questions arise in connection with this provision. First, whether the correlation between the agreed yield limit and the resulting seismic magnitude is such as to satisfy the earlier proponents of a threshold agreement. Second, what "sacrifice", if any, have the two powers made by limiting their weapon explosions to a 150-kiloton yield. And third, why have they set the date of effective limitation of explosion yields 21 months ahead of the signing of the treaty?

In view of the difficulty of defining a magnitude-yield ratio, the answer to the first question cannot be very precise. According to some scientists, seismic magnitude 5.9 might roughly represent 150 kilotons [33]. It would appear, therefore, that a 150-kiloton explosion is higher, by a factor of five to ten, than the yield corresponding to the magnitudes proposed in previous years [34]. Former advocates of a threshold agreement can be satisfied only in so far as their general approach was accepted by the two great powers, but their main postulate, that of reducing significantly the yield of tests, has not been met.

To answer the second question, it is not necessary to examine all testing activities of the USA and the USSR since the conclusion of the 1963 Partial Test Ban Treaty. It is sufficient, and certainly more significant, to estimate the yields of explosions carried out during the past few years in connection with the development of a new generation of warheads and to relate them to the 150-kiloton threshold agreed upon in the TTBT. But even then the task is complicated, because many explosions were not announced by the testing states and, when they were announced, the yield was given either in very approximate terms or not indicated at all. (A few explosions, in view of their location outside the usual weapon testing sites, are presumed to be part of a programme for peaceful uses of nuclear energy.) Nevertheless, some tentative computations were made by Swedish seismologists for the period covering 1969–73 on the basis of generally available seismometric data. For calibration purposes, the yields officially declared by the USA for 12 underground nuclear explosions conducted in previous years at the Nevada Test Site, and the yields published in the USSR for two large chemical explosions and two peaceful nuclear explosions were used. However, the Soviet tests were conducted outside known test sites and this circumstance has reduced the accuracy of the yield estimates for weapon explosions. The results of these calculations are summarized in appendix 14B. It shows the number of explosions the yields of which can be estimated with a high degree of confidence to be above or below the 150-kiloton threshold, and also the number of explosions the yields of which cannot be reliably determined with the data available. It appears that, for the period examined, most of the US and Soviet explosions were well below 150 kilotons and only a small fraction was above 150 kilotons [35]. Indeed, in recent years, attention has been devoted mainly to warheads for small tactical weapons or for such strategic weapons as have a yield lower than that established in the new treaty. Thus, the restriction imposed by the TTBT does not imply any real sacrifice on the part of the two powers, and the yield permitted is still ten times higher than that of the Hiroshima bomb.

As to the distant date set for the entry into force of the yield limitation, the official reason given was that considerable time is needed to make all verification arrangements and to conclude an agreement regulating explosions for peaceful purposes. However, to comprehend fully the meaning of this provision, account must also be taken of the fact that some warheads now under development are planned to have a yield exceeding the agreed limit. Their testing must, therefore, take place before the restrictions become effective. In the USA at least one new warhead belongs to this category, namely the improved warhead for the Minuteman III missile (about 400 kilotons). The size of the warheads for the US Trident submarine-launched missile (the suggested yield being 200 kilotons) and the size of the bomb or air-launched missile for the B-1 supersonic bomber remain to be determined. It is believed that about ten tests may be needed for each weapon. The US Secretary of Defense has admitted that the time delay will permit the "completion of certain developments that are underway" [36], and the US Atomic Energy Commission has asked for a supplementary budget to carry out accelerated testing of large warheads before March 1976. In the USSR, the threshold could affect the development of warheads for the large SS-18 missile. Be that as it may, a period of almost two years should suffice to carry out all these programmes and, considering the time needed for preparations, a series of intensive testing can be expected in late 1975. Apart from the above-mentioned weapons, neither power needs to conduct tests larger than 150 kilotons to carry out its present nuclear weapon projects.

In addition to the limit placed on the size of underground nuclear weapon tests, each party has committed itself, under Article I of the TTBT, to restrict the number of tests to a minimum. The commitment is not linked to the March 1976 deadline. It should, therefore, be binding as of the date of entry into force of the treaty, that is, the date of the exchange of instruments of ratification (Article IV), which may take place sooner. However, the term "minimum" is vague. Since there is no common understanding between the parties as to what it actually means [37], it may be subject to different interpretations. But if the rate of testing does not decrease in comparison with the preceding years, it will be difficult to conclude that this provision has been observed.

Verification

Article II stipulates that each party will use "national technical means" of verification at its disposal to provide assurance of compliance with the provisions of the treaty. The same formula was used in the US-Soviet treaty on the limitation of anti-ballistic missile systems (ABM Treaty).

National technical means to control a test ban may consist of seismic monitoring, satellite observation, or electronic eavesdropping. Seismic monitoring is considered to be the most useful method (especially when the size of tests is to be measured). In verifying a comprehensive treaty, all one would need to ascertain is whether a nuclear explosion had taken place, whatever its size. But in the threshold treaty the aim of verification is twofold: to determine whether a seismic event has a strength equivalent to a yield of 150 kilotons or more and, if so, whether it is an explosion or a natural earthquake. The latter problem is easy to solve as existing seismic methods can adequately identify nuclear explosions even of a smaller size. It is more difficult to satisfy oneself that the explosion yield has not exceeded the permissible limit, because seismic signals produced by a given underground explosion vary depending on a number of factors. Exact yield determination requires knowledge about the environment in which the test has been carried out, as well as about the explosions previously performed at the same site.

Accordingly, in a protocol to the treaty, the USA and the USSR have agreed to exchange information necessary to establish a correlation between given yields of explosions at the specified sites and the seismic signals produced, and to improve each side's assessments of the yields of explosions based on the measurements derived from its own seismic instruments. The data to be provided comprise: (*a*) the geographic coordinates of the boundaries of each test site and of the boundaries of the geophysically distinct testing areas therein; (*b*) the geology of the testing areas of the sites—the rock characteristics of geological formations and the basic physical properties of the rock, that is, density, seismic velocity, water saturation, porosity, and depths of water table; (*c*) the geographic coordinates of underground nuclear weapon tests, after they have been conducted; and (*d*) yield, date, time, depth and coordinates for two nuclear weapon tests for calibration purposes from each geophysically distinct testing area where underground nuclear weapon tests have been and are to be conducted, the yield of such explosions being as near as possible to the limit defined in the treaty and not less than one-tenth of that limit. The exchange of this data is to be carried out simultaneously with the exchange of instruments of ratification of the treaty. It may be noted that, while some data concerning the testing sites are probably known by the two powers anyway, the information on calibration explosions is practically unverifiable. It must be assumed, therefore, that the parties will act in good faith and that no attempt will be made to falsify the actual yields and mislead the other side.

If calibration tests were carried out at the usual test sites (Nevada in the USA, and Semipalatinsk and Novaya Zemlya in the USSR), the data obtained would make it possible to determine with a high degree of reliability the yield of all tests previously conducted in these sites. The secrets hitherto closely guarded by the two powers would be disclosed. But the parties are allowed to use other sites. The protocol provides that in the case of testing areas where data are not available on two tests for calibration purposes, "the data pertaining to one such test shall be exchanged, if available, and the data pertaining to the second test shall be exchanged as soon as possible after the second test having a yield in the above-mentioned range." Even after the entry into force of the treaty, the parties are entitled to specify a new test site or testing area, but information on the geographic coordinates and geology should be transmitted to the other party prior to using that site or area. The data needed for calibration purposes should also be transmitted in advance, if available; if they are not available they should be transmitted as soon as possible after they have been obtained by the transmitting party (point 3 of the protocol).

Each party undertakes not to interfere with the national technical means of verification of the other party. This clause can be interpreted as an obligation not to use evasion techniques, such as "cavity de-coupling" involving the emplacement of a nuclear device in a large cavity in hard rock or salt medium which may reduce the recorded seismic magnitude. In addition, the USA and the USSR have pledged themselves to conduct all nuclear weapon tests solely within specified testing areas, and the USA stated that it had a substantial degree of confidence, within a factor that is very tolerable for military purposes, that it would know violations of the ban as long as the testing took place at known sites [36]. Thus, the parties have decided to place reliance on their own verification capabilities.

As a complement to technical verification, the parties shall, as necessary, consult with each other, make inquiries and furnish information in response to such inquiries (Article II). The provision is probably meant to deal with disputes over explosions that may seem to violate the yield restriction. Such disputes, however, are not likely to arise since the threshold is high enough not to provide a motive for violating the treaty.

Peaceful nuclear explosions

The provisions of the treaty do not extend to underground nuclear explosions carried out by the parties for peaceful purposes (Article III). This means that the threshold of 150 kilotons does not apply to such explosions. But it is not possible to distinguish with certainty nuclear tests serving peaceful aims from those serving military aims. A mere statement by the testing state that its intention is "peaceful" may not be found satisfactory; the loophole could be taken advantage of for a new large weapon development, if at some point in the future this became necessary.

On the other hand, if the yield limit of 150 kilotons were imposed on all underground nuclear explosions, certain peaceful applications of nuclear energy, such as large-scale excavation projects, would have to be abandoned altogether. The studies on the possible use of nuclear explosions to dig a sea-level Panama Canal indicated that some 300 nuclear blasts with yields ranging up to 15 megatons would be required [38]. It has also been estimated that the construction by nuclear excavation of the northern 65-km part of the Pechora-Kama-Volga canal in the USSR, would require about 250 nuclear explosives with yields of up to 600 kilotons each, while the yield for any one "salvo" of charges might attain three megatons [39]. Besides, in conformity with point 5 of the protocol to the treaty, peaceful nuclear explosions must be carried out only outside the specified test sites, that is, in areas for which calibration data may not be available. Therefore, verification of compliance with a uniform threshold for all explosions, irrespective of their location, could pose serious problems. It was probably with these considerations in mind that the parties undertook to conclude "at the earliest possible time" a separate agreement by which underground nuclear explosions for peaceful purposes shall be governed (Article III). Nothing in the text indicates that this is a condition for the treaty to become effective. Nevertheless, the parties were agreed that the treaty would not be ratified unless there was also an agreement for the handling of peaceful nuclear explosions [40].

An understanding in principle on some of the requirements for verifying that peaceful nuclear explosions are not weapon tests had been reached already in the course of the negotiations on the TTBT. These requirements include prior notification, precise definition of time and place and, most important, the presence of observers [2]. The effectiveness of observation will, of course, depend on the mandate and prerogatives of the observers. Their presence would be most useful if they could ascertain that only existing explosives which have already been tested, and not untried devices, meant for weapon purposes, are used. This may be difficult to achieve even if the characteristics of the explosive were disclosed.

US-Soviet talks on rules governing peaceful nuclear explosions began in the autumn of 1974. Their outcome may be important for the implementation of Article V of the Non-Proliferation Treaty, according to which potential benefits from peaceful applications of nuclear explosions must be made available to non-nuclear-weapon parties "under appropriate international observation and through appropriate international procedures". The USA has made it clear that the agreement sought for would not be applicable to the problem posed by the development of nuclear explosive capability by a non-nuclear-weapon state, as it is impossible for a non-nuclear-weapon state to develop a capability to conduct nuclear explosions for peaceful purposes without, in the process, acquiring a device which could be used as a nuclear weapon [2].

Other provisions

The duration of the treaty has been set for a period of five years and the parties have undertaken to continue negotiations "with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapon tests". If such a solution is not found, the treaty can be extended for successive five-year periods unless either party notifies the other of its termination no later than six months prior to its expiration. It will be noted that the Partial Test Ban Treaty, which has also envisaged the conclusion of a comprehensive agreement, is of unlimited duration. Beside the possibility of terminating the treaty through a simple notification, without obligation to explain the reasons, each party has the right to withdraw from the TTBT at any time, if it decides that "extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests". In the latter case, six months prior notice should include a statement of the extraordinary events the notifying party regards as having jeopardized its supreme interests. As distinct from the multilateral arms control agreements signed in recent years (the Non-Proliferation Treaty, the Sea-Bed Treaty and the Biological Disarmament Convention), there is no obligation to notify the UN Security Council of the withdrawal.

No special amendment procedure has been provided for, but the parties "may, as necessary, hold consultations to consider the situation relevant to the substance of this Treaty" and introduce possible amendments to its text.

Summary and conclusions

Unlike the PTBT, the July 1974 treaty limiting underground nuclear weapon tests is a purely bilateral affair between the USA and the USSR. Adherence by other states is not envisaged. As it stands now, the treaty can hardly be turned into a multilateral instrument: the methods of control are geared solely to the two powers. Only the United Kingdom announced that it had committed itself to abide by the provisions of the treaty, even though it was not formally party to it [41]. The remaining two nuclear-weapon-powers—China and France—will certainly ignore it, since they have not even subscribed to the ban on atmospheric testing. The majority of other countries have taken a very sceptical view, while India found in the treaty added justification for pursuing its programme of peaceful nuclear explosions.

The treaty has, no doubt, a few positive aspects. It will complicate the development of new high-yield warheads by both sides. It will also make it difficult for them to carry out stockpile-sampling, because the existing large thermonuclear weapons could not be tested at their full yield. Cessation of explosions in the megaton range may have favourable environmental effects. It will reduce risks of radioactive venting, artificial earthquakes or tidal waves. Most important, however, are the verification provisions. It will be the first time that detailed information concerning sites and yield of nuclear weapon explosions will be exchanged between the parties. Apart from the political significance of this procedure constituting a step towards greater openness among states, a suitable verification framework could be created for use in a possible comprehensive test ban. There may also be a "peaceful" spin-off from the exchange of seismic data. It could promote cooperation of the two powers in the field of earthquake prediction, as provided for in the 24 May 1972 US-Soviet Environmental Protection Agreement. In this context, it is interesting to note that Canada has expressed the hope that the seismological and geographical information exchanged between the USA and the USSR, would be made available to all countries, leading, among other things, to a better worldwide understanding of the Earth's structure [42]. Also Sweden asked for access to such data [43].

Even more significant would be the acceptance of on-site international observation of peaceful nuclear explosions. This would amount to a breakthrough in the great powers' approach, notably that of the Soviet Union, to the problem of verification, and perhaps set a precedent for other arms control measures. Participation of third countries or international organizations in the envisaged observation would further enhance the value of this step.

All this does not alter the fact that the treaty has contributed very little, if at all, to the cessation of the nuclear arms race. No wonder that it was met with disappointment by world public opinion which has condemned all nuclear weapon tests through UN resolutions, and which year after year has been asking for their complete cessation. It can be argued that partial limitation is better than no limitation at all. This would be true if limitation meant some slowing down of the pace of development or deployment of arms. However, in the July 1974 treaty the threshold was set so high that the arms control effect has been entirely lost. The yield limitation does not even reflect the capabilities of the verification methods. According to some scientists, a nuclear explosion of one-tenth the yield agreed upon by the USA and the USSR can be detected by existing means [44]. Other experts have estimated that the detection/identification threshold for underground nuclear explosions in hard rock in the Northern hemisphere lies now in the yield-range of two to three kilotons [45]. The parties are permitted to do whatever they need for the continuation of their nuclear weapon programmes. All warheads for tactical nuclear weapons and most warheads for strategic nuclear weapons, presently deployed or planned to be deployed, can be tested in their full explosive yield. Ample time has been left to test a few types of warheads whose yield may exceed the agreed limit, and there is not even a solid guarantee that the number of tests will decrease.

What can be affected is a possible new generation of nuclear weapons, as it may be difficult to render their yields larger than 150 kilotons without testing. But the value of this constraint is problematic. If absolutely necessary, low-yield tests could be related to devices of larger yields. Besides, the existing trend is to improve the effectiveness of nuclear weapon systems by increasing the accuracy of missiles rather than by increasing the yield of warheads. With the introduction of multiple independently-targetable re-entry vehicles (MIRVs), multi-megaton weapons are falling into obsolescence anyway.

Furthermore, if peaceful nuclear explosions exceeding 150 kilotons were allowed without limitation on their numbers, and without very strict control over their "peaceful" nature, the US-Soviet treaty may not signify any restriction on testing activities whatsoever. It is also doubtful, whether it will have a favourable impact on political decisions concerning more important arms control undertakings. The parties have promised to work towards the cessation of all underground weapon tests, but the credibility of such promises has been undermined during the past decade. Further agreements lowering the yield threshold cannot be excluded, but the prospects for a comprehensive test ban may have been postponed indefinitely.

One gets the impression that the idea of a threshold treaty was hastily conceived for purposes unrelated to arms control considerations. It seems to have served rather as a cover-up for the inability of the leaders of the two great powers to reach at that time an agreement on strategic offensive arms limitations and as a demonstration that "détente" works. It may also have been motivated by a desire to allay the criticism about non-fulfilment by the nuclear-weapon powers of their obligations under the Non-Proliferation Treaty. But the TTBT can hardly be considered an effective measure relating to cessation of the nuclear arms race, as required under the NPT. At this juncture, nothing short of a commitment to halt nuclear weapon tests at once, or, at least, phase them out within a definite time limit, could provide evidence of the great powers' willingness to work towards nuclear disarmament.

II. *Strategic arms limitation*

Defensive arms

In 1972, when the Treaty on the limitation of anti-ballistic missile systems (ABM Treaty) was signed, the USSR had 64 ABM launchers deployed around Moscow and no ABM protection of ICBM silos. The USA was then building two ABM sites for the protection of its intercontinental ballistic missiles (ICBMs), one at Grand Forks, North Dakota, and another in the vicinity of Malmstrom Air Base in Montana; it had no ABM system around Washington. The treaty allowed the parties to have two ABM sites, one to defend the national capital, and the other to defend an ICBM complex, with up to 100 ABM launchers and 100 ABM interceptor missiles on each site. The centres of the two ABM deployment areas for each party were to be separated by no less than 1 300 km.

On 3 July 1974, the USA and the USSR signed a protocol to the ABM Treaty, introducing further restrictions on ballistic missile defence. (For the text of the protocol see appendix 14C). Under Article I of the protocol, the USA and the USSR have undertaken to forego the deployment of an ABM system or its components in one of the two areas permitted by the treaty. Nevertheless, each side will have the right to dismantle or destroy the ABM and its components where they are presently deployed and to deploy them in the alternative area. Prior to initiation of construction of the new site, notification must be given during the year beginning 3 October 1977, and ending 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. The exchange of one area for another may take place only once. Accordingly, the USA could remove the ABM system from the area containing ICBM silo launchers and deploy it in an area centred on its capital, and the USSR could remove the ABM system from the area centred on its capital and deploy it in an area containing ICBM silo launchers. The deployment of ABMs within the area selected by each party would be limited by the levels and other requirements (including radar size and numbers) previously established by the ABM Treaty. The protocol enters into force upon exchange of instruments of ratification.

In assessing the importance of the new agreement, one has to bear in mind that even when the ABM Treaty was being negotiated, there were serious doubts whether either power would ever exercise its option to build a second ABM site. It was mainly because of the difficulty in agreeing on whether to choose the defence of the capital or that of the ICBMs, that the parties then decided to provide for two ABM sites. Indeed, the USA continued the construction of the ABM complex at Grand Forks for the defence of ICBM silo launchers (while stopping the construction of the other complex), but abandoned the idea of protecting its capital.[1] Neither did the USSR take advantage of the relevant treaty provision: it took no action to build a second site near a missile field. Moreover, the USA was planning to keep the Grand Forks ABM complex in a state of inactivity ("mothballed") upon the completion of its construction, while the USSR did not even expand the ABM defence of Moscow to the permitted level of 100 launchers. The new obligation undertaken by the two powers does not, therefore, entail any real sacrifice on their part. Nevertheless, a legally binding document which removes the possibility of a decision being taken in the future by either power to build a second ABM site without breaking its commitments, may be considered a useful step towards the maintenance of strategic stability.

Since the means of anti-missile protection remaining on both sides are patently inadequate to prevent warheads from getting through to the target, the question can be asked why the parties have refrained from reducing their ABM sites to zero. One explanation may be that the preservation of even a token defence provides justification for the development of improved, more reliable models of launchers and interceptors, as well as related radar installations. In fact, such activities, which are allowed under Article IV of the ABM Treaty, have never ceased. The USA has continued research to improve missile interceptors and has been testing the capability of the missile site radar (MSR) and its data processor to search for and acquire an ICBM target, to discriminate between the target and dummy or other objects, and to track the target itself [46]. The USSR has conducted flight

[1] In the fiscal year 1973 defence procurement bill (PL 93-436) the US Congress prohibited the Department of Defense from beginning work on an ABM site to protect Washington D.C.

tests of new interceptor missiles. Under the protocol, the right to modernize and replace ABM systems or their components, as provided in Article VII of the ABM Treaty, will not be affected. Thus, the basis for competition in defensive systems, though narrowed, has not been eliminated. Moreover, the development of new means of anti-ballistic missile protection, based on other physical principles than the present ABM systems, has not been prohibited; in 1972 the parties merely agreed that in the event of such new systems being created in the future, their specific limitations would be subject to discussion and agreement. (Agreed interpretation E, attached to the ABM Treaty). All this constitutes a latent danger to the permanency of the ABM limitations. Even though the treaty and the protocol to it are of indefinite duration, each party is entitled to withdraw from its obligations, at any time, invoking its "supreme interests". It is noteworthy that one of the arguments put forward in the USA for continued research and development on MIRV is the need to prepare against the contingency that the USSR might decide to undertake a massive ABM deployment in defiance of the ABM Treaty [47]. In practice, abrogation of the treaty would occur only if one of the parties achieved a technological breakthrough, and continued development and testing activities help to nurture the hope that a strategically significant anti-missile defence could, perhaps, sometime be deployed. Therefore, only a complete renunciation of any type of anti-ballistic missile defence would be meaningful from the arms control point of view. It would definitely confirm the acceptance by the two sides of the concept of mutual vulnerability to ballistic missiles. The development of non-ballistic nuclear missiles, namely cruise missiles, as well as stand-off missiles launched from strategic bombers at long ranges (to avoid having to penetrate air defences) may, of course, pose new problems. At the present time, however, there does not seem to be an interest, on either side, in restricting the defences other than those of the ABM.

Offensive arms

In the 1973 "Basic principles of negotiations on the further limitation of strategic offensive arms", the USA and the USSR undertook (*a*) to replace the 26 May 1972 Interim Agreement on certain limitation measures by a permanent one; (*b*) to include in the new agreement "more complete" measures, seeking both quantitative and qualitative restrictions on strategic offensive arms; (*c*) to sign the new agreement in 1974; and pending this (that is, before the end of 1974), (*d*) to reach agreements on separate measures supplementing the 1972 Interim Agreement.

None of these commitments were fulfilled, and the very idea of searching for a permanent treaty has been abandoned, at least for the next decade. As announced during the June-July 1974 meeting of Soviet and US leaders in

Moscow, and as subsequently confirmed at the November 1974 summit meeting, held in Vladivostok, the two powers have opted for another temporary arrangement.

In a joint statement issued on 24 November 1974, the USA and the USSR expressed their intention to conclude an agreement on the limitation of strategic offensive arms, which would cover the period from October 1977 to 31 December 1985.

The new agreement will incorporate some relevant provisions of the 1972 Interim Agreement (remaining in force until October 1977) and will include the following limitations: (*a*) both sides will be entitled to have a certain agreed aggregate number of strategic delivery vehicles; and (*b*) both sides will be entitled to have a certain agreed aggregate number of intercontinental ballistic missiles (ICBMs) and submarine-launched ballistic missiles (SLBMs) equipped with multiple independently-targetable warheads (MIRVs).

Negotiations to work out an agreement on the basis of the principles enumerated above were to start and be completed in 1975, while negotiations on further limitations and possible reductions of strategic arms in the period after 1985, were to begin no later than 1980–81. (For the text of the US-Soviet joint statement, see appendix 14D.) Subsequently, in response to criticism voiced especially in the USA, the wording of the joint statement was altered so as to enable negotiations on reductions and the reductions themselves to take place sooner than originally envisaged [48].

On 2 December 1974, President Ford revealed the agreed aggregate numbers which supplement the general framework of the new agreement. These are: (*a*) for each side a ceiling of 2 400 will be put on the total number of intercontinental ballistic missiles, submarine-launched missiles and heavy bombers; and (*b*) of each side's total of 2 400, the number of missiles that can be armed with MIRVs will be limited to 1 320 [49].

The new agreement would differ substantially from the Interim Agreement, currently in force.

The latter deals only with two types of strategic offensive weapons—fixed land-based intercontinental ballistic missile (ICBM) launchers and ballistic missile launchers on modern submarines. According to an official US statement, the new agreement would include land-based intercontinental ballistic missiles, submarine-launched missiles and heavy bombers, as well as "certain other categories of weapons that would have the characteristics of strategic weapons" [50]. But the statement was ambiguous on a number of points.

1. It was not clear, whether the first two types of weapons enumerated therein, were identical with the weapons covered by the Interim Agreement. The number of *missile launchers* may or may not coincide with the number of *missiles* in the possession of the parties. In any event, the omission of the

term "fixed" in connection with ICBMs indicated that the new agreement would be concerned also with mobile land-based missile launchers. The inclusion of mobile launchers in the agreed limits would formally license their possession, and this would signify a reversal of the US position held in 1972. At that time, the USA stated that it would consider the deployment of operational land-mobile ICBM launchers as inconsistent with the objectives of the Interim Agreement.

2. The definition of a "heavy bomber" was not provided. The Interim Agreement covered only such ICBM launchers as were capable of ranges in excess of the shortest distance between the northeastern border of the continental USA and the northwestern border of the continental USSR. If, by analogy, this qualification should apply to bombers, it would have to be made clear whether bombers capable of reaching the other side's territory in a one-way mission, or requiring mid-air refuelling for a two-way mission, would be counted as strategic delivery systems subject to limitations. It appears that at least one type of such aircraft on each side will be excluded from the limitations: the Soviet Backfire and the US FB-111 [51]. Missiles launched from bombers can reach an adversary without necessarily overflying its territory. But it seems that short-range attack missiles (SRAMs) on US bombers would not count [51].

3. "Other categories of weapons", having the characteristics of strategic weapons, were not specified. Most probably they include yet another type of mobile intercontinental missile—air-borne in addition to land-based. The USA has already tested an ICBM launched from a transport aircraft. Since, in principle, each bomber will be counted as a single delivery vehicle, irrespective of the number of missiles it carries, the question may arise whether a bomber carrying more than one *intercontinental* missile will also be so counted.

4. Furthermore, there was some doubt as to whether multiple, but not independently-targetable, re-entry vehicles would be subject to the same limitations as single-warhead missiles.

Under the Interim Agreement, the freedom to choose the mix of ICBM and SLBM launchers within the agreed overall levels is restricted. The USA and the USSR are not allowed to start (after 1 July 1972) construction of additional fixed land-based ICBM launchers, nor to exceed the ceilings either for SLBM launchers—710 for the USA and 950 for the USSR—or for modern ballistic missile submarines—44 for the USA and 62 for the USSR.

Under the new agreement, each power will apparently have greater freedom to determine the composition of its force so long as the aggregate number of strategic weapons does not exceed the set ceiling. The sub-ceiling imposed by the Interim Agreement on land-based launchers for modern "heavy" missiles will remain in force, while another important sub-ceiling, that on missiles equipped with multiple independently-targetable vehicles, will be introduced.

A major innovation consists in eliminating the numerical disparities stipulated in the Interim Agreement. While the latter permitted an edge of 40 per cent more ICBM launchers and missile launching submarines, and one-third more SLBM launchers in favour of the Soviet Union, the new agreement will establish the same number of strategic delivery systems for the two powers.

The general terms of the Vladivostok statement have yet to be translated into concrete treaty language. Technical details, including definitions, remain to be settled.

Measures of verification must be worked out. The parties will probably place reliance on their "national technical means" of verification, that is, reconnaissance satellites, as they do under the ABM Treaty and the Interim Agreement. These means are certainly sufficient to check the numbers of fixed ICBM launchers and submarines deployed. But there may be difficulties in ascertaining the numbers of mobile, including air-borne, ICBM launchers. And to solve the problem of distinguishing MIRVed missiles from "ordinary" missiles, the parties may agree that once a MIRV capacity of a given missile has been demonstrated, all deployed missiles of the same type would be presumed to be MIRVed. Such a solution would correspond to the language used in the US President's statement, namely, that the limitation applied to the number of missiles that "can" be armed with MIRVs. Otherwise, differentiation would be impossible without verification that would be so intrusive as to prove unrealistic.

Although not all the understandings reached by the USA and the USSR were revealed, and the final shape of the new agreement will depend on the outcome of detailed negotiations, some tentative conclusions regarding the significance of the Vladivostok statement can already be drawn.

An important criterion for judging the value of an arms control treaty is whether the fire-power of the contracting parties has been reduced or, at least, frozen at the existing levels. This applies fully to SALT. Thus, the USSR—which in mid-1974 had 1 567 ICBMs, 636 SLBMs and 140 heavy bombers, together 2 343 strategic delivery vehicles—will be allowed to increase the number of its missiles or bombers by 57 to reach the permitted ceiling of 2 400. As compared with the target figures of the Interim Agreement—1 408 ICBMs and 950 SLBMs, plus 140 heavy bombers not covered by the Agreement—together 2 498 strategic delivery vehicles, it will have to reduce its missile-building programme by 98, or more, if it had planned to deploy a larger number of heavy bombers than it possessed in 1972.

On the other hand, the USA—which in mid-1974 had 1 054 ICBMs, 656 SLBMs and 420 heavy bombers, together 2 130 strategic delivery vehicles—will be allowed to increase the number of its missiles by 270 to reach the permitted ceiling of 2 400, or by 241 if compared with the target figures of the Interim Agreement, namely 1 000 ICBMs and 710

SLBMs, plus 449 heavy bombers possessed in 1972 but not covered by the Agreement—together 2 159 strategic delivery vehicles.

However, these increases (in the case of the USA) or decreases (in the case of the USSR) are not sufficient indicators of changes in the nuclear fire-power of the parties. At the present stage of the strategic arms race, due to the introduction of MIRVs, it is the number of nuclear warheads, as well as the quality of missiles and warheads, which matter, rather than the number of missiles alone. Therefore, it may be useful to compare the number of warheads allowed under the future agreement with the levels which existed in 1972, at the time of the conclusion of the SALT Interim Agreement, and the levels prevailing in 1974, the year when the Vladivostok statement was issued.

The future agreement is to provide for a ceiling of 1 320 MIRVed missiles. The exact number of warheads which will be mounted on each missile is unknown. At present, the US land-based Minuteman III missile contains three warheads, and the submarine-launched Poseidon missile around ten. Soviet MIRVing capability is estimated at four to eight warheads on a land-based ICBM [52].

On this basis, it would seem safe to assume that a MIRVed missile on each side will have, on average, six warheads. The total number of warheads on the maximum allowed number of MIRVed missiles for each side would then amount to 7 920 (1 320×6). In addition, the parties will be allowed to possess 1 080 (2 400−1 320) non-MIRVed delivery vehicles. If these carried one warhead each, the aggregate number of warheads for the USA and the USSR would be 9 000 (7 920+1 080).

The figures would be considerably higher, if missiles carrying multiple, but not independently-targetable, re-entry vehicles (MRV) were included in the 1 080 limit for non-MIRVed vehicles and, especially, if the full payload carried by heavy bombers were to be counted. In the first instance, assuming that a MRVed missile would carry three warheads, as is now the case, the aggregate number of warheads for each of the two powers could go up to 11 160 (7 920+1 080×3), unless both sides decided to forego MRVs, the effectiveness of which is not much higher than that of a single warhead. In the second instance, the increases would be different for each power; at present US bombers carry an average of four warheads and the Soviet bombers two. (Derived from reference [53]). But modern US bombers might carry as many as 24 missiles [54–55]. Consequently, the number of warheads on US bombers could amount to 10 080 (420×24), bringing the US total to 18 660 if the remaining non-MIRVed vehicles were fitted with one warhead (7 920+10 080+660) or to 19 980 if they were fitted with three MRVs (7 920+10 080+660×3). For the USSR a corresponding increase would be much less significant; its present bomber fleet is smaller than the US fleet and the bombers are hardly capable of carrying more warheads than

Table 14.1. Nuclear warheads on US and Soviet missiles and bombers

	Actual levels				Permitted levels	
	1972		1974 (mid-year)		1985	1985
Number of war-heads on	USA	USSR	USA	USSR	USA	USSR
ICBMs	1 474[a]	1 527	1 854[a]	1 647[c]	–	–
SLBMs	3 280[b]	444	4 464[b]	636	–	–
Heavy bombers	1 796[d]	280[e]	1 680[d]	280[e]	–	–
Total	**6 550**	**2 251**	**7 998**	**2 563**	**18 660[f]–19 980[g]**	**9 420[f]–11 300[g]**

[a] Warheads on US Minuteman III are counted three to a missile (MIRV).
[b] Warheads on US Polaris A-3 are counted three to a missile (MRV); on US Poseidon C-3—10 to a missile (MIRV).
[c] Warheads on Soviet SS-11 mod. 3 are counted three to a missile (MRV).
[d] Warheads on US bombers are counted four to a bomber; the US medium-range FB-111 is not included in the count.
[e] Warheads on Soviet bombers are counted two to a bomber.
[f] On the assumption that a MIRVed missile will have, on the average, six warheads; that the two powers will maintain the same number of heavy bombers as in 1974, but with 24 warheads on US bombers and four warheads on Soviet bombers; and that the remaining non-MIRVed missiles will carry one warhead each.
[g] On the same assumption as above, except that the remaining non-MIRVed missiles will carry three warheads each (MRV).

they carry now. Little is known about the Soviet Union's programmes in this field, but even if it were assumed that its bomb-carrying capacity would double within the next few years (from two to four), the number of warheads on Soviet bombers would amount only to 560 (140×4). The total would then be 9 420 if the remaining non-MIRVed vehicles were fitted with one warhead (7 920+560+940), or 11 300 if they were fitted with three MRVs (7 920+560+940×3).

Against these totals, allowed until 1985, the figures for 1972 and 1974 are shown in table 14.1.

It would appear that in 11 years, from 1974 to 1985, the USA could increase the number of its strategic warheads by nearly 12 000 and the USSR by over 8 700, and in 13 years, from 1972, when the first SALT agreements were signed, to 1985, by almost 13 500 and over 9 000, respectively. The figures are approximate but certainly not overestimated. They may, perhaps, never be reached. But the important thing is that the parties will not be prevented from doubling or even trebling their present strategic warhead inventories (with yields ranging from about a hundred kilotons to a few megatons), if they decide to do so, and it may be noted that tactical warheads which have a lower yield would not be subject to any restriction whatsoever.

Qualitative changes in strategic offensive weaponry over a ten-year period are more difficult to measure. But since modernization and replacement of these weapons will not be prohibited, and may even be expressly allowed as under the Interim Agreement, their accuracy, penetrability, survivability, range and yield-to-weight ratio will, no doubt, improve. Consequently, the new agreement will sanction an increase in the nuclear fire-power of the two sides. The proponents of the agreement do not deny that this will be the case but they advance the following arguments in its favour: (*a*) that a "firm" ceiling will be put on the strategic arms race; (*b*) that equal limits will be placed on the strategic forces of each side; (*c*) that a "solid" basis will be created from which future arms reductions can be negotiated; (*d*) that economic waste will be prevented; and (*e*) that without an agreement, the force levels would be substantially higher over the next ten years [48].

As far as the first argument is concerned, it is true that a ceiling will be put on the number of strategic delivery vehicles, but its "firmness" is uncertain, because the agreement will be valid only for a limited period. And even if the ceiling were not to be raised after the expiration of the agreement, it would be incorrect to consider a measure limiting the number of vehicles, MIRVed or non-MIRVed, as tantamount to halting the strategic arms race. In the important field of qualitative improvements in missiles and bombers, including missile throw-weight capability, rivalry between the two powers will not cease. Since the USSR has built heavier land-based missiles than the USA, which permits it to mount a greater number of warheads per missile, the USA may consider increasing the number and/or the yield of warheads on its own MIRVed missiles, if it decides that this is strategically necessary; it would not be prevented from doing so under the new agreement. Neither would the USSR be inhibited in its attempts to match the accuracy of US missiles and in placing greater emphasis on bombers than it has hitherto. The licensing of mobile ICBMs will open new vistas for great-power competition and may create new dangers to the stability of the strategic balance. No restraints will be applied to cruise missiles launched from surface ships, planes or submarines, because of their non-intercontinental range. Further development of antisubmarine means of warfare will not be affected at all.

Similarly misleading is the "equality" argument. The same number of strategic delivery vehicles fixed for the two powers does not denote equality in strategic forces. Because the USA and the USSR have been developing their nuclear weapon systems in different ways and using different kinds of technology, the mix of strategic weapons for each side will continue to be different. Asymmetries are likely to persist, and perhaps widen, as a result of the lack of limitations on the number and yield of warheads, as a consequence of inescapably unequal advances in the qualitative improvement of missiles, and also because of geographic reasons. For example, the US shorter-range bombers and missiles based in Europe and other areas close to the USSR and capable of delivering nuclear charges will not be included in the new agreement. This gives the USA an advantage, even though their so-called forward-based systems may not be suitable for a "significant" attack on the Soviet Union [49].

On the other hand, since the USSR is considerably larger in size than the USA, it has more space in which to deploy land-based missiles. Furthermore, its population is more dispersed and separated from sea-based nuclear threats by large land areas, while the US urban population is concentrated along the seacoasts within the reach not only of submarine-launched strategic missiles but also of shorter-range cruise missiles. Other factors weighing in the strategic equation are the US submarine bases abroad, as well as the nuclear forces of the US NATO allies, which have no counterpart on the Warsaw Treaty Organization's side and which are not subject to contractual limitations. Admittedly, some of these inequalities are difficult or impossible to remove, but their existence is incontrovertible. The parties themselves concede that it is not strict strategic equality that they seek, but rather a sort of balance which would give them a perception of equal security. If this is so, the contention that negotiations about reductions would be possible only when the very high levels permitted by the new agreement were reached, seems untenable. It is incomprehensible why a balance and equal security could not be achieved by bringing the present levels, which are already high enough to destroy humanity several times over, down to a common, lower plateau, and by halting or significantly slowing down the introduction of new arms. The policy of continued armaments contradicts the declared intention to disarm. At present, neither side can really threaten the overall strategic forces of the other, while an arms race, by its very nature, generates temptations among the competitors to overtake each other. It is bound to create instabilities and, thereby, new difficulties on the way to weapon reductions.

It has been stated that the USA is not planning new appropriations for the strategic weapons programme, except as rendered necessary by inflation [45]. It is not known whether this is also the case in the Soviet Union. In any event, given the envisaged build-up in the field of strategic offensive arms, it is most unlikely that military appropriations for this purpose will be reduced by either side. The present expenditures of the two great powers are high enough to be considered an economic waste even without further increases.

Finally, the assertion that without an agreement the strategic forces would exceed the limits now established is unwarranted. The same reasoning was used to justify the high levels of armaments set by the 1972 Interim Agreement and did not carry much conviction, since the agreement placed no constraints on actual offensive weapon programmes. Under the new agreement, some armaments programmes may be subject to alterations or adjustments with a view to securing the most advantageous mix of strategic weapons, but none of the important, on-going strategic build-up projects will be curtailed. In particular, the USA is expected to continue the construction of its new Trident submarines and B-1 strategic bombers, and the

USSR—the deployment of its new ICBM and SLBM systems, including MIRVs. These would probably have been the main developments in the strategic arms race during the next ten years, in any case. It would have been very difficult to do more because of technological and economic constraints. Consequently, the Vladivostok statement hardly deserves to be called a breakthrough. It simply rationalizes further arms expansion. Nuclear disarmament has once again proved to be a will-o'-the-wisp.

III. *Chemical disarmament*

In a joint communiqué of 3 July 1974, the governments of the USA and the USSR agreed to consider a joint initiative at the Conference of the Committee on Disarmament (CCD) "with respect to the conclusion, as a first step, of an international convention dealing with the most dangerous, lethal means of chemical warfare".

This initiative did not materialize during the 1974 CCD session. Instead, the Conference examined a draft convention submitted by Japan on 30 April 1974 on "the prohibition of the development, production and stockpiling of chemical weapons and on their destruction" [56], which was a modified and expanded version of an earlier Japanese working paper [57].

Main provisions of the Japanese draft convention

In the proposed convention the parties would commit themselves to complete chemical disarmament. Temporary exemptions, however, were allowed.

The comprehensive nature of the ban was laid down in Article I, as follows: the parties would undertake never under any circumstances to develop, produce, stockpile or otherwise acquire or retain chemical agents of types and in quantities that have no justification for protective or other peaceful purposes, or weapons, equipment or means of delivery designed to use such agents for hostile purposes or in armed conflict.

Under Article II, all agents, weapons, equipment and means of delivery, specified above, in the possession of the parties or under their jurisdiction and control, would be destroyed or diverted to peaceful purposes as soon as possible and under international observation.

The parties would have to undertake not to transfer to anyone the agents and equipment prohibited under the convention and not to assist in their manufacture (Article III).

Exceptions to the comprehensive ban would be allowed under Article IV: the parties might take provisional measures, as set out in Annex I to the convention, until further agreements, including those on effective verification, were reached. Two versions of Annex I were proposed. Alternative A would permit the parties to suspend the application of Articles I and II with regard to certain chemical agents; the categories of such agents would be specified in a schedule to the annex. Alternative B would also permit exclusions from the general prohibition (the scope of these exclusions and the procedure to bring them into effect were not indicated); it would list, however, only agents to be banned obligatorily. The parties would be free to decide whether or not to take the provisional measures. Those desiring to do so must notify the depositary governments at the time of, or within a short time after, the deposit of their instruments of ratification or accession to the convention. Absence of such notification would be considered as acceptance of a comprehensive ban, without any exception, as of the entry into force of the convention for a given state. The possibility of amending the schedules to Annex I was envisaged: the number of agents exempted from the ban could be gradually reduced, or the number of agents obligatorily prohibited could increase, through negotiations aimed at eliminating the provisional exclusions (Article XIII), and through conferences to be held once every three years (Article XVII).

Articles V to X deal with national and international methods of verification to ensure the fulfilment of the obligations.

National verification organs would be established by states party to the convention with the task of observing and supervising national activities related to the subject matter of the convention. They would collect relevant statistical and other information, submit periodic reports to an international organ, along the lines set out in a special annex to the convention (Annex II), and would cooperate with the international organ by submitting to it requested information, and by accepting inspection.

The international organ, the International Verification Agency (IVA), would be responsible for the analysis and evaluation of periodic reports and statistical and other documents or information submitted by the parties. It would be its duty to request explanations from the parties and to conduct inquiries and inspections in case of suspicion of breaches. It would also notify the parties and the UN Security Council, if necessary, of the results of its analysis and evaluation of its inquiries and inspections. In addition, it would consult and cooperate with the national organs, recommend amendments to the convention annexes, observe the destruction or conversion to peaceful purposes of chemical agents, weapons, equipment and means of delivery, and carry out decisions which may be adopted at the conferences of the parties to the convention. The composition of the IVA and the details pertaining to its functions would be given in Annex III.

Japan considered that among all the activities to be prohibited under a chemical disarmament convention, production of chemical warfare agents was the most susceptible to verification. It suggested that the reports by national verification organs should be drawn up in such a way as to trace the flow of relevant substances from the unloading of raw material or intermediates to the loading of end products, and that the IVA should be given the right of access to the records and data held by the national organs.

With regard to stockpiling, Japan suggested that the parties submit information concerning the prohibited chemical agents which they possessed, as well as programmes for the destruction of these agents or their conversion to peaceful purposes [2].

Inspections would be carried out either at the invitation of the party which was asked to give explanations, or at the initiative of the IVA, if the explanations provided were considered inadequate. A party refusing to accept inspection on its territory would have to give "adequate" reasons for its refusal. If the suspicions persisted, the state deeming that its "supreme interests" had been jeopardized would have the right to withdraw from the convention (Article XVIII). The UN Security Council might be requested to take action in favour of a state exposed to danger as a result of violation of the convention (Article XI).

Finally, it was stated that the convention should not be interpreted as in any way limiting or detracting from the obligations under the 1925 Geneva Protocol prohibiting the use of chemical and biological weapons or the 1972 Convention on the Prohibition of the Development, Production and Stockpiling of Biological and Toxin Weapons and on their Destruction.

Consideration of the draft convention

The debate in the CCD centred on the question of defining the chemical agents to be banned, determining the scope of the prohibitions and devising a verification system.

The consensus was that chemical agents banned under a disarmament convention could be defined in a general way using a criterion of purpose, as agents of types and in quantities that have no justification for protective or peaceful purposes. It was understood that this definition, to be practical, should be supplemented by other criteria, especially a criterion of toxicity. A working paper submitted by the USA, pointed out that toxicity measurements from different laboratories should be made consistent with each other through standardization of the experimental procedures, but noted that a toxicity criterion clearly separating single-purpose supertoxic chemical warfare agents from dual-purpose chemicals was unlikely to be found [3].

Binary weapon components, however, may not be covered by the criterion of toxicity because, while relatively harmless in themselves, they generate a nerve gas only when they mix with each other in flight or shortly before hitting the target. It was suggested therefore that they should fall under the general-purpose criterion prohibiting the production of single-purpose agents and of unwarranted quantitites of dual-purpose agents [27]. The need to include in the ban all supertoxic chemical compounds, not only organophosphorus agents, was also stressed.

With regard to the scope of the prohibitions, Sweden expressed the opinion that in a partial agreement it would be advisable to have in one document both a list of agents suspended from the ban and a list of substances or categories of substances obligatorily banned, which—as the Japanese draft put it—should never be excluded from the ban. This would amount to a combination of alternatives A and B of the annex to the Japanese draft. Under this construction, all chemical agents not suspended would be forbidden, but the agents not obligatorily prohibited, both those known at present and possibly developed in the future, could be subsequently considered as candidates either for suspension or for unconditional prohibition [27].

On the other hand, Canada proposed that the prohibitions should be phased not on the basis of excluded agents, but on the basis of excluded activities. This would mean that the development and production of all chemical warfare agents, munitions and delivery systems would be generally prohibited, while states having stockpiles of chemical agents would undertake to destroy, within a fixed period of time, some agreed types and quantities (or percentage of total stocks) of these weapons. The destruction of remaining stocks would take place in further stages [2]. Canada stated that allowance must be made for harassing or irritant agents recognized as essential for civil riot control or agents having legitimate peaceful uses. But it suggested that the production and stockpiling of incapacitating agents should be prohibited because their unpredictable effects make them unsuitable for civil police purposes [59].

The USA presented a study of a possible control system to prevent diversion of phosphorus from normal manufacturing channels to nerve agent production. The conclusion was that since phosphorus was a key raw material for the manufacture of any organophosphorus nerve agent, economic monitoring of the phosphorus industry could play a useful role in verifying compliance with a production ban [60]. This was the first time that the USA had admitted the applicability of such a verification method. Greater attention, however, was focused on the requirement to destroy the stockpiles of chemical weapons.

The USA described in detail the incineration procedures employed in the disposal of mustard gas and discussed possible methods of verification of the disposal process. It concluded that technical methods of inspection could provide a high degree of assurance that disposal operations were in fact being carried out, without revealing industrial or military secrets [61–62].

Canada also held that on-site verification of destruction of declared stocks was technically feasible and would involve minimal political and commercial intrusion [63]. The process of destruction and disposal of stocks of mustard gas—through mustard hydrolysis—which Canada had actually employed, was found economical, efficient and non-hazardous [64].

The Soviet Union remained opposed to any foreign inspection or observation on its territory and advocated national or self-control supplemented by a voluntary international exchange of information.

Summary and conclusions

The Japanese draft was only a framework for a possible agreement. It provided for a complete chemical disarmament to be achieved in successive stages. Japan contended that supertoxic warfare agents (and possibly also mustard-type agents) should be banned first, because adequate verification of nonproduction of these chemicals is now feasible; the prohibition of the remaining agents would be postponed until equally effective verification measures were devised.

Verification is certainly essential to deter treaty violations or to enable their timely detection but its stringency should be commensurate with the importance of the weapons banned. Supertoxic chemicals are the most dangerous warfare agents. Therefore, they require strict control measures to reduce to a minimum the risk to which a state might be exposed in case of breaches. Non-supertoxic agents have less and, in many cases, negligible value as weapons. Consequently, they require considerably less rigid control. There would seem to be no valid reason why a convention could not be made comprehensive right away, at least as regards development and production, and provide for verification measures with different degrees of stringency, depending on the character of the banned agents. Even the tightest control possible could not prevent diversion of some dual-purpose agents to military purposes. In this case, more reliance would have to be placed on the 1925 Geneva Protocol prohibiting the use of chemical weapons which a chemical disarmament convention is meant to strengthen, not replace.

A treaty banning the production and stockpiling of all chemical warfare agents would, of course, not be acceptable to those states which do not recognize the comprehensive character of the Geneva Protocol and continue to claim the right to use in war and, consequently, to manufacture in peacetime, certain types of warfare agents, such as irritants or antiplant chemicals. This may well have been one of the reasons why a partial treaty was found preferable to a comprehensive one. Another reason may have been the unwillingness of highly industrialized states to submit their civilian production of dual-purpose chemicals to restrictions and to open it up for international scrutiny which could reveal industrial and commercial secrets.

Yet another reason, perhaps more important, could have been the emergence of binary weapons. A ban on the production of supertoxic warfare agents, taken literally, would not cover the components of binary munitions, which have a relatively low toxicity. A comprehensive convention would be impossible without renunciation of binary technology, but such an important decision had not yet been made by the state or states concerned when the Japanese draft was submitted.

To be of any value, a partial ban would have to cover the components of binary weapons. Otherwise, one category of lethal weapons would be permitted to be replaced by another, perhaps less effective in combat, but more convenient and safer to handle, transport and store.

The Japanese draft did not specify how, in practice, compliance with the prohibitions to develop, produce and stockpile chemical weapons, was to be checked. In the opinion of experts, however, there are ways of ensuring that single-purpose chemical agents are not being manufactured and of gaining a reasonable degree of confidence that dual-purpose agents are used only for peaceful purposes. Since in a binary process one of the components is not a commercial agent, verification of its nonproduction should not be intrinsically more difficult than in the case of other chemicals. There are also technical means to provide confirmation of the destruction of declared stocks. However, no solution was suggested to the problem of "hidden weapons". Considering the uncertainty about the nature and size of the existing chemical arsenals, it would appear unlikely that a first-stage agreement could impose complete elimination of stocks.

A convention only providing for a partial destruction of stocks, would, no doubt, and justifiably, be viewed as discriminatory or unbalanced by non-CW states which would be renouncing the acquisition of chemical weapons for ever. But retention of some in-kind retaliatory (or deterrence) capabilities may help to de-emphasize the need for very strict control, including intrusive on-site inspection—the usual stumbling-block in all disarmament negotiations. It could facilitate an agreement which would stop the production and spread of chemical weapons as well as the development of new CW technology, and diminish the size of chemical weapon stockpiles through their partial destruction. Moreover, a ban on production, strictly observed for a considerable period of time, could bring about a gradual reduction of stockpiles due to their inevitable deterioration. The interest of the military in chemical methods of warfare would then probably also gradually decrease.

A convention providing for the destruction of all chemical agents and weapons in existence will be unattainable as long as the fear of hidden stocks persists. It might become a reality only if at least one of the great powers decided, irrespective of the behaviour of other states, (as was the case with biological weapons in 1969) to outlaw chemical weapons altogether, to forego its chemical deterrence and chemical retaliatory option and, without giving up its defence arrangements, to dispose of these weapons unilaterally.

The twenty-ninth session of the UN General Assembly requested the CCD to continue negotiations, as a matter of high priority, with a view to reaching early agreement on effective measures for the prohibition of the development, production and stockpiling of all chemical weapons and for their destruction [65]. In the course of the discussion on the relevant resolution, many delegations appealed to states to refrain from any action likely to render more difficult or to delay the conclusion of the agreement.

IV. *Prohibition of environmental means of warfare*

On 3 July 1974, the USA and the USSR issued a joint statement to the following effect:

> The United States of America and the Union of Soviet Socialist Republics:
>
> Desiring to limit the potential danger to mankind from possible new means of warfare;
>
> Taking into consideration that scientific and technical advances in environmental fields, including climate modification, may open possibilities for using environmental modification techniques for military purposes;
>
> Recognizing also that proper utilization of scientific and technical advances could improve the inter-relationship of man and nature;
>
> 1. Advocate the most effective measures possible to overcome the dangers of the use of environmental modification techniques for military purposes.
> 2. Have decided to hold a meeting of United States and Soviet representatives this year for the purpose of exploring this problem.
> 3. Have decided to discuss also what steps might be taken to bring about the measures referred to in paragraph 1.

The statement was received with satisfaction by many states. Nevertheless, it gave rise to certain misgivings, because it referred only to limitation or overcoming the danger of the use of environmental modification techniques for military purposes, instead of eliminating the danger by outlawing the techniques in question. Furthermore, since the statement specifically mentioned climate modification, that is long-term weather alteration, there was a suspicion that short-term change of meteorological conditions, known as weather modification, had been deliberately left out, even though weather modification techniques were more ready for use and, therefore, posed a more imminent problem [66]. Indeed, vast rainmaking operations were carried out by the USA in Indochina, from March 1967 to July 1972, with the objective of supplementing natural rainfall during the normal rainy season and extending its length [67].

It will be recalled that on 11 July 1973, one year before the US-Soviet statement was issued, the US Senate accepted a resolution calling upon the US government to seek the agreement of other governments to a treaty prohibiting the use of any environmental or geophysical modification activity as a weapon of war, or the carrying out of any research or experimentation directed thereto. The proposed text of a treaty included the following list of prohibited activites:

(1) any weather modification activity which has as a purpose, or has as one of its principal effects, a change in the atmospheric conditions over any part of the earth's surface, including, but not limited to, any activity designed to increase or decrease precipitation, increase or supress hail, lightning, or fog, and direct or divert storm systems;

(2) any climate modification activity which has as a purpose, or has as one of its principal effects, a change in the long-term atmospheric conditions over any part of the earth's surface;

(3) any earthquake modification activity which has as a purpose, or has as one of its principal effects, the release of the strain energy instability within the solid rock layers beneath the earth's crust;

(4) any ocean modification activity which has as a purpose, or has as one of its principal effects, a change in the ocean currents or the creation of a seismic disturbance of the ocean (tidal wave) [68].

In September 1974, at the request of the USSR, an item was included in the agenda of the twenty-ninth UN General Assembly, entitled "Prohibition of action to influence the environment and climate for military and other purposes incompatible with the maintenance of international security, human well-being and health" [69]. The Soviet Union presented a draft convention which took a broader approach to the problem of environmental means of warfare than the joint statement [70].

According to the Soviet draft convention each party would undertake "not to use meteorological, geophysical or any other scientific or technological means of influencing the environment, including the weather and climate, for military and other purposes incompatible with the maintenance of international security, human well-being and health, and, furthermore, never under any circumstances to resort to such means of influencing the environment and climate or to carry out preparations for their use" (Article I). The activities prohibited would be those active influences on the surface of the land, the sea-bed and the ocean floor, the depths of the earth, the marine environment, the atmosphere or on any other element of environment that may cause damage by the following means:

(*a*) introduction into the cloud systems (air masses) of chemical reagents for the purpose of causing precipitation (formation of clouds) and other means of bringing about a redistribution of water resources;

(*b*) modification of the elements of the water, climate and the hydrological system on land in any part of the surface of the earth;

(*c*) direct or indirect action to influence the electrical processes in the atmosphere;

(*d*) direct or indirect disturbance of the elements of the energy and water balance of meteorological phenomena (cyclones, anticyclones, cloud front systems);

(*f*) direct or indirect stimulation of seismic waves by any methods or means that seas and oceans, the seashore, sea-bed and ocean floor that may lead to a change in the hydrological system, water interchange process and the ecology of the biological resources of the seas and oceans;

(*d*) direct or indirect stimulation of seismic waves by any methods or means that may produce earthquakes and accompanying processes and phenomena, or destructive ocean waves, including tsunami;

(*g*) direct or indirect action on the surface of an area of water that may lead to a disturbance of the thermal and gaseous interchange between the hydrosphere and the atmosphere;

(*h*) the creation of artificial continuous electromagnetic and acoustic fields in the oceans and seas;

(*i*) modification of the natural state of the rivers, lakes, swamps and other aqueous elements of the land by any methods or means, leading to reduction in the water-level, drying up, flooding, inundation, destruction of hydrotechnical installations or having other harmful consequences;

(*j*) disturbance of the natural state of the lithosphere, including the land surface, by mechanical, physical or other means, causing erosion, a change in the mechanical structure, desiccation or flooding of the soil, or interference with irrigation or land improvement systems;

(*k*) the burning of vegetation and other actions leading to a disturbance of the ecology of the vegetable and animal kingdom;

(*l*) direct or indirect action to influence the ionized or ozone layers in the atmosphere, the introduction of heat and radiant energy absorbing agents in the atmosphere and the contiguous layer, or other action that might lead to disturbances of the thermal and radiation equilibrium of the earth-atmosphere-sun system.

It was envisaged that the list might be supplemented or amended depending on the progress of scientific and technological research (Article II).

Compliance with the obligations was to be ensured by states adopting, in accordance with their own constitutional procedures, the necessary measures to prohibit and prevent any activity contrary to the agreed provisions (Article IV). In case of suspicion of breaches, complaints could be lodged with the UN Security Council, and each party would be bound to cooperate in carrying out any investigation the Security Council may undertake (Article VI). The parties would also be under obligation to furnish or support assistance provided in accordance with the UN Charter to any party to the convention that might make such a request, in the event of the Security Council deciding that the said party had been subjected to danger as a result of the violation of the convention (Article VII). It was noted that the convention should not impede the economic or scientific and technological development of the parties or international economic and scientific cooperation in the utilization, preservation and improvement of the environment for peaceful purposes (Article V). Entry into force of the convention and of possible amendments to it would require ratification by the depositary governments (Article VIII and Article XI). The operation of the convention would be considered at conferences of the parties (Article IX), and each party would have the right to withdraw from its obligations, if it decided that its supreme interests were threatened (Article X).

The Soviet Union expressed the view that the implementation of its proposal would contribute not only to the limitation of the arms race but also to the preservation of the environment in the interest of mankind [71].

The Soviet initiative met with a positive response in the UN General Assembly. Many delegations appreciated the fact that the whole question of geophysical and meteorological methods of warfare was being submitted for multilateral consideration instead of being dealt with bilaterally, between the USA and the USSR, as orginally conceived by these powers. The United States, however, argued that the problem had not yet been defined and that it was premature to conclude that a convention would be feasible or effective; it doubted whether the Soviet draft provided a suitable basis for discussion. France found the subject interesting and the study of it timely, but wondered whether priority should be accorded to rules concerning hypothetical dangers when nothing was being done in the area of the immediate threat posed by nuclear weapons [72]. China reacted negatively, accusing the USSR of diverting the attention of world opinion from the accelerated arms expansion [73].

In the course of the discussion in the General Assembly some participants suggested that, prior to elaborating a convention, a thorough technical examination of all the problems involved was necessary [74–76]. The Netherlands stressed that a study was needed to mark the dividing line between geophysical warfare in the proper sense and any other kind of action undertaken outside a warlike context that would be detrimental to the human environment or, while being advantageous in one way or another to one country, could have a negative impact on the environmental conditions of others. Attention was also drawn to the fact that restrictions or prohibitions on the use of geophysical or meteorological methods of warfare came within the purview of humanitarian law applicable in armed conflicts because of the indiscriminate nature of these means of combat. Sweden pointed out that the broad wording of Article I of the Soviet draft convention should be clarified, since it may create complications in determining whether a particular action fell under the convention or not. As a matter of fact, the way the item was phrased could convey the impression that some action to influence the environment for military and "other" purposes might not be considered incompatible with the maintenance of international peace and security, and that such action would not be prohibited.

Considering the difficulty in drawing up a comprehensive list of prohibitions, Sweden suggested that, as a first step, a general framework should be created by formulating guiding principles, following which agreement could be reached on specific measures. Moreover, it was opposed to entrusting the UN Security Council with the sole responsibility of deciding what action should be taken when a complaint was lodged, and to giving the depositary governments a right of veto as regards the amendments to the convention [77]. The United Kingdom underlined the need for appropriate verification procedures [73].

The resolution, which was passed in the UN General Assembly on 9 December 1974, removed some of the ambiguities mentioned above. In particular, it specified that the measures to be adopted should prohibit action to influence the environment and climate for military and other *hostile* purposes, *which are* incompatible with the maintenance of international security, human well-being and health. It took note of the Soviet draft convention as well as of other points of view and suggestions put forward during the discussion of this question, and requested the CCD to proceed, as soon as possible, to achieving agreement on the text of a convention and to submit a report [78]. Five delegations abstained, including the USA and France. But the latter power explained that it was opposed only to referring the matter to the CCD and had no objection to the resolution as a whole. On the other hand, some delegations which voted in favour of the resolution were uncertain whether the time was ripe to negotiate detailed provisions of an international convention [73].

The Soviet list of prohibitions is more extensive than the one incorporated in the 1973 US Senate resolution, but other provisions in the two documents are couched in very similar terms. It may be noted that a broad interpretation of some of the prohibitions proposed by the USSR would imply restrictions on certain on-going military programmes, such as nuclear testing in the atmosphere and underground, as well as antisubmarine warfare activities. In any event, it would probably be easier to work towards a series of agreements successively prohibiting different kinds of environmental warfare than to strive for an "omnibus" treaty covering the entire spectrum of the problem, and providing for both more and less urgent, and often unrelated, measures. Technical details will have to be worked out and there may be difficulties with definitions, but it seems that a sound point of departure for orderly negotiations on what has been termed "collective ecological security" [76], already exists. Research in the field of the military use of the environment is still relatively little advanced and this circumstance could make it easier to reach an accord. Constraints on new weapons before they have been fully developed and especially on such warfare techniques which are inherently indiscriminate and unpredictable in their effects, would definitely contribute to the circumscription of the arms race.

V. *The Indian Ocean as a zone of peace*

No progress was made in 1974 in the implementation of the UN declaration designating the Indian Ocean as a zone of peace [79]. The *Ad Hoc* Committee set up in 1972 for the purpose of studying practical measures to further the objectives of the declaration [80], was not in a position to secure the cooperation of the four permanent members of the UN Security Council, not participating in the work of the committee, namely, France, the UK, the USA and the USSR (China is a member of the committee); the envisaged consultations with these powers with a view to ascertaining their precise policy and position regarding the implementation of the declaration on the Indian Ocean did not take place. The committee has even failed to draw up a programme of action for the states directly concerned. Its deliberations were dominated by polemical exchanges between India and Pakistan, in consonance with the precarious political situation on the Indian subcontinent [81]. Three years after the adoption of the declaration on the Indian Ocean there were still no agreed definitions of the basic terms used in it, such as the "limits" of the ocean for the purpose of the zone of peace, "littoral and hinterland states", "major maritime states", "military bases" and "military installations".

The inertia of the committee stood in sharp contrast with the continuing military activity in the Indian Ocean area (see chapter 5). The factual statement prepared by the UN Secretary-General with the assistance of consultant experts [82–83] has shown that the UN call for a halt to the further escalation and expansion of the great powers' military presence in the Indian Ocean, is not being observed. Though contested by a few countries, mostly with reference to details, and often because of divergent interpretations of the term "military base" [84], the statement unequivocally indicated that during the past few years there has been a substantial increase in naval activities and deployment in the Indian Ocean. Subsequent debates at the twenty-ninth UN General Assembly have confirmed that the great powers, and in particular the USA and the USSR, intend to maintain their freedom of action and, while describing their own presence as merely temporary and innocuous, they are interested mainly in removing the presence of their rival.

The shortcomings in the work of the *Ad Hoc* Committee on the Indian Ocean were reflected in its report [85]. The report contained the following recommendations aimed at transforming the committee from a deliberative body into a negotiating forum: (*a*) the *Ad Hoc* Committee should continue and intensify its efforts in accordance with its mandate; (*b*) it should proceed with its consultations with the four permanent members of the Security Council which are not members of the committee; (*c*) it should give attention in 1975 to the definition of terms employed in the declaration on the Indian Ocean; and (*d*) consideration should be given to the convening, as early as possible, of a conference of the littoral and hinterland states of the Indian Ocean.

The above recommendations were endorsed by the UN General Assembly which again called upon the great powers to refrain from increasing and strengthening their military presence in the region of the Indian Ocean as an essential first step towards the relaxation of tension and the promotion of peace and security in the area [86].

However, it would be incorrect to ascribe the non-implementation of the Indian Ocean declaration solely to external factors. The internal situation in the region is equally, if not more, important for the maintenance of peace, and the countries there are far from having uniform ideas about the structure of such a peace. The existing military alliances with the great powers, either formal or *de facto,* are maintained with the acquiescence of the states in the region which are eager to minimize their active or passive involvement in the great power rivalry. Some states may even be interested in the presence of all the great powers in the Indian Ocean so as to prevent the area from becoming the monopoly of any one of them or from falling under the hegemony of another state [87]. Others consider that the reduction of the presence of the major powers in the Indian Ocean must be followed by a limitation of naval armaments of the Indian Ocean countries, so as to maintain a military equilibrium in the region [88].

Moreover, the Indian nuclear explosion, regarded by some of its neighbours as a first step towards nuclear weapon acquisition, increased tension in the region and thereby adversely affected the prospects for establishing a zone of peace. The call for the disposition of nuclear weapons by the great powers, as contained in the declaration, was never meant as licensing the deployment of indigenous nuclear weapons. Indeed, the prevention of nuclear weapon proliferation through relevant legal commitments of all the significant states in the area has all along been considered a necessary prerequisite for the materialization of the peace zone concept.

VI. *Nuclear-weapon-free zones*

In the wake of the nuclear weapon explosion carried out by India in May 1974, there has been a renewed international interest in the setting up of nuclear-weapon-free zones in various parts of the world. Several proposals to this effect were discussed at the CCD and at the twenty-ninth UN General Assembly.

A proposal for the declaration and establishment of a nuclear-free zone in South Asia was initiated by Pakistan [89] which considered that since all the countries of South Asia had proclaimed their opposition to the acquisition of nuclear weapons and to the introduction of such weapons into the region, there existed a "common denominator" for an agreement establishing a nuclear-weapon-free zone in the area. Expressing the belief that the materialization of its idea would strengthen international peace and security and promote stability and economic development in South Asia, Pakistan suggested that the UN General Assembly proclaim South Asia as a nuclear-weapon-free zone; that consultations be held, as soon as possible, among the countries of the region and, at an appropriate stage, with the nuclear-weapon powers, to give practical shape to this proclamation; that the UN Secretary-General be authorized to invite the countries of the region to begin consultations; and that the Assembly lay down guidelines to facilitate the process of negotiations [90]. As possible parties to the South Asian zonal aggreement Pakistan mentioned Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka, but did not rule out the possibility of including other states as well. It recalled that India had stated, both before and after its nuclear explosion, that it would not develop or acquire nuclear weapons and that it intended to use nuclear energy exclusively for peaceful purposes. Pakistan considered it important that, until an agreement was reached, the states of the region should refrain from any action incompatible with the objective of denuclearizing South Asia, such as nuclear testing without appropriate means of verifying the peaceful nature of the explosions. A pledge by the nuclear-weapon powers to respect the nuclear-weapon-free status of South Asia was deemed to be an essential element of the denuclearization arrangements [90–91].

India's reaction to the Pakistani proposal was totally negative. India said that it had supported nuclear-free zones in other regions because they were proposed, after determining, by agreement among the states concerned, the "appropriateness of the region and the suitability of conditions." In the opinion of India, South Asia could not be considered as a distinct zone, geographically or politically, and the presence in Asia of countries belonging to military alliances, as well as the existence of nuclear-weapon powers would have a bearing on the viability of a nuclear-weapon-free zone. Referring to nuclear explosions for peaceful purposes, India stressed that there could be no question of imposing on its nuclear programme any régime that was not universal, which was discriminatory and to which it was not a party. It pointed out that no regional consultations prior to the submission of the item to the United Nations had taken place, even though vital national interests were involved [93–94].

The Soviet Union was also of the view that the adoption of a substantive decision by the UN General Assembly on the question of a nuclear-weapon-free zone should be preceded by an understanding, among the states which might participate in the establishment of the zone, with regard to its geographical limits and the content of any future agreement [93]. But Sri Lanka, one of the countries which spoke extensively on the subject, regarded consultations as absolutely necessary only at the stage of defining the concept of the zone and of putting it into effect [92].

Of all the nuclear-weapon powers China was the only one to endorse the

Pakistani proposal unreservedly [93–94]. Express support was also given by a number of Afro-Asian countries.

As a result of the deliberations, two resolutions were adopted by the UN General Assembly. One, drafted by India, stipulated that the initiative for the creation of a nuclear-free zone in the appropriate region of Asia should come from the states of the region concerned, taking into account its special features and geographical extent [95]. The other, initiated by Pakistan, endorsed "in principle" the concept of a nuclear-weapon-free zone in South Asia (instead of declaring South Asia a nuclear-weapon-free zone, as originally suggested); it furthermore invited the states of the South Asian region and "such other neighbouring non-nuclear-weapon states as may be interested" to initiate necessary consultations with the view to establishing a nuclear-weapon-free zone and urged them, in the interim, to refrain from any action contrary to the achievement of those objectives. In the same resolution the General Assembly also expressed the hope that all states, in particular the nuclear-weapon states, would cooperate towards the effective realization of the aims of the resolution, and requested the Secretary-General to convene a meeting for the envisaged consultations [96].

These two resolutions, though seemingly complementary, embodied quite different approaches (all attempts at obtaining a consolidated text had failed). While the first resolution aimed at putting an end to the UN debate on the denuclearization of South Asia, at least until the states in the area were agreed among themselves, the other was intended to involve the United Nations directly in the promotion of this idea. Under such circumstances, it is difficult to see how a meeting of South Asian states and of other interested non-nuclear neighbouring states could be convened under UN auspices, if at all. India stated that it did not feel bound by the second resolution or obliged to enter into any consultations [97–98]. It is noteworthy that neither resolution referred to the NPT (India and Pakistan are not parties to this treaty).

The establishment of a nuclear-weapon-free zone in the Middle East was proposed by Iran [99]; the proposal drew attention to the increased danger of nuclear-weapon proliferation inherent in the greater access of states to nuclear technology. No geographical limits of the zone were suggested, except for an indication that it should encompass as wide an area as possible, because the security interests of the entire region must be taken into consideration. Egypt, which co-sponsored the proposal [100], put forward the following requirements: (*a*) that the states in the Middle East region should refrain from producing, acquiring or possessing nuclear weapons; (*b*) that the nuclear states should refrain from introducing nuclear weapons into the area, or using nuclear weapons against any state of the region; and (*c*) that a system of international control affecting both the nuclear states and the states of the region should be established for the implementation of the above-mentioned commitments. Egypt emphasized that the establishment of a nuclear-weapon-free zone should not prevent the parties from enjoying the benefits of the peaceful uses of nuclear energy, especially for the economic development of the developing countries. Both Iran (party to the NPT) and Egypt (signatory but not party) spoke about the complementary role of nuclear-weapon-free zones to the Non-Proliferation Treaty. Egypt expressed its readiness to ratify the NPT as soon as Israel had acceded to it [98–101]. Jordan, too, considered that all states in the area should become parties to the NPT and that this was a basic requirement for denuclearization. Israel maintained that the best way to make progress in this regard was for the states concerned to hold direct consultations and ultimately to convene a regional conference to discuss the matter.

In a resolution adopted on 9 December 1974, the UN General Assembly commended the idea of a nuclear-weapon-free zone in the region of the Middle East and considered it indispensable that all parties in the area proclaim their intention to refrain, on a reciprocal basis, from producing, testing, obtaining, acquiring or in any other way possessing nuclear weapons. The resolution called upon the parties concerned in the area to accede to the NPT and expressed the hope that all states, in particular the nuclear-weapon states, would cooperate towards the effective realization of the aims of the resolution. The Secretary-General was requested to ascertain the views of the parties with respect to the implementation of the resolution and to report to the Security Council and to the General Assembly [102]. The resolution was adopted by an overwhelming majority (128 votes in favour) with no opposition and two abstentions (Israel and Burma). Nevertheless, doubts were expressed by the United States as to whether the states in the region should be asked to undertake immediate commitments in advance of actual negotiations and the conclusion of an agreement on a denuclearized zone.

Yet another UN resolution on a nuclear-weapon-free zone concerned Africa [103]. It was introduced by Nigeria which expressed concern about South Africa's nuclear capabilities [104]. The Assembly reaffirmed its decisions on this subject taken in 1961 and 1965 [105–106]; reiterated its call on all states to respect and abide by the declaration of the Assembly of Heads of State and Government of the Organization of African Unity on the denuclearization of Africa, made in 1964; and asked all states to refrain from testing, manufacturing, deploying, transporting, storing, using or threatening to use nuclear weapons on the African continent. (The reference to "transporting" nuclear weapons, that is, to transit across Africa, was an addition to the prohibitions enumerated in the 1965 UN resolution.) The General Assembly also requested the Secretary-General to render all necessary assistance to the Organization of African Unity towards the realization of the objectives of the resolution. In geographical terms, the African zone was described as including the continental African states, Madagascar and other islands surrounding Africa.

Finally, the UN General Assembly requested that a study should be carried out by an *ad hoc* group of qualified governmental experts under the auspices of the Conference of the Committee on Disarmament on the question of nuclear-weapon-free zones in all its aspects. It called upon interested governments and international organizations concerned to extend such assistance as may be required from them for the carrying out of such a comprehensive study. The relevant resolution [107] was adopted at the initiative of Finland, which for years had been advocating the establishment of a nuclear-weapon-free zone in Northern Europe and which, in November 1974, reiterated its proposal known as the "Kekkonen plan" [108]. In the opinion of Finland, the envisaged study would cover definitions, the structure and form of agreements establishing nuclear-weapon-free zones, the character of legal rights and obligations, institutional arrangements, verification, security guarantees, peaceful uses of nuclear energy, the role of peaceful nuclear explosions, interrelationships among various nuclear-weapon-free zones and cooperation between them, as well as the relationship of the zonal agreements to other disarmament and arms control agreements, global or regional [109].

Some general principles for the establishment of nuclear-weapon-free zones were proposed during the debate.

The United States and the United Kingdom formulated the following criteria: (*a*) the initiative should be taken by the states of the region concerned; (*b*) the zone should preferably include all the states in the area, whose participation was deemed important; (*c*) the creation of the zone should not disturb the existing security arrangements; and (*d*) provision should be made for adequate verification [71, 110–11].

Romania, the proponent of a "zone of peace and cooperation free from nuclear weapons and foreign military bases" in the Balkans, suggested that an agreement on regional denuclearization should be conceived as an integral part of a system of measures leading to the complete elimination of nuclear weapons; it should provide for mutual obligations on the part of all parties; it should provide guarantees for equal security through an undertaking by nuclear-weapon-states not to use or threaten to use nuclear weapons against the countries of the zone and to respect the status agreed among the states of the region; it should not impose any limits on the use of nuclear energy for peaceful purposes, but should guarantee possibilities for all states, on an equal footing and without discrimination, to carry out research in this field and to take advantage of the discoveries of nuclear physics for the purpose of development; and it should establish a system of controls based on the principle of complete equality of states [27, 112].

The Latin American Treaty of Tlatelolco has often been mentioned as a possible model for nuclear-weapon-free zones in other regions. However, this treaty is not entirely free from ambiguities. It explicitly permits explosions of nuclear devices for peaceful purposes. Most signatories recognize that such explosions are not allowed unless and until nuclear devices not capable of being used for weapons purposes have been developed—a condition which can hardly be fulfilled. This position is shared by the USA and the UK, which are parties to Additional Protocol II of the treaty, a protocol which provides for an undertaking by nuclear-weapon-states to respect the status of military denuclearization of Latin America. But Argentina, Brazil and Nicaragua do not recognize restrictions on nuclear explosions for peaceful purposes, "including explosions which involve devices similar to those used in nuclear weapons." These differences of interpretation, as well as the absence of a clause prohibiting the transit of nuclear weapons through the territories of the contracting parties, are usually referred to by the USSR as the main reasons for its refusal to adhere to Protocol II of the Tlatelolco Treaty.

Whatever the detailed provisions of a nuclear-weapon-free zone agreement, its essential element is a prohibition of nuclear weapons in a given geographical area. This means that the countries concerned undertake (*a*) to forego the manufacture of nuclear weapons or their acquisition by other means, and (*b*) to proscribe the presence of foreign nuclear forces on their territory. The zonal approach is therefore more comprehensive than that taken in the Non-Proliferation Treaty, under which non-nuclear-weapon states renounce a nuclear-weapon option, but may allow the stationing of nuclear weapons on their territory under the control of another power.

The characteristic feature of the most recent proposals for nuclear-weapon-free zones is that they concern regions where countries have not even fulfilled the first requirement, that is, to forego the manufacture of nuclear weapons or their acquisition by other means. These countries are, as a rule, sufficiently developed in the technological sense to produce a nuclear device—India in South Asia, Israel in the Middle East, or South Africa on the African continent. It is precisely in these cases that the danger of nuclear-weapon proliferation is the greatest. But it would be unrealistic to expect states which have refused to join the Non-Proliferation Treaty to undertake zonal commitments, which are much broader. Moreover, proposals for zonal arrangements presuppose that negotiations will be conducted, and agreements will be signed, by all the parties concerned, providing, among other things, some measure of reciprocal control. This, under the circumstances existing in conflict areas, does not seem to be feasible. On the other hand, adherence to the NPT does not require direct talks among the countries in the region; it can be effected through a unilateral act by each state. Furthermore, verification exclusively by an international agency (IAEA), as stipulated by the NPT, would certainly be less objectionable to political opponents than a combined international-regional verification procedure as stipulated, for example, in the treaty prohibiting nuclear weapons in Latin America.

In other words, while a zonal solution to denuclearization is possible only after all major political disputes in a given region have been settled, submission to the NPT régime can take place sooner; by allaying the fears and suspicions among the nations concerned it could actually contribute to the settlement of the disputes. Proscription of foreign nuclear presence might then become easier to negotiate as a complement to the non-proliferation obligations. As far as the guarantee of non-use of nuclear weapons is concerned, it would be more equitable if such an assurance were given to all non-nuclear-weapon states, irrespective of any zonal arrangements, and in the first place, to those which have no foreign nuclear forces stationed on their territory. This would remove one possible motive for states to maintain a nuclear option.

The twenty-ninth UN General Assembly has explicitly recognized that the independence, territorial integrity and sovereignty of non-nuclear-weapon states need to be safeguarded against the use or threat of use of nuclear weapons [113]. France has already made it clear that its policy is not to use or threaten to use nuclear weapons against non-nuclear powers [72], while China has gone even further by declaring that at no time and in no circumstances would it be the first to use nuclear weapons. The USA and the UK have undertaken a "non-use commitment" only with regard to the Latin American states party to the Treaty of Tlatelolco, while the USSR has declined to contract even such a limited obligation.

VII. *The disarmament negotiating machinery*

By a decision taken on 18 December 1973 the UN General Assembly set up an *ad hoc* committee with the task of examining all the views and suggestions expressed by governments on the convening of a world disarmament conference and related problems, including conditions for the realization of such a conference [114]. The committee consists of the following 40 non-nuclear-weapon states: Algeria, Argentina, Austria, Belgium, Brazil, Bulgaria, Burundi, Canada, Chile, Colombia, Czechoslovakia, Egypt, Ethiopia, Hungary, India, Indonesia, Iran, Italy, Japan, Lebanon, Liberia, Mexico, Mongolia, Morocco, the Netherlands, Nigeria, Pakistan, Peru, the Philippines, Poland, Romania, Spain, Sri Lanka, Sweden, Tunisia, Turkey, Venezuela, Yugoslavia, Zaire and Zambia.

The states possessing nuclear weapons have been invited to cooperate or maintain contact with the *ad hoc* committee and enjoy the same rights as the designated members. In 1974, three nuclear-weapon powers—France, the UK and the USSR— participated in the meetings, while China and the USA maintained contact with the committee through its chairman.

As a result of 16 meetings, held between May and September 1974, the committee produced a report containing a summary of governmental statements, but did not formulate any conclusions or recommendations. It merely stated that it had taken note of a suggestion that there should be

> ... continued application of methods and means used until now for helping to clear the way towards the initiation of the preparation for convening a world disarmament conference, particularly the contacts by the Chairman and members of the *Ad Hoc* Committee on a personal basis with the nuclear Powers, in order to explore the possibility of reaching agreement on the solution of at least some of the disarmament problems most frequently mentioned in the debates, and with a view to reaching agreement on the question of convening a world disarmament conference.

It appears from the committee's report that a large number of states are strongly in favour of convening a world disarmament conference after "due preparation", and some of them, including the USSR, urge that preparatory steps should be taken without delay. Another point of view, represented by China, is that a world disarmament conference could be convened only if the following prerequisites are met: (*a*) all nuclear-weapon states should undertake an obligation not to be the first to use nuclear weapons, particularly against non-nuclear-weapon states; and (*b*) they should also put an end to all forms of military presence on the territory of other countries. Yet another opinion, held by the USA, is that the proposed conference could not at present, or in the near future, contribute to the achievement of concrete arms control agreements, although it might perhaps prove useful if convened at an "appropriate" time.

The proponents of a world disarmament conference pursue the following main goals:

1. to draw the attention of the international community to the magnitude and gravity of the arms race and determine a general line of action to halt the race;

2. to assess the results achieved in disarmament negotiations and evaluate the significance and implementation of international agreements concluded so far;

3. to encourage further disarmament efforts and formulate guidelines and priorities with a view to the ultimate goal of general and complete disarmament under effective international control;

4. to suggest practical and mutually acceptable disarmament measures;

5. to review and make recommendations on the political, economic and military aspects of disarmament and to strengthen the link between disarmament and economic development.

The consensus is that all states should be invited to a world disarmament conference on an equal footing, and that active participation by all nuclear-weapon states is an indispensable requirement for the success of such a conference. In this connection the attitude of China is considered the main obstacle to convening the conference, the general impression being that a change in China's position would also affect the present US stand. As a matter of fact, the whole idea of convening a world conference was conceived chiefly with a view to involving China in disarmament negotiations.

A resolution, unanimously adopted by the twenty-ninth UN General Assembly, asked all states to communicate to the Secretary-General their comments in the light of the views and suggestions compiled in the report of the *ad hoc* committee. The General Assembly also decided that the committee should prepare, on the basis of consensus, an analytical report, including any conclusions and recommendations it may deem pertinent, concerning the comments received, and maintain close contact with the representatives of nuclear-weapon states "in order to keep currently informed of any change in their respective positions". The nuclear-weapon states were invited to cooperate or maintain contact with the committee, while the UN Secretary-General was requested to render it all necessary assistance [115].

Since no decision with regard to the convening of a world disarmament conference has been taken, no real preparatory work can be performed by the *ad hoc* committee, let alone fixing such details as the time, place, duration or the procedure of the conference. But the opinion widely held is that efforts towards convening a world conference should not slow down or interfere with the work carried out in other international bodies. Accordingly, the UN General Assembly has agreed to reinforce the Conference of the Committee on Disarmament (CCD), the only multilateral disarmament negotiating forum now in existence. It endorsed the enlargement of the composition of the committee, as of 1 January 1975, from 26 to 31 members, by the inclusion of the German Democratic Republic, the Federal Republic of Germany, Iran, Peru and Zaire [116]. It also added new items to the CCD agenda, such as the elaboration of a convention prohibiting environmental means of warfare and the study of the question of nuclear-weapon-free zones. It is clear, however, that so long as China and France refuse to participate in the work of the CCD, any arms control agreements reached there are bound to have only limited significance.

VIII. *Definition of aggression*

On 14 December 1974, the UN General Assembly approved a definition of aggression [117], the text of which had been elaborated by a special committee [118] established in 1967 [119].

The General Assembly considered that aggression is the most serious and dangerous form of the illegal use of force, "being fraught, in the conditions created by the existence of all types of weapons of mass destruction, with the possible threat of a world conflict and all its catastrophic consequences", and declared that a war of aggression was a crime against international peace. Aggression, itself, has been defined, in a general way, as the use of armed force by a state against the sovereignty, territorial integrity or political independence of another state, or in any other manner inconsistent with the Charter of the United Nations (Article 1). More specifically, the following acts qualify as acts of aggression, regardless of a declaration of war (Article 3):

(*a*) The invasion or attack by the armed forces of a State of the territory of another State, or any military occupation, however temporary, resulting from such invasion or attack, or any annexation by the use of force of the territory of another State or part thereof;
(*b*) Bombardment by the armed forces of a State against the territory of another State or the use of any weapons by a State against the territory of another State;
(*c*) The blockade of the ports or coasts of a State by the armed forces of another State;
(*d*) An attack by the armed forces of a State on the land, sea or air forces, or marine and air fleets of another State;
(*e*) The use of armed forces of one State which are within the territory of another State with the agreement of the receiving State, in contravention of the conditions provided for in the agreement or any extension of their presence in such territory beyond the termination of the agreement;
(*f*) The action of a State in allowing its territory, which it has placed at the disposal of another State, to be used by that other State for perpetrating an act of aggression against a third State;
(*g*) The sending by or on behalf of a State of armed bands, groups, irregulars or mercenaries, which carry out acts of armed force against another State of such gravity as to amount to the acts listed above, or its substantial involvement therein.

The above enumeration of aggressive acts contains only the most obvious cases; it is illustrative, not exhaustive. The determination of whether also other acts constitute aggression under the provisions of the UN Charter has been left to the UN Security Council (Article 4). An important point in the definition is that not every first use of armed force by a state shall be automatically determined as an act of aggression; such an act, committed in contravention of the Charter, will only be *prima facie* evidence of aggression. The Security Council may conclude, in the light of relevant circumstances, including the fact that the acts concerned or their consequences are not of sufficient gravity, that aggression has not been committed, notwithstanding the first use of armed force (Article 2). The text makes it clear that the provisions of the UN Charter, concerning cases in which the use of force is lawful, are not affected (Article 6). The struggle of peoples forcibly deprived of their right to self-determination, freedom and independence, "particularly peoples under colonial and racist régimes or other forms of alien domination", does not come under the definition of aggression (Article 7).

The definition refers to the principle contained in the 1970 Declaration on principles of international law concerning friendly relations and cooperation among states, according to which no state or group of states has the right to intervene, "directly or indirectly, for any reason whatsoever", in the internal or external affairs of any other state (paragraph 20 of the special committee's report). Statements have also been included to the effect that nothing in the definition shall be construed as a justification for a state to block, contrary to international law, the routes of free access of a land-locked country to and from the sea, nor as prejudicing the authority of a state to exercise its rights within its national jurisdiction, provided such exercise is not inconsistent with the UN Charter (paragraphs 9 and 10 of the UN General Assembly Sixth Committee's report). The latter statement is meant as an adjunct to Article 3 (*d*) (see above), in order to safeguard the right of states to use force against foreign planes or ships conducting unlawful activities at sea or in the airspace under the jurisdiction of these states. (For the full text of the definition, the explanatory notes and the pertinent statements, see appendix 14F.)

The definition of aggression is one of the most controversial problems of international law, because it touches upon the vital interests of states and is bound up with the system of collective security. It has been the subject of international discussion for the past fifty years, first under the auspices of the League of Nations, and later in various United Nations bodies. The provisions of the UN Charter have made the need for a definition of aggression all the more necessary, as the Charter has limited more strictly than the Covenant of the League of Nations the right of states to resort to war and to use force in international relations. Moreover, the UN Security Council was given the power to decide what measures should be taken in the case of aggression to restore international peace and security, but had been left without guidance as to when, and under what circumstances, the use of force constituted an act of aggression. Such guidance has now been provided.

However, the recently adopted definition, a result of political compromise, suffers from lack of precision. Thus, for example, no clarification is given for the distinction made between a "war of aggression", qualified as a crime, and "aggression" which is not so qualified but which "gives rise to international responsibility" (Article 5). It is stated that the first use of armed force by a state "in contravention of the Charter" shall constitute *prima facie* evidence of aggression (Article 2), but it is not clear who would determine whether the act committed had or had not violated the Charter. Furthermore, such terms as "sufficient gravity", used in Article 2 in connection with the determination of acts of aggression, or "substantial involvement", used in Article 3 (*g*) to define the responsibility of a state for the sending of armed bands against another state, are too vague to ensure a uniform interpretation. There are also gaps in the definition. No mention is made of aggression committed by means other than the use of armed force, such as economic pressure to influence the conduct of other states, a practice which is frequent in international relations. The definition is a recommendation by the UN General Assembly. Although passed without formal opposition, it does not have the same binding legal force as a treaty.

Whatever the legal status of the definition of aggression, its application may well prove impossible. The UN Security Council, which maintains the ultimate power of determining the existence of a threat to peace, breach of the peace or act of aggression, adopts its decisions on substantive matters by an affirmative vote of the majority, including the concurring votes of the permanent members. Thus, each permanent member of the Council—China, France, the UK, the USA and the USSR—has the right to veto a determination of aggression arrived at by other members. In practice, this means that an aggression committed by any of these powers could never be formally declared as such, because no aggressor would admit his guilt and accept a finding condemning him. Yet some of the most serious acts of aggression have been committed by the great powers themselves, or had the approval and support or served the purposes of at least one of them. This deficiency obviously relates to the present international order in general. The definition of aggression is only a reflection of the existing state of affairs in the world.

Notwithstanding its shortcomings, and given the limitations imposed by the UN Charter, the definition can, nevertheless, play some positive role. By filling a gap in the UN legal structure relating to the maintenance of international peace and security, it can serve to indicate those factors which must be taken into account in determining the circumstances under which the use of force is incompatible with international law. It may, perhaps, at least to some extent, facilitate the protection of the rights of smaller countries which are the principal victims of aggression. And finally, it may promote efforts towards further progressive development of international law through a codification of international responsibility for aggression and the establishment of an international criminal jurisdiction.

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55. "B-1—Next Generation of Airborne Strategic Deterrents", AIAA Paper No. 73–75, AIAA 9th Annual Meeting and Technical Display, Washington, 8–10 January 1973.
56. Disarmament Conference document CCD/420.
57. Disarmament Conference document CCD/413.
58. Disarmament Conference document CCD/435.
59. Disarmament Conference document CCD/433.
60. Disarmament Conference document CCD/437.
61. Disarmament Conference document CCD/436.
62. Disarmament Conference document CCD/PV. 654.
63. Disarmament Conference document CCD/PV. 638.
64. Disarmament Conference document CCD/434.
65. UN document A/RES/3256 (XXIX).
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70. UN document A/C.1L. 675.
71. UN document A/C.1/PV. 1998.
72. UN document A/C.1/PV. 2005.
73. UN document A/C.1/PV. 2028.
74. UN document A/C.1/PV. 2010.
75. UN document A/C.1/PV. 2011.
76. UN document A/C.1/PV. 2014.
77. UN document A/C.1/PV. 2019.
78. UN document A/RES/3264 (XXIX).
79. UN document A/RES/2832 (XXVI).
80. UN document A/RES/2992 (XXVII).
81. UN documents A/AC. 159/SR. 12–23.
82. UN document A/AC. 159/1.
83. UN document A/AC. 159/1/Rev. 1.
84. UN documents A/AC. 159/2–11.
85. Official Records, 29th Session, Supplement No. 29 (A/9629).
86. UN document A/RES/3259A (XXIX).
87. Statement by Singapore Foreign Minister, 17 December 1974, reported in *International Herald Tribune,* 18 December 1974.
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91. UN document A/C.1/PV. 2020.
92. UN document A/C.1/PV. 2022.
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94. UN document A/PV. 2252.
95. UN document A/RES/3265 A (XXIX).
96. UN document A/RES/3265 B (XXIX).
97. UN document A/C.1/PV. 2025.
98. UN document A/PV. 2309.
99. UN document A/9693.
100. UN document A/9693/Add. 1.
101. UN document A/C.1/PV. 2001.
102. UN document A/RES/3263 (XXIX).
103. UN document A/RES/3261 E (XXIX).
104. UN document A/C.1/PV. 2025.
105. UN document A/RES/1652 (XVI).
106. UN document A/RES/2033 (XX).
107. UN document A/RES/3261 F (XXIX).
108. *Pravda,* 10 November 1974.
109. UN document A/C.1/PV. 2003.
110. Disarmament Conference document CCD/PV. 639.
111. UN document A/C.1/PV. 2008.
112. UN document A/C.1/PV. 2012.
113. UN document A/RES/3261 B (XXIX).
114. UN document A/RES/3183 (XXVIII).
115. UN document A/RES/3260 (XXIX).
116. UN document A/RES/3261 B (XXIX).
117. UN document A/RES/3314 (XXIX).
118. UN Official Records: Twenty-Ninth Session. Supplement No. 19 (A/9619).
119. UN document A/RES/2330 (XXII).

Appendix 14A

Treaty between the United States of America and the Union of Soviet Socialist Republics on the limitation of underground nuclear weapon tests

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament under strict and effective international control,

Recalling the determination expressed by the Parties to the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water in its preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time, and to continue negotiations to this end,

Noting that the adoption of measures for the further limitation of underground nuclear weapon tests would contribute to the achievement of these objectives and would meet the interests of strengthening peace and the further relaxation of international tension,

Reaffirming their adherence to the objectives and principles of the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water and of the Treaty on the Non-Proliferation of Nuclear Weapons,

Have agreed as follows:

ARTICLE I

1. Each Party undertakes to prohibit, to prevent, and not to carry out any underground nuclear weapon test having a yield exceeding 150 kilotons at any place under its jurisdiction or control, beginning 31 March 1976.

2. Each Party shall limit the number of its underground nuclear weapon tests to a minimum.

3. The Parties shall continue their negotiations with a view toward achieving a solution to the problem of the cessation of all underground nuclear weapon tests.

ARTICLE II

1. For the purpose of providing assurance of compliance with the provisions of the Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with the generally recognized principles of international law.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

3. To promote the objectives and implementation of the provisions of this Treaty the Parties shall, as necessary, consult with each other, make inquiries and furnish information in response to such inquiries.

ARTICLE III

The provisions of this Treaty do not extend to underground nuclear explosions carried out by the Parties for peaceful purposes. Underground nuclear explosions for peaceful purposes shall be governed by an agreement which is to be negotiated and concluded by the Parties at the earliest possible time.

ARTICLE IV

This Treaty shall be subject to ratification in accordance with the constitutional procedures of each Party. This Treaty shall enter into force on the day of the exchange of instruments of ratification.

ARTICLE V

1. This Treaty shall remain in force for a period of five years. Unless replaced earlier by an agreement in implementation of the objectives specified in paragraph 3 of Article 1 of this Treaty, it shall be extended for successive five-year periods unless either Party notifies the other of its termination no later than six months prior to the expiration of the Treaty. Before the expiration of this period the Parties may, as necessary, hold consultations to consider the situation relevant to the substance of this Treaty and to introduce possible amendments to the text of the Treaty.

2. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from this Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

3. This Treaty shall be registered pursuant to Article 102 of the Charter of the United Nations.

Done at Moscow on 3 July, 1974, in duplicate, in the English and Russian languages, both texts being equally authentic.

Protocol to the treaty between the United States of America and the Union of Soviet Socialist Republics on the limitation of underground nuclear weapon tests

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Having agreed to limit underground nuclear weapon tests,

Have agreed as follows:

1. For the purpose of ensuring verification of compliance with the obligations of the Parties under the Treaty by national technical means, the Parties shall, on the basis of reciprocity, exchange the following data:

(a) The geographic co-ordinates of the boundaries of each test site and of the boundaries of the geophysically distinct testing areas therein.

(b) Information on the geology of the testing areas of the sites (the rock characteristics of geological formations and the basic physical properties of the rock, i.e., density, seismic velocity, water saturation, porosity and depth of water table).

(c) The geographic co-ordinates of underground nuclear weapon tests, after they have been conducted.

(d) Yield, date, time, depth and co-ordinates for two nuclear weapon tests for calibration purposes from each geophysically distinct testing area where underground nuclear weapon tests have been and are to be conducted. In this connexion the yield of such explosions for calibration purposes should be as near as possible to the limit defined in Article I of the Treaty and not less than one-tenth of that limit. In the case of testing areas where data are not available on two tests for calibration purposes, the data pertaining to one such test shall be exchanged, if available, and the data pertaining to the second test shall be exchanged as soon as possible after a second test having a yield in the above-mentioned range. The provisions of the Protocol shall not require the Parties to conduct tests solely for calibration purposes.

2. The Parties agree that the exchange of data pursuant to subparagraphs a, b, and d of paragraph 1 shall be carried out simultaneously with the exchange of instruments of ratification of the Treaty, as provided in Article IV of the Treaty, having in mind that the Parties shall, on the basis of reciprocity, afford each other the opportunity to familiarize themselves with these data before the exchange of instruments of ratification.

3. Should a Party specify a new test site or testing area after the entry into force of the Treaty, the data called for by subparagraphs a and b of paragraph 1 shall be transmitted to the other Party in advance of use of that

site or area. The data called for by subparagraph d of paragraph 1 shall also be transmitted in advance of use of that site or area if they are available; if they are not available, they shall be transmitted as soon as possible after they have been obtained by the transmitting Party.

4. The Parties agree that the test sites of each Party shall be located at places under its jurisdiction or control and that all nuclear weapon tests shall be conducted solely within the testing areas specified in accordance with paragraph 1.

5. For the purposes of the Treaty, all underground nuclear explosions at the specified test sites shall be considered nuclear weapon tests and shall be subject to all the provisions of the Treaty relating to nuclear weapon tests. The provisions of Article III of the Treaty apply to all underground nuclear explosions conducted outside of the specified test sites, and only to such explosions.

This Protocol shall be considered an integral part of the Treaty.

Done at Moscow on 3 July, 1974.

Appendix 14B

Estimated yields of underground explosions in the USA and the USSR, 1969–73

	United States			Soviet Union		
	Peaceful explo- sions	Weapon tests	All tests	Peaceful[b] explo- sions	At test sites	All sites
Stronger than 150 kt	–	7	7	–	8	8
Around 150 kt[a]	–	8	8	5	8	13
Weaker than 150 kt	3	86	89	23	38	61

[a] This line shows the number of explosions for which available seismometric data did not permit confident statements on whether they had yields below or above 150 kt.
[b] The explosions in this column are listed as peaceful because they occurred in places other than the two main testing sites.

Appendix 14C

Protocol to the treaty between the United States of America and the Union of Soviet Socialist Republics on the limitation of anti-ballistic missile systems

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Proceeding from the basic principles of relations between the United States of America and the Union of Soviet Socialist Republics signed on 29 May 1972,

Desiring to further the objectives of the Treaty between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems signed on 26 May 1972, hereinafter referred to as the Treaty,

Reaffirming their conviction that the adoption of further measures for the limitation of strategic arms would contribute to strengthening international peace and security,

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,

Have agreed as follows:

ARTICLE I

1. Each Party shall be limited at any one time to a single area out of the two provided in Article III of the Treaty for deployment of anti-ballistic missile (ABM) systems or their components and accordingly shall not exercise its right to deploy an ABM system or its components in the second of the two ABM system deployment areas permitted by Article III of the Treaty, except as an exchange of one permitted area for the other in accordance with Article II of this Protocol.

2. Accordingly, except as permitted by Article II of this Protocol: The United States of America shall not deploy an ABM system or its components in the area centered on its capital, as permitted by Article III (a) of the Treaty, and the Soviet Union shall not deploy an ABM system or its components in the deployment area of intercontinental ballistic missile (ICBM) silo launchers as permitted by Article III (b) of the Treaty.

ARTICLE II

1. Each Party shall have the right to dismantle or destroy its ABM system and the components thereof in the area where they are presently deployed and to deploy an ABM system or its components in the alternative area permitted by Article III of the Treaty, provided that prior to initiation of construction, notification is given in accord with the procedure agreed to by the Standing Consultative Commission during the year beginning 3 October 1977 and ending 2 October 1978, or during any year which commences at five year intervals thereafter, those being the years for periodic review of the Treaty, as provided in Article XIV of the Treaty. This right may be exercised only once.

2. Accordingly, in the event of such notice, the United States would have the right to dismantle or destroy the ABM system and its components in the deployment area of ICBM silo launchers and to deploy an ABM system or its components in the area centered on its capital, as permitted by Article III (a) of the Treaty, and the Soviet Union would have the right to dismantle or destroy the ABM system and its components in the area centered on its capital and to deploy an ABM system or its components in an area containing ICBM silo launchers, as permitted by Article III (b) of the Treaty.

3. Dismantling or destruction and deployment of ABM systems or their components and the notification thereof shall be carried out in accordance with Article VIII of the ABM Treaty and procedures agreed to in the Standing Consultative Commission.

ARTICLE III

The rights and obligations established by the Treaty remain in force and shall be complied with by the Parties except to the extent modified by this Protocol. In particular, the deployment of an ABM system or its components within the area selected shall remain limited by the levels and other requirements established by the Treaty.

ARTICLE IV

This Protocol shall be subject to ratification in accordance with the constitutional procedures of each Party. It shall enter into force on the day of the exchange of instruments of ratification and shall thereafter be considered an integral part of the Treaty.

Done at Moscow on 3 July 1974, in duplicate, in the English and Russian languages, both texts being equally authentic.

Appendix 14D

Joint US-Soviet statement of 24 November 1974

During their working meeting in the area of Vladivostok on November 23–24, 1974, General Secretary of the Central Committee of the CPSU L. I. Brezhnev and President of the USA Gerald R. Ford discussed in detail the question of further limitations of strategic offensive arms.

They reaffirmed the great significance that both the USSR and the United States attach to the limitation of strategic offensive arms. They are convinced that a long-term agreement on this question would be a significant contribution to improving relations between the USSR and the USA to reducing the danger of war and to enhancing world peace.

Having noted the value of previous agreements on this question, including the Interim Agreement of May 26, 1972, they reaffirm the intention to conclude a new agreement on the limitation of strategic offensive arms, to last through 1985.

As a result of the exchange of views on the substance of such a new agreement the General Secretary of the Central Committee of the CPSU and the President of the United States of America concluded that favourable prospects exist for completing the work on this agreement in 1975.

Agreement was reached that further negotiations will be based on the following provisions:

1. The new agreement will incorporate the relevant provisions of the Interim Agreement of May 26, 1972, which will remain in force until October 1977.

2. The new agreement will cover the period from October 1977 through December 31, 1985.

3. Based on the principle of equality and equal security, the new agreement will include the following limitations:

a) both Sides will be entitled to have a certain agreed aggregate number of strategic delivery vehicles;

b) both Sides will be entitled to have a certain agreed aggregate number of intercontinental ballistic missiles and submarine-launched ballistic missiles equipped with multiple independently targetable warheads.

4. The new agreement will include a provision for further negotiations beginning not later than 1980–1981 on the question of further limitation and possible reductions of strategic arms in the period after 1985.

5. Negotiations between the delegations of the USSR and the USA to work out the new agreement incorporating the foregoing points will resume in Geneva in January 1975.

Appendix 14E

Working papers on the prohibition of chemical weapons, presented at the Conference of the Committee on Disarmament (CCD) in 1974

CCD/427; Sweden; Some observations on the draft convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction presented by the delegation of Japan on 30 April 1974 (CCD/420).

CCD/430; Japan; Working paper containing the views of Japanese experts on the scope of prohibition and on the verification of organophosphorus compounds for the informal meetings with the participation of experts of the CCD in 1974.

CCD/432; Finland; Methodology for chemical analysis and identification of CW agents.

CCD/433; Canada; The problem of defining compounds having military significance as irritating and incapacitating agents.

CCD/434; Canada; Destruction and disposal of Canadian stocks of World War II mustard agent.

CCD/435; United States; Working paper on the toxicity of chemical warfare agents.

CCD/436; United States; Working paper on chemical agent destruction.

CCD/437; United States; Working paper on diversion of commercial chemicals for weapons.

Appendix 14F

Definition of aggression

This definition was adopted by the UN General Assembly on 14 December 1974 [Resolution 3314 (XXIX)] upon recommendation by the Sixth Committee of the UN General Assembly (A/9890), based on the report of the Special Committee on the Question of Defining Aggression (A/9619).

The General Assembly,

Basing itself on the fact that one of the fundamental purposes of the United Nations is to maintain international peace and security and to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace,

Recalling that the Security Council, in accordance with Article 39 of the Charter of the United Nations, shall determine the existence of any threat to the peace, breach of the peace or act of aggression and shall make recommendations, or decide what measures shall be taken in accordance with Articles 41 and 42, to maintain or restore international peace and security,

Recalling also the duty of States under the Charter to settle their international disputes by peaceful means in order not to endanger international peace, security and justice,

Bearing in mind that nothing in this definition shall be interpreted as in any way affecting the scope of the provisions of the Charter with respect to the functions and powers of the organs of the United Nations,

Considering also that, since aggression is the most serious and dangerous form of the illegal use of force, being fraught, in the conditions created by the existence of all types of weapons of mass destruction, with the possible threat of a world conflict and all its catastrophic consequences, aggression should be defined at the present stage,

Reaffirming the duty of States not to use armed force to deprive peoples of their right to self-determination, freedom and independence, or to disrupt territorial integrity,

Reaffirming also that the territory of a State shall not be violated by being the object, even temporarily, of military occupation or of other measures of force taken by another State in contravention of the Charter, and that it shall not be the object of acquisition by another State resulting from such measures or the threat thereof,

Reaffirming also the provisions of the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations,

Convinced that the adoption of a definition of aggression ought to have the effect of deterring a potential aggressor, would simplify the determination of acts of aggression and the implementation of measures to suppress them and would also facilitate the protection of the rights and lawful interests of, and the rendering of assistance to, the victim,

Believing that, although the question whether an act of aggression has been committed must be considered in the light of all the circumstances of each particular case, it is nevertheless desirable to formulate basic principles as guidance for such determination,

Adopts the following Definition:*

ARTICLE I

Aggression is the use of armed force by a State against the sovereignty, territorial integrity or political independence of another State, or in any other manner inconsistent with the Charter of the United Nations, as set out in this Definition.

Explanatory note: In this Definition the term "State"

(a) Is used without prejudice to questions of recognition or to whether a State is a Member of the United Nations, and

(b) Includes the concept of a "group of States" where appropriate.

ARTICLE II

The first use of armed force by a State in contravention of the Charter shall constitute *prima facie* evidence of an act of aggression although the Security Council may, in conformity with the Charter, conclude that a determination that an act of aggression has been committed would not be justified in the light of other relevant circumstances including the fact that the acts concerned or their consequences are not of sufficient gravity.

ARTICLE III

Any of the following acts, regardless of a declaration of war, shall, subject to and in accordance with the provisions of article 2, qualify as an act of aggression:

(a) The invasion or attack by the armed forces of a State of the territory of another State, or any military occupation, however temporary, resulting from such invasion or attack, or any annexation by the use of force of the territory of another State or part thereof;

(b) Bombardment by the armed forces of a State against the territory of another State or the use of any weapons by a State against the territory of another State;

(c) The blockade of the ports or coasts of a State by the armed forces of another State;

(d) An attack by the armed forces of a State on the land, sea or air forces, or marine and air fleets of another State;

(e) The use of armed forces of one State which are within the territory of another State with the agreement of the receiving State, in contravention of the conditions provided for in the agreement or any extension of their presence in such territory beyond the termination of the agreement;

(f) The action of a State in allowing its territory, which it has placed at the disposal of another State, to be used by that other State for perpetrating an act of aggression against a third State;

(g) The sending by or on behalf of a State of armed bands, groups, irregulars or mercenaries, which carry out acts of armed force against another State of such gravity as to amount to the acts listed above, or its substantial involvement therein.

ARTICLE IV

The acts enumerated above are not exhaustive and the Security Council may determine that other acts constitute aggression under the provisions of the Charter.

ARTICLE V

No consideration of whatever nature, whether political, economic, military or otherwise, may serve as a justification for aggression.

A war of aggression is a crime against international peace. Aggression gives rise to international responsibility.

No territorial acquisition or special advantage resulting from aggression are or shall be recognized as lawful.

ARTICLE VI

Nothing in this Definition shall be construed as in any way enlarging or diminishing the scope of the Charter including its provisions concerning cases in which the use of force is lawful.

ARTICLE VII

Nothing in this Definition, and in particular article 3, could in any way prejudice the right to self-determination, freedom and independence, as derived from the Charter, of peoples forcibly deprived of that right and referred to in the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations, particularly peoples under colonial and racist régimes or other forms of alien domination; nor the right of these peoples to struggle to that end and to seek and receive support, in accordance with the principles of the Charter and in conforming with the above-mentioned Declaration.

ARTICLE VIII

In their interpretation and application the above provisions are interrelated and each provision should be construed in the context of the other provisions.

* The following explanatory notes on articles 3 and 5 are included in the report of the Special Committee on the Question of Defining Aggression:

1. With reference to article 3, subparagraph (b), the Special Committee agreed that the expression "any weapons" is used without making a distinction between conventional weapons, weapons of mass destruction and any other kind of weapon.
2. With reference to the first paragraph of article 5, the Committee had in mind, in particular, the principle contained in the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations according to which "No State or group of States has the right to intervene, directly or indirectly, for any reason whatever, in the internal or external affairs of any other State".
3. With reference to the second paragraph of article 5, the words "international responsibility" are used without prejudice to the scope of this term.
4. With reference to the third paragraph of article 5, the Committee states that this paragraph should not be construed so as to prejudice the established principles of international law relating to the inadmissibility of territorial acquisition resulting from the threat or use of force.

The report of the Sixth Committee of the UN General Assembly contains the following statements on the Definition:

The Sixth Committee agreed that nothing in the Definition of Aggression, and in particular article 3 (c), shall be construed as a justification for a State to block, contrary to international law, the routes of free access of a land-locked country to and from the sea.

The Sixth Committee agreed that nothing in the Definition of Aggression, and in particular article 3 (d), shall be construed as in any way prejudicing the authority of a State to exercise its rights within its national jurisdiction, provided such exercise is not inconsistent with the Charter of the United Nations.

Appendix 14G

UN General Assembly resolutions on disarmament and related matters

I. *Member states of the United Nations as of 17 September 1974*

Total membership: 138

Member	Date of admission	
Afghanistan	19 Nov	1946
Albania	14 Dec	1955
Algeria	8 Oct	1962
Argentina	24 Oct	1945
Australia	1 Nov	1945
Austria	14 Dec	1955
Bahamas	18 Sep	1973
Bahrain	21 Sep	1971
Bangladesh	17 Sep	1974
Barbados	9 Dec	1966
Belgium	27 Dec	1945
Bhutan	21 Sep	1971
Bolivia	14 Nov	1945
Botswana	17 Oct	1966
Brazil	24 Oct	1945
Bulgaria	14 Dec	1955
Burma	19 Apr	1948
Burundi	18 Sep	1962
Byelorussia	24 Oct	1945
Canada	9 Nov	1945
Central African Republic	20 Sep	1960
Chad	20 Sep	1960
Chile	24 Oct	1945
China	24 Oct	1945
Colombia	5 Nov	1945
Congo	20 Sep	1960
Costa Rica	2 Nov	1945
Cuba	24 Oct	1945
Cyprus	20 Sep	1960

Czechoslovakia	24 Oct	1945
Dahomey	20 Sep	1960
Democratic Yemen[a]	14 Dec	1967
Denmark	24 Oct	1945
Dominican Republic	24 Oct	1945
Ecuador	21 Dec	1945
Egypt[b]	24 Oct	1945
El Salvador	24 Oct	1945
Equatorial Guinea	12 Nov	1968
Ethiopia	13 Nov	1945
Fiji	13 Oct	1970
Finland	14 Dec	1955
France	24 Oct	1945
Gabon	20 Sep	1960
Gambia	21 Sep	1965
German Democratic Republic	18 Sep	1973
Germany, Federal Republic of	18 Sep	1973
Ghana	8 Mar	1957
Greece	25 Oct	1945
Grenada	17 Sep	1974
Guatemala	21 Nov	1945
Guinea	12 Dec	1958
Guinea-Bissau	17 Sep	1974
Guyana	20 Sep	1966
Haiti	24 Oct	1945
Honduras	17 Dec	1945
Hungary	14 Dec	1955
Iceland	19 Nov	1946
India	30 Oct	1945
Indonesia[c]	28 Sep	1950
Iran	24 Oct	1945
Iraq	21 Dec	1945
Ireland	14 Dec	1955
Israel	11 May	1949
Italy	14 Dec	1955
Ivory Coast	20 Sep	1960
Jamaica	18 Sep	1962
Japan	18 Dec	1956
Jordan	14 Dec	1955
Kenya	16 Dec	1963
Khmer Republic	14 Dec	1955
Kuwait	14 May	1963
Laos	14 Dec	1955
Lebanon	24 Oct	1945

Lesotho	17 Oct	1966
Liberia	2 Nov	1945
Libya	14 Dec	1955
Luxembourg	24 Oct	1945
Madagascar	20 Sep	1960
Malawi	1 Dec	1964
Malaysia[d]	17 Sep	1957
Maldives	21 Sep	1965
Mali	28 Sep	1960
Malta	1 Dec	1964
Mauritania	27 Oct	1961
Mauritius	24 Apr	1968
Mexico	7 Nov	1945
Mongolia	27 Oct	1961
Morocco	12 Nov	1956
Nepal	14 Dec	1955
Netherlands	10 Dec	1945
New Zealand	24 Oct	1945
Nicaragua	24 Oct	1945
Niger	20 Sep	1960
Nigeria	7 Oct	1960
Norway	27 Nov	1945
Oman	7 Oct	1971
Pakistan	30 Sep	1947
Panama	13 Nov	1945
Paraguay	24 Oct	1945
Peru	31 Oct	1945
Philippines	24 Oct	1945
Poland	24 Oct	1945
Portugal	14 Dec	1955
Qatar	21 Sep	1971
Romania	14 Dec	1955
Rwanda	18 Sep	1962
Saudi Arabia	24 Oct	1945
Senegal	28 Sep	1960
Sierra Leone	27 Sep	1961
Singapore	21 Sep	1965
Somalia	20 Sep	1960
South Africa	7 Nov	1945
Spain	14 Dec	1955
Sri Lanka[e]	14 Dec	1955
Sudan	12 Nov	1956
Swaziland	24 Sep	1968
Sweden	19 Nov	1946

Syrian Arab Republic[b]	24 Oct	1945
	(resumed 13 Oct	1961)
Thailand	16 Dec	1946
Togo	20 Sep	1960
Trinidad and Tobago	18 Sep	1962
Tunisia	12 Nov	1956
Turkey	24 Oct	1945
Uganda	25 Oct	1962
Ukraine	24 Oct	1945
Union of Soviet Socialist Republics	24 Oct	1945
United Arab Emirates	9 Dec	1971
United Kingdom	24 Oct	1945
United Republic of Cameroon	20 Sep	1960
United Republic of Tanzania[f]	14 Dec	1961
United States	24 Oct	1945
Upper Volta	20 Sep	1960
Uruguay	18 Dec	1945
Venezuela	15 Nov	1945
Yemen	30 Sep	1947
Yugoslavia	24 Oct	1945
Zaire	20 Sep	1960
Zambia	1 Dec	1964

[a] Formerly listed as People's Democratic Republic of Yemen.
[b] Egypt and Syria were original members of the United Nations from 24 October 1945. Following a plebiscite on 21 February 1958, the United Arab Republic was established by a union of Egypt and Syria and continued as a single member. On 13 October 1961, Syria, having resumed its status as an independent state, resumed its separate membership in the United Nations. On 2 September 1971, the United Arab Republic changed its name to Arab Republic of Egypt.
[c] By letter of 20 January 1965, Indonesia announced its decision to withdraw from the United Nations "at this stage and under the present circumstances". By telegram of 19 September 1966, it announced its decision "to resume full co-operation with the United Nations and to resume participation in its activities". On 28 September 1966, the General Assembly took note of this decision and the president invited representatives of Indonesia to take seats in the Assembly.
[d] The Federation of Malaya joined the United Nations on 17 September 1957. On 16 September 1963, its name changed to Malaysia, following the admission to the new federation of Singapore, Sabah (North Borneo) and Sarawak. Singapore became an independent State on 9 August 1965 and a member of the United Nations on 21 September 1965.
[e] Formerly Ceylon.
[f] Tanganyika was a member of the United Nations from 14 December 1961 and Zanzibar was a member from 16 December 1963. Following the ratification on 26 April 1964, of Articles of Union between Tanganyika and Zanzibar, the United Republic of Tanganyika and Zanzibar continued as a single member, changing its name to United Republic of Tanzania on 1 November 1964.

II. *List of UN resolutions adopted in 1974*

The list includes resolutions exclusively concerning disarmament, as well as those dealing with economic, colonial, legal and general political questions, but referring to disarmament matters. In the latter case, the negative votes or abstentions do not necessarily reflect the positions of states on the disarmament paragraphs of the relevant resolutions.

Only the essential parts of each resolution are given here. The text has been abridged, but the wording is close to that of the resolution.

The resolutions are grouped according to subjects, irrespective of the agenda items under which they were discussed.

Resolution no. and date of adoption	Subject and contents of resolution	Voting results
3261 C (XXIX) 9 December 1974	**Strategic arms limitation** Urges the USSR and the USA to broaden the scope and accelerate the pace of their strategic arms limitation talks, and stresses the necessity and urgency of reaching agreement on important qualitative limitations and substantial reductions of their strategic nuclear weapon systems as a positive step towards nuclear disarmament; and invites the governments of the USSR and the USA to keep the General Assembly informed in good time of the results of their negotiations.	*In favour* 105 *Against* 1: Albania *Abstentions* 23: Belgium, Bhutan, Bulgaria, Burundi, Byelorussia, Colombia, Cuba, Czechoslovakia, France, German Democratic Republic, Germany (Federal Republic of), Hungary, India, Italy, Luxembourg, Mongolia, Poland, Romania, Ukraine, USSR, United Kingdom, United States, Zambia *Absent or not participating in the vote:* Chad, China, Gabon, Malawi, Maldives, Saudi Arabia, South Africa, Swaziland, United Republic of Tanzania
3261 D (XXIX) 9 December 1974	**Non-proliferation of nuclear weapons** Appeals to all states, in particular nuclear-weapon states, to exert concerted efforts in all the appropriate international forums with a view to working out promptly effective measures for the cessation of the nuclear arms race and for the prevention of the further proliferation of nuclear weapons; requests the IAEA to continue its studies on the peaceful applications of nuclear explosions, their utility and feasibility, including legal, health and safety aspects; calls upon the CCD, in submitting its report on the elaboration of a treaty designed to achieve a comprehensive test ban, to include a section on its consideration of the arms control implica-	*In favour* 115 *Against* 3: Albania, China, India *Abstentions* 12: Algeria, Argentina, Bangladesh, Bhutan, Brazil, Burundi, Cuba, France, Guinea, Mauritius, Yugoslavia, Zambia *Absent or not participating in the vote:* Chad, Gabon, Malawi, Maldives, Panama, Saudi Arabia, South Africa, Swaziland

tions of peaceful nuclear explosions; expresses the hope that the review conference of the NPT will also give consideration to the role of peaceful nuclear explosions as provided for in that treaty; invites the USSR and the USA to provide the review conference with information concerning such steps as they have taken since the entry into force of the treaty, or intend to take, for the conclusion of the special basic international agreement on nuclear explosions for peaceful purposes; and invites the Secretary-General, should he deem it appropriate, to submit further comments on this matter, taking into account the above reports.

3257 (XXIX) 9 December 1974	**Nuclear weapon tests** Condemns all nuclear weapon tests, in whatever environment they may be conducted; reaffirms its deep concern at the continuance of such testing, both in the atmosphere and underground, and at the lack of progress towards a comprehensive test ban agreement; calls upon all states not yet parties to the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water to adhere to it forthwith; emphasizes once more the urgency of concluding a comprehensive test ban agreement; reminds the nuclear-weapon states of their special responsibility to initiate proposals to this end; calls upon all states to refrain from the testing of nuclear weapons, in any environment, pending conclusion of such an agreement; requests the CCD to give the highest priority to the conclusion of a comprehensive test ban agreement.	*In favour* 95[b] *Against* 3: Albania, China, France *Abstentions* 33: Algeria, Belgium, Bulgaria, Burundi, Byelorussia, Central African Republic, Congo, Cuba, Czechoslovakia, Democratic Yemen, Equatorial Guinea, German Democratic Republic, Germany (Federal Republic of), Guinea, Guinea-Bissau, Hungary, Iraq, Italy, Luxembourg, Madagascar, Malawi, Mauritania, Mongolia, Pakistan, Poland, Portugal, Romania, Ukraine, USSR, United Arab Emirates, United Kingdom, United States, Zaire *Absent or not participating in the vote:* Bhutan, Chad, Gabon, Maldives, Mali, South Africa, Swaziland
3226 (XXIX) 12 November 1974	**Atomic radiation** Notes with concern that there has been further radioactive contamination from nuclear weapon tests since the UN Scientific Committee on the Effects of Atomic Radiation submitted its last report; and requests the Committee to continue its work to increase knowledge of the levels and effects of atomic radiation from all sources.	Adopted without objection
3262 (XXIX) 9 December 1974	**Latin American nuclear-weapon-free zone** Notes with satisfaction that the United Kingdom deposited its instrument of ratification of Additional Protocol I of the Treaty of Tlatelolco on 11 December 1969 and that the Netherlands did likewise on 26 July 1971, and urges the other two states which under the Treaty may become parties to its Additional Protocol I to sign and ratify it as soon as possible, in order that the peoples of the territories in question may receive the benefits which derive from the Treaty.	*In favour* 115 *Against* 0 *Abstentions* 17: Argentina, Bulgaria, Byelorussia, Central African Republic, Cuba, Czechoslovakia, Democratic Yemen, France, German Democratic Republic, Guinea, Guyana, Hungary, Mongolia, Poland, Ukraine, USSR, United States *Absent or not participating in the vote:* Gabon, Malawi, Maldives, Saudi Arabia, South Africa, Swaziland

Resolution no. and date of adoption	Subject and contents of resolution	Voting results
3258 (XXIX) 9 December 1974	Urges the USSR to sign and ratify Additional Protocol II of the Treaty of Tlatelolco, as has already been done by the other four nuclear-weapon states.	*In favour* 114 *Against* 0 *Abstentions* 15: Bulgaria, Byelorussia, Cuba, Czechoslovakia, Democratic Yemen, German Democratic Republic, Guinea, Guyana, Hungary, Mongolia, Poland, Syrian Arab Republic, Ukraine, USSR, United Arab Emirates *Absent or not participating in the vote:* Bhutan, Chad, Gabon, Malawi, Maldives, Mali, Saudi Arabia, South Africa, Swaziland
3261 E (XXIX) 9 December 1974	**African nuclear-weapon-free zone** Reaffirms its call upon all states to consider and respect the continent of Africa as a nuclear-free zone; reiterates its call upon all states to respect and abide by the declaration of the Assembly of Heads of state and government of the Organization of African Unity on the denuclearization of Africa; and reiterates further its call upon all states to refrain from testing, manufacturing, deploying, transporting, storing, using or threatening to use nuclear weapons on the African continent.	*In favour* 131 *Against* 0 *Abstentions* 0 *Absent or not participating in the vote:* Albania, Gabon, Malawi, Maldives, Saudi Arabia, South Africa, Swaziland
3265 A (XXIX) 9 December 1974	**South Asian nuclear-weapon-free zone** Recognizing that, in appropriate regions and by agreement among the states concerned, the creation of nuclear-weapon-free zones could promote the cause of general and complete disarmament under effective international control, considers that the initiative for the creation of a nuclear-weapon-free zone in the appropriate region of Asia should come from the states of the region concerned, taking into account its special features and geographical extent.	*In favour* 104[c] *Against* 1: Dahomey *Abstentions* 27: Bahamas, Barbados, Burma, Central African Republic, China, Congo, Denmark, Dominican Republic, Fiji, France, Gabon, Grenada, Israel, Ivory Coast, Jordan, Malawi, Malaysia, Mali, Niger, Norway, Pakistan, Saudi Arabia, Sweden, Turkey, United Kingdom, United Republic of Tanzania, United States *Absent or not participating in the vote:* Albania, Colombia, Libya, Maldives, Oman, South Africa
3265 B (XXIX) 9 December 1974	Bearing in mind that the establishment of a nuclear-weapon-free zone would, *inter alia,* entail: (*a*) commitments by the states concerned to use exclusively for peaceful purposes nuclear materials and facilities under their jurisdiction and to prevent the testing, use, manufacture, production, acquisition or storage of any nuclear weapons or nuclear launching devices; (*b*) an equitab-	*In favour* 96 *Against* 2: Bhutan, India *Abstentions* 36: Bahamas, Bangladesh, Barbados, Bulgaria, Burma, Byelorussia, Chad, Cuba, Cyprus, Czechoslovakia, Denmark, Fiji, France, Gambia, German Democratic Republic, Greece, Grenada, Guyana, Hungary, Israel, Malawi, Malaysia,

le and non-discriminatory system of verification and inspection to ensure that nuclear programmes are in conformity with the foregoing commitments; and, (*c*) undertakings by nuclear-weapon states not to use or threaten the use of nuclear weapons against the states of the region, and having considered the question of the establishment of a nuclear-weapon-free zone in South Asia without prejudice to the extension of the zone to include such other regions of Asia as may be practicable, takes note of the affirmation by the states of the region not to acquire or manufacture nuclear weapons and to devote their nuclear programmes exclusively to the economic and social advancement of their peoples; endorses, in principle, the concept of a nuclear-weapon-free zone in South Asia; invites the states of the South Asian region and such other neighbouring non-nuclear-weapon states as may be interested to initiate, without delay, necessary consultations with a view to establishing a nuclear-weapon-free zone and urges them, in the interim, to refrain from any action contrary to the achievement of these objectives; expresses the hope that all states, in particular the nuclear-weapon states, will lend their full cooperation for the effective realization of the aims of the resolution; and requests the Secretary-General to convene a meeting for the purpose of the consultations envisaged above.

Mauritius, Mongolia, Norway, Poland, Portugal, Sweden, Thailand, Ukraine, USSR, United Kingdom, United Republic of Tanzania, United States, Yugoslavia, Zambia
Absent or not participating in the vote: Albania, Equatorial Guinea, Maldives, South Africa

3263 (XXIX)
9 December 1974

Middle East nuclear-weapon-free zone

Commends the idea of the establishment of a nuclear-weapon-free zone in the region of the Middle East; considers that, in order to advance the idea of a nuclear-weapon-free zone in the region of the Middle East, it is indispensable that all parties concerned in the area proclaim solemnly and immediately their intention to refrain, on a reciprocal basis, from producing, testing, obtaining, acquiring or in any other way possessing nuclear weapons; calls upon the parties concerned in the area to accede to the Non-Proliferation Treaty; and expresses the hope that all states and, in particular, the nuclear-weapon states, will lend their full cooperation for the effective realization of the aims of this resolution.

In favour 128
Against 0
Abstentions 2: Burma, Israel
Absent or not participating in the vote: Albania, Gabon, Iraq, Libya, Malawi, Maldives, Saudi Arabia, South Africa

3261 F (XXIX)
9 December 1974

Study of nuclear-weapon-free zones

Decides to undertake a comprehensive study of the question of nuclear-weapon-free zones in all of its aspects; requests that the study be carried out by an *ad hoc* group of qualified governmental experts under the auspices of the CCD; calls upon interested governments and international organizations concerned to extend

Adopted by consensus

Resolution no. and date of adoption	Subject and contents of resolution	Voting results
	such assistance as may be required from them for the carrying out of the study; requests the CCD to transmit the study in a special report to the UN General Assembly.	
3261 G (XXIX) 9 December 1974	**Security of non-nuclear-weapon states** Believing it necessary to consider ways to strengthen assurances against nuclear attack or threat and thus give greater confidence to the non-nuclear-weapon states, declares firm support for the independence, territorial integrity and sovereignty of non-nuclear-weapon states; and recommends to member states to consider in all appropriate forums the question of strengthening the security of non-nuclear-weapon states.	Adopted without vote
3213 (XXIX) 5 November 1974	**Peaceful uses of nuclear energy** Notes with appreciation the reorientation of the programme of the International Atomic Energy Agency (IAEA), in view of the energy situation, by the adoption of an expanded programme for nuclear power and reactors, nuclear safety standards and environmental protection, and the International Nuclear Information System, as well as the steps taken by the IAEA in expanding its training programme to meet the need of developing countries; realizes the importance of the initiative taken by the IAEA in arranging for an international conference on nuclear power and the fuel cycle, to be convened in 1977, to review and appraise the role of nuclear energy and alternative energy sources in satisfying energy demand in the future; commends the IAEA on the steps it has taken to establish, within its framework, an international service for nuclear explosions for peaceful purposes under appropriate international control, particularly the approval of the procedures in responding to requests for services related to nuclear explosions for peaceful purposes, and the resolution of the Board of Governors of 13 September 1974 to establish, within the IAEA, a separate organizational unit for this purpose; urges all countries concerned to ratify or accede to the NPT or finalize their safeguards agreements with the IAEA as soon as possible in accordance with the provisions of that treaty.	*In favour* 66 *Against* 0 *Abstentions* 9: Algeria, Argentina, Bangladesh, Brazil, France, India, Nicaragua, Niger, Senegal *Absent or not participating in the vote:* Afghanistan, Albania, Bahamas, Bahrain, Barbados, Bhutan, Bolivia, Burundi, Central African Republic, Chad, Chile, China, Colombia, Congo, Dahomey, Democratic Yemen, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Fiji, Gabon, Gambia, Ghana, Grenada, Guatemala, Guinea-Bissau, Guyana, Haiti, Honduras, Iceland, Iraq, Jamaica, Jordan, Laos, Lebanon, Lesotho, Liberia, Maldives, Mali, Malta, Mauritania, Mauritius[a], Morocco, Nigeria, Panama, Paraguay, Qatar, Saudi Arabia, Sierra Leone, Singapore, Somalia, South Africa, Syrian Arab Republic, Togo, Trinidad and Tobago, Turkey, Uganda, United Arab Emirates, United Republic of Tanzania, Upper Volta, Uruguay, Zambia

3259 A (XXIX)
9 December 1974

Indian Ocean as a zone of peace

Urges the littoral and hinterland states of the Indian Ocean, the permanent members of the Security Council and other major maritime users of the Indian Ocean to give a tangible support to the establishment and preservation of the Indian Ocean as a zone of peace; calls upon the great powers to refrain from increasing and strengthening their military presence in the region of the Indian Ocean as an essential first step towards the relaxation of tension and the promotion of peace and security in the area; requests the littoral and hinterland states of the Indian Ocean to enter, as soon as possible, into consultations with a view to convening a conference on the Indian Ocean; and invites all states, especially the great powers, to cooperate in a practical manner with the *Ad Hoc* Committee on the Indian Ocean in the discharge of its functions.

In favour 103
Against 0
Abstentions 26: Austria, Belgium, Bulgaria, Byelorussia, Canada, Cuba, Czechoslovakia, Denmark, France, German Democratic Republic, Germany (Federal Republic of), Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Mongolia, Netherlands, Norway, Poland, Turkey, Ukraine, USSR, United Kingdom, United States
Absent or not participating in the vote: Bhutan, Chad, Gabon, Guinea-Bissau, Maldives, Mali, Saudi Arabia, South Africa, Swaziland

3259 B (XXIX)
9 December 1974

Decides to enlarge the composition of the *Ad Hoc* Committee on the Indian Ocean by the addition of no more than three member states.

Adopted without vote

3256 (XXIX)
9 December 1974

Chemical and biological weapons

Urges all states to make every effort to facilitate agreement on the effective prohibition of the development, production and stockpiling of all chemical weapons and on their destruction; requests the CCD to continue negotiations as a matter of high priority, bearing in mind existing proposals, with a view to reaching early agreement; invites all states that have not yet done so to sign and ratify the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, with a view to its entry into force and effective implementation at an early date; and invites all states that have not yet done so to accede to or ratify the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925, in the course of 1975 in commemoration of the fiftieth anniversary of its signing, and calls anew for the strict observance by all states of the principles and objectives contained therein.

Adopted without vote

3255 A (XXIX)
9 December 1974

Napalm and other incendiary weapons

Taking note of the readiness of the International Committee of the Red Cross to convoke another conference of government experts, which would receive and consider new information and

In favour 108
Against 0
Abstentions 13: Bulgaria, Byelorussia, Czechoslovakia, France,

Resolution no. and date of adoption	Subject and contents of resolution	Voting results
	focus on such conventional weapons as have been, or may become, the subject of proposed bans or restrictions of use and study the possibility, contents and form of such proposed bans or restrictions; urges all governments to examine the considerable body of facts which is now available on the matter and to compile without delay such supplementary data as may be required by them to focus upon specific proposals for prohibitions or restrictions; appeals to all governments to cooperate in the clarification of the issues and to consider all proposals and suggestions which have been or may be advanced on the matter; and invites the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts to continue its consideration of the question of the use of napalm and other incendiary weapons as well as other specific conventional weapons which may be deemed to cause unnecessary suffering or to have indiscriminate effects, and its search for agreement on possible rules prohibiting or restricting the use of such weapons.	German Democratic Republic, Hungary, Israel, Mongolia, Poland, Ukraine, USSR, United Kingdom, United States *Absent or not participating in the vote:* Bahamas, Bhutan, Chad, Equatorial Guinea, Gabon, Grenada, Guinea,[a] Guinea-Bissau, Jamaica, Lesotho, Maldives, Mali, Mauritius,[a] Saudi Arabia, South Africa, Swaziland, Togo
3255 B (XXIX) 9 December 1974	Deeply disturbed at the continuing use of napalm and other incendiary weapons, condemns the use of napalm and other incendiary weapons in armed conflicts in circumstances where it may affect human beings or may cause damage to the environment and/or natural resources; urges all states to refrain from the production, stockpiling, proliferation and use of such weapons, pending the conclusion of agreements on the prohibition of these weapons; and invites all governments, the International Committee of the Red Cross, the specialized agencies and the other international organizations concerned to transmit to the Secretary-General all information about the use of napalm and other incendiary weapons in armed conflicts.	*In favour* 98 *Against* 0 *Abstentions* 27: Australia, Austria, Belgium, Bulgaria, Byelorussia, Canada, Czechoslovakia, Denmark, France, German Democratic Republic, Germany (Federal Republic of), Greece,[a] Hungary, Ireland, Israel, Italy, Japan, Luxembourg, Mongolia, Netherlands, Norway, Poland, Turkey, Ukraine, USSR, United Kingdom, United States *Absent or not participating in the vote:* Bhutan, Chad, Gabon, Grenada, Guinea,[a] Guinea-Bissau, Jamaica, Lesotho, Maldives, Mali, Saudi Arabia, South Africa, Swaziland
3264 (XXIX) 9 December 1974	**Environmental means of warfare** Considers it necessary to adopt, through the conclusion of an appropriate international convention, effective measures to prohibit action to influence the environment and climate for military and other hostile purposes, which are incompatible with the maintenance of international security, human well-being and health;	*In favour* 126 *Against* 0 *Abstentions* 5: Chile, France, Mali, Paraguay, United States *Absent or not participating in the vote:* Albania, Burundi, China, Maldives, Saudi Arabia, South Africa, Togo

takes note of the draft international convention submitted by the USSR, as well as other points of view and suggestions put forward during the discussion of this question; and requests the CCD to proceed as soon as possible to achieving agreement on the text of such a convention and to submit a report on the results achieved for consideration by the General Assembly.

3235 (XXIX)
12 November 1974

Outer space

Commends the Convention on Registration of Objects Launched into Outer Space, the text of which is annexed to the resolution, and requests the Secretary-General to open the convention for signature and ratification at the earliest possible date. (For the text of the convention see page 512.)

Adopted unanimously

3254 (XXIX)
9 December 1974

Reduction of military budgets

Having examined the report of the group of consultant experts on the reduction of military budgets, transmitted to the General Assembly by the Secretary-General on 14 October 1974, invites all states to communicate to the Secretary-General, before 30 June 1975, their views and suggestions on all those points they deem pertinent with regard to the matters covered in the report, including the following: (*a*) meaning and scope of a definition of "military budgets" which has the greatest probability of receiving general acceptance; (*b*) feasible and adequate procedures so that the United Nations may establish a system of standardized military budgets of the states envisaged in the resolution 3093 B (XXVIII); (see SIPRI Yearbook 1974 p. 430); (*c*) per cent reduction advisable for the states permanent members of the Security Council, bearing in mind that a 10 per cent reduction has been proposed; (*d*) definition of what should be understood by "other States with a major economic and military potential"; (*e*) per cent reduction advisable for these states; (*f*) part of the resources released through the reduction of military budgets which should be allotted to international assistance for developing countries; and (*g*) international system or mechanism, within the framework of the United Nations, which should be employed in order to achieve the best distribution and utilization of the additional assistance allotted to the developing countries, taking into account the goals set for the Second United Nations Development Decade;

In favour 99
Against 2: Albania, China
Abstentions 12: Bulgaria, Byelorussia, Cuba, Czechoslovakia, France, German Democratic Republic, Hungary, Mongolia, Paraguay, Poland, Ukraine, USSR
Absent or not participating in the vote: Bahamas, Bhutan, Central African Republic,[a] Chad, Equatorial Guinea, Gabon, Grenada, Guinea,[a] Guinea-Bissau, Honduras, Iceland,[a] Iraq,[a] Israel,[a] Jamaica, Kenya,[a] Lesotho, Maldives, Mali, Mauritius,[a] Qatar, Saudi Arabia, South Africa, Swaziland, Togo, Upper Volta[a]

Resolution no. and date of adoption	Subject and contents of resolution	Voting results
3328 (XXIX) 16 December 1974	**Military bases in colonial territories** Calls upon the colonial powers to withdraw immediately and unconditionally their military bases and installations from colonial territories and to refrain from establishing new ones.	*In favour* 118 *Against* 0 *Abstentions* 10: Belgium, France, Germany (Federal Republic of), Israel, Luxembourg, Netherlands, Spain, United Kingdom, United States, Uruguay *Absent or not participating in the vote:* Bangladesh, Barbados, Bhutan, Bolivia, Equatorial Guinea, Gambia, Malawi, Maldives, Paraguay, South Africa
3261 B (XXIX) 9 December 1974	**Expansion of the CCD** Endorses the agreement that has been reached to the effect that the composition of the CCD will be increased as from 1 January 1975 with the following members: German Democratic Republic, Germany (Federal Republic of), Iran, Peru and Zaire.	Adopted without vote
3260 (XXIX) 9 December 1974	**World disarmament conference** Invites all states to communicate to the Secretary-General, before 31 March 1975, their comments on the main objectives of a world disarmament conference; decides that the *Ad Hoc* Committee on the World Disarmament Conference shall resume its work on 1 April 1975, and that in discharging its assigned task it shall give priority to the following two functions: (*a*) to prepare and to submit to the General Assembly at its thirtieth session, on the basis of consensus, an analytical report, including any conclusions and recommendations it may deem pertinent, concerning the comments received, (*b*) to maintain close contact with the representatives of the states possessing nuclear weapons in order to keep currently informed of any change in their respective positions; and renews its invitation to the states possessing nuclear weapons to cooperate or maintain contact with the *Ad Hoc* Committee, it being understood that they will enjoy the same rights as the appointed members of the Committee.	Adopted unanimously
3281 (XXIX) 12 December 1974	**Economic rights and duties of states** Adopts and proclaims a charter of economic rights and duties of states which in article 15 provides that all states have the duty to	*In favour* 120 *Against* 6: Belgium, Denmark, Germany (Federal Repub-

	promote the achievement of general and complete disarmament under effective international control and to utilize the resources freed by effective disarmament measures for the economic and social development of countries, allocating a substantial portion of such resources as additional means for the development needs of developing countries.	lic of), Luxembourg, United Kingdom, United States *Abstentions* 10: Austria, Canada, France, Ireland, Israel, Italy, Japan, Netherlands, Norway, Spain *Absent or not participating in the vote:* Maldives, South Africa
3261 A (XXIX) 9 December 1974	**Disarmament and development** *Recalling* the link between the Disarmament Decade and the Second United Nations Development Decade, invites member states to report to the General Assembly on the measures and policies they have adopted to achieve the purposes and objectives of the Disarmament Decade.	Adopted without vote
3319 (XXIX) 14 December 1974	**Human rights in armed conflicts** Urges all participants in the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts to do their utmost to reach agreement on additional rules which may help to alleviate the suffering brought about by armed conflicts and to respect and to protect non-combatants and civilian objects in such conflicts; and calls upon all parties to armed conflicts to acknowledge and to comply with their obligations under the humanitarian instruments and to observe the international humanitarian rules which are applicable, in particular the Hague Conventions of 1899 and 1907, the Geneva Protocol of 1925 and the Geneva Conventions of 1949.	Adopted unanimously
3318 (XXIX) 14 December 1974	Proclaims a declaration on the protection of women and children in emergency and armed conflict and calls for its strict observance by all member states.	*In favour* 110 *Against* 0 *Abstentions* 14[e]
3314 (XXIX) 14 December 1974	**Definition of aggression** Approves the definition of aggression, the text of which is annexed to the resolution (see p. 462); calls upon all states to refrain from all acts of aggression and other uses of force contrary to the Charter of the United Nations and the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States; and calls the attention of the Security Council to the definition of aggression, recommending that it should, as appropriate, take account of that definition as guidance in determining, in accordance with the Charter, the existence of an act of aggression.	Adopted without vote

Resolution no. and date of adoption	Subject and contents of resolution	Voting results
3283 (XXIX) 12 December 1974	**Peaceful settlement of international disputes** Urges member states not already parties to instruments establishing the various facilities and machinery available for the peaceful settlement of disputes to consider becoming parties to such instruments and, in the case of the International Court of Justice, recognizes the desirability that states study the possibility of accepting, with as few reservations as possible, the compulsory jurisdiction of the Court; calls upon member states to make full use and seek improved implementation of the means and methods provided for in the Charter of the United Nations and elsewhere for the exclusively peaceful settlement of any dispute or any situation, the continuance of which is likely to endanger the maintenance of international peace and security, including negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, good offices including those of the Secretary-General, or other peaceful means of their own choice.	*In favour* 68 *Against* 10: Bulgaria, Byelorussia, Cuba, Czechoslovakia, German Democratic Republic, Hungary, Mongolia, Poland, Ukraine, USSR *Abstentions* 35: Algeria, Bahrain, Bangladesh, Central African Republic, Chad, Congo, Democratic Yemen, Ethiopia, France, Grenada, Guyana, Iceland, India, Iraq, Jamaica, Kuwait, Libya, Mali, Mauritania, Mauritius, Oman, Senegal, Somalia, Sudan, Syrian Arab Republic, Trinidad and Tobago, Tunisia, Uganda, United Arab Emirates, United Republic Tanzania, Upper Volta, Yemen, Yugoslavia, Zaire, Zambia *Absent or not participating in the vote:* Albania, Bahamas, Barbados, Bolivia, Burundi, China, Dominican Republic, Equatorial Guinea, Gabon, Gambia, Guatemala, Honduras, Lesotho, Madagascar, Maldives, Malta, Nicaragua, Paraguay, Qatar, Saudi Arabia, Sierra Leone, South Africa, Swaziland, Togo, Uruguay
3332 (XXIX) 17 December 1974	**Strengthening of International Security** Solemnly reaffirms all the principles and provisions contained in the Declaration on the Strengthening of International Security of 1970 and urgently appeals to all states to implement and adhere to all the provisions of the Declaration and to broaden the scope of détente to cover the entire world, to stop the arms race, as well as to take practical steps to reduce armaments.	*In favour* 119 *Against* 1: United States *Abstentions* 14: Belgium, Canada, Denmark, France, Germany (Federal Republic of), Ireland, Israel, Italy, Japan, Kenya,[a] Luxembourg, Netherlands, Turkey, United Kingdom *Absent or not participating in the vote:* Albania, China, Maldives, South Africa

[a] Later advised the Secretariat it had intended to vote in favour.
[b] Greece, which voted in favour, later advised the Secretariat it had intended to abstain.
[c] Qatar, which voted in favour, later advised the Secretariat it had intended to abstain.
[d] Later advised the Secretariat it had intended to abstain.
[e] The states are not specified because the votes were not recorded.

III. *Record of the nuclear-weapon powers' votes on the main resolutions concerning disarmament at the UN General Assembly in 1974*

Subject	Resolution No.	China	France	USSR	UK	USA
Strategic arms limitation	3261 C	Not voting	Abstaining	Abstaining	Abstaining	Abstaining
Non-proliferation of nuclear weapons	3261 D	No	Abstaining	Yes	Yes	Yes
Nuclear weapon tests	3257	No	No	Abstaining	Abstaining	Abstaining
Latin American nuclear-weapon-free zone	3262	Yes	Abstaining	Abstaining	Yes	Abstaining
	3258	Yes	Yes	Abstaining	Yes	Yes
African nuclear-weapon-free zone	3261 E	Yes	Yes	Yes	Yes	Yes
South Asian nuclear-weapon-free zone	3265 A	Abstaining	Abstaining	Yes	Abstaining	Abstaining
	3265 B	Yes	Abstaining	Abstaining	Abstaining	Abstaining
Middle East nuclear-weapon-free zone	3263	Yes	Yes	Yes	Yes	Yes
Indian Ocean as a zone of peace	3259 A	Yes	Abstaining	Abstaining	Abstaining	Abstaining
Napalm and other incendiary weapons	3255 A	Yes	Abstaining	Abstaining	Abstaining	Abstaining
	3255 B	Yes	Abstaining	Abstaining	Abstaining	Abstaining
Environmental means of warfare	3264	Not voting	Abstaining	Yes	Yes	Abstaining
Reduction of military budgets	3254	No	Abstaining	Abstaining	Yes	Yes

15. The implementation of agreements related to disarmament

Square-bracketed references, thus [1], *refer to the list of references on page 504.*

I. *Strategic arms limitation agreements*

A controversy arose about the interpretation of the replacement clauses contained in the Protocol of 26 May 1972 to the 1972 US-Soviet Interim Agreement "on certain measures with respect to the limitation of strategic offensive arms". The Protocol stipulates that over and above the specified base lines for the ballistic missile launchers on nuclear-powered submarines —656 for the USA and 740 for the USSR, the agreed upper levels—710 for the USA and 950 for the USSR—can be reached by the parties only as replacements for equal numbers of ballistic missile launchers of older types deployed prior to 1964 or of ballistic missile launchers on older submarines. It provides, however, that the deployment of modern submarine-launched ballistic missiles (SLBMs) on any submarine, "regardless of type", would be counted against the total level of SLBMs permitted for the two powers.[1] The clause was aimed at the USSR which was allowed to retain, in addition to 950 launchers on nuclear-powered submarines, some 70 launchers for short-range (700 and 300 miles) missiles on its 22 diesel-powered "G"-class submarines. These were to remain outside the agreement, unless equipped with modern SLBM launchers. In other words, launchers for ballistic missiles on diesel-powered submarines could not be used for replacement purposes. Replacement would have to come from other missile forces. However, the term "modern" as applied to SLBMs was not defined.

To remove possible ambiguity, an understanding was reached on 24 July 1972 to the effect that a missile of the type which was deployed on nuclear-powered submarines commissioned in the USSR since 1965 would be considered a modern SLBM, and that the aggregate levels of ballistic missile launchers on submarines, established by the Protocol, included launchers for such modern missiles which may be deployed on diesel-powered submarines [1]. But even this clarification proved to be insufficient. An uncertainty remained as to whether new missiles, of types different from those deployed on nuclear-powered submarines commissioned since 1965, would be counted against the total level permitted if deployed on non-nuclear-powered submarines. This ostensible loophole provoked heated political

[1] For the full text of the Interim Agreement and the Protocol, see the *SIPRI Yearbook 1973*, pp. 25–28.

debate in the USA, but was closed on 18 June 1974 when, after some resistance on the part of the USSR, a new agreed text was elaborated by the experts of the two sides. It provides that "modern" missiles are, in effect, all those developed after 1964, regardless of whether or not they were deployed on nuclear-powered submarines commissioned after 1965 [2].

The above dispute was of no real strategic significance. Although there were reports that new missiles were being specially developed for the diesel-powered submarines, it is doubtful whether the Soviet Union, being allowed to build as many as 62 modern ballistic missile submarines, would choose to install modern weapons on obsolete, vulnerable ships.

More important were allegations about compliance by the parties with the SALT agreements. The following charges were made in the USA [3–6]:

1. The USSR was constructing underground command posts at its missile bases which could be altered to house missiles; about 30 such facilities were said to have been built or to be under construction, and it was presumed that as many as 150 might be set up if one command post was destined to service a group of ten missiles. The activity was described by some as contrary to the Interim Agreement under which the parties undertook not to start construction of additional fixed land-based intercontinental ballistic missile (ICBM) launchers after 1 July 1972, while others felt confident that reconnaissance satellites could show the difference between command posts and missile silos [7].

2. The USSR had developed a new mobile radar, presumably meant for use in an anti-ballistic missile system, while according to a common understanding reached during the SALT negotiations, the prohibition on deployment of mobile ABM systems and components ruled out the deployment of ABM radars which were not permanent fixed types. The potential of the new radar (the product of mean emitted power in watts and antenna area in square metres) was alleged to exceed the three million permitted under the ABM Treaty.

3. The USSR was jamming US electronic reconnaissance systems used to monitor Soviet missile testing activities, in spite of the obligation not to interfere with the national technical means of verification of the other party.

4. The USSR was installing canvas covers over its submarine construction facilities, contravening the undertaking not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of the Interim Agreement. (It may be noted that this obligation did not require changes in current construction, assembly, conversion, or overhaul practices.) The USA recalled its statement of 20 May 1972, emphasizing the importance it attached to this undertaking, including in particular its application to "fitting out or berthing submarines".

5. The USSR was developing a mobile land-based missile launcher. Although this had not been specifically prohibited, the USA stated that it

would consider the deployment of operational land-mobile ICBM launchers during the period of the Interim Agreement as inconsistent with the objectives of that agreement.

6. The USSR was building new large-size missiles as potential replacements for the existing force of considerably smaller missiles, without regard to the common understanding that, in the process of modernization and replacement, the dimensions of land-based ICBM silo launchers would not be significantly increased; this meant that an increase would not be greater than 10–15 per cent of the existing dimensions of land-based ICBM launchers. (It should be noted that new launching techniques can heighten the performance of a missile without necessarily increasing the size of the launcher.)

The Soviet Union, in turn, complained that the USA had put tent structures over some of its land-based missiles in order to camouflage them [8].

All these allegations were rejected by the respective parties. The USSR stated that not a single silo for a ground-based missile launching pad had been set up since May 1972, and that no tests of new intercontinental mobile systems were being made [9]. The USA admitted that aluminium sheds had been placed over underground missile silos to protect freshly poured concrete while it dried, but denied any attempt at camouflage [10]. In fact, none of these accusations have been properly substantiated. Nevertheless, they reflect the degree of distrust which exists between the two powers and their apprehension that the other side may take advantage of the ambiguous language of the accords reached.

To clarify situations which generate suspicion regarding compliance, a special mechanism was established under the 1972 SALT Agreements in the form of a Standing Consultative Commission (SCC), a permanent joint US-Soviet body. The commission also discusses practical matters concerning the fulfillment of the contracted obligations. As a result of its work, two protocols were signed during the July 1974 meeting between the leaders of the USA and the USSR: (*a*) Procedures governing replacement, dismantling or destruction and notification thereof for strategic offensive arms; and (*b*) Procedures governing replacement, dismantling or destruction and notification thereof for ABM systems and their components.

The first protocol is related to the agreed interpretation of the Interim Agreement, according to which the dismantling or destruction of ICBM launchers of older types, deployed prior to 1964, and ballistic missile launchers on older submarines, being replaced by new SLBM launchers on modern submarines must be initiated at the time of the beginning of sea trials of a replacement submarine, and completed in the agreed period of time. The second protocol describes the technical implementation of Article VIII of the ABM Treaty under which ABM systems or their components in excess of the numbers or outside the area specified in the treaty, as well as those prohibited by the treaty, shall be destroyed or dismantled under agreed procedures.

Both documents were signed publicly but their contents have not been revealed. This secrecy was criticized in the CCD as not conducive to confidence-building between the two powers and the rest of the world [11].

II. *The Antarctic Treaty*

The seventh consultative meeting of parties to the Antarctic Treaty, held in 1972 in Wellington, New Zealand, noted the technological developments in polar mineral exploration and the increasing interest in the possible existence of exploitable minerals in the Antarctic Treaty area [12]. It has been known for some time that there are deposits in the Antarctic continent of copper, chromium, platinum, gold and uranium, as well as of diamonds, coal and iron ore. But the renewed interest of the past two years in Antarctic resources has mainly related to the fact that traces of ethane and methane—the usual indicators of the presence of natural gas and sometimes also of offshore oil—were found on the continental shelf in the area. Varying estimates have been made of the potential resources of oil in the region. According to one of them, the western Antarctic continental shelves alone could contain 45 billion barrels of oil and 115 trillion cubic feet of natural gas, which would be equal, roughly speaking, to the proven reserves of the USA [13]. The technical difficulties of exploiting mineral resources in the Antarctic environment are enormous, but experts believe that they can be overcome within a decade or two. From the legal point of view, the question is whether such activities would be compatible with the Antarctic Treaty.

The treaty has banned any measures of a military nature and the testing of any type of weapon; it has introduced a moratorium on claims to territorial sovereignty, opened up the Antarctic for international cooperation in the scientific investigation of the continent and provided for the exchange of relevant information as well as of personnel engaged in the investigation; it has also promoted the preservation of living resources. However, economic activity has neither been permitted nor prohibited. This may have been an oversight or a deliberate omission, but it cannot be claimed that exploration and exploitation of economic resources fall under the category of activities which the parties undertook to prevent as "contrary to the principles or purposes" of the treaty (Article X). Notwithstanding the legal situation, it seems clear that unless some rules of conduct are agreed upon before economic exploration and exploitation in the Antarctic become a fact of life, the peaceful continent may become an area of international conflict. Some parties may decide to revive their territorial claims, hitherto kept in abeyance, and perhaps even defy the demilitarized status of the Antarctic to assert their rights. The whole treaty structure would then be in jeopardy.

The Wellington meeting recognized the need for a study of the whole question of mineral exploration with a view to further discussion at the next meeting due to take place in Oslo, Norway, in June 1975. But the fact that only 18 nations are now parties to the Antarctic Treaty (the recent accession being that of the German Democratic Republic) and that only 12 of them, the founder members, enjoy full rights under the treaty, including the exclusive right to participate in consultative meetings, complicates the search for a generally acceptable solution.[2] Even if some consensus were reached among the "consultative parties", who may modify or amend the treaty by agreement among themselves, any such consensus might be challenged by the "non-consultative parties". Also countries which have not acceded to the treaty may dispute the right of a small group of states to decide on how to manage exploration and exploitation of the Antarctic resources, even though the group in question represents most of the powers which would be capable of engaging in meaningful economic activities there. Thus, for example, there have been indications that Brazil, which is not an Antarctic Treaty power, intends to claim sovereignty over a section of Antarctica, to which other countries have already laid claim. Yet others may consider that since the Antarctic has no permanent population, and has never been effectively occupied or under the control of any state, it should be declared a common heritage of mankind. Consequently, they could insist on the establishment of the same kind of international authority as is being envisaged for the sea-bed and the ocean floor beyond national jurisdiction. Living resources would also be important in this context. It is believed that the krill in the waters in this part of the world is a very large reservoir of protein. The Law of the Sea Conference can provide a clue to the solution of some of the problems involved, particularly as regards exploitation of the continental shelf or fishing activities. In the meantime, however, a moratorium on all exploitation of natural resources would probably be a reasonable move, until a formula acceptable to all—or, at any rate, to most—countries has been worked out. A unilateral action in oil extraction, as is being contemplated by certain agencies in the USA, could destroy the prospects for further peaceful developments in the Antarctic.

III. *The Partial Test Ban Treaty*

According to preliminary data, 36 nuclear explosions[3] were carried out in 1974, seven more than in 1973. (See table 15.1.) It should be noted that the United Kingdom resumed testing after a nine-year interval, by exploding a nuclear device in Nevada, USA. It stated that no further British tests would

[2] For an analysis of the treaty structure, see the *SIPRI Yearbook 1973*, p. 477.
[3] For more information concerning these explosions, see appendix 15A.

Table 15.1. Nuclear explosions in 1973 and 1974

State	Environment	1973	1974
USSR	Underground	14	20
USA	Underground	9	6
UK	Underground	0	1
India	Underground	0	1
France	Atmosphere	5	7
China	Atmosphere	1	1
		29	**36**

take place in the near future. India conducted its first nuclear explosion and said that other tests would follow soon.

As in the past, the atmospheric tests by China and France provoked protests on the part of governments and non-governmental organizations in the regions where they were conducted—in the South Pacific and in North East Asia. The criticism was directed mainly against France, but was less vigorous than the year before, because the French government had indicated that its 1974 series of tests would be the last carried out in the atmosphere. A communiqué issued by the office of the French President on 8 June 1974 said that ". . . in view of the stage reached in carrying out the French nuclear defence programme, France will be in a position to pass on to the stage of underground explosions as soon as the series of tests planned for this summer is completed." Further statements to this effect were contained in a note of 10 June 1974 from the French Embassy in Wellington, in a letter of 1 July 1974 from the President of France to the Prime Minister of New Zealand, in a press conference on 25 July 1974 by the President of France, in a speech made on 23 September 1974 by the French Minister for Foreign Affairs in the UN General Assembly, and in a television interview and press conference on 16 August and 11 October 1974 by the French Minister for Defence. Basing itself on these statements, the International Court of Justice found, on 20 December 1974, that the objective of Australia and New Zealand in instituting proceedings against France, in 1973, because of the latter's nuclear explosions in the South Pacific region, had been achieved and that the applicants' claim no longer had any object [14].[4] Nevertheless, France has not joined the Partial Test Ban Treaty.

One of the main concerns of world public opinion, relating to nuclear tests in the atmosphere, is about radioactive fallout. The levels of radioactive contamination are periodically reviewed by a special UN body, the Scientific Committee on the Effects of Atomic Radiation. On 18 October 1974, the committee submitted a report covering the years up to and including 1973; some data extended into 1974 [15]. With regard to long-lived nuclides, the report stated:

[4] For a discussion of the case, see *French Nuclear Tests in the Atmosphere: The Question of Legality* (Stockholm International Peace Research Institute, 1974).

The cumulative deposits of strontium 90 had only slightly changed since 1965. In the northern hemisphere the slow decrease started in 1966 continued, the annual deposition being insufficient to compensate the loss of strontium 90 from the ground due to radioactive decay. A slight decrease in the cumulative deposit was also noted in the southern hemisphere in 1973. In both hemispheres the annual depositions of strontium 90 and caesium 137 in 1972 and 1973 had been the lowest recorded since the beginning of systematic measurements. Dietary levels have tended to level off after the steady and steep decrease that had taken place, particularly in the northern hemisphere between 1963 and 1967.

The situation was different as regards short-lived nuclides. The committee stated:

. . . in 1973 in the northern hemisphere and in 1974 in the southern hemisphere iodine 131 had been detected at a number of sites. The thyroid doses from iodine 131 already assessed in 1974 for the southern hemisphere were higher than those observed in that hemisphere in 1972 and 1973 and were approaching the level of doses observed in the years 1967, 1968, 1970 and 1971. The thyroid doses from iodine 131 in 1973 in the northern hemisphere were higher than those observed in that hemisphere in 1972 and were approaching the levels observed in the years 1965, 1966 and 1967. The monitoring of iodine 131 was still in progress and additional data were anticipated.

The committee added that radioactive contamination from nuclear explosions needed to be kept under review in the light of both future data and of increased knowledge of the mechanisms through which radioactive material spreads in the environment and is distributed in the human body.

In a resolution adopted on 12 November 1974, the UN General Assembly noted that there had been further radioactive contamination from nuclear weapon tests, and expressed concern about the potentially harmful effects on present and future generations resulting from the levels of radiation to which man is exposed [16].

While nuclear explosions in the atmosphere constitute the main source of radioactive contamination, there have also been some important leakages from underground tests. Approximately a dozen nuclear tests conducted by the Soviet Union since August 1963 have vented radioactivity into the atmosphere and across Soviet borders in northern Europe and the Far East. Two or three US tests have also released radioactive fallout over the Canadian and Mexican borders [17]. The complaint by Pakistan about radioactive contamination of its territory from the Indian underground explosion was rejected by India. Under the Partial Test Ban Treaty (PTBT) any nuclear explosion causing radioactive debris "to be present outside the territorial limits" of the state under whose jurisdiction or control the explosion is conducted, is forbidden. It can, therefore, be concluded that this provision has not been observed by the main parties to the treaty.

Moreover, the pledge of the nuclear-weapon powers, given in the PTBT, to achieve the discontinuance of all test explosions has remained unfulfilled. The statistics show that approximately half the total of 1 012 nuclear explosions, conducted since 1945, were carried out after the conclusion of the PTBT. (See appendix 15B.)

The twenty-ninth UN General Assembly reiterated its condemnation of nuclear weapon tests, in whatever environment they may be conducted, called upon states not yet parties to the PTBT to adhere to it, and requested the CCD to give the highest priority to the conclusion of a comprehensive test ban agreement [18]. (For an assessment of the July 1974 US-Soviet Threshold Test Ban Treaty, see chapter 14.)

IV. *The Outer Space Treaty*

On 26 November 1974, the UN General Assembly commended a text of the Convention on Registration of Objects Launched into Outer Space. It requested the Secretary-General to open the convention for signature and ratification at the earliest possible date [19]. The convention provides that when a space object is launched into Earth orbit or beyond, the state which launches or procures the launching of the object, shall register it by means of an entry into an appropriate register which it will maintain. The UN Secretary-General will keep a central register in which the information furnished by the launching states will be recorded. The state on whose registry a space object is carried (the state of registry), shall provide, as soon as practicable, the following information: (*a*) name of launching state or states; (*b*) an appropriate designator of the space object or its registration number; (*c*) date and territory or location of launch; (*d*) basic orbital parameters, including nodal period, inclination, apogee and perigee; (*e*) general function of the space object.

Each state of registry shall also notify the UN Secretary-General of space objects concerning which it has previously transmitted information, and which have been, but no longer are, in orbit. (For the full text of the convention, see appendix 15C.)

The convention formalizes, on a mandatory basis, the voluntary registration system which had been in existence since the early 1960s, and introduces uniformity with regard to the form and content of data furnished by states. The procedure is in accordance with the principle contained in the Outer Space Treaty that states bear international responsibility for national activities in outer space. Its practical importance lies in complementing the Convention on International Liability for Damage Caused by Space Objects, of 29 March 1972, the implementation of which requires identification of these objects and determination of their origin.

A shortcoming of the convention on registration is that it does not provide for compulsory marking of space objects, even though in many cases this may be the only means to ensure the settlement of claims for compensation in case of material damage. Demands for mandatory marking were made during the negotiations, but were rejected by the space powers who asserted that such a technique was not only economically prohibitive, but also unfeasible as the marking would not survive re-entry into the atmosphere. However, the convention stipulates that whenever the application of its provisions has not enabled a state party to identify a space object which has caused damage to it, other parties, including in particular states possessing space monitoring and tracking facilities, shall respond to a request by that state for assistance in the identification of the object. There is also a provision for convening a conference to review the convention, taking into account any relevant technological developments, including those relating to the identification of space objects.

The current work of the UN Committee on the peaceful uses of outer space includes preparation of a treaty relating to the moon, study of the legal implications of remote sensing of the Earth from space, as well as elaboration of principles governing the use by states of artificial Earth satellites for direct television broadcasting [20].

V. *The Treaty of Tlatelolco*

On 9 October 1974, Chile deposited the instrument of ratification of the Treaty for the prohibition of nuclear weapons in Latin America. However, unlike most other Latin American countries, it had not waived the requirements for the entry into force of the treaty as specified in Article 28, namely that all states in the region, which were in existence when the treaty was opened for signature, should deposit the instruments of ratification, that the Additional Protocols I and II of the treaty be signed and ratified by those states to which they apply, and that agreements on safeguards be concluded with the IAEA. The treaty has, therefore, not entered into force for Chile, notwithstanding the ratification. By 31 December 1974, the number of states bound by the treaty (18) was the same as the year before.

On the other hand, the number of parties to Additional Protocol II of the Treaty of Tlatelolco has increased due to the deposit of the instruments of ratification by France, on 22 March 1974, and China, on 12 June 1974. The United Kingdom and the USA adhered to it in 1969 and 1971, respectively. Under this protocol, the nuclear-weapon states undertake to respect the statute of military denuclearization of Latin America, not to contribute to acts involving a violation of the treaty, and not to use or threaten to use nuclear weapons against the parties to it.

France reaffirmed its statement, made on signing the protocol, that it interprets its undertaking to mean that it presents no obstacle to the full exercise of the right of self-defence; that the treaty does not apply to transit;

that the application of the legislation referred to in Article 3 of the treaty relates to legislation which is consistent with international law; and that the provisions of Articles 1 and 2 of the protocol apply to the text of the treaty as it stood at the time when the protocol was signed.[5] Subsequently, on 15 April 1974, France made a supplementary statement to the effect that it was prepared to consider that its obligations under Additional Protocol II applied 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 Additional Protocol I.

By the end of 1974, the USSR was the only nuclear-weapon power not yet party to Additional Protocol II, even though one of the conditions it had put forward for becoming one, namely, that all the other nuclear-weapon powers assume the same obligations, had been fulfilled. A UN General Assembly resolution, passed on 9 December 1974, appealed to the Soviet Union to sign and ratify the protocol [21].

The Indian nuclear explosion, carried out in 1974, raised the question of whether India fell in the category of states to which Additional Protocol II was applicable. The Secretary-General of the Agency for the prohibition of nuclear weapons in Latin America (OPANAL) indicated that he was expecting India to sign and ratify the protocol [22].

It should be noted that Article 28, paragraph 4, of the treaty stipulates that after the entry into force of the treaty for all the countries of the zone, the rise of a new power possessing nuclear weapons shall have the effect of suspending the execution of the treaty for those countries which have ratified it without waiving the requirement that Additional Protocol II should be signed and ratified by all the countries concerned, and which request such suspension, and that the treaty shall remain suspended until the new power ratifies the protocol. Moreover, under Article 30, paragraph 1, any party may denounce the treaty if in its opinion there have arisen or may arise circumstances connected, among others, with the content of Additional Protocol II which affect its supreme interests or the peace and security of one or more contracting parties. However, the relevance of these provisions to India is disputable. The Treaty of Tlatelolco refers to powers "possessing nuclear weapons" and not to powers which have exploded a nuclear device. Since India denies that it has acquired a nuclear weapon it cannot consider itself a possible party to Additional Protocol II.

The other protocol to the Treaty of Tlatelolco, Additional Protocol I, was also a subject of discussion in 1974. For the first time, at the request of the parties, the question of its implementation was taken up by the UN General Assembly as a separate item on its agenda [23]. The protocol provides that the extra-continental or continental states, which *de jure* or *de facto* are internationally responsible for territories lying within the limits of the

[5] For the text of the treaty and the protocols to it, see the *SIPRI Yearbook 1969/70*, pp. 237–53.

geographical zone established by the treaty, undertake to apply the statute of military denuclearization to such territories. Two of the states to which the protocol applies, the United Kingdom and the Netherlands, adhered to it in 1969 and 1971, respectively. The General Assembly appealed to the remaining states, France and the USA, to become parties to this protocol as well, in order that the peoples of the territories lying within the zone, which are not sovereign political entities, "may receive the benefits which derive from the Treaty" [24]. Both powers, however, are opposed to joining the protocol.

France said that its commitment under Additional Protocol II represented the "absolute limit" to which it was prepared to go in respect of the Treaty of Tlatelolco. In explaining its position, France pointed out that its representatives had not participated in the drafting of Additional Protocol I (France attended the meetings of the Preparatory Committee for the Denuclearization of Latin America only as an observer); that the parties to the protocol were treated less favourably than the parties to the treaty insofar as the provisions for the entry into force and denunciation were concerned, in spite of the fact that they assumed similar obligations; that the states signing the protocol were not invited to become members of the agency (OPANAL) set up by the parties to ensure respect for the treaty obligations; and that the provisions of the treaty related to a zone of such an extent that it included the high seas, which was not in keeping with the "normally accepted concept of international law".

But the main argument was that, since in matters of defence the French government had only one doctrine applying to all its territory, no distinction could be drawn between various parts of this territory (that is, between metropolitan France, on the one hand, and Martinique, Guadeloupe and Guiana, on the other) and that, in particular, no part of the territory under French sovereignty could be given a denuclearized status because France was a nuclear power [25].

Mexico denied that the parties to Additional Protocol I and the parties to the Treaty of Tlatelolco were treated unequally. As regards the indivisibility-of-defence doctrine, Mexico remarked that there were precedents in the history of France, when even a portion of its metropolitan territory was subject to a different defence régime than the rest of the country by being totally demilitarized [26].[6]

As regards the USA, it is clear that its objection to Additional Protocol I stems from the fact that it does not want to include in the denuclearized zone the Virgin Islands, which it considers US territory, or Puerto Rico which has the status of "commonwealth" associated with the USA. The US

[6] One pertinent example is the case of Huninguen (*Fr.* Huningue), an Alsatian town on the left bank of the Rhine near the Swiss frontier at the city of Basle, which was "permanently" demilitarized under the Treaty of Peace concluded in Paris on 20 November 1815. The demilitarized status of the area was maintained and respected by the French government when after World War I it started building the Maginot line [26–27].

position on this question had been made clear as early as 1965 [28]. It will be recalled, in this connection, that Cuba had demanded the abolition of the US military base at Guantanamo as one of the conditions for joining the Treaty of Tlatelolco.

In the present situation, the prospects for enlarging the group of signatories of Additional Protocol I of the Treaty of Tlatelolco seem slight.

VI. *The Non-Proliferation Treaty*

In 1974, the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) suffered a serious setback. The number of states possessing nuclear weapons or other nuclear explosive devices, which the treaty had intended to freeze, increased due to a nuclear explosion carried out by India, not party to the NPT. The Atomic Energy Commission of India explained that the test was part of a programme for the study of peaceful applications of nuclear explosions with a view to possible use of this technology in mining and earth-moving operations.

Several countries criticized the Indian explosion; others showed understanding for India's policy (see appendix 15D). Few doubts were officially expressed about India's peaceful intentions, but there was widespread concern about the possible repercussions of the explosion in the field of nuclear arms control. The question arose whether it was possible to prevent further erosion of the NPT. In this connection, the international debate held at the Disarmament Conference in Geneva, in the International Atomic Energy Agency, and in the United Nations, centred on the need for regulating nuclear explosions having peaceful applications and for tightening safeguards on supplies of nuclear material.

Peaceful nuclear explosions.

Under the NPT, nuclear weapons and "other nuclear explosive devices" are subject to the same prohibitions, because they contain the same nuclear components and require essentially the same technology. A clear understanding on this point existed between the NPT negotiators who later became parties to the treaty, and was formally confirmed in the interpretative statements by the UK, the USA and the USSR on the eve of the signing of the NPT. The 1974 UN General Assembly pointed out that it had not yet been proved possible to differentiate between the technology of nuclear weapons and that of nuclear explosive devices for peaceful purposes [29]. However, states which have renounced their nuclear weapon option are entitled, under the NPT, to potential benefits from any peaceful applications of nuclear explosions. These benefits must be made available by the nuclear-weapon powers pursuant to a special international agreement or agreements, through an appropriate international body, on a nondiscriminatory basis and at low cost. Negotiations on this subject should have commenced "as soon as possible after the treaty enters into force", but no such negotiations have, as yet, taken place.

Since the signing of the NPT, uncertainty has arisen with regard to the practicality of peaceful nuclear explosions as no sure way has yet been devised to deal with the environmental problems they pose—such as seismic and radioactive effects. Neither is it clear how such explosions could be made compatible with a ban on nuclear weapon testing. To obtain authoritative answers to these and other questions, the UN General Assembly, in a resolution adopted on 9 December 1974, requested the International Atomic Energy Agency (IAEA) to continue its studies on the utility and feasibility of peaceful applications of nuclear explosions, including legal, health and safety aspects. It also called upon the Conference of the Committee on Disarmament (CCD) to consider the arms control implications of peaceful nuclear explosions, and invited the USA and the USSR to provide information concerning such steps as they had taken since the entry into force of the NPT, or intended to take, for the conclusion of the special basic international agreement on nuclear explosions for peaceful purposes, which is envisaged in Article V of the treaty [29].

In the course of the debate, the United States, in an indirect reference to India, stressed that it was impossible for a non-nuclear-weapon state to develop a capability to conduct nuclear explosions for peaceful purposes without, in the process, acquiring a device which could be used as a nuclear weapon, and that, therefore, the objective of preventing the spread of nuclear weapons was incompatible with the development or acquisition of peaceful nuclear explosives by non-nuclear-weapon states. Many countries which shared this opinion, appealed to India to place its nuclear programme under international control and thereby to demonstrate its peaceful aims. But in the view of the Director-General of the IAEA it would also be valuable if states in possession of nuclear explosives were to "volunteer to accept international observations when they carried out a nuclear explosion for peaceful purposes" [30].

Some preliminary work related to the regulation of peaceful nuclear explosions has already been carried out by the IAEA. In June 1972, the IAEA Board approved "Guidelines for the international observation by the IAEA of nuclear explosions for peaceful purposes under the provisions of the Treaty on the Non-Proliferation of Nuclear Weapons or analogous provisions in other international agreements". The guidelines define the basic purpose of international observation as being to verify that, in the course of conducting a peaceful nuclear explosion project in a non-nuclear-weapon state, the intent and letter of Articles I and II of the NPT are not violated. The rights and obligations of the IAEA and of the states concerned are also specified [31]. On 13 September 1974, the IAEA adopted "Procedures for the Agency to use in responding to requests for services related to nuclear explosions for peaceful purposes" [32]. At the same time a decision was taken to establish within the IAEA Secretariat—when the number or nature of requests received by the IAEA for assistance related to applications of peaceful nuclear explosions indicate the need to do so—a separate organizational unit with responsibility for the provision of an international service for such explosions under appropriate international observation and procedures. By February 1975 no government had requested assistance from the IAEA in connection with a defined project involving the application of nuclear explosions for peaceful purposes. In 1971, however, the Department of Mines and Power of Madagascar (party to the NPT) requested information on the possible use of a peaceful nuclear explosion for blowing up a rock obstruction in a harbour construction project. The Agency then contacted France, the UK, the USA and the USSR. All expressed willingness to supply the services of experts for an appraisal of the feasibility of using a nuclear explosion for this purpose. This was conveyed to the Madagascar authorities but there were no further developments [33].

In January 1975, a panel of experts was convened by the IAEA to study projects involving the peaceful application of nuclear explosions as well as the health and safety aspects and the economics of such projects.

Recently, there have been reports that a nuclear-weapon power, party to the NPT, was approached by a non-nuclear-weapon state, not party to the NPT, for assistance in carrying out nuclear explosions for peaceful purposes. The NPT is not explicit as to whether or not non-parties may be provided with peaceful explosion benefits. But it would seem that such assistance, even if given under international observation, would not be concordant with the policy of assuring the widest possible adherence to the NPT.

Nuclear safeguards

Under Article III of the NPT, the non-nuclear-weapon parties are under an obligation to negotiate and conclude safeguards agreements with the IAEA, covering all their peaceful nuclear activities, within the prescribed time-limit—24 months for the original parties and 18 months for acceding states. By 1 February 1975, only 35 such agreements had come into force, that is, about 44 per cent of the total number of agreements required for the 80 non-nuclear-weapon states party to the NPT. Other agreements were either signed but not yet effective, or approved by the IAEA Board but not signed, or still under discussion. Seventeen countries had not even started negotiations with the IAEA (see appendix 15E). In most cases the deadlines mentioned above had elapsed.

The control provisions constitute part and parcel of the NPT commitments. If the NPT were to be followed to the letter, the parties which failed to accept the IAEA safeguards on all source or special fissionable material in all peaceful nuclear activities within their territories, as provided by the treaty, should have been denied further nuclear supplies. It is true that some of the defaulting states do not have significant nuclear activities, and in a few instances the delay might be justified by technical difficulties. But unless a new definitive date is set for the conclusion of safeguards agreements, the present unsatisfactory state of affairs could persist for a number of years.

While in the case of parties to the NPT the lack of safeguards in all peaceful nuclear activities is not alarming because of their commitment not to acquire any nuclear explosive devices, the situation is different as regards non-nuclear-weapon states which are not party to the NPT. As a result of the policies of the suppliers, these states find themselves in a privileged position as compared with those who have formally forsaken the nuclear weapon option, because the safeguards they are required to apply are primarily facility oriented (see appendix 15F). This means that they may put a single facility under IAEA safeguards while retaining unsafeguarded all or part of a nuclear fuel cycle. Under these conditions, there can be no certainty that non-peaceful nuclear activities are not carried out on the territory of the recipient state. Moreover, since the non-NPT safeguards are intended to prevent the use of the supplied nuclear material and equipment for military purposes, the term "military" may be interpreted by some as not precluding the manufacture of "peaceful" nuclear explosives. Paradoxically, countries which are not party to the NPT, and which insist on the right to conduct their own nuclear explosions, have been able to secure more material supplies and technical aid for their nuclear programmes than the parties to the NPT, in clear contradiction of Article I of the NPT, which prohibits assistance or encouragement, "in any way", to manufacture nuclear explosive devices.

The Indian nuclear explosion brought about a wider realization of the fact that the present availability of nuclear technology and fissionable material aggravates the possibility of nuclear weapon proliferation. Consequently, in the second half of 1974, some steps were taken to tighten the safeguards. In June 1974, the governments of the United Kingdom, the USA and the USSR announced that they would henceforth provide the IAEA, on a continuing basis, with information regarding exports and imports of nuclear material out of and into the three respective countries. The information, meant to make the safeguards activity of the Agency more effective and efficient, would be as follows [36]:

1. With respect to the anticipated export of nuclear material (excluding

exports of source material for non-nuclear purposes), in an amount exceeding one effective kilogram, for peaceful purposes to any non-nuclear-weapon state: (*a*) the organization or company which will prepare the nuclear material for export; (*b*) the description, and if possible the expected composition and quantity, of nuclear material in the anticipated export; and (*c*) the state and organization or company to which the nuclear material is to be exported and, where applicable (that is, in those cases in which nuclear material is processed further in a second state before retransfer to a third state), the state and organization or company of ultimate destination.

The foregoing information will be provided normally at least ten days prior to export of the material; confirmation of each export, including actual quantity and composition and date of shipment, will be provided promptly after shipment.

2. With respect to each import, in an amount greater than one effective kilogram, of nuclear material which, immediately prior to export, is subject to safeguards, under an agreement with the IAEA, in the state from which the material is imported: (*a*) the state and organization or company from which the nuclear material is received; and (*b*) the description, composition and quantity of nuclear material in the shipment.

Moreover, a group of exporting states reached a common understanding on the way in which each of them would interpret and implement either its commitments under Article III.2 of the NPT or its own policies regarding exports of certain categories of equipment and material. This understanding was communicated to the Director-General of the IAEA with a memorandum containing a list of equipment and material especially designed or prepared for the processing, use or production of special fissionable material which, when provided by one of these states to any non-nuclear-weapon state, would bring about IAEA safeguards in respect of the nuclear material processed or used in the equipment or material in question. This so-called trigger list is meant as a minimum, with the states concerned reserving the right to add items to it (see appendix 15G). It will help to keep commercial considerations from interfering with the policy of non-proliferation.

Finally, the Director-General of the IAEA received a letter from the USA, of 3 October 1974, confirming the understanding inherent in all the bilateral agreements for cooperation to which the US government is a party, that the use of any material or equipment supplied by the USA under such agreements for any nuclear explosive device was precluded; as well as the understanding inherent in the safeguards agreements related to such cooperation agreements, that the IAEA would verify, *inter alia,* that the safeguarded material was not used for any nuclear explosive device. It was further noted that the continued cooperation of the USA with other countries in the nuclear field was dependent on the assurance that these understandings would continue to be respected in the future. In a letter of the same date, the USSR confirmed that the NPT obligation, not to assist, encourage or induce any non-nuclear-weapon state to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, applies in full to the supply to any non-nuclear-weapon state of the equipment and materials mentioned in Article III.2 of the treaty, which may not be used in those countries for the manufacture of nuclear weapons or other nuclear explosive devices.

Simultaneously, the USA stated:

> Deliveries to the European Atomic Energy Community and to its Members of source and special fissionable material and of equipment and material especially designed or prepared for the processing, use or production of special fissionable material, under contracts made pursuant to existing agreements between the United States of America and the European Atomic Energy Community will continue to be made, in the light of our expectation that the agreement between the International Atomic Energy Agency, the European Atomic Energy Community and certain of its Member States, signed on 5 April 1973, will enter into force in the very near future.

The USSR emphasized the importance of the "speediest possible completion of the process of accession to the Treaty by the countries members of the European Atomic Energy Community which have signed it, and of the entry into force of the appropriate Safeguards Agreement with the Agency". As a matter of fact, supplies of nuclear material to the countries of the Community (Euratom), which were neither party to the NPT nor subject to any IAEA safeguards, were clearly flying in the face of the provisions of the NPT.

It may be added that a joint Anglo-Soviet declaration on the non-proliferation of nuclear weapons, signed on 17 February 1975, expressed the hope that all suppliers of nuclear material and equipment would observe the safeguards applied by the IAEA to meet Article III of the NPT. It is also significant that the position of France, a non-party to the NPT, seems to have decidedly evolved in the direction of preventing further proliferation of nuclear weapons. In a communiqué issued at the conclusion of a meeting between the US and French Presidents in Martinique, on 16 December 1974, the two leaders stated that they had explored how, as exporters of nuclear materials and technology, the two countries could coordinate their efforts to assure improved safeguards of nuclear material.

Furthermore, possibilities are being considered to develop an international convention to improve physical security against the theft or diversion of nuclear material. It was suggested that the IAEA should play a normative role in the development of worldwide rules for the safe handling, transport and storage of the rapidly increasing amount of plutonium produced, as well as the disposal of radioactive waste [30].

All the measures hitherto taken to strengthen the safeguards on supplies of nuclear material to non-nuclear-weapon states not party to the NPT, however useful, cannot substitute adherence to the NPT and acceptance by non-nuclear-weapon states of nuclear safeguards in all their peaceful nuclear activities. They certainly do not add to the incentives for states to assume NPT obligations, while the present fragility of the treaty lies precisely in insufficient participation, especially of countries with significant nuclear activities. At the end of January 1975, there were no more than 83 parties to the NPT, with only one accession during the whole year of 1974. (The Partial Test Ban Treaty, for instance, has as many as 106 parties.) A resolution of the twenty-ninth UN General Assembly urged all countries concerned to ratify or accede to the NPT or finalize their safeguards agreements with the IAEA as soon as possible in accordance with the provisions of that treaty, in view of the fact that the review conference of the parties to the NPT would take place in May 1975 [37].

The tendency towards further proliferation of nuclear weapons would be positively restrained, and a wider adherence to the NPT ensured, if all the provisions of the treaty were scrupulously observed. In particular, the nuclear powers must live up to their pledge to halt the arms race and to bring about nuclear disarmament, in accordance with Article VI of the NPT. Significant reductions of the nuclear weapon arsenals could generate political and moral inhibitions dampening the nuclear ambitions nurtured by some non-nuclear-weapon states.

VII. *The Sea-Bed Treaty*

In 1974, three states—Italy, Panama and Qatar—joined the 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, bringing the total number of parties to 55.

An important exchange of communications took place between Yugoslavia and the USA, a depositary power, concerning Article III of the Sea-Bed Treaty. The article in question states, in paragraph 1, that in order to promote the objectives of, and ensure compliance with, the provisions of the treaty, each state party to it shall have the right to verify through observation the activities of other parties on the sea-bed and the ocean floor and in the subsoil thereof beyond the specified sea-bed zone, provided that observation does not interfere with such activities. On 25 February 1974, the Yugoslav ambassador transmitted to the US Secretary of State a note stating that, in the view of the Yugoslav government, this provision should be interpreted in such a way that a state exercising its right under it is obliged to notify in advance the coastal state, insofar 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 January 1975, the US Secretary of State, presenting the view of his government, stated that insofar as the

Yugoslav note was intended to be interpretative of the treaty, the USA could not accept it as a valid interpretation, and did not consider that it could have any effect on the existing law of the sea; insofar as the note was intended to be a reservation to the treaty, the USA placed on record its formal objection to it on the grounds that it was incompatible with the object and purpose of the treaty. The USA also drew attention to the fact that the note was submitted too late to be legally effective as a reservation. (The Yugoslav instrument of ratification of the Sea-Bed Treaty was deposited on 25 October 1973.)

No progress has been made with regard to the implementation of Article V of the Sea-Bed Treaty, under which the parties undertook to continue negotiations concerning further measures in the field of disarmament for the prevention of an arms race on the sea-bed, even though the treaty is coming up for review already in 1977. The reason for this delay, put forward mainly by the great powers, is that the possibility of reaching a new agreement will depend on the outcome of the Third United Nations Conference on the Law of the Sea. This conference, the first substantive session of which was held in the summer of 1974 in Caracas, and the second session in the spring of 1975 in Geneva, deals with a broad range of issues, including those concerning the régime of the high seas, the continental shelf, the territorial sea (including the question of its breadth and the question of international straits), fishing and conservation of the living resources of the high seas, the establishment of an international régime and machinery to govern the exploration and exploitation of resources of the sea-bed beyond national jurisdiction, the preservation of the marine environment (including the prevention of pollution) and scientific research. However, there has been no discussion of measures even remotely related to arms control on the sea-bed, with the exception of a proposal (contained in a draft convention article) submitted by Kenya and Mexico, to the following effect: "No state shall be entitled to construct, maintain, deploy or operate on or over the continental shelf of another state any military installations or devices or any other installations for whatever purposes without the consent of the coastal state" [38].

As early as 1969, Canada advanced the concept of a 200-mile zone extending from the outer limits of a 12-mile coastal band, in which only the coastal state, or another state acting with its explicit consent, would be able to perform the defensive activities not prohibited under the Sea-Bed Treaty. Nigeria suggested a 50-mile zone for a similar purpose. And in 1973, in the UN Sea-Bed Committee, which was carrying out the preparatory work for the Law of the Sea Conference, a few Latin American states suggested that the emplacement of any kind of facilities on the sea-bed of the "adjacent sea" should be subject to authorization and regulation by the coastal state. It may be noted that the present trend towards a coastal state's wider jurisdiction over the marine resources, including protection of the marine environment, as expressed in the concept of a 200-mile economic zone or "patrimonial" sea, may imply the right on the part of the coastal state to impose certain regulations and, in particular, to restrict certain military activities, as well as research for military purposes, in an area often even wider than its continental shelf. Coastal states may assert that the installation of military devices by another state in a zone of their economic activities would interfere with such activities. Exclusive or preferential economic rights could not be effectively exercised without the right to prevent emplantation of undesirable objects on the sea-bed, or the use of peaceful facilities for non-peaceful aims. Since the continental shelf is a more convenient place to emplant the devices in question than the outlying area, the definition of the status of the shelf by the Law of the Sea Conference may determine the future of the above proposals. (For a discussion of these and other security aspects in the Law of the Sea debate, see chapter 16.)

VIII. *The BW Convention*

On 16 December 1974, the US Senate consented to the ratification of the Convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction, which had been signed in April 1972. The arguments presented by the US administration in favour of ratification were as follows [39]:

1. The military utility of biological weapons is dubious at best: the effects are unpredictable and potentially uncontrollable, and there exists no military experience concerning them. Hence the prohibitions of the convention do not deny the USA a militarily viable option and verifiability is therefore less important.

2. Biological weapons are particularly repugnant from a moral point of view.

3. Widespread adherence to the convention can help discourage some misguided competition in biological weapons.

The ratification act was signed by the US President on 22 January 1975.

It will be recalled that in 1969 the USA unilaterally renounced all methods of biological warfare and decided to dispose of existing stocks of bacteriological weapons. Subsequently, these commitments were extended to cover toxins. US adherence to the BW Convention transformed its unilateral declaration into an international obligation.

On 11 February 1975, the Presidium of the Supreme Soviet of the USSR also ratified the BW Convention, while the United Kingdom had completed all the parliamentary procedures for ratification even sooner.

According to the text of the convention, its entry into force takes place after the deposit of the instruments of ratification by 22 governments, including the governments designated as depositaries (the UK, the USA and the USSR). By 31 December 1974 there were 37 ratifications, and only the deposit of the instruments of ratification by the three depositary governments was required. This requirement was met on 26 March 1975.

Upon the entry into force of the convention, each state party to it must, within nine months, destroy or divert to peaceful purposes all agents and toxins, as well as weapons, equipment or means of delivery designed to use the agents or toxins for hostile purposes or in armed conflict, which are in its possession or under its jurisdiction or control. No verification of compliance with this obligation is envisaged. The USA announced, some time ago, that its entire stockpile of biological and toxin agents and weapons had been destroyed and that the biological warfare facilities had been converted to peaceful uses. Similar communications from other parties may be forthcoming. The Soviet Union promised to give appropriate notification.

The convention provides for the possibility of lodging complaints about alleged breaches with the UN Security Council which may initiate an investigation and decide whether a party has been exposed to danger as a result of violation of the convention. But the Security Council has not yet formally agreed to receive, consider and act upon such complaints. A draft resolution to this effect was submitted in April 1972, but was not even discussed because of the threat of a Chinese veto. It is questionable, whether the convention can be considered as fully operative without the Security Council assuming the functions assigned to it by the parties.

Simultaneously with the BW convention, the USA ratified the Geneva Protocol of 17 June 1925, for the prohibition of the use in war of asphyxiating, poisonous and other gases, and of bacteriological methods of warfare. A reservation attached to the ratification says that the protocol shall cease to be binding on the government of the United States 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 fails to respect the prohibitions laid down in the protocol.

Many states party to the Geneva Protocol (including China, France, the UK and the USSR) have made their adherence to it conditional on reciprocity but, unlike in other cases (except in the case of the Netherlands) the reservation submitted by the USA concerns only chemical methods of warfare. The United States has, thereby, renounced the "second use" of bacteriological methods of warfare in conformity with its obligations under the BW Convention. Indeed, the latter convention proclaims the determination of the parties "to exclude completely the possibility of bacteriological (biological) agents and toxins being used as weapons". Also the phrase "never in any circumstances" relating to the prohibition of the development, production and stockpiling of biological weapons, must be understood as allowing no exemption from the ban on the use of these weapons. This was one reason why, in 1972, Ireland decided to withdraw all its reservations made upon accession. The effectiveness of the Geneva Protocol would, no doubt, increase, if the other parties followed Ireland's example. In any event, a reservation concerning possible use of bacteriological methods of warfare in retaliation is incompatible with the provisions of the BW Convention.

With regard to the scope of the obligations related to chemical warfare, the USA made a number of exceptions and, thus, fell short of the requirements put forward by most countries. It decided to renounce as a matter of national policy [39]:

1. The first use of herbicides in war *except* use, under regulations applicable to their domestic use, for control of vegetation within US bases and installations or around their immediate defensive perimeters.

2. The first use of riot control agents in war, *except* in defensive military modes to save lives, such as: (*a*) use of riot control agents in riot control circumstances to include controlling rioting prisoners of war. This exception would permit use of riot control agents in riot situations in areas under direct and distinct US military control; (*b*) use of riot control agents in situations where civilian casualties can be reduced or avoided. This use would be restricted to situations in which civilians are used to mask or screen attacks; (*c*) use of riot control agents in rescue missions. The use of riot control agents would be permissible in the recovery of remotely isolated personnel such as downed aircrews (and passengers); (*d*) use of riot control agents in rear echelon areas outside the combat zone to protect convoys from civil disturbances, terrorists and paramilitary organizations.

It was also officially stated that the US President must approve in advance any use of riot control agents and chemical herbicides in war.

The above interpretation of the Geneva Protocol is more liberal than the one previously advocated by the US Department of Defense which had contended that the use of irritants and antiplant chemicals was not covered by the protocol at all. Some of the uses now considered as permitted relate to non-combat situations or are similar to domestic police uses. Nevertheless, it is regrettable that the USA has disregarded the 1969 UN resolution which declared as contrary to the generally recognized rules of international law the use in international armed conflicts of *any* chemical agents of warfare—chemical substances, whether gaseous, liquid or solid—which might be employed because of their direct toxic effects on man, animals or plants.

The US interpretation is not part of the instrument of ratification and cannot, therefore, be formally challenged by other states. There is a danger, however, that the restrictive understanding of the scope of the protocol by the USA may open the way for others to make their own interpretation as "a matter of national policy", thus weakening the force of this important document. In practical terms, there is a risk of escalation in the case of use of irritants or herbicides, because another nation not sharing the US view could contend that the Geneva Protocol had been violated and then feel free to use any type of chemical weapon.

Notwithstanding these deficiencies, the ratification of the Geneva Protocol by the United States is an important event, coming, as it does, 50 years after the signing of the protocol. It enters into force with the deposit of the instrument of ratification with the French government. All militarily important states are now bound by it, but many small states are still missing. By 31 December 1974, there were 93 parties (see appendix 15H). And yet, chemical warfare is more likely to occur between small countries than among the great powers. The UN General Assembly invited all states that have not yet done so to accede to or ratify the 1925 Geneva Protocol in the course of 1975 in commemoration of the 50th anniversary of its signing and called anew for the strict observance by all states of the principles and objectives contained therein [40].

The ratification of the Geneva Protocol by the USA and the entry into force of the BW Convention, may facilitate the negotiation of an agreement on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction. (For the current state of these negotiations see chapter 14.)

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Appendix 15A

Announced and presumed nuclear explosions in 1972–74

Note:

1. The following sources have been used in compiling the lists:
(*a*) Research Institute of the Swedish National Defence,
(*b*) US Atomic Energy Commission (AEC),
(*c*) US Geological Survey,
(*d*) Press reports.

2. The geographical coordinates for the US explosions in 1972 and 1973 are given in degrees, minutes and seconds, while those for the US explosions in 1974 and for all the other explosions are given in degrees using decimal notation.

3. The events marked with an asterisk (*) may be part of a programme for peaceful uses of nuclear explosions in view of their location outside the usual weapon testing sites.

4. m_b (body wave magnitudes), M_s (surface wave magnitudes) indicate the size of the event; the data have been provided by the Hagfors Observatory of the Research Institute of the Swedish National Defence.

5. The yields of explosions are AEC announcements.

6. In the case of very weak events, it is impossible to distinguish, through seïsmological methods only, between chemical and nuclear explosions.

I. Revised list of nuclear explosions in 1972[a]

Date *GMT*	Latitude *deg*	Longitude *deg*	Region	m_b	M_s	Yield *kt*
USSR						
10 Feb	49.986 N	78.886 E	E Kazakh	6.3		20–200
10 Mar	49.755 N	78.180 E	E Kazakh	5.8		20–200
28 Mar	49.730 N	78.186 E	E Kazakh	5.6		20–200
11 Apr	37.4 N	62.0 E	Turkmen*	4.8		
7 Jun	49.761 N	78.175 E	E Kazakh	5.7		20–200
6 Jul	49.724 N	77.979 E	E Kazakh	4.8		
9 Jul	49.9 N	35.2 E	N of Black Sea*	5.0	2.8	
14 Jul	55.8 N	47.4 E	N of Caspian Sea*	3.6		
16 Aug	49.759 N	78.146 E	E Kazakh	5.6		20–200
20 Aug	49.462 N	48.179 E	W Kazakh*	6.3	3.4	20–200
26 Aug	49.994 N	77.781 E	E Kazakh	5.8		20–200
28 Aug	73.336 N	55.085 E	Novaya Zemlya		4.7	1 000
2 Sep	49.957 N	77.726 E	E Kazakh	5.3		
4 Sep	67.689 N	33.445 E	W Russia*		3.0	
21 Sep	52.127 N	51.994 E	W Russia*	5.2		20–200
3 Oct	46.848 N	45.010 E	NW of Caspian Sea*	6.1	3.0	200–1 000
2 Nov	49.913 N	78.837 E	E Kazakh		4.1	200–1 000
24 Nov	52.779 N	51.067 E	W Russia*	5.1		
24 Nov	51.843 N	64.152 E	W Kazakh*	5.1		20–200
10 Dec	49.847 N	78.099 E	E Kazakh	6.0		20–200
10 Dec	50.114 N	78.808 E	E Kazakh	6.7	4.3	200–1 000
28 Dec	51.7 N	77.2 E	E Kazakh	4.9		
USA						
19 Apr	37.07.19 N	116.05.02 W	Nevada Test Site			<20
17 May	37.07.14 N	116.05.16 W	Nevada Test Site			<20
19 May	37.03.53 N	116.00.06 W	Nevada Test Site	4.9		<20
20 Jul	37.12.52 N	116.11.00 W	Nevada Test Site	4.8		<20
21 Sep	37.04.55 N	116.02.12 W	Nevada Test Site	5.7	4.1	20–200
26 Sep	37.07.17 N	116.05.09 W	Nevada Test Site			<20
21 Dec	37.08.24 N	116.05.00 W	Nevada Test Site	5.1		20–200
France						
25 Jun			Mururoa			
30 Jun			Mururoa			
29 Jul			Mururoa			
China						
7 Jan			Lop Nor			<20
18 Mar			Lop Nor		4.3	20–200

[a] A preliminary list of nuclear explosions in 1972 was published in the *SIPRI Yearbook 1973*, pp. 475–76.

II. Revised list of nuclear explosions in 1973[a]

Date *GMT*	Latitude *deg*	Longitude *deg*	Region	m_b	M_s	Yield *kt*
USSR						
16 Feb	49.835 N	78.232 E	E Kazakh	5.6		20–200
19 Apr	50.006 N	77.725 E	E Kazakh	5.6		20–200
10 Jul	49.780 N	78.058 E	E Kazakh			20–200
23 Jul	49.986 N	78.853 E	E Kazakh	7.1	4.4	200–1 000
15 Aug	42.711 N	67.410 E	Central Kazakh*	5.6	3.4	20–200
28 Aug	50.550 N	68.395 E	Central Kazakh*	5.5	3.4	20–200
12 Sep	73.302 N	55.161 E	Novaya Zemlya		5.8	3 000–6 000
19 Sep.	45.635 N	67.850 E	Central Kazakh*	5.2	3.3	20–200
27 Sep	70.756 N	53.872 E	Novaya Zemlya	5.9	3.9	20–200
30 Sep	51.608 N	54.582 E	W Russia*	5.7	3.3	20–200
26 Oct	49.765 N	78.196 E	E Kazakh	5.5		20–200
26 Oct	53.656 N	55.375 E	S Ural*			<20
27 Oct	70.779 N	54.177 E	Novaya Zemlya		5.9	3 000–6 000
14 Dec	50.036 N	79.011 E	E Kazakh	6.6		200–1 000
USA						
8 Mar	37.06.12 N	116.01.36 W	Nevada	5.7		20–200
25 Apr	37.00.17 N	116.01.42 W	Nevada	4.7		20–200
26 Apr	37.07.23 N	116.03.30 W	Nevada	5.8	3.8	20–200
17 May	39.47.34 N	108.21.59 W	Colorado*	5.4		3×30
5 Jun	37.11.06 N	116.12.54 W	Nevada			<20
6 Jun	37.14.42 N	116.20.45 W	Nevada	6.5	4.7	200–1 000
21 Jun	37.08.4 N	115.99.3 W	Nevada	5.8	3.9	
28 Jun	37.08.54 N	116.05.09 W	Nevada	5.3		20–200
12 Oct	37.12.01 N	116.12.11 W	Nevada	4.8		<20
France						
21 Jul			Mururoa			5.5
28 Jul			Mururoa			<5
19 Aug			Mururoa			5–10
25 Aug			Mururoa			
28 Aug			Mururoa			
China						
27 Jun	40.559 N	89.532 E	S Sinkiang			2 000–3 000

[a] A preliminary list of nuclear explosions in 1973 was published in the *SIPRI Yearbook 1974*, p. 499.

III. Preliminary list of nuclear explosions in 1974

Date *GMT*	Latitude *deg*	Longitude *deg*	Region	m_b	M_s	Yield *kt*
USSR						
30 Jan	49.894 N	77.993 E	E Kazakh	4.6		
30 Jan	49.835 N	78.079 E	E Kazakh	5.5		20–200
16 Apr	49.994 N	78.824 E	E Kazakh	5.2		
16 May	49.743 N	78.150 E	E Kazakh	5.6	3.6	20–200
31 May	49.952 N	78.844 E	E Kazakh	6.7		20–200
25 Jun	49.899 N	78.115 E	E Kazakh	5.0		
8 Jul	53.8 N	55.2 E	Ural Mountains*	5.3		
10 Jul	49.789 N	78.139 E	E Kazakh	5.7		
22 Jul	70.682 N	53.545 E	Novaya Zemlya			
14 Aug	68.913 N	75.899 E	W Siberia*	5.2		20–200
29 Aug	73.366 N	55.094 E	Novaya Zemlya		5.4	1 000–3 000
29 Aug	67.233 N	62.119 E	Ural Mountains*	5.2		
13 Sep	50.0 N	78.0 E	E Kazakh	5.5		
16 Oct	49.972 N	78.968 E	E Kazakh	6.7		20–200
2 Nov	70.817 N	54.063 E	Novaya Zemlya		5.4	3 000–4 000
7 Dec	49.908 N	77.648 E	E Kazakh	4.7		
12 Dec	70.9 N	53.0 E	Novaya Zemlya			
16 Dec	50.4 N	77.1 E	E Kazakh	5.3		
16 Dec	50.3 N	77.3 E	E Kazakh	5.0		
27 Dec	50.2 N	78.9 E	E Kazakh			20–200
USA[a]						
27 Feb	37.104 N	116.053 W	S Nevada	5.8	4.2	20–200
19 Jun	37.198 N	116.188 W	S Nevada	5.1		
10 Jul	37.068 N	116.032 W	S Nevada	6.0		20–200
14 Aug	37.023 N	116.036 W	S Nevada			<20
30 Aug	37.150 N	116.083 W	S Nevada	5.8		20–200
26 Sep	37.133 N	116.068 W	S Nevada	5.6		20–200
UK						
A British nuclear explosion was reported to have been carried out in Nevada, USA. This may have been one of the explosions listed above.						
France						
16 Jun			Mururoa			
7 Jul			Mururoa			
17 Jul			Mururoa			
26 Jul			Mururoa			
15 Aug			Mururoa			
25 Aug			Mururoa			
15 Sep			Mururoa			
China						
17 Jun	39.5 N	89.4 E	S Sinkiang	4.6	4.3	200–1 000
India						
18 May	26.949 N	71.704 E	N India	5.1		

[a] One of the explosions listed here may have been a British explosion.

Appendix 15B

Nuclear explosions, 1945–74 (announced and presumed)

a atmospheric
u underground and underwater (the latter are put in brackets)

	USA		USSR		United Kingdom		France		China		India		
Year	a	u	a	u	a	u	a	u	a	u	a	u	Total
I. 1945–5 August 1963 (the signing of the Partial Test Ban Treaty)													
1945	3	0											3
1946	1	1 (1)											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	13	2 (1)	4	0	0	0							19
1956	14	0	7	0	6	0							27
1957	26	2	13	0	7	0							48
1958	53	13 (2)	26	0	5	0							97
	155	19 (4)	57	0	21	0							252
			+33[a]										33[a]
1945–1958	155	19 (4)	90	0	21	0							285
1959	0	0	0	0	0	0							0
1960	0	0	0	0	0	0	3	0					3
1961	0	9	30	2 (1)	0	0	1	1					43
1962	38	50 (1)	41	1	0	2	0	1					133
1963 –5 Aug 1963	0	11	0	0	0	0	0	2					13
1959 – 5 Aug 1963	38	70 (1)	71	3 (1)	0	2	4	4					192
1945–1958	155	19 (4)	90	0	21	0	0	0					285
1945 –5 Aug 1963	*193*	*89 (5)*	*161*	*3 (1)*	*21*	*2*	*4*	*4*					*477*
II. 5 August 1963 – 31 December 1974													
5 Aug 1963 –Dec 1963	0	14	0	0	0	0	0	1					15
1964	0	28	0	6	0	1	0	3	1	0			39
1965	0	28	0	9	0	1	0	4	1	0			43
1966	0	40	0	14	0	0	5	1	3	0			63
1967	0	28	0	14	0	0	3	0	2	0			47
1968	0	37[b]	0	12	0	0	5	0	1	0			55
1969	0	28	0	15	0	0	0	0	1	1			45
1970	0	30	0	13	0	0	8	0	1	0			52
1971	0	12	0	18	0	0	5	0	1	0			36
1972	0	7	0	22	0	0	3	0	2	0			34
1973	0	9	0	14	0	0	5	0	1	0			29
1974	0	6[c]	0	20	0	1	7	0	1	0	0	1	36[f]
5 Aug 1963–1974	*0*	*267*	*0*	*157*	*0*	*3*	*41*	*9*	*15*	*1*	*0*	*1*	*494*[f]
		+23[d]											*23*[d]
		+18[e]											*18*[e]

	USA		USSR		United Kingdom		France		China		India		
Year	a	u	a	u	a	u	a	u	a	u	a	u	Total
III. 1945–31 December 1974													
1945 –5 Aug 1963	*193*	*89 (5)*	*161*	*3 (1)*	*21*	*2*	*4*	*4*	*0*	*0*	*0*	*0*	*477*
5 Aug 1963–1974	*0*	*267*	*0*	*157*	*0*	*3*	*41*	*9*	*15*	*1*	*0*	*1*	*494*[f]
		+23[d]											*23*[d]
		+18[e]											*18*[e]
1945–1974	**193**	**397 (5)**	**161**	**160**	**21**	**5**	**45**	**13**	**15**	**1**	**0**	**1**	**1 012**[f]

[a] Up to 1958. The dates of these explosions are unknown.
[b] Including five devices used simultaneously in the same test (Buggy) counted here as five.
[c] One of these explosions may have been a British explosion conducted in Nevada, USA.
[d] Explosions conducted between 15 September 1961 and 20 August 1963. Their dates are not specified in the lists available.
[e] Explosions conducted from 1970 to 1973. Their dates are not specified in the lists available.
[f] The data for 1974 are preliminary.

Appendix 15C

Convention on registration of objects launched into outer space

The States Parties to this Convention,

Recognizing the common interest of all mankind in furthering the exploration and use of outer space for peaceful purposes,

Recalling that the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 27 January 1967 affirms that States shall bear international responsibility for their national activities in outer space and refers to the State on whose registry an object launched into outer space is carried,

Recalling also that the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space of 22 April 1968 provides that a launching authority shall, upon request, furnish identifying data prior to the return of an object it has launched into outer space found beyond the territorial limits of the launching authority,

Recalling further that the Convention on International Liability for Damage Caused by Space Objects of 29 March 1972 establishes international rules and procedures concerning the liability of launching States for damage caused by their space objects,

Desiring, in the light of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, to make provision for the national registration by launching States of space objects launched into outer space,

Desiring further that a central register of objects launched into outer space be established and maintained, on a mandatory basis, by the Secretary-General of the United Nations,

Desiring also to provide for States Parties additional means and procedures to assist in the identification of space objects,

Believing that a mandatory system of registering objects launched into outer space would, in particular, assist in their identification and would contribute to the application and development of international law governing the exploration and use of outer space,

Have agreed on the following:

ARTICLE I

For the purposes of this Convention:

(*a*) The term "launching State" means:

(i) A State which launches or procures the launching of a space object;

(ii) A State from whose territory or facility a space object is launched;

(*b*) The term "space object" includes component parts of a space object as well as its launch vehicle and parts thereof;

(*c*) The term "State of registry" means a launching State on whose registry a space object is carried in accordance with article II.

ARTICLE II

1. When a space object is launched into earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain. Each launching State shall inform the Secretary-General of the United Nations of the establishment of such a registry.

2. Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.

3. The contents of each registry and the conditions under which it is maintained shall be determined by the State of registry concerned.

ARTICLE III

1. The Secretary-General of the United Nations shall maintain a Register in which the information furnished in accordance with article IV shall be recorded.

2. There shall be full and open access to the information in this Register.

ARTICLE IV

1. Each State of registry shall furnish to the Secretary-General of the United Nations, as soon as practicable, the following information concerning each space object carried on its registry:

(*a*) Name of launching State or States;

(*b*) An appropriate designator of the space object or its registration number;

(*c*) Date and territory or location of launch;

(*d*) Basic orbital parameters, including:

(i) Nodal period,

(ii) Inclination,

(iii) Apogee,

(iv) Perigee;

(*e*) General function of the space object

2. Each State of registry may, from time to time, provide the Secretary-General of the United Nations with additional information concerning a space object carried on its registry.

3. Each State of registry shall notify the Secretary-General of the United Nations, to the greatest extent feasible and as soon as practicable, of space objects concerning which it has previously transmitted information, and which have been but no longer are in earth orbit.

ARTICLE V

Whenever a space object launched into earth orbit or beyond is marked with the designator or registration number referred to in article IV, paragraph 1 (*b*), or both, the State of registry shall notify the Secretary-General of this fact when submitting the information regarding the space object in accordance with article IV. In such case, the Secretary-General of the United Nations shall record this notification in the Register.

ARTICLE VI

Where the application of the provisions of this Convention has not enabled a State Party to identify a space object which has caused damage to it or to any of its natural or juridical persons, or which may be of a hazardous or deleterious nature, other States Parties, including in particular States possessing space monitoring and tracking facilities, shall respond to the greatest extent feasible to a request by that State Party, or transmitted through the Secretary-General on its behalf, for assistance under equitable and reasonable conditions in the identification of the object. A State Party making such a request shall, to the greatest extent feasible, submit information as to the time, nature and circumstances of the events giving rise to the request. Arrangements under which such assistance shall be rendered shall be the subject of agreement between the parties concerned.

ARTICLE VII

1. In this Convention, with the exception of articles VIII to XII inclusive, references to States shall be deemed to apply to any international intergovernmental organization which conducts space activities if the organization declares its acceptance of the rights and obligations provided for in this convention and if a majority of the States members of the organization are States Parties to this Convention and the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

2. States members of any such organization which are States Parties to this Convention shall take all appropriate steps to ensure that the organization makes a declaration in accordance with paragraph 1 of this article.

ARTICLE VIII

1. This Convention shall be open for signature by all States at United Nations Headquarters in New York. Any State which does not sign this Convention before its entry into force in accordance with paragraph 3 of this article may accede to it at any time.

2. This Convention shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Secretary-General of the United Nations.

3. This Convention shall enter into force among the States which have deposited instruments of ratification on the deposit of the fifth such instrument with the Secretary-General of the United Nations.

4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Convention, it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Secretary-General shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification of and accession to this Convention, the date of its entry into force and other notices.

ARTICLE IX

Any State Party to this Convention may propose amendments to the Convention. Amendments shall enter into force for each State Party to the Convention accepting the amendments upon their acceptance by a majority of the States Parties to the Convention and thereafter for each remaining State Party to the Convention on date of acceptance by it.

ARTICLE X

Ten years after the entry into force of this Convention, the question of the review of the Convention shall be included in the provisional agenda of the United Nations General Assembly in order to consider, in the light of past application of the Convention, whether it requires revision. However, at any time after the Convention has been in force for five years, at the request of one third of the States Parties to the Convention and with the concurrence of the majority of the States Parties, a conference of the States Parties shall be convened to review this Convention. Such review shall take into account in particular any relevant technological developments, including those relating to the identification of space objects.

ARTICLE XI

Any State Party to this Convention may give notice of its withdrawal from the Convention one year after its entry into force by written notification to the Secretary-General of the United Nations. Such withdrawal shall take effect one year from the date or receipt of this notification.

ARTICLE XII

The original of this Convention, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations, who shall send certified copies thereof to all signatory and acceding States.

IN WITNESS WHEREOF the undersigned, being duly authorized thereto by their respective Governments, have signed this Convention, opened for signature at New York on . . .

Appendix 15D

Official reactions to the first Indian nuclear explosion

Australia

The Australian government views with concern any action that may encourage or facilitate further proliferation of nuclear weapons. It is a matter of regret that a number of countries, including India have not become parties to the Non-Proliferation Treaty. (*From the statement by the Foreign Minister, issued on 21 May 1974.*)

Belgium

The people of Belgium are troubled by real concern over the underground nuclear explosion carried out by the Indian government and the lack of agreement by the nuclear powers to limit their nuclear weapons. (*From the statement by the representative to the First Political Committee of the UN General Assembly, 14 November 1974.*)

Canada

The Canadian government is very disturbed by the announcement that India has exploded a nuclear device.

Canada has been consistently opposed to all forms of nuclear testing and considers it most regrettable that yet another country has now conducted a nuclear explosion. This represents a severe set-back to efforts being made in the international community to prevent all nuclear testing and to inhibit the proliferation of nuclear explosion technology. (*From the statement by the Secretary of State for External Affairs, 18 May 1974.*)

For all intents and purposes, India now has developed the capability of producing a nuclear weapon. The development of this technology by India is bound to have serious and wide-spread repercussions throughout Asia and the world.

Canada cannot be expected to assist and subsidize, directly or indirectly, a nuclear programme which, in a key respect, undermines the position which Canada has for a long time been firmly convinced is best for world peace and security. The Canadian government has suspended shipments to India of nuclear equipment and material and has instructed the Atomic Energy of Canada Limited, pending clarification of the situation, to suspend its co-operation with India regarding nuclear reactor projects and the more general technological exchange arrangements which it has with the Indian Atomic Energy Commission. (*From the statement by the Secretary of State for External Affairs, 22 May 1974.*)

Finland

It is the considered view of the Finnish government that the Indian nuclear explosion does not cripple the Non-Proliferation Treaty. If anything, it serves to underline the urgent necessity of doing everything that can be done in order to strengthen the treaty. (*From the statement by the representative to the First Political Committee of the UN General Assembly, 29 October 1974.*)

Federal Republic of Germany

The government of the Federal Republic of Germany fears that the explosion of a nuclear device by a non-nuclear-weapon state might result in a serious set-back to the policy of non-proliferation of nuclear weapons, arms control and disarmament, which it strongly supports. (*From the statement by the representative to the International Atomic Energy Agency at the IAEA Board of Governors meeting, June 1974.*)

Japan

India's experiment runs counter to world public opinion and Japan's consistent stand opposing proliferation of nuclear weapons. (*From the statement by the Acting Foreign Minister, 18 May 1974.*)

The nuclear test conducted by India, whatever its reasons may be, will intensify the nuclear-test competition which, in turn, will increase the danger of the annihilation of makind. (*From the resolution adopted by the House of Representatives, 23 May 1974.*)

Maldives

In discussing India's programme for the development of nuclear energy for peaceful purposes, the Prime Minister of the Republic of Maldives expressed his appreciation and full understanding of India's policy in this field. (*From the joint communiqué issued on 14 January 1975, at the conclusion of the visit of the Prime Minister of India to Maldives.*)

Netherlands

India has proceeded to nuclear proliferation, at least in a technical sense. The event in Rajasthan undoubtedly represents a serious set-back to international efforts to prevent the further spread of nuclear weapons and to ban nuclear tests everywhere and by everyone. The fear arises that a psychological dam that has, so far, kept the awful power of nuclear explosive devices in the hands of a strictly limited group of States, has been breached and that an uncertain future as to the containment of this group lies ahead. (*From the statement by the representative to the Conference of the Committee on Disarmament, 23 May 1974.*)

New Zealand

Such an action, however carefully defined its purpose, runs counter to the Non-Proliferation Treaty and can only encourage other countries with similar capabilities. (*From the statement by the Prime Minister, 22 May 1974.*)

Nigeria

Nigera is opposed to all nuclear tests and calls for a comprehensive test ban. Hence it regrets the Indian test. (*From the statement by the representative to the Conference of the Committee on Disarmament, 23 May 1974.*)

Pakistan

India has shattered to pieces the Non-Proliferation Treaty. In as much as proliferation of nuclear weapons is a danger to the whole world, the United Nations has a clear and pressing duty to address itself more vigorously to the question of credible security assurances against nuclear threat or blackmail to all non-nuclear weapons states. The existing assurances extended by the Security Council lack credibility. (*From the statement by the Prime Minister, 19 May 1974.*)

Sweden

The explosion of a nuclear device in India must be regarded as a severe set-back in the international work for détente and disarmament. (*From the statement by the Prime Minister, 20 May 1974.*)

United Kingdom

The Indian nuclear explosion has introduced a new factor with world and regional implications; it reinforces the need to ensure wider acceptance of the Non-Proliferation Treaty to which Her Majesty's Government continue to attach the greatest importance. (*From the statement by the Minister of State at the Foreign and Commonwealth Office, 24 May 1974.*)

United States

The United States has always been against nuclear proliferation. This position was adopted because of the adverse impact nuclear proliferation will have on world stability. This remains the position of the United States government. (*From the statement by the representative to the Conference of the Committee on Disarmament, commenting on the Indian nuclear explosion, 21 May 1974.*)

Zambia

Agreeing that the benefits of the use of nuclear technology for peaceful purposes should be available to all countries, Zambia expressed full understanding of India's policy in this context. (*From the joint communiqué issued on 25 January 1975, at the conclusion of the visit of the President of Zambia to India.*)

The Central Treaty Organization (CENTO)

The Indian nuclear test has introduced a new factor with world and regional implications which will require further study. The Ministers express their opposition to nuclear proliferation. (*From the communiqué of the Council of Ministers of CENTO, 22 May 1974.*)

Appendix 15E

Status of NPT safeguards agreements with non-nuclear-weapon states, as of 31 January 1975

I. *Agreements in force*

States with significant nuclear activities

Australia
Austria
Bulgaria
Canada
Czechoslovakia
Denmark
Finland
German Democratic Republic
Greece
Hungary
Iran
Iraq
Mexico
Norway
Poland
Philippines
Romania
Thailand
Republic of Viet-Nam
Yugoslavia
Zaire 21

States without significant nuclear activities

Cyprus
Dominican Republic
Fiji
Holy See
Iceland
Ireland
Lebanon
Lesotho

Madagascar	
Malaysia	
Mauritius	
Mongolia	
Nepal	
New Zealand	14
Total	35

II. *Agreements signed but not in force*

States with significant nuclear activities

Uruguay	1

States without significant nuclear activities

Bolivia	
Costa Rica	
Ghana	
Ecuador	
Jordan	
Morocco	6
Total	7

III. *Agreements approved by the IAEA Board but not signed*

States with significant nuclear activities

–	0

States without significant nuclear activities

El Salvador	
Haiti	
Honduras	
Nicaragua	
Swaziland	5
Total	5

IV. *Agreements under negotiation*

States with significant nuclear activities

Sweden	1

States without significant nuclear activities

Afghanistan	
Botswana	
Gabon	
Guatemala	
Jamaica	
Kenya	
Laos	
Maldives	
Mali	
Malta	
Nigeria	
San Marino	
Somalia	
Sudan	
Tonga	15
Total	16

Appendix 15F

Agreements providing for IAEA safeguards other than those in connection with the NPT, approved by the IAEA Board, as of 31 January 1975

Parties	Subject	Entry into force
IAEA project agreements		
Argentina	Siemens SUR-100	13 Mar 1970
	RAEP reactor	2 Dec 1964
Chile	Herald reactor	19 Dec 1969
Finland[1]	FiR-1 reactor	30 Dec 1960
	FINN sub-critical assembly	30 Jul 1963
Greece[1]	GRR-1 reactor	1 Mar 1972
Indonesia	Additional core-load for Triga reactor	19 Dec 1969
Iran[1]	UTRR reactor	10 May 1967
Japan	JRR-3	24 Mar 1959
Mexico[1]	TRIGA-III reactor	18 Dec 1963
	Siemens SUR-100	21 Dec 1971
	Laguna Verde nuclear power plant	12 Feb 1974
Pakistan	PRR reactor	5 Mar 1962
	Booster rods for KANUPP	17 Jun 1968
Philippines[1]	PRR-1 reactor	28 Sep 1966
Romania[1]	TRIGA reactor	30 Mar 1973
Spain	Coral I reactor	23 Jun 1967
Turkey	Sub-critical assembly	17 May 1974
Uruguay	URR reactor	24 Sep 1965
Republic of Viet-Nam[1]	VNR-1 reactor	16 Oct 1967
Yugoslavia[1]	TRIGA-II reactor	4 Oct 1961
	KRSKO nuclear power plant	14 Jun 1974
Zaire[1]	TRICO reactor	27 Jun 1962
Transfer agreements		
(Agreements for transfer of safeguards under bilateral cooperation agreements between the indicated parties)		
Argentina/USA		25 Jul 1969
Australia[1]/USA		26 Sep 1966
Australia[1]/Japan		28 Jul 1972
Austria[1]/USA		24 Jan 1970
Brazil/USA		20 Sep 1972
Canada/Japan		12 Nov 1969

Parties	Subject	Entry into force
Canada/India		30 Sep 1971
Taiwan/USA		6 Dec 1971
Colombia/USA		9 Dec 1970
Denmark[1]/United Kingdom		23 Jun 1965
Denmark[1]/USA		29 Feb 1968
France/Japan		22 Sep 1972
Greece[1]/USA		13 Jan 1966
India/USA		27 Jan 1971
Indonesia/USA		6 Dec 1967
Iran[1]/USA		20 Aug 1969
Israel/USA		15 Jun 1966
Japan/USA		10 Jul 1968
Japan/United Kingdom		15 Oct 1968
Republic of Korea/USA		19 Mar 1973
Pakistan/Canada		17 Oct 1969
Philippines[1]/USA		19 Jul 1968
Portugal/USA		19 Jul 1969
South Africa/USA		28 Jun 1974
Spain/USA		28 Jun 1974
Sweden/USA		1 Mar 1972
Switzerland/USA		28 Feb 1972
Thailand[1]/USA		10 Sep 1965
Turkey/USA		5 Jun 1969
Venezuela/USA		27 Mar 1968
Republic of Viet-Nam[1]/USA		25 Oct 1965
Unilateral submissions		
Argentina	Atucha power reactor facility	3 Oct 1972
	Nuclear material	23 Oct 1973
	Embalse power reactor facility	6 Dec 1974
Chile	Nuclear material	Entry into force awaited
Taiwan	Taiwan research reactor facility	13 Oct 1969
Mexico[1]	All nuclear activities	6 Sep 1968
Panama[2]	All nuclear activities	Entry into force awaited
Spain	Nuclear material	19 Nov 1974
United Kingdom	Certain nuclear activities	14 Dec 1972

[1] Application of IAEA safeguards under this agreement has been suspended as the state has concluded an agreement in connection with the NPT.
[2] At present Panama has no significant nuclear activities. The agreement is concluded under Article 13 of the Treaty for the prohibition of nuclear weapons in Latin America.

Appendix 15G

Memorandum B attached to the letters from supplier countries, addressed in 1974 to the Director-General of the IAEA

Introduction

1. The Government has had under consideration procedures in relation to exports of certain categories of equipment and material, in the light of its commitment not to provide equipment or material especially designed or prepared for the processing, use or production of special fissionable material to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material produced, processed or used in the equipment or material in question is subject to safeguards under an agreement with the International Atomic Energy Agency.

The designation of equipment or material especially designed or prepared for the processing, use or production of special fissionable material

2. The designation of items of equipment or material especially designed or prepared for the processing, use or production of special fissionable material (hereinafter referred to as the "Trigger List") adopted by the Government is as follows (quantities below the indicated levels being regarded as insignificant for practical purposes):

2.1. *Reactors and equipment therefor:*

2.1.1. Nuclear reactors capable of operation so as to maintain a controlled self-sustaining fission chain reaction, excluding zero energy reactors, the latter being defined as reactors with a designed maximum rate of production of plutonium not exceeding 100 grams per year.

2.1.2. Reactor pressure vessels:

Metal vessels, as complete units or as major shop-fabricated parts therefor, which are especially designed or prepared to contain the core of a nuclear reactor as defined in paragraph 2.1.1 above and are capable of withstanding the operating pressure of the primary coolant.

2.1.3. Reactor fuel charging and discharging machines:

Manipulative equipment especially designed or prepared for inserting or removing fuel in a nuclear reactor as defined in paragraph 2.1.1 above capable of on-load operation or employing technically sophisticated positioning or alignment features to allow complex off-load fuelling operations such as those in which direct viewing of or access to the fuel is not normally available.

2.1.4. Reactor control rods:

Rods especially designed or prepared for the control of the reaction rate in a nuclear reactor as defined in paragraph 2.1.1 above.

2.1.5. Reactor pressure tubes:

Tubes which are especially designed or prepared to contain fuel elements and the primary coolant in a reactor as defined in paragraph 2.1.1 above at an operating pressure in excess of 50 atmospheres.

2.1.6. Zirconium tubes:

Zirconium metal and alloys in the form of tubes or assemblies of tubes, and in quantities exceeding 500 kg, especially designed or prepared for use in a reactor as defined in paragraph 2.1.1 above, and in which the relationship of hafnium to zirconium is less than 1:500 parts by weight.

2.1.7. Primary coolant pumps:

Pumps especially designed or prepared for circulating liquid metal as primary coolant for nuclear reactors as defined in paragraph 2.1.1 above.

2.2. *Non-nuclear materials for reactors:*

2.2.1. Deuterium and heavy water:

Deuterium and any deuterium compound in which the ratio of deuterium to hydrogen exceeds 1:5000 for use in a nuclear reactor as defined in paragraph 2.1.1 above in quantities exceeding 200 kg of deuterium atoms for any one recipient country in any period of 12 months.

2.2.2. Nuclear grade graphite:

Graphite having a purity level better than 5 parts per million boron equivalent and with a density greater than 1.50 grams per cubic centimetre in quantities exceeding 30 metric tons for any one recipient country in any period of 12 months.

2.3.1. Plants for the reprocessing of irradiated fuel elements, and equipment especially designed or prepared therefor.

2.4.1. Plants for the fabrication of fuel elements.

2.5.1. Equipment, other than analytical instruments, especially designed or prepared for the separation of isotopes of uranium.

Clarifications of certain of the items on the above list are annexed.

The application of safeguards

3. The Government is solely concerned with ensuring, where relevant, the application of safeguards in non-nuclear-weapon States not party to the

Treaty on the Non-Proliferation of Nuclear Weapons (NPT) with a view to preventing diversion of the safeguarded nuclear material from peaceful purposes to nuclear weapons or other nuclear explosive devices. If the Government wishes to supply Trigger List items for peaceful purposes to such a State, it will:

(*a*) Specify to the recipient State, as a condition of supply, that the source or special fissionable material produced, processed or used in the facility for which the item is supplied shall not be diverted to nuclear weapons or other nuclear explosive devices; and

(*b*) Satisfy itself that safeguards to that end, under an agreement with the Agency and in accordance with its safeguards system, will be applied to the source or special fissionable material in question.

Direct exports

4. In the case of direct exports to non-nuclear-weapon States not party to NPT, the Government will satisfy itself, before authorizing the export of the equipment or material in question, that such equipment or material will fall under a safeguards agreement with the Agency.

Retransfers

5. The Government, when exporting Trigger List items, will require satisfactory assurances that the items will not be re-exported to a non-nuclear-weapon State not party to NPT unless arrangements corresponding to those referred to above are made for the acceptance of safeguards by the State receiving such re-export.

Miscellaneous

6. The Government reserves to itself discretion as to interpretation and implementation of its commitment referred to in paragraph 1 above and the right to require, if it wishes, safeguards as above in relation to items it exports in addition to those items specified in paragraph 2 above.

Annex

Clarifications of items on the Trigger List

A. *Complete nuclear reactors*

(Item 2.1.1 of the Trigger List is)

1. A "nuclear reactor" basically includes the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain or come in direct contact with or control the primary coolant of the reactor core.

2. The export of the whole set of major items within this boundary will take place only in accordance with the procedures of the memorandum. Those individual items within this functionally defined boundary which will be exported only in accordance with the procedures of the memorandum are listed in paragraphs 2.1.1 to 2.1.5. Pursuant to paragraph 6 of the memorandum, the Government reserves to itself the right to apply the procedures of the memorandum to other items within the functionally defined boundary.

3. It is not intended to exclude reactors which could reasonably be capable of modification to produce significantly more than 100 grams of plutonium per year. Reactors designed for sustained operation at significant power levels, regardless of their capacity for plutonium production, are not considered as "zero energy reactors".

B. *Pressure vessels*
(Item 2.1.2 of the Trigger List)

4. A top plate for a reactor pressure vessel is covered by item 2.1.2 as a major shop-fabricated part of a pressure vessel.

5. Reactor internals (e. g. support columns and plates for the core and other vessel internals, control rod guide tubes, thermal shields, baffles, core grid plates, diffuser plates, etc.) are normally supplied by the reactor supplier. In some cases, certain internal support components are included in the fabrication of the pressure vessel. These items are sufficiently critical to the safety and reliability of the operation of the reactor (and, therefore, to the guarantees and liability of the reactor supplier), so that their supply, outside the basic supply arrangement for the reactor itself, would not be common practice. Therefore, although the separate supply of these unique, especially designed and prepared, critical, large and expensive items would not necessarily be considered as falling outside the area of concern, such a mode of supply is considered unlikely.

C. *Reactor control rods*
(Item 2.1.4 of the Trigger List)

6. This item includes, in addition to the neutron absorbing part, the support or suspension structures therefor if supplied separately.

D. *Fuel reprocessing plants*
(Item 2.3.1 of the Trigger List)

7. A "plant for the reprocessing of irradiated fuel elements" includes the equipment and components which normally come in direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams. The export of the whole set of major items within this boundary will take place only in accordance with the procedures of the memorandum. In the present state of technology only two items of

equipment are considered to fall within the meaning of the phrase "and equipment especially designed or prepared therefor". These items are:

(*a*) Irradiated fuel element chopping machines: remotely operated equipment especially designed or prepared for use in a reprocessing plant as identified above and intended to cut, chop or shear irradiated nuclear fuel assemblies, bundles or rods; and

(*b*) Critically safe tanks (e. g. small diameter, annular or slab tanks) especially designed or prepared for use in a reprocessing plant as identified above, intended for dissolution of irradiated nuclear fuel and which are capable of withstanding hot, highly corrosive liquid, and which can be remotely loaded and maintained.

8. Pursuant to paragraph 6 of the memorandum, the Government reserves to itself the right to apply the procedures of the memorandum to other items within the functionally defined boundary.

E. *Fuel fabrication plants*
(Item 2.4.1 of the Trigger List)

9. A "plant for the fabrication of fuel elements" includes the equipment:

(*a*) Which normally comes in direct contact with, or directly processes, or controls, the production flow of nuclear material, or

(*b*) Which seals the nuclear material within the cladding.

10. The export of the whole set of items for the foregoing operations will take place only in accordance with the procedures of the memorandum. The Government will also give consideration to application of the procedures of the memorandum to individual items intended for any of the foregoing operations, as well as for other fuel fabrication operations, such as checking the integrity of the classing or the seal, and the finish treatment to the solid fuel.

F. *Isotope separation plant equipment*
(Item 2.5.1 of the Trigger List)

11. "Equipment, other than analytical instruments, especially designed or prepared for separation of isotopes of uranium" includes each of the major items of equipment especially designed or prepared for the separation process.

Appendix 15H

List of states which have signed, ratified, acceded or succeeded to the Geneva Protocol of 17 June 1925, for the prohibition of the use in war of asphyxiating, poisonous and other gases, and of bacteriological methods of warfare, as of 31 December 1974

(The text of the Protocol can be found in the 1969/70 SIPRI Yearbook, p. 438 or in the 1974 SIPRI Yearbook, p. 418.)

Note

Some states, former non-self-governing territories, acceded to the Geneva Protocol without referring to the obligations previously undertaken on their behalf by the colonial power. In these cases, the date of the notification by the government of France, the depositary government, is indicated as the date of entry into force of the accession for the countries concerned, in accordance with paragraph 2 of the operative part of the Protocol.

Other states, former non-self-governing territories, officially informed the government of France that they consider themselves bound by the Geneva Protocol by virtue of its ratification by the power formerly responsible for their administration. In such cases of continuity of obligations under the Geneva Protocol, the date of receipt of the country's notification by the French government is indicated. In the absence of a statement to the contrary the succession is regarded as applying also to reservations attached to the ratification of the Protocol.

States which, upon attaining independence, made general statements of continuity to the treaties concluded by the power formerly responsible for their administration, but have not notified the government of France that their statements specifically applied to the Geneva Protocol, are not listed here. The French government considers that a general statement of continuity, made by a country attaining independence, does not entitle the government with which an international convention has been deposited to consider that country as bound by the said convention.

Although the total number of ratifications, accessions and successions to the Geneva Protocol is 94, account should be taken of the facts that Estonia, Latvia and Lithuania, which signed and ratified the Protocol, no longer have independent status; both the Federal Republic of Germany and the German Democratic Republic are bound by ratification on behalf of Germany; and both the People's Republic of China and Taiwan are bound by accession on behalf of China.

Thus, the total number of actual parties to the Geneva Protocol, as of 31 December 1974, is 93.

I. List of signatories and ratifications

Signatory	*Deposit of ratification*
Austria	9 May 1928
Belgium	4 Dec 1928[1]
Brazil	28 Aug 1970
British Empire	9 Apr 1930[2]
Bulgaria	7 Mar 1934[3]
Canada	6 May 1930[4]
Chile	2 Jul 1935[5]
Czechoslovakia	16 Aug 1938[6]
Denmark	5 May 1930
Egypt	6 Dec 1928
El Salvador	
Estonia	28 Aug 1931[7]
Ethiopia	20 Sep 1935[8]
Finland	26 Jun 1929
France	10 May 1926[9]
Germany	25 Apr 1929[10]
Greece	30 May 1931
India	9 Apr 1930[11]
Italy	3 Apr 1928
Japan	21 May 1970
Latvia	3 Jun 1931
Lithuania	15 Jun 1933
Luxembourg	1 Sep 1936
Netherlands	31 Oct 1930[12]
Nicaragua	
Norway	27 Jul 1932
Poland	4 Feb 1929
Portugal	1 Jul 1930[13]
Romania	23 Aug 1929[14]
Serbs, Croats and Slovenes, Kingdom of the (Yugoslavia)	12 Apr 1929[15]
Siam (Thailand)	6 Jun 1931
Spain	22 Aug 1929[16]
Sweden	25 Apr 1930
Switzerland	12 Jul 1932
Turkey	5 Oct 1929
USA	
Uruguay	
Venezuela	8 Feb 1928

II. List of accessions and successions

Country	*Notification*	
Argentina	12 May	1969
Australia	24 May	1930[17]
Central African Republic	31 Jul	1970
China	24 Aug	1929[18]
Cuba	24 Jun	1966
Cyprus	29 Nov	1966[19]
Dominican Republic	8 Dec	1970
Ecuador	16 Sep	1970
Fiji	21 Mar	1973[20]
Gambia	5 Nov	1966[21]
Ghana	3 May	1967
Holy See	18 Oct	1966
Hungary	11 Oct	1952
Iceland	2 Nov	1967
Indonesia	21 Jan	1971[22]
Iran (Persia)	5 Nov	1929
Iraq	8 Sep	1931[23]
Ireland (Irish Free State)	29 Aug	1930[24]
Israel	20 Feb	1969[25]
Ivory Coast	27 Jul	1970
Jamaica	28 Jul	1970[26]
Kenya	6 Jul	1970
Kuwait	15 Dec	1971[27]
Lebanon	17 Apr	1969
Lesotho	10 Mar	1972[28]
Liberia	17 Jun	1927
Libya	29 Dec	1971[29]
Madagascar	2 Aug	1967
Malawi	14 Sep	1970
Malaysia	10 Dec	1970
Maldives	27 Dec	1966[30]
Malta	9 Oct	1970[31]
Mauritius	23 Dec	1970[32]
Mexico	28 May	1932
Monaco	6 Jan	1967
Mongolia	6 Dec	1968[33]
Morocco	13 Oct	1970
Nepal	9 May	1969
New Zealand	24 May	1930[34]
Niger	5 Apr	1967[35]
Nigeria	15 Oct	1968[36]

Pakistan	15 Apr	1960[37]
Panama	4 Dec	1970
Paraguay	22 Oct	1933[38]
Philippines	8 Jun	1973
Rwanda	11 May	1964[39]
Saudi Arabia	27 Jan	1971
Sierra Leone	20 Mar	1967
South Africa	24 May	1930[40]
Sri Lanka (Ceylon)	20 Jan	1954
Syrian Arab Republic	17 Dec	1968[41]
Togo	5 Apr	1971
Tonga	28 Jul	1971
Trinidad and Tobago	24 Nov	1970[42]
Tunisia	12 Jul	1967
Uganda	24 May	1965
United Republic of Tanzania	22 Apr	1963
Upper Volta	3 Mar	1971
USSR	15 Apr	1928[43]
Yemen	17 Mar	1971

Postscript

On 16 December 1974, the US Senate consented to the ratification of the Geneva Protocol with the reservation that the Protocol "shall cease to be binding on the government of the United States 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 fails to respect the prohibitions laid down in the Protocol." The ratification act was signed by the US President on 22 January 1975. The instrument of ratification was deposited with the French government on 10 April 1975.

Notes:

[1] (1) The said Protocol is only binding on the Belgian government as regards States which have signed or ratified it or which may accede to it. (2) The said Protocol shall *ipso facto* cease to be binding on the Belgian government in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

[2] The British Plenipotentiary declared when signing: "my signature does not bind India or any British Dominion which is a separate Member of the League of Nations and does not separately sign or adhere to the Protocol".

(1) The said Protocol is only binding on His Britannic Majesty as regards those Powers and States which have both signed and ratified the Protocol or have finally acceded thereto. (2) The said Protocol shall cease to be binding on His Britannic Majesty towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, fail to respect the prohibitions laid down in the Protocol.

[3] The said Protocol is only binding on the Bulgarian government as regards States which have signed or ratified it or which may accede to it. The said Protocol shall *ipso facto* cease to be binding on the Bulgarian government in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.

[4] (1) The said Protocol is only binding on His Britannic Majesty as regards those States which have both signed and ratified it, or have finally acceded thereto. (2) The said Protocol shall cease to be binding on His Britannic Majesty towards any State at enmity with Him whose armed forces, or whose allies *de jure* or in fact fail to respect the prohibitions laid down in the Protocol.
[5] (1) The said Protocol is only binding on the Chilean government as regards States which have signed and ratified it or which may definitely accede to it. (2) The said Protocol shall *ipso facto* cease to be binding on the Chilean government in regard to any enemy State whose armed forces, or whose allies, fail to respect the prohibitions which are the object of this Protocol.
[6] The Czechoslovak Republic shall *ipso facto* 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.
[7] (1) The said Protocol is only binding on the Estonian government as regards States which have signed or ratified it or which may accede to it. (2) The said Protocol shall *ipso facto* cease to be binding on the Estonian government in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.
[8]The document deposited by Ethiopia, a signer of the Protocol, is registered as an accession. The date given is therefore the date of notification by the French government.
[9] (1) The said Protocol is only binding on the government of the French Republic as regards States which have signed or ratified it or which may accede to it. (2) The said Protocol shall *ipso facto* cease to be binding on the government of the French Republic in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.
[10] On 2 March 1959, the embassy of Czechoslovakia transmitted to the French Ministry for Foreign Affairs a document stating the applicability of the Protocol to the German Democratic Republic. This was reaffirmed in a note of the German Democratic Republic, of 23 September 1974, received by the French government on 21 October 1974.
[11] (1) The said Protocol is only binding on His Britannic Majesty as regards those States which have both signed and ratified it, or have finally acceded thereto. (2) The said Protocol shall cease to be binding on His Britannic Majesty towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, fail to respect the prohibitions laid down in the Protocol.
[12] Including Netherlands Indies, Surinam and Curaçao.
As regards the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, this Protocol shall *ipso facto* cease to be binding on the Royal Netherlands government with regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions laid down in the Protocol.
[13] (1) The said Protocol is only binding on the government of the Portuguese Republic as regards States which have signed and ratified it or which may accede to it. (2) The said Protocol shall *ipso facto* cease to be binding on the government of the Portuguese Republic in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions which are the object of this Protocol.
[14] (1) The said Protocol only binds the Romanian government in relation to States which have signed and ratified or which have definitely acceded to the Protocol. (2) The said Protocol shall cease to be binding on the Romanian government in regard to all enemy States whose armed forces or whose allies *de jure* or in fact do not respect the restrictions which are the object of this Protocol.
[15] The said Protocol shall cease to be binding on the government of the Serbs, Croats and Slovenes in regard to any enemy State whose armed forces or whose allies fail to respect the prohibitions which are the object of this Protocol.
[16] Declares as binding *ipso facto,* without special agreement with respect to any other Member or State accepting and observing the same obligation, that is to say, on condition of reciprocity, the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous and other Gases and of Bacteriological Methods of Warfare, signed at Geneva on 17 June, 1925.
[17] Subject to the reservations that His Majesty is bound by the said Protocol only towards those Powers and States which have both signed and ratified the Protocol or have acceded thereto, and that His Majesty shall cease to be bound by the Protocol towards any Power at enmity with Him whose armed forces, or the armed forces of whose allies, do not respect the Protocol.
[18] 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. The People's Republic of China considers itself bound by the Protocol on condition of reciprocity on the part of all the other contracting and acceding powers.
[19] In a note of 21 November 1966, Cyprus declared that it was bound by the Protocol which had been made applicable to it by the British Empire.

[20] In a declaration of succession of 26 January 1973 addressed to the depositary government, the government of Fiji confirmed that the provisions of the Protocol were applicable to it by virtue of the ratification by the United Kingdom. The Protocol is only binding on Fiji as regards states which have both signed and ratified it and which will have finally acceded thereto. The Protocol shall cease to be binding on Fiji in regard to any enemy state whose armed forces or the armed forces of whose allies fail to respect the prohibitions which are the object of the Protocol.

[21] In a declaration of 11 October 1966, Gambia confirmed its participation in the Protocol which had been made applicable to it by the British Empire.

[22] In an official declaration of 13 January 1971 addressed to the French government, the government of Indonesia reaffirmed its acceptance of the Geneva Protocol which had been ratified on its behalf by the Netherlands on 31 October 1930, and stated that it remained signatory to that Protocol.

[23] On condition that the Iraq government shall be bound by the provisions of the Protocol only towards those States which have both signed and ratified it or have acceded thereto, and that it shall not be bound by the Protocol towards any State at enmity with Iraq whose armed forces, or the forces of whose allies, do not respect the provisions of the Protocol.

[24] The government of the Irish Free State 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 said Protocol, the government of the Irish Free State would cease to be bound by the said Protocol in regard to such State. In a note of 7 February 1972, received by the depositary government on 10 February 1972, the government of Ireland declared that it had decided to withdraw the above reservations made at the time of accession to the Protocol.

[25] The said Protocol is only binding on the State of Israel as regards States which have signed and ratified or acceded to it. The said Protocol shall cease *ipso facto* to be binding on the State of 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 this Protocol.

[26] On this date Jamaica declared to the depositary government that it considered itself bound by the provisions of the Protocol on the basis of the ratification by the British Empire in 1930.

[27] The accession of the State of Kuwait to this 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 mentioned in this Protocol by any of the Parties, the State of Kuwait will not be bound, with regard to the Party committing the breach, to apply the provisions of this Protocol. In a note of 25 January 1972, addressed to the depositary government, Israel objected to the above reservations.

[28] By a note of 10 February 1972 addressed to the depositary government, Lesotho confirmed that the provisions of the Protocol were applicable to it by virtue of the ratification by the British Empire on 9 April 1930.

[29] The accession to the Protocol does not imply recognition or the establishment of any relations with Israel. The present Protocol is binding on the Libyan Arab Republic only as regards States which are effectively bound by it and will cease to be binding on the Libyan Arab Republic 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. In a note of 25 January 1972 addressed to the depositary government, Israel objected to the above reservations.

[30] In a declaration of 19 December 1966, Maldives confirmed its adherence to the Protocol.

[31] By a notification of 25 September 1970, the government of Malta informed the French government that it considered itself bound by the Geneva Protocol as from 21 September 1964, the provisions of the Protocol having been extended to Malta by the government of the United Kingdom, prior to the former's accession to independence.

[32] By a notification of 27 November 1970, the government of Mauritius informed the French government that it considered itself bound by the Geneva Protocol as from 12 March 1968, the date of its accession to independence.

[33] In the case of violation of this prohibition by any State in relation to the People's Republic of Mongolia or its allies, the government of the People's Republic of Mongolia shall not consider itself bound by the obligations of the Protocol towards that State.

[34] Same reservations as Australia. (See footnote 17.)

[35] In a letter of 18 March 1967, Niger declared that it was bound by the adherence of France to the Protocol.

[36] The Protocol is only binding on Nigeria as regards States which are effectively bound by it and shall cease to be binding on Nigeria as regards States whose forces or whose allies' armed forces fail to respect the prohibitions which are the object of the Protocol.

[37] By a note of 13 April 1960, Pakistan informed the depositary government that it was a party to the Protocol by virtue of Paragraph 4 of the Annex to the Indian Independence Act of 1947.

[38] This is the date of receipt of the instrument of accession. The date of the notification by the French government "for the purpose of regularization" is 13 January 1969.
[39] In a declaration of 21 March 1964, Rwanda recognized that it was bound by the Protocol which had been made applicable to it by Belgium.
[40] Same reservations as Australia. (See footnote 17.)
[41] The accession by the Syrian Arab Republic to this Protocol and the ratification of the Protocol by its government 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 this Protocol.
[42] By a note of 9 October 1970, the government of Trinidad and Tobago notified the French government that it considered itself bound by the Protocol, the provisions of which had been made applicable to Trinidad and Tobago by the British Empire prior to the former's accession to independence.
[43] (1) The said Protocol only binds the government of the Union of Soviet Socialist Republics in relation to the States which have signed and ratified or which have definitely acceded to the Protocol. (2) The said Protocol shall cease to be binding on the government of the Union of Soviet Socialist Republics 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.

On 2 March 1970, the Byelorussian Soviet Socialist Republic stated that "it recognizes itself to be a Party" to the Geneva Protocol of 1925 (United Nations doc. A/8052, Annex III).

Appendix 15I

List of parties to the 1949 Geneva Conventions for the protection of war victims,[1] *as of 31 December 1974*

Total number of parties: 138

Note

1. A diplomatic conference held at Geneva from 21 April to 12 August 1949 adopted the following conventions:

Convention (I) for the amelioration of the condition of the wounded and sick in armed forces in the field.

Convention (II) for the amelioration of the condition of the wounded, sick and shipwrecked members of armed forces at sea.

Convention (III) relative to the treatment of prisoners of war.

Convention (IV) relative to the protection of civilian persons in time of war.

The conventions were signed at Geneva on 12 August 1949 and entered into force on 21 October 1950. They have been deposited with the Swiss Federal Council. Many states have made reservations regarding various articles of the conventions.

2. A diplomatic conference on the reaffirmation and development of international humanitarian law applicable in armed conflicts, which opened in 1974 in Geneva, and is continuing in 1975, is discussing two additional protocols to the 1949 Geneva Conventions: one relating to the protection of victims of international armed conflicts, and another relating to the protection of victims of non-international armed conflicts.

I. List of ratifications[2]

Switzerland	31 Mar	1950
Yugoslavia	21 Apr	1950
Monaco	5 Jul	1950
Liechtenstein	21 Sep	1950
Chile	12 Oct	1950
India	9 Nov	1950
Czechoslovakia	19 Dec	1950

Holy See	22 Feb	1951
Philippines[3]	7 Mar 1951/6 Oct	1952
Lebanon	10 Apr	1951
Pakistan	12 Jun	1951
Denmark	27 Jun	1951
France	28 Jun	1951
Israel	6 Jul	1951
Norway	3 Aug	1951
Italy	17 Dec	1951
Guatemala	14 May	1952
Spain	4 Aug	1952
Belgium	3 Sep	1952
Mexico	29 Oct	1952
Egypt	10 Nov	1952
El Salvador	17 Jun	1953
Luxembourg	1 Jul	1953
Austria	27 Aug	1953
Syrian Arab Republic	2 Nov	1953
Nicaragua	17 Dec	1953
Sweden	28 Dec	1953
Turkey	10 Feb	1954
Cuba	15 Apr	1954
Union of Soviet Socialist Republics	10 May	1954
Romania	1 Jun	1954
Bulgaria	22 Jul	1954
Ukraine	3 Aug	1954
Byelorussia	3 Aug	1954
Netherlands	3 Aug	1954
Hungary	3 Aug	1954
Ecuador	11 Aug	1954
Poland	26 Nov	1954
Finland	22 Feb	1955
United States	2 Aug	1955
Venezuela	13 Feb	1956
Peru	15 Feb	1956
Greece	5 Jun	1956
Argentina	18 Sep	1956
Afghanistan	26 Sep	1956
China	28 Dec	1956
Iran	20 Feb	1957
Albania	27 May	1957
Brazil	29 Jun	1957
United Kingdom	23 Sep	1957
Australia	14 Oct	1958

Sri Lanka (Conventions I, II and III)	28 Feb	1959
New Zealand	2 May	1959
Portugal	14 Mar	1961
Paraguay	23 Oct	1961
Colombia	8 Nov	1961
Ireland	27 Sep	1962
Canada	14 May	1965
Uruguay	5 Mar	1969
Ethiopia	2 Oct	1969

II. List of accessions[4]

Jordan	29 May	1951
South Africa	31 Mar	1952
Japan	21 Apr	1953
San Marino	29 Aug	1953
Republic of Viet-Nam	14 Nov	1953
Liberia	29 Mar	1954
Federal Republic of Germany	3 Sep	1954
Thailand	29 Dec	1954
Panama	10 Feb	1956
Iraq	14 Feb	1956
Libya	22 May	1956
Morocco	26 Jul	1956
Laos	29 Oct	1956
German Democratic Republic	30 Nov	1956
Haiti	11 Apr	1957
Tunisia	4 May	1957
Democratic Republic of Viet-Nam	28 Jun	1957
Democratic People's Republic of Korea	27 Aug	1957
Sudan	23 Sep	1957
Dominican Republic	22 Jan	1958
Ghana	2 Aug	1958
Indonesia	30 Sep	1958
Khmer Republic	8 Dec	1958
Mongolia	20 Dec	1958
Sri Lanka (Convention IV)	23 Feb	1959
Algeria	3 Jul	1962
Cyprus	23 May	1962
Malaysia	24 Aug	1962
Saudi Arabia	18 May	1963
Somalia	12 Jul	1962

Trinidad and Tobago		
Convention I	17 May	1963
Conventions II, III and IV	24 Sep	1963
Nepal	7 Feb	1964
Uganda	18 May	1964
Mali	24 May	1965
Iceland	10 Aug	1965
Honduras	31 Dec	1965
Republic of Korea	16 Aug	1966
Kenya	20 Sep	1966
Zambia	19 Oct	1966
Kuwait	2 Sep	1967
Malawi	5 Jan	1968
Botswana	29 Mar	1968
Costa Rica	15 Oct	1969
Yemen	16 Jul	1970
Chad	5 Aug	1970
Bahrain	30 Nov	1971
United Arab Emirates	10 May	1972
Singapore	27 Apr	1973
Swaziland	28 Jun	1973
Provisional Revolutionary Government of the Republic of South Viet-Nam	3 Dec	1973
Oman	31 Jan	1974
Guinea-Bissau	21 Feb	1974

III. List of successions[4]

Zaire	30 Jun	1960
Nigeria	1 Oct	1960
Upper Volta	5 Aug	1960
Ivory Coast	7 Aug	1960
Dahomey	1 Aug	1960
Togo	27 Apr	1960
Mauritania	28 Nov	1960
Tanzania	9 Dec	1961
Senegal	20 Aug	1960
Madagascar	26 Jun	1960
Cameroon	1 Jan	1960
Niger	3 Aug	1960
Rwanda	1 Jul	1962
Jamaica	6 Aug	1962
Gabon	17 Aug	1960
Sierra Leone	27 Apr	1961

Central African Republic	13 Aug	1960
Gambia	18 Feb	1965
People's Republic of Congo	15 Aug	1960
Lesotho	4 Oct	1966
Guyana	26 May	1966
Malta	21 Sep	1964
Barbados	30 Nov	1966
Mauritius	12 Mar	1968
Fiji	10 Oct	1970
Burundi	1 Jul	1962
Bangladesh	26 Mar	1971

[1] Entry into force of the four conventions: for Switzerland and Yugoslavia—21 October 1950; for the Republic of Korea—23 September 1966; and for the Provisional Revolutionary Government of the Republic of South Viet-Nam—3 December 1973. For other states parties—six months after the deposit of the instrument of ratification or accession.
[2] Listed in the order of the deposit of the instruments of ratification.
[3] The instrument of ratification concerning Convention I was deposited on 7 March 1951, while that concerning Conventions II, III and IV was deposited on 6 October 1952.
[4] Listed in the order the notifications were received. For successions, the date indicated is the date of entry into force.

Appendix 15J

Bilateral arms control agreements between the USA and the USSR, as of 31 December 1974

Summary of the relevant provisions of the agreements

Memorandum of understanding regarding the establishment of a direct communications link ("Hot Line" Agreement)

Establishes a direct communications link between the governments of the USA and the USSR for use in time of emergency. An annex attached to the memorandum provides for two circuits, namely 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.

Signed at Geneva on 20 June 1963.

Entered into force on 20 June 1963.

Agreement on measures to improve the USA-USSR direct communications link ("Hot Line" Modernization Agreement)

Establishes, for the purpose of increasing the reliability of the direct communications link set up pursuant to the Memorandum of understanding of 20 June 1963, two additional circuits between the USA and the USSR each using a satellite communications system (the US circuit being arranged through Intelsat and the Soviet circuit through the Molniya II system), and a system of terminals (more than one) in the territory of each party. Matters relating to the implementation of these improvements are set forth in an annex to the agreement.

Signed at Washington on 30 September 1971.

Entered into force on 30 September 1971.

Agreement on measures to reduce the risk of outbreak of nuclear war between the USA and the USSR (Nuclear Accidents Agreement)

Provides for immediate notification in the event of an accidental, unauthorized incident involving a possible detonation of a nuclear weapon (the party whose nuclear weapon is involved should take necessary measures to render harmless or destroy such weapon), immediate notification in the event of detection by missile warning systems of unidentified objects, or in the event of signs of interference with these systems or with related communications facilities, as well as advance notification of planned missile launches extending beyond the national territory in the direction of the other party.

Signed at Washington on 30 September 1971.

Entered into force on 30 September 1971.

Agreement on the prevention of incidents on and over the high seas

Provides for measures to assure the safety of navigation of the ships of the armed forces of the USA and the USSR on the high seas and flight of their military aircraft over the high seas including rules of conduct for ships engaged in surveillance of other ships, as well as ships engaged in launching or landing aircraft. The parties also undertake to give notification of actions on the high seas which represent a danger to navigation or to aircraft in flight, and exchange information concerning instances of collisions, instances which result in damage, or other incidents at sea between their ships and aircraft.

Signed at Moscow on 25 May 1972.

Entered into force on 25 May 1972.

Treaty on the limitation of anti-ballistic missile systems (SALT ABM Treaty)

Prohibits the deployment of ABM systems for the defence of the whole territory of the USA and the USSR 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 some intercontinental ballistic missiles (ICBMs). 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. National technical means of verification will be used to provide assurance of compliance with the provisions of the treaty.

Signed at Moscow on 26 May 1972.

Entered into force on 3 October 1972.

Interim agreement on certain measures with respect to the limitation of strategic offensive arms (SALT Interim Agreement)

Provides for a freeze for up to five years of the aggregate number of fixed land-based intercontinental ballistic missile (ICBM) launchers 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.

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 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 SLBMs—in the USA over 656 ballistic missile launchers on nuclear-powered submarines and in the USSR over 740 ballistic missile launchers on nuclear-powered submarines, operational and under construction—may become operational as replacements for equal numbers of ballistic missile launchers of types deployed prior to 1964, or of ballistic missile launchers on older submarines.

Signed at Moscow on 26 May 1972.

Entered into force on 3 October 1972.

Protocol to the Agreement on the prevention of incidents on and over the high seas, signed on 25 May 1972

Provides that ships and aircraft of the parties shall not make simulated attacks by aiming guns, missile launchers, torpedo tubes and other weapons at non-military ships of the other party, nor launch nor drop any objects near non-military ships of the other party in such a manner as to be hazardous to these ships or to constitute a hazard to navigation.

Signed at Washington on 22 May 1973.

Entered into force on 22 May 1973.

Agreement on the prevention of nuclear war

Provides that the parties will act in such a manner as to exclude the outbreak of nuclear war between them and between either of the parties and other countries. Each party will refrain from the threat or use of force against the other party, against the allies of the other party and against other countries in circumstances which may endanger international peace and security. If at any time relations between the parties or between either party and other countries appear to involve the risk of a nuclear conflict, or if relations between countries not parties to this agreement appear to involve the risk of nuclear war between the USSR and the USA or between either party and other countries, the Soviet Union and the United States, acting in accordance with the provisions of this agreement, shall immediately enter into urgent consultations with each other and make every effort to avert this risk.

Signed at Washington on 22 June 1973.

Entered into force on 22 June 1973.

Protocol to the Treaty on the limitation of anti-ballistic missile systems (SALT ABM Treaty)

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 signing the Protocol and to deploy an ABM system or its components in the alternative area permitted by the ABM treaty, provided that, prior to initiation of construction, notification is given during the year beginning 3 October 1977, and ending 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.

Signed at Moscow on 3 July 1974.

Treaty on the limitation of underground nuclear weapon tests (Threshold Test Ban Treaty—TTBT)

Prohibits the carrying out of any underground nuclear weapon test having a yield exceeding 150 kilotons, beginning 31 March 1976. Each party undertakes to limit the number of its underground nuclear weapon tests to a minimum. The provisions of the treaty do not extend to underground nuclear explosions for peaceful purposes which shall be governed by an agreement to be concluded at the earliest possible time. National technical means of verification will be used to provide assurance of compliance and a protocol, which is an integral part of the treaty, specifies the data that have to be exchanged between the parties to ensure such verification.

Signed at Moscow on 3 July 1974.

Appendix 15K

Multilateral agreements related to disarmament, as of 31 December 1974

I. *Summary of the relevant provisions of the agreements*

Antarctic Treaty

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, the carrying out of military manoeuvres, or the testing of any type of weapons, as well as any nuclear explosions.

Signed at Washington on 1 December 1959.
Entered into force on 23 June 1961.
The depositary government: USA.

Treaty banning nuclear weapon tests in the atmosphere, in outer space and under water (Partial Test Ban Treaty—PTBT)

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.

Signed at Moscow on 5 August 1963.
Entered into force on 10 October 1963.
The depositary governments: UK, USA, USSR.

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)

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 stationing 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 monoeuvres on celestial bodies are also forbidden.

Signed at London, Moscow and Washington on 27 January 1967.

Entered into force on 10 October 1967.

The depositary governments: UK, USA, USSR.

Treaty for the prohibition of nuclear weapons in Latin America (Treaty of Tlatelolco)

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 International Atomic Energy Agency (IAEA) for the application of safeguards to their nuclear activities.

Under *Additional Protocol I,* annexed to the treaty, 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,* annexed to the treaty, the nuclear-weapon states undertake to respect the statute of military denuclearization of Latin America as defined in the treaty, not to contribute to acts involving a violation of the treaty, and not to use or threaten to use nuclear weapons against the parties to the treaty.

Signed at Mexico City on 14 February 1967.

The treaty enters into force for each state that has ratified it when the requirements specified in the treaty have been met, that is, that all states in the region which were in existence when the treaty was opened for signature, deposit the instruments of ratification, that Additional Protocols I and II be signed and ratified by those states to which they apply (see above), and that agreements on safeguards be concluded with the IAEA. The signatory states have the right to waive, wholly or in part, those requirements.

The Additional Protocols enter into force for the states that have ratified them on the date of the deposit of their instruments of ratification.

The depositary government: Mexico.

Treaty on the non-proliferation of nuclear weapons (Non-Proliferation Treaty—NPT)

Prohibits the transfer by nuclear-weapon states to any recipient whatsoever of nuclear weapons or other nuclear explosive devices or of control over them. 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 on effective measures relating to cessation of the nuclear arms race and to nuclear disarmament, and on a treaty on general and complete disarmament.

Signed at London, Moscow and Washington on 1 July 1968.

Entered into force on 5 March 1970.

The depositary governments: UK, USA, USSR.

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)

Prohibits emplanting or emplacement 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) of 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.

Signed at London, Moscow and Washington on 11 February 1971.

Entered into force on 18 May 1972.

The depositary governments: UK, USA, USSR.

Convention on the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons and on their destruction (BW Convention)

Prohibits the development, production, stockpiling, 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 agènts 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.

Signed at London, Moscow and Washington on 10 April 1972.

Entered into force on 26 March 1974.

The depositary governments: UK, USA, USSR.

II. *List of states which have signed, ratified, acceded or succeeded to multilateral agreements related to disarmament, as of 31 December 1974*

Total number of parties

Antarctic Treaty	18	
Partial Test Ban Treaty	106	
Outer Space Treaty	71	
Treaty of Tlatelolco	18	
Non-Proliferation Treaty	83	
Sea-Bed Treaty	55	
BW Convention	37	(The convention entered into force on 26 March 1975)

Note

1. Abbreviations used in the list:
S: signature
R: deposit of instruments of ratification, accession or succession. Place of signature and/or deposit of the instrument of ratification, accession or succession:
L: London
M: Moscow
W: Washington
P.I: Additional Protocol I to the Treaty of Tlatelolco
P.II: Additional Protocol II to the Treaty of Tlatelolco
S.A.: Safeguards agreement concluded with the International Atomic Energy Agency (IAEA) under the Non-Proliferation Treaty or the Treaty of Tlatelolco.

2. The footnotes at the end of the table are grouped separately for each agreement.

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Afghanistan		S: 8 Aug 1963 LW 9 Aug 1963 M R: 12 Mar 1964 L 13 Mar 1964 W 23 Mar 1964 M	S: 27 Jan 1967 W 30 Jan 1967 M
Algeria		S: 14 Aug 1963 LW 19 Aug 1963 M	
Argentina	S: 1 Dec 1959 R: 23 Jun 1961	S: 8 Aug 1963 W 9 Aug 1963 LM	S: 27 Jan 1967 W 18 Apr 1967 M R: 26 Mar 1969 MW
Australia	S: 1 Dec 1959 R: 23 Jun 1961	S: 8 Aug 1963 LMW R: 12 Nov 1963 LMW	S: 27 Jan 1967 W R: 10 Oct 1967 LMW
Austria		S: 11 Sep 1963 MW 12 Sep 1963 L R: 17 Jul 1964 LMW	S: 20 Feb 1967 LMW R: 26 Feb 1968 LMW
Barbados			R: 12 Sep 1968 W
Belgium	S: 1 Dec 1959 R: 26 Jul 1960	S: 8 Aug 1963 LMW R: 1 Mar 1966 LMW	S: 27 Jan 1967 LM 2 Feb 1967 W R: 30 Mar 1973 W 31 Mar 1973 LM
Bolivia		S: 8 Aug 1963 W 21 Aug 1963 L 20 Sep 1963 M R: 4 Aug 1965 MW 25 Jan 1966 L	S: 27 Jan 1967 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 LMW R: 4 Feb 1970 W 5 Feb 1970 M 5 Mar 1970 L	S: 11 Feb 1971 LMW R: 22 Apr 1971 M 23 Apr 1971 L 21 May 1971 W	S: 10 Apr 1972 LMW R:[11]
S:[1] 27 Sep 1967		S:[1] 3 Sep 1971 LMW	S: 1 Aug 1972 M 3 Aug 1972 L 7 Aug 1972 W
	S:[1] 27 Feb 1970 LMW R: 23 Jan 1973 LMW S.A.: 10 Jul 1974	S: 11 Feb 1971 LMW R: 23 Jan 1973 LMW	S: 10 Apr 1972 LMW
	S: 1 Jul 1968 LMW R: 27 Jun 1969 LMW S.A.:[2] 23 Jul 1972	S: 11 Feb 1971 LMW R: 10 Aug 1972 LMW	S: 10 Apr 1972 LMW R:[1] 10 Aug 1973 LMW
S: 18 Oct 1968 R:[2] 25 Apr 1969	S: 1 Jul 1968 W		S: 16 Feb 1973 W R: 16 Feb 1973 W
	S: 20 Aug 1968 LMW S.A.:[3,4] 5 Apr 1973	S: 11 Feb 1971 LMW R: 20 Nov 1972 LMW	S: 10 Apr 1972 LMW
S: 14 Feb 1967 R:[2] 18 Feb 1969	S: 1 Jul 1968 W R: 26 May 1970 W S.A.:[5,6,8] 23 Aug 1974	S: 11 Feb 1971 LMW	S: 10 Apr 1972 W

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Botswana		R:[1] 5 Jan 1968 M 14 Feb 1968 L 4 Mar 1968 W	S: 27 Jan 1967 W
Brazil		S: 8 Aug 1963 LW 9 Aug 1963 M R: 15 Dec 1964 M 15 Jan 1965 W 4 Mar 1965 L	S: 30 Jan 1967 M 2 Feb 1967 LW R:[1] 5 Mar 1969 LMW
Bulgaria		S: 8 Aug 1963 LMW R: 13 Nov 1963 W 21 Nov 1963 M 2 Dec 1963 L	S: 27 Jan 1967 LMW R: 28 Mar 1967 M 11 Apr 1967 W 19 Apr 1967 L
Burma		S: 14 Aug 1963 LMW R: 15 Nov 1963 LMW	S: 22 May 1967 LMW R: 18 Mar 1970 LMW
Burundi		S: 4 Oct 1963 W	S: 27 Jan 1967 W
Byelorussia		S: 8 Oct 1963 M R:[2] 16 Dec 1963 M	S:[2] 10 Feb 1967 M R: 31 Oct 1967 M
Canada		S: 8 Aug 1963 LMW R: 28 Jan 1964 LMW	S: 27 Jan 1967 LMW R: 10 Oct 1967 LMW
Central African Republic		R: 22 Dec 1964 W 24 Aug 1965 L 25 Sep 1965 M	S: 27 Jan 1967 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 W R: 28 Apr 1969 L	S: 11 Feb 1971 W R: 10 Nov 1972 W	S: 10 Apr 1972 W
S:[3] 9 May 1967 R:[4] 29 Jan 1968		S:[2] 3 Sep 1971 LMW	S: 10 Apr 1972 LMW R: 27 Feb 1973 LMW
	S: 1 Jul 1968 LMW R: 5 Sep 1969 W 18 Sep 1969 M 3 Nov 1969 L S.A.: 29 Feb 1972	S: 11 Feb 1971 LMW R: 16 Apr 1971 M 7 May 1971 W 26 May 1971 L	S: 10 Apr 1972 LMW R: 2 Aug 1972 L 13 Sep 1972 W 19 Sep 1972 M
		S: 11 Feb 1971 LMW	S: 10 Apr 1972 LMW
	R: 19 Mar 1971 M	S: 11 Feb 1971 MW	S: 10 Apr 1972 MW
		S: 3 Mar 1971 M R: 14 Sep 1971 M	S: 10 Apr 1972 M
	S: 23 Jul 1968 LW 29 Jul 1968 M R: 8 Jan 1969 LMW S.A.: 21 Feb 1972	S: 11 Feb 1971 LMW R:[3] 17 May 1972 LMW	S: 10 Apr 1972 LMW R: 18 Sep 1972 LMW
	R: 25 Oct 1970 W	S: 11 Feb 1971 W	S: 10 Apr 1972 W

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Chad		S: 26 Aug 1963 W R: 1 Mar 1965 W	
Chile	S: 1 Dec 1959 R: 23 Jun 1961	S: 8 Aug 1963 W 9 Aug 1963 LM R: 6 Oct 1965 L	S: 27 Jan 1967 W 3 Feb 1967 L 20 Feb 1967 M
China			
Colombia		S: 16 Aug 1963 MW 20 Aug 1963 L	S: 27 Jan 1967 W
Costa Rica		S: 9 Aug 1963 L 13 Aug 1963 W 23 Aug 1963 M R: 10 Jul 1967 W	
Cuba			
Cyprus		S: 8 Aug 1963 LMW R: 15 Apr 1965 L 21 Apr 1965 M 7 May 1965 W	S: 27 Jan 1967 W 15 Feb 1967 M 16 Feb 1967 L R: 5 Jul 1972 LW 20 Sep 1972 M
Czechoslovakia	R: 14 Jun 1962	S: 8 Aug 1963 LMW R: 14 Oct 1963 LM 17 Oct 1963 W	S: 27 Jan 1967 LMW R: 11 May 1967 L 18 May 1967 M 22 May 1967 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 LM R: 10 Mar 1971 W 11 Mar 1971 M 23 Mar 1971 L		
S: 14 Feb 1967 R:[10] 9 Oct 1974			S: 10 Apr 1972 LMW
P.II:[5] S: 21 Aug 1973 R: 12 Jun 1974			
S: 14 Feb 1967 R:[2] 4 Aug 1972	S: 1 Jul 1968 W	S: 11 Feb 1971 W	S: 10 Apr 1972 W
S: 14 Feb 1967 R:[2] 25 Aug 1969	S: 1 Jul 1968 W R: 3 Mar 1970 W S.A.:[5,6,8] 12 Jul 1973	S: 11 Feb 1971 W	S: 10 Apr 1972 W R: 17 Dec 1973 W
			S: 12 Apr 1972 M
	S: 1 Jul 1968 LMW R: 10 Feb 1970 M 16 Feb 1970 W 5 Mar 1970 L S.A.:[5] 26 Jan 1973	S: 11 Feb 1971 LMW R: 17 Nov 1971 LM 30 Dec 1971 W	S: 10 Apr 1972 LW 14 Apr 1972 M R: 6 Nov 1973 L 13 Nov 1973 W 21 Nov 1973 M
	S: 1 Jul 1968 LMW R: 22 Jul 1969 LMW S.A.: 3 Mar 1972	S: 11 Feb 1971 LMW R: 11 Jan 1972 LMW	S: 10 Apr 1972 LMW R: 30 Apr 1973 LMW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Dahomey		S:[3] 27 Aug 1963 W 3 Sep 1963 L 9 Oct 1963 M R: 15 Dec 1964 W 23 Dec 1964 M 22 Apr 1965 L	
Democratic Yemen			
Denmark	R: 20 May 1965	S: 9 Aug 1963 LMW R: 15 Jan 1964 LMW	S: 27 Jan 1967 LMW R: 10 Oct 1967 LMW
Dominican Republic		S: 16 Sep 1963 W 17 Sep 1963 L 19 Sep 1963 M R: 3 Jun 1964 M 18 Jun 1964 L 22 Jul 1964 W	S: 27 Jan 1967 W R: 21 Nov 1968 W
Ecuador		S: 27 Sep 1963 W 1 Oct 1963 LM R: 6 May 1964 W 8 May 1964 L 13 Nov 1964 M	S: 27 Jan 1967 W 16 May 1967 L 7 Jun 1967 M R: 7 Mar 1969 W
Egypt		S:[4] 8 Aug 1963 LMW R: 10 Jan 1964 LMW	S: 27 Jan 1967 MW R: 10 Oct 1967 W 23 Jan 1968 M
El Salvador		S: 21 Aug 1963 W 22 Aug 1963 L 23 Aug 1963 M R: 3 Dec 1964 W 7 Dec 1964 L 9 Feb 1965 M	S: 27 Jan 1967 W R: 15 Jan 1969 W
Equatorial Guinea			

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 W R: 31 Oct 1972 W	S: 18 Mar 1971 W	S: 10 Apr 1972 W
	S: 14 Nov 1968 M	S: 23 Feb 1971 M	S: 26 Apr 1972 M
	S: 1 Jul 1968 LMW R: 3 Jan 1969 LMW S.A.:[9,10] 1 Mar 1972	S: 11 Feb 1971 LMW R: 15 Jun 1971 LMW	S: 10 Apr 1972 LMW R: 1 Mar 1973 LMW
S: 28 Jul 1967 R:[2] 14 Jun 1968	S: 1 Jul 1968 W R: 24 Jul 1971 W S.A.:[5] 11 Oct 1973	S: 11 Feb 1971 W R: 11 Feb 1972 W	S: 10 Apr 1972 W R: 23 Feb 1973 W
S: 14 Feb 1967 R:[2] 11 Feb 1969	S: 9 Jul 1968 W R: 7 Mar 1969 W S.A.:[8] 2 Oct 1974		S: 14 Jun 1972 W
	S: 1 Jul 1968 LM		S: 10 Apr 1972 LM
S: 14 Feb 1967 R:[2] 22 Apr 1968	S: 1 Jul 1968 W R: 11 Jul 1972 W S.A.:[7]		S: 10 Apr 1972 W
		S: 4 Jun 1971 W	

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Ethiopia		S: 9 Aug 1963 LW 19 Sep 1963 M	S: 27 Jan 1967 LW 10 Feb1967 M
Fiji		R:[1] 14 Jul 1972 M 18 Jul 1972 W 14 Aug 1972 L	R:[3] 18 Jul 1972 W 14 Aug 1972 L 29 Aug 1972 M
Finland		S: 8 Aug 1963 LMW R: 9 Jan 1964 LMW	S: 27 Jan 1967 LMW R: 12 Jul 1967 LMW
France	S: 1 Dec 1959 R: 16 Sep 1960		S: 25 Sep 1967 LMW R: 5 Aug 1970 LMW
Gabon		S: 10 Sep 1963 W R: 20 Feb 1964 W 4 Mar 1964 L 9 Mar 1964 M	
Gambia		R:[1] 27 Apr 1965 MW 6 May 1965 L	S: 2 Jun 1967 L
German Democratic Republic	R:[3] 19 Nov 1974 W	S: 8 Aug 1963 M R:[5] 30 Dec 1963 M	S: 27 Jan 1967 M R:[4] 2 Feb 1967 M
Germany, Federal Republic of		S: 19 Aug 1963 LMW R:[6] 1 Dec 1964 LW	S: 27 Jan 1967 LMW R:[5] 10 Feb 1971 LW

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 5 Sep 1968 LMW R: 5 Feb 1970 M 5 Mar 1970 LW	S: 11 Feb 1971 LMW	S: 10 Apr 1972 LMW
	R:[11] 18 Jul 1972 W 14 Aug 1972 L 29 Aug 1972 M S.A.:[5] 22 Mar 1973		S: 22 Feb 1973 L R: 4 Sep 1973 W 1 Oct 1973 L
	S: 1 Jul 1968 LMW R: 5 Feb 1969 LMW S.A.: 9 Feb 1972	S: 11 Feb 1971 LMW R: 8 Jun 1971 LMW	S: 10 Apr 1972 LMW R: 4 Feb 1974 LMW
P.II:[6] S: 18 Jul. 1973 R: 22 Mar 1974			
	R: 19 Feb 1974 W		S: 10 Apr 1972 L
	S: 4 Sep 1968 L 20 Sep 1968 W 24 Sep 1968 M	S: 18 May 1971 L 21 May 1971 M 29 Oct 1971 W	S: 2 Jun 1972 M 8 Aug 1972 L 9 Nov 1972 W
	S: 1 Jul 1968 M R:[12] 31 Oct 1969 M S.A.: 7 Mar 1972	S:[4] 11 Feb 1971 M R: 27 Jul 1971 M	S: 10 Apr 1972 M R: 28 Nov 1972 M
	S:[13] 28 Nov 1969 LMW S.A.:[3,4] 5 Apr 1973	S:[5] 8 Jun 1971 LMW	S: 10 Apr 1972 LMW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Ghana		S: 8 Aug 1963 M 9 Aug 1963 W 4 Sep 1963 L R: 27 Nov 1963 L 9 Jan 1964 W 31 May 1965 M	S: 27 Jan 1967 W 15 Feb 1967 M 3 Mar 1967 L
Greece		S: 8 Aug 1963 W 9 Aug 1963 LM R: 18 Dec 1963 LMW	S: 27 Jan 1967 W R: 19 Jan 1971 L
Guatemala		S: 23 Sep 1963 W R:[3] 6 Jan 1964 W	
Guinea			
Guyana			S: 3 Feb 1967 W
Haiti		S: 9 Oct 1963 W	S: 27 Jan 1967 W
Holy See			S: 5 Apr 1967 L
Honduras		S: 8 Aug 1963 W 15 Aug 1963 L 16 Aug 1963 M R: 2 Oct 1964 W 2 Dec 1964 L	S: 27 Jan 1967 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 MW 24 Jul 1968 L R: 4 May 1970 L 5 May 1970 W 11 May 1970 M S.A.:[5,8] 23 Aug 1973	S: 11 Feb 1971 LMW R: 9 Aug 1972 W	S: 10 Apr 1972 MW
	S: 1 Jul 1968 MW R: 11 Mar 1970 W S.A.:[3] 1 Mar 1972	S: 11 Feb 1971 M 12 Feb 1971 W	S: 10 Apr 1972 L 12 Apr 1972 W 14 Apr 1972 M
S: 14 Feb 1967 R:[3] 6 Feb 1970	S: 26 Jul 1968 W R: 22 Sep 1970 W	S: 11 Feb 1971 W	S: 9 May 1972 W R: 19 Sep 1973 W
		S: 11 Feb 1971 MW	
			S: 3 Jan 1973 W
S: 14 Feb 1967 R:[3] 23 May 1969	S: 1 Jul 1968 W R: 2 Jun 1970 W S.A.:[5,6,7]		S: 10 Apr 1972 W
	R:[14] 25 Feb 1971 LMW S.A.:[5] 1 Aug 1972		
S: 14 Feb 1967 R:[2] 23 Sep 1968	S: 1 Jul 1968 W R: 16 May 1973 W S.A.:[7]	S: 11 Feb 1971 W	S: 10 Apr 1972 W

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Hungary		S: 8 Aug 1963 LMW R: 21 Oct 1963 L 22 Oct 1963 W 23 Oct 1963 M	S: 27 Jan 1967 LMW R: 26 Jun 1967 LMW
Iceland		S: 12 Aug 1963 LMW R: 29 Apr 1964 LMW	S: 27 Jan 1967 LMW R: 5 Feb 1968 LMW
India		S: 8 Aug 1963 LMW R: 10 Oct 1963 L 14 Oct 1963 M 18 Oct 1963 W	S: 3 Mar 1967 LMW
Indonesia		S: 23 Aug 1963 LMW R: 20 Jan 1964 M 27 Jan 1964 W 8 May 1964 L	S: 27 Jan 1967 W 30 Jan 1967 M 14 Feb 1967 L
Iran		S: 8 Aug 1963 LMW R: 5 May 1964 LMW	S: 27 Jan 1967 L
Iraq		S: 13 Aug 1963 LMW R: 30 Nov 1964 L 1 Dec 1964 W 3 Dec 1964 M	S: 27 Feb 1967 LW 9 Mar 1967 M R: 4 Dec 1968 M 23 Sep 1969 L
Ireland		S: 8 Aug 1963 LW 9 Aug 1963 M R: 18 Dec 1963 LW 20 Dec 1963 M	S: 27 Jan 1967 LW R: 17 Jul 1968 W 19 Jul 1968 L
Israel		S: 8 Aug 1963 LMW R: 15 Jan 1964 LW 28 Jan 1964 M	S: 27 Jan 1967 LMW

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 LMW R: 27 May 1969 LMW S.A.: 30 Mar 1972	S: 11 Feb 1971 LMW R: 13 Aug 1971 LMW	S: 10 Apr 1972 LMW R: 27 Dec 1972 LMW
	S: 1 Jul 1968 LMW R: 18 Jul 1969 LMW S.A.:[5] 16 Oct 1974	S: 11 Feb 1971 LMW R: 30 May 1972 LMW	S: 10 Apr 1972 LMW R: 15 Feb 1973 LMW
		R:[6] 20 Jul 1973 LMW	S:[2] 15 Jan 1973 LMW R: 15 Jul 1974 LMW
	S:[15] 2 Mar 1970 LMW		S: 20 Jun 1972 MW 21 Jun 1972 L
	S: 1 Jul 1968 LMW R: 2 Feb 1970 W 10 Feb 1970 M 5 Mar 1970 L S.A.:[2] 15 May 1974	S: 11 Feb 1971 LMW R: 26 Aug 1971 LW 6 Sep 1972 M	S: 10 Apr 1972 MW 16 Nov 1972 L R: 22 Aug 1973 LW 27 Aug 1973 M
	S: 1 Jul 1968 M R: 29 Oct 1969 M S.A.: 29 Feb 1972	S: 22 Feb 1971 M R:[7] 13 Sep 1972 M	S: 11 May 1972 M
	S: 1 Jul 1968 MW 4 Jul 1968 L R: 1 Jul 1968 W 2 Jul 1968 M 4 Jul 1968 L S.A.:[5,9] 29 Feb 1972	S: 11 Feb 1971 LW R: 19 Aug 1971 LW	S:[8] 10 Apr 1972 LW R: 27 Oct 1972 LW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Italy		S: 8 Aug 1963 LMW R: 10 Dec 1964 LMW	S: 27 Jan 1967 LMW R: 4 May 1972 LMW
Ivory Coast		S: 5 Sep 1963 W R: 5 Feb 1965 W	
Jamaica		S: 13 Aug 1963 LMW	S: 29 Jun 1967 LMW R: 6 Aug 1970 W 10 Aug 1970 L 21 Aug 1970 M
Japan	S: 1 Dec 1959 R: 4 Aug 1960	S: 14 Aug 1963 LMW R: 15 Jun 1964 LMW	S: 27 Jan 1967 LMW R: 10 Oct 1967 LMW
Jordan		S: 12 Aug 1963 LW 19 Aug 1963 M R: 29 May 1964 L 7 Jul 1964 M 10 Jul 1964 W	S: 2 Feb 1967 W
Kenya		R: 10 Jun 1965 L 11 Jun 1965 W 30 Jun 1965 M	
Khmer Republic			
Korea, South		S: 30 Aug 1963 LW R:[3] 24 Jul 1964 LW	S: 27 Jan 1967 W R:[6] 13 Oct 1967 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S:[16] 28 Jan 1969 LMW S.A.:[3,4] 5 Apr 1973	S: 11 Feb 1971 LMW R:[8] 3 Sep 1974 LMW	S: 10 Apr 1972 LMW
	S: 1 Jul 1968 W R: 6 Mar 1973 W	R: 14 Jan 1972 W	S: 23 May 1972 W
S: 26 Oct 1967 R:[2] 26 Jun 1969	S: 14 Apr 1969 LMW R: 5 Mar 1970 LMW	S: 11 Oct 1971 LW 14 Oct 1971 M	
	S:[17] 3 Feb 1970 LMW	S: 11 Feb 1971 LMW R: 21 Jun 1971 LMW	S: 10 Apr 1972 LMW
	S: 10 Jul 1968 W R: 11 Feb 1970 W S.A.:[7]	S: 11 Feb 1971 LMW R: 17 Aug 1971 W 30 Aug 1971 M 1 Nov 1971 L	S: 10 Apr 1972 W 17 Apr 1972 L 24 Apr 1972 M
	S: 1 Jul 1968 W R: 11 Jun 1970 M		
	R: 2 Jun 1972 W	S: 11 Feb 1971 W	S: 10 Apr 1972 W
	S:[18] 1 Jul 1968 W	S:[7] 11 Feb 1971 LW	S:[4] 10 Apr 1972 LW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Kuwait		S:[7] 20 Aug 1963 LMW R: 20 May 1965 W 21 May 1965 L 17 Jun 1965 M	R:[7] 7 Jun 1972 W 20 Jun 1972 L 4 Jul 1972 M
Laos		S: 12 Aug 1963 LMW R: 10 Feb 1965 L 12 Feb 1965 W 7 Apr 1965 M	S: 27 Jan 1967 W 30 Jan 1967 L 2 Feb 1967 M R: 27 Nov 1972 M 29 Nov 1972 W 15 Jan 1973 L
Lebanon		S: 12 Aug 1963 W 13 Aug 1963 LM R: 14 May 1965 W 20 May 1965 L 4 Jun 1965 M	S: 23 Feb 1967 LMW R: 31 Mar 1969 LM 30 Jun 1969 W
Lesotho			S: 27 Jan 1967 W
Liberia		S: 8 Aug 1963 W 16 Aug 1963 L 27 Aug 1963 M R: 19 May 1964 W 22 May 1964 L 16 Jun 1964 M	
Libya		S: 9 Aug 1963 L 16 Aug 1963 MW R: 15 Jul 1968 L	R: 3 Jul 1968 W
Luxembourg		S: 13 Aug 1963 L 3 Sep 1963 W 13 Sep 1963 M R: 10 Feb 1965 LMW	S: 27 Jan 1967 MW 31 Jan 1967 L
Madagascar		S: 23 Sep 1963 W R: 15 Mar 1965 W	R:[8] 22 Aug 1968 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 15 Aug 1968 MW 22 Aug 1968 L		S: 14 Apr 1972 MW 27 Apr 1972 L R:[5] 18 Jul 1972 W 26 Jul 1972 L 1 Aug 1972 M
	S: 1 Jul 1968 LMW R: 5 Mar 1970 LW 20 Feb 1970 M	S: 11 Feb 1971 LW 15 Feb 1971 M R: 19 Oct 1971 L 22 Oct 1971 M 3 Nov 1971 W	S: 10 Apr 1972 LMW R: 20 Mar 1973 M 22 Mar 1973 W 25 Apr 1973 L
	S: 1 Jul 1968 LMW R: 15 Jul 1970 LM 20 Nov 1970 W S.A.:[5] 5 Mar 1973	S: 11 Feb 1971 LMW	S: 10 Apr 1972 LW 21 Apr 1972 M
	S: 9 Jul 1968 W R: 20 May 1970 W S.A.:[5] 12 Jun 1973	S: 8 Sep 1971 W R: 3 Apr 1973 W	S: 10 Apr 1972 W
	S: 1 Jul 1968 W R: 5 Mar 1970 W	S: 11 Feb 1971 W	S: 10 Apr 1972 W 14 Apr 1972 L
	S: 18 Jul 1968 L 19 Jul 1968 W 23 Jul 1968 M		
	S: 14 Aug 1968 LMW S.A.:[3,4] 5 Apr 1973	S: 11 Feb 1971 LMW	S: 10 Apr 1972 LM 12 Apr 1972 W
	S: 22 Aug 1968 W R: 8 Oct 1970 W S.A.:[5] 14 Jun 1973	S: 14 Sep 1971 W	S: 13 Oct 1972 L

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Malawi		R:[1] 26 Nov 1964 MW 7 Jan 1965 L	
Malaysia		S: 8 Aug 1963 W 12 Aug 1963 L 21 Aug 1963 M R: 15 Jul 1964 M 16 Jul 1964 LW	S: 20 Feb 1967 W 21 Feb 1967 L 3 May 1967 M
Maldives			
Mali		S: 23 Aug 1963 LMW	R: 11 Jun 1968 M
Malta		R:[1] 25 Nov 1964 MW 1 Dec 1964 L	
Mauritania		S: 13 Sep 1963 W 17 Sep 1963 L 8 Oct 1963 M R: 6 Apr 1964 W 15 Apr 1964 L 28 Apr 1964 M	
Mauritius		R:[1] 30 Apr 1969 MW 12 May 1969 L	R:[3] 7 Apr 1969 W 21 Apr 1969 L 13 May 1969 M
Mexico		S: 8 Aug 1963 LMW R: 27 Dec 1963 LMW	S: 27 Jan 1967 LMW R: 31 Jan 1968 LMW

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
			S: 10 Apr 1972 W
	S: 1 Jul 1968 LMW R: 5 Mar 1970 LMW S.A.:[5] 29 Feb 1972	S: 20 May 1971 LMW R: 21 Jun 1972 LMW	S: 10 Apr 1972 LMW
	S: 11 Sep 1968 W R: 7 Apr 1970 W		
	S: 14 Jul 1969 W 15 Jul 1969 M R: 10 Feb 1970 M 5 Mar 1970 W	S: 11 Feb 1971 W 15 Feb 1971 M	S: 10 Apr 1972 W
	S: 17 Apr 1969 W R: 6 Feb 1970 W	S: 11 Feb 1971 LW R: 4 May 1971 W	S: 11 Sep 1972 L
	S: 1 Jul 1968 W R: 8 Apr 1969 W 14 Apr 1969 L 25 Apr 1969 M S.A.:[5] 31 Jan 1973	S: 11 Feb 1971 W R: 23 Apr 1971 W 3 May 1971 L 18 May 1971 M	S: 10 Apr 1972 W R: 7 Aug 1972 W 11 Jan 1973 L 15 Jan 1973 M
S:[7] 14 Feb 1967 R:[2] 20 Sep 1967 S.A.: 6 Sep 1968	S:[19] 26 Jul 1968 LMW R: 21 Jan 1969 LMW S.A.:[6] 14 Sep 1973		S:[6] 10 Apr 1972 LMW R: 8 Apr 1974 LMW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Mongolia		S: 8 Aug 1963 LM R: 1 Nov 1963 M 7 Nov 1963 L	S: 27 Jan 1967 M R: 10 Oct 1967 M
Morocco		S: 27 Aug 1963 MW 30 Aug 1963 L R: 1 Feb 1966 L 18 Feb 1966 M 21 Feb 1966 W	R: 21 Dec 1967 LM 22 Dec 1967 W
Nepal		S: 26 Aug 1963 LM 30 Aug 1963 W R: 7 Oct 1964 LMW	S: 3 Feb 1967 MW 6 Feb 1967 L R: 10 Oct 1967 L 16 Oct 1967 M 22 Nov 1967 W
Netherlands	R:[1] 30 Mar 1967	S: 9 Aug 1963 LMW R:[8] 14 Sep 1964 LMW	S: 10 Feb 1967 LMW R:[9] 10 Oct 1969 LMW
New Zealand	S: 1 Dec 1959 R: 1 Nov 1960	S: 8 Aug 1963 LMW R: 10 Oct 1963 LW 16 Oct 1963 M	S: 27 Jan 1967 LMW R: 31 May 1968 LMW
Nicaragua		S: 13 Aug 1963 LW 16 Aug 1963 M R: 26 Jan 1965 L 26 Feb 1965 MW	S: 27 Jan 1967 W 13 Feb 1967 L
Niger		S: 24 Sep 1963 LW R: 3 Jul 1964 M 6 Jul 1964 L 9 Jul 1964 W	S: 1 Feb 1967 W R: 17 Apr 1967 L 3 May 1967 W
Nigeria		S: 30 Aug 1963 M 2 Sep 1963 L 4 Sep 1963 W R: 17 Feb 1967 L 25 Feb 1967 M 28 Feb 1967 W	R: 14 Nov 1967 L

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 M R: 14 May 1969 M S.A.:[5] 5 Sep 1972	S: 11 Feb 1971 LM R: 8 Oct 1971 M 15 Nov 1971 L	S: 10 Apr 1972 LMW R: 5 Sep 1972 W 14 Sep 1972 L 20 Oct 1972 M
	S: 1 Jul 1968 LMW R: 27 Nov 1970 M 30 Nov 1970 L 16 Dec 1970 W S.A.:[5,8] 30 Jan 1973	S: 11 Feb 1971 MW 18 Feb 1971 L R: 26 Jul 1971 L 5 Aug 1971 W 18 Jan 1972 M	S: 2 May 1972 L 3 May 1972 W 5 Jun 1972 M
	S: 1 Jul 1968 LMW R: 5 Jan 1970 W 9 Jan 1970 M 3 Feb 1970 L S.A.:[5] 22 Jun 1972	S: 11 Feb 1971 MW 24 Feb 1971 L R: 6 Jul 1971 L 29 Jul 1971 M 9 Aug 1971 W	S: 10 Apr 1972 LMW
P.I:[8] S: 15 Mar 1968 R: 26 Jul 1971	S: 20 Aug 1968 LMW S.A.:[3,4,20] 5 Apr 1973	S: 11 Feb 1971 LMW	S: 10 Apr 1972 LMW
	S: 1 Jul 1968 LMW R: 10 Sep 1969 LMW S.A.:[5] 29 Feb 1972	S: 11 Feb 1971 LMW R: 24 Feb 1972 LMW	S: 10 Apr 1972 LMW R: 13 Dec 1972 W 18 Dec 1972 L 10 Jan 1973 M
S: 15 Feb 1967 R:[3,9] 24 Oct 1968	S: 1 Jul 1968 LW R: 6 Mar 1973 W S.A.:[5,6,7]	S: 11 Feb 1971 W R: 7 Feb 1973 W	S: 10 Apr 1972 LW
		S: 11 Feb 1971 W R: 9 Aug 1971 W	S: 21 Apr 1972 W R: 23 Jun 1972 W
	S: 1 Jul 1968 LMW R: 27 Sep 1968 L 7 Oct 1968 W 14 Oct 1968 M		S: 3 Jul 1972 M 10 Jul 1972 L 6 Dec 1972 W R: 3 Jul 1973 W 9 Jul 1973 L 20 Jul 1973 M

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Norway	S: 1 Dec 1959 R: 24 Aug 1960	S: 9 Aug 1963 LMW R: 21 Nov 1963 LMW	S: 3 Feb 1967 LMW R: 1 Jul 1969 LMW
Pakistan		S: 14 Aug 1963 LMW	S: 12 Sep 1967 LMW R: 8 Apr 1968 LMW
Panama		S: 20 Sep 1963 W R: 24 Feb 1966 W	S: 27 Jan 1967 W
Paraguay		S: 15 Aug 1963 LW 21 Aug 1963 M	
Peru		S: 23 Aug 1963 LMW R: 20 Jul 1964 W 4 Aug 1964 L 21 Aug 1964 M	S: 30 Jun 1967 W
Philippines		S: 8 Aug 1963 LW 14 Aug 1963 M R:[3] 10 Nov 1965 L 15 Nov 1965 W 8 Feb 1966 M	S: 27 Jan 1967 LW 29 Apr 1967 M
Poland	R: 8 Jun 1961	S: 8 Aug 1963 LMW R: 14 Oct 1963 LMW	S: 27 Jan 1967 LMW R: 30 Jan 1968 LMW
Portugal		S: 9 Oct 1963 LW	

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 LMW R: 5 Feb 1969 LMW S.A.:[9] 1 Mar 1972	S: 11 Feb 1971 LMW R: 28 Jun 1971 LM 29 Jun 1971 W	S: 10 Apr 1972 LMW R: 1 Aug 1973 LW 23 Aug 1973 M
			S: 10 Apr 1972 LMW R: 25 Sep 1974 M 3 Oct 1974 LW
S: 14 Feb 1967 R:[2] 11 Jun 1971	S: 1 Jul 1968 W	S: 11 Feb 1971 W R: 20 Mar 1974 W	S: 2 May 1972 W R: 20 Mar 1974 W
S: 26 Apr 1967 R:[2] 19 Mar 1969	S: 1 Jul 1968 W R: 4 Feb 1970 W 5 Mar 1970 L	S: 23 Feb 1971 W	
S: 14 Feb 1967 R:[2] 4 Mar 1969	S: 1 Jul 1968 W R: 3 Mar 1970 W		S: 10 Apr 1972 LMW
	S: 1 Jul 1968 W 18 Jul 1968 M R: 5 Oct 1972 W 16 Oct 1972 L 20 Oct 1972 M S.A.:[2] 16 Oct 1974		S: 10 Apr 1972 LW 21 Jun 1972 M R: 21 May 1973 W
	S: 1 Jul 1968 LMW R: 12 Jun 1969 LMW S.A.: 11 Oct 1972	S: 11 Feb 1971 LMW R: 15 Nov 1971 LMW	S: 10 Apr 1972 LMW R: 25 Jan 1973 LMW
			S: 29 Jun 1972 W

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Qatar			
Romania	R:[2] 15 Sep 1971	S: 8 Aug 1963 LMW R: 12 Dec 1963 LMW	S: 27 Jan 1967 LMW R: 9 Apr 1968 LMW
Rwanda		S: 19 Sep 1963 W R: 22 Oct 1963 L 16 Dec 1963 M 27 Dec 1963 W	S: 27 Jan 1967 W
San Marino		S: 17 Sep 1963 W 20 Sep 1963 L 24 Sep 1963 M R: 3 Jul 1964 L 9 Jul 1964 W 27 Nov 1964 M	S: 21 Apr 1967 W 24 Apr 1967 L 6 Jun 1967 M R: 29 Oct 1968 W 21 Nov 1968 M 3 Feb 1969 L
Saudi Arabia			
Senegal		S: 20 Sep 1963 W 23 Sep 1963 L 9 Oct 1963 M R: 6 May 1964 L 12 May 1964 M 2 Jun 1964 W	
Sierra Leone		S: 4 Sep 1963 L 9 Sep 1963 M 11 Sep 1963 W R: 21 Feb 1964 L 4 Mar 1964 W 29 Apr 1964 M	S: 27 Jan 1967 LM 16 May 1967 W R: 13 Jul 1967 M 14 Jul 1967 W 25 Oct 1967 L
Singapore		R:[1] 12 Jul 1968 MW 23 Jul 1968 L	

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
		R: 12 Nov 1974 L	S: 14 Nov 1972 L
	S: 1 Jul 1968 LMW R: 4 Feb 1970 LMW S.A.: 27 Oct 1972	S: 11 Feb 1971 LMW R:[9] 10 Jul 1972 LMW	S: 10 Apr 1972 LMW
		S: 11 Feb 1971 W	S: 10 Apr 1972 MW
	S:[18] 1 Jul 1968 W 29 Jul 1968 L 21 Nov 1968 M R: 10 Aug 1970 L 20 Aug 1970 M 31 Aug 1970 W		S: 12 Sep 1972 W 30 Jan 1973 M 21 Mar 1973 L
		S: 7 Jan 1972 W R: 23 Jun 1972 W	S: 12 Apr 1972 W R: 24 May 1972 W
	S: 1 Jul 1968 MW 26 Jul 1968 L R: 17 Dec 1970 M 22 Dec 1970 W 15 Jan 1971 L	S: 17 Mar 1971 W	S: 10 Apr 1972 W
	R:[25]	S: 11 Feb 1971 L 12 Feb 1971 M 24 Feb 1971 W	S: 7 Nov 1972 W 24 Nov 1972 L
	S: 5 Feb 1970 LMW	S: 5 May 1971 LMW	S: 19 Jun 1972 LMW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Somalia		S: 19 Aug 1963 MW	S: 2 Feb 1967 W
South Africa	S: 1 Dec 1959 R: 21 Jun 1960	R: 10 Oct 1963 LW 22 Nov 1963 M	S: 1 Mar 1967 W R: 30 Sep 1968 W 8 Oct 1968 L
Spain		S: 13 Aug 1963 W 14 Aug 1963 L R: 17 Dec 1964 LW	R: 27 Nov 1968 L 7 Dec 1968 W
Sri Lanka		S: 22 Aug 1963 LW 23 Aug 1963 M R: 5 Feb 1964 W 12 Feb 1964 M 13 Feb 1964 L	S: 10 Mar 1967 L
Sudan		S: 9 Aug 1963 LMW R: 4 Mar 1966 LW 28 Mar 1966 M	
Swaziland		R: 29 May 1969 LW 3 Jun 1969 M	
Sweden		S: 12 Aug 1963 LMW R: 9 Dec 1963 LMW	S: 27 Jan 1967 LMW R: 11 Oct 1967 LMW
Switzerland		S: 26 Aug 1963 LMW R: 16 Jan 1964 LMW	S: 27 Jan 1967 LW 30 Jan 1967 M R: 18 Dec 1969 LMW

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 LMW R: 5 Mar 1970 L 12 Nov 1970 W		S: 3 Jul 1972 M
		S: 11 Feb 1971 W R: 14 Nov 1973 W 26 Nov 1973 L	S: 10 Apr 1972 W
			S: 10 Apr 1972 LW
	S: 1 Jul 1968 LMW		S: 10 Apr 1972 LMW
	S: 24 Dec 1968 M R: 31 Oct 1973 W 22 Nov 1973 M 10 Dec 1973 L	S: 11 Feb 1971 L 12 Feb 1971 M	
	S: 24 Jun 1969 L R: 11 Dec 1969 L 16 Dec 1969 W 12 Jan 1970 M S.A.:[5, 7]	S: 11 Feb 1971 W R: 9 Aug 1971 W	
	S: 19 Aug 1968 LMW R: 9 Jan 1970 LMW	S: 11 Feb 1971 LMW R: 28 Apr 1972 LMW	S:[10]
	S:[21] 27 Nov 1969 LMW	S: 11 Feb 1971 LMW	S:[7] 10 Apr 1972 LMW

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Syrian Arab Republic		S: 13 Aug 1963 LMW R: 1 Jun 1964 LMW	R:[10] 14 Nov 1968 M
Taiwan		S: 23 Aug 1963 W R: 18 May 1964 W	S: 27 Jan 1967 W R: 24 Jul 1970 W
Thailand		S: 8 Aug 1963 LMW R: 15 Nov 1963 L 21 Nov 1963 M 29 Nov 1963 W	S: 27 Jan 1967 LMW R: 5 Sep 1968 L 9 Sep 1968 M 10 Sep 1968 W
Togo		S: 18 Sep 1963 W. R: 7 Dec 1964 W	S: 27 Jan 1967 W
Tonga		R:[1] 22 Jun 1971 M 7 Jul 1971 W	R:[8] 22 Jun 1971 L 7 Jul 1971 W 24 Aug 1971 M
Trinidad & Tobago		S: 12 Aug 1963 LW 13 Aug 1963 M R: 14 Jul 1964 W 16 Jul 1964 L 6 Aug 1964 M	S: 24 Jul 1967 L 17 Aug 1967 M 28 Sep 1967 W
Tunisia		S: 8 Aug 1963 W 12 Aug 1963 L 13 Aug 1963 M R: 26 May 1965 LM 3 Jun 1965 W	S: 27 Jan 1967 LW 15 Feb 1967 M R: 28 Mar 1968 L 4 Apr 1968 M 17 Apr 1968 W
Turkey		S: 9 Aug 1963 LMW R: 8 Jul 1965 LMW	S: 27 Jan 1967 LMW R: 27 Mar 1968 LMW

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
	S: 1 Jul 1968 M R:[18] 24 Sep 1969 M		S: 14 Apr 1972 M
	S: 1 Jul 1968 W R: 27 Jan 1970 W	S: 11 Feb 1971 W R: 22 Feb 1972 W	S: 10 Apr 1972 W R:[8] 9 Feb 1973 W
	R: 7 Dec 1972 L S.A.: 16 May 1974		S: 17 Jan 1973 W
	S: 1 Jul 1968 W R: 26 Feb 1970 W	S: 2 Apr 1971 W R: 28 Jun 1971 W	S: 10 Apr 1972 W
	R:[11] 7 Jul 1971 LW 24 Aug 1971 M		
S: 27 Jun 1967 R:[10] 3 Dec 1970	S: 20 Aug 1968 W 22 Aug 1968 L		
	S: 1 Jul 1968 LMW R: 26 Feb 1970 LMW	S: 11 Feb 1971 LMW R: 22 Oct 1971 M 28 Oct 1971 L 29 Oct 1971 W	S: 10 Apr 1972 LMW R: 18 May 1973 W 30 May 1973 M 6 Jun 1973 L
	S: 28 Jan 1969 LMW	S: 25 Feb 1971 LMW R: 19 Oct 1972 W 25 Oct 1972 L 30 Oct 1972 M	S: 10 Apr 1972 LMW R: 25 Oct 1974 M 4 Nov 1974 L 5 Nov 1974 W

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Uganda		S: 29 Aug 1963 LW R: 24 Mar 1964 L 2 Apr 1964 W	R: 24 Apr 1968 W
Ukraine		S: 8 Oct 1963 M R:[3] 30 Dec 1963 M	S:[2] 10 Feb 1967 M R: 31 Oct 1967 M
Union of Soviet Socialist Republics	S: 1 Dec 1959 R: 2 Nov 1960	S: 5 Aug 1963 M R: 10 Oct 1963 LMW	S: 27 Jan 1967 LMW R: 10 Oct 1967 LMW
United Arab Emirates			
United Kingdom	S: 1 Dec 1959 R: 31 May 1960	S: 5 Aug 1963 M R:[9] 10 Oct 1963 LMW	S: 27 Jan 1967 LMW R:[11] 10 Oct 1967 LMW
United Republic of Cameroon		S:[3] 27 Aug 1963 W 6 Sep 1963 L	S: 27 Jan 1967 W
United Republic of Tanzania		S: 16 Sep 1963 L 18 Sep 1963 W 20 Sep 1963 M R: 6 Feb 1964 L	
United States	S: 1 Dec 1959 R: 18 Aug 1960	S: 5 Aug 1963 M R: 10 Oct 1963 LMW	S: 27 Jan 1967 LMW R: 10 Oct 1967 LMW
Upper Volta		S: 30 Aug 1963 W	S: 3 Mar 1967 W R: 18 Jun 1968 W

Treaty of Tlatelolco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
		S: 3 Mar 1971 M R: 3 Sep 1971 M	S: 10 Apr 1972 M
	S: 1 Jul 1968 LMW R: 5 Mar 1970 LMW	S: 11 Feb 1971 LMW R: 18 May 1972 LMW	S: 10 Apr 1972 LMW R:[11]
			S: 28 Sep 1972 L
P.I:[11] S: 20 Dec 1967 R: 11 Dec 1969 P.II:[11] S: 20 Dec 1967 R: 11 Dec 1969	S: 1 Jul 1968 LMW R:[22] 27 Nov 1968 LW 29 Nov 1968 M	S:[10] 11 Feb 1971 LMW R: 18 May 1972 LMW	S:[5] 10 Apr 1972 LMW R:[11]
	S: 17 Jul 1968 W 18 Jul 1968 M R: 8 Jan 1969 W	S: 11 Nov 1971 M	
		S: 11 Feb 1971 W	S: 16 Aug 1972 L
P.II:[12] S: 1 Apr 1968 R: 12 May 1971	S: 1 Jul 1968 LMW R: 5 Mar 1970 LMW	S: 11 Feb 1971 LMW R: 18 May 1972 LMW	S: 10 Apr 1972 LMW R:[11]
	S: 25 Nov 1968 W 11 Aug 1969 M R: 3 Mar 1970 W		

	Antarctic Treaty	Partial Test Ban Treaty	Outer Space Treaty
Uruguay		S: 12 Aug 1963 W 27 Sep 1963 LM R: 25 Feb 1969 L	S: 27 Jan 1967 W 30 Jan 1967 M R: 31 Aug 1970 W
Venezuela		S: 16 Aug 1963 MW 20 Aug 1963 L R: 22 Feb 1965 M 3 Mar 1965 L 29 Mar 1965 W	S: 27 Jan 1967 W R: 3 Mar 1970 W
Viet-Nam, South		S: 1 Oct 1963 W	S: 27 Jan 1967 W
Western Samoa		S: 5 Sep 1963 L 6 Sep 1963 MW R: 15 Jan 1965 W 19 Jan 1965 L 8 Feb 1965 M	
Yemen		S: 13 Aug 1963 M 6 Sep 1963 W	
Yugoslavia		S: 8 Aug 1963 LMW R: 15 Jan 1964 L 31 Jan 1964 M 3 Apr 1964 W	S: 27 Jan 1967 LMW
Zaïre		S: 9 Aug 1963 LW 12 Aug 1963 M R: 28 Oct 1965 W	S: 27 Jan 1967 W 29 Apr 1967 M 4 May 1967 L
Zambia		R:[1] 11 Jan 1965 MW 8 Feb 1965 L	R: 20 Aug 1973 W 21 Aug 1973 M 28 Aug 1973 L

Treaty of Tlateloco	Non-Proliferation Treaty	Sea-Bed Treaty	BW Convention
S: 14 Feb 1967 R:[2] 20 Aug 1968 S.A.:[18] 24 Sep 1971	S: 1 July 1968 W R: 31 Aug 1970 W S.A.:[8,28] 24 Sep 1971	S: 11 Feb 1971 W	
S: 14 Feb 1967 R:[2, 14] 23 Mar 1970	S: 1 Jul 1968 W		S: 10 Apr 1972 W
	S: 1 Jul 1968 W R: 10 Sep 1971 W S.A.:[2] 9 Jan 1974	S: 11 Feb 1971 W	S: 10 Apr 1972 W
	R:[26]		
	S: 23 Sep 1968 M	S: 23 Feb 1971 M	S: 10 Apr 1972 W 17 Apr 1972 M 10 May 1972 L
	S: 10 Jul 1968 LMW R:[24] 4 Mar 1970 W 5 Mar 1970 LM S.A.: 28 Dec 1973	S: 2 Mar 1971 LMW R:[11] 25 Oct 1973 LMW	S: 10 Apr 1972 LMW R: 25 Oct 1973 LMW
	S: 22 Jul 1968 W 26 Jul 1968 M 17 Sep 1968 L R: 4 Aug 1970 W S.A.: 9 Nov 1972		S: 10 Apr 1972 LMW
		R: 9 Oct 1972 L 1 Nov 1972 W 2 Nov 1972 M	

The Antarctic Treaty

[1] The Netherlands stated that the accession is also valid for Surinam and the Netherlands Antilles.
[2] Romania stated that the provisions of the first paragraph of Article XIII of the Antarctic Treaty are not in accordance with the principle according to which multilateral treaties whose object and purposes concern the international community, as a whole, should be opened for universal participation.
[3] The German Democratic Republic stated its view that Article XIII, § 1, of the Antarctic Treaty, was inconsistent with the principle that all states whose policies are guided by the purposes and principles of the United Nations Charter have a right to become parties to treaties which affect the interests of all states.

The Partial Test Ban Treaty

[1] Notification of succession.
[2] The United States considers that the Byelorussian SSR and the Ukrainian SSR are already covered by the signature and deposit of ratification by the USSR.
[3] With a statement that this does not imply the recognition of any territory or régime not recognized by this state.
[4] Egypt stated that its ratification of the Treaty does not mean or imply any recognition of Israel or any treaty relations with Israel.
[5] The United States did not accept the notification of signature and deposit of ratification by the German Democratic Republic.
[6] The Federal Republic of Germany stated that the Treaty applies also to Land Berlin.
[7] Kuwait stated that its signature and ratification of the Treaty does not in any way imply its recognition of Israel, nor does it oblige it to apply the provisions of the Treaty in respect of the said country.
[8] The Netherlands stated that the ratification is also valid for Surinam and the Netherlands Antilles.
[9] The UK stated its view that if a régime 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 the recognition of that régime by any other state.

The Outer Space Treaty

[1] The Brazilian government interprets Article 10 of the Treaty as a specific recognition that the granting of tracking facilities by the parties to the Treaty shall be subject to agreement between the states concerned.
[2] The United States considers that the Byelorussian SSR and the Ukrainian SSR are already covered by the signature and deposit of ratification by the USSR.
[3] Notification of succession.
[4] The USA stated that this did not imply recognition of the German Democratic Republic.
[5] The Federal Republic of Germany stated that the Treaty applies also to Land Berlin.
[6] With a statement that this does not imply the recognition of any territory or régime not recognized by this state.
[7] 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.
[8] Madagascar acceded to the Treaty with the understanding that under Article 10 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.
[9] The Netherlands stated that the ratification is also valid for Surinam and the Netherlands Antilles.
[10] The Syrian Arab Republic 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.
[11] The United Kingdom's ratification is in respect of the United Kingdom of Great Britain and Northern Ireland, the Associated States (Antigua, Dominica, Grenada, Saint Christopher-Nevis-Anguilla and Saint Lucia) and Territories under the territorial sovereignty of the United Kingdom, as well as the State of Brunei, the Kingdom of Swaziland, the Kingdom of Tonga and the British Solomon Islands Protectorate. On depositing its instrument of ratification, the United Kingdom declared that the Treaty will not be applicable in regard to Southern Rhodesia unless and until the United Kingdom informs the other depositary governments that it is in a position to ensure that the obligations imposed by the Treaty in respect of that territory can be fully implemented.

The Treaty of Tlatelolco

[1] Argentina stated that it understands Article 18 as recognizing the right of the 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 the case of Colombia the declaration was made subsequent to the deposit of ratification—on 6 September 1972) in accordance with § 2 of Article 28, which waived the requirements specified in § 1 of that Article, namely, that all states in the region deposit the instruments of ratification; that Additional Protocol I and Additional Protocol II be signed and ratified by those states to which they apply; and that agreements on safeguards be concluded with the IAEA.

[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.

[4] Brazil stated that it did not waive the requirements laid down in Article 28 of the Treaty. (The Treaty is therefore not yet in force for Brazil.) In ratifying the Treaty, Brazil reiterated its interpretation of Article 18, which it made upon signing.

[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 her means of transportation and delivery carrying nuclear weapons to cross the territory, territorial sea or air space of Latin American countries. It is necessary to point out that the signing of Additional Protocol II to the Treaty for the Prohibition of Nuclear Weapons in Latin America by the Chinese Government does not imply any change whatsoever in China's principled stand on the disarmament and nuclear weapons issue and, in particular, does not affect the Chinese Government's consistent stand against the treaty on non-proliferation of nuclear weapons and the partial nuclear 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 super-powers, which possess huge numbers of nuclear weapons, must first of all undertake earnestly not to use or threaten to use nuclear weapons against the Latin American countries and the Latin American nuclear-weapon-free zone, and they must be asked to undertake to observe and implement the following: (1) dismantling of all foreign military bases in Latin America and refraining from establishing any new foreign military bases there; (2) prohibition of the passage of any means of transportation and delivery carrying nuclear weapons through Latin American territory. territorial sea or air space."

[6] 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 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 a legislation which is consistent with international law. The provisions of Articles 1 and 2 of the Protocol apply to the text of the Treaty of Tlatelolco 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 provisions of Article 29 thereof 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 April 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.

[9] 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.

[7] In 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 procedure established therein.

[8] The Netherlands stated that the Protocol shall not be interpreted as prejudicing the position of the Netherlands as regards its recognition or non-recognition of the rights of or claims to sovereignty of the parties to the Treaty, or of the grounds on which such claims are made. With respect to nuclear explosions for peaceful purposes on the territory of Surinam and the Netherlands Antilles no other rules apply than those operative for the parties to the Treaty.

[10] The Treaty is not yet in force for Trinidad and Tobago; the requirements laid down in Article 28 of the Treaty have not been waived.

[11] When signing and ratifying Additional Protocol I and Additional Protocol II, the United Kingdom made the following declarations of understanding:

In connection with Article 3, defining the term "territory" as including the territorial sea, air space 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 Additional 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 weapons purposes.

Its signing and ratification 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 re-consider the extent to which it could be regarded as committed by the provisions of Additional Protocol II.

In addition, the UK declared that its undertaking under Article 3 of Additional 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 1 of Additional Protocol I becomes effective.

[12] The United States signed and ratified Additional Protocol II with the following understandings and declarations:

In connection with Article 3 defining the term "territory" as including the territorial sea, air space 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.

Paragraph 4 of Article 18 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 Paragraph 2 of Article 4 of the Treaty, in the same manner as Protocol II requires it to act with respect to the territories of the parties.

[13] The Safeguards Agreement was concluded in accordance with Article III of the NPT. An additional protocol provides that the safeguards under the NPT shall also apply to Uruguay's obligations under Article 13 of the Treaty of Tlatelolco.

The Non-Proliferation Treaty

[1] On signing the Treaty, Australia stated, *inter alia,* that it wanted to be assured that there was sufficient degree of support for the Treaty, regarded it as essential that the Treaty should not affect security commitments under existing treaties of mutual security, and considered that the safeguards agreement to be concluded by Australia with the IAEA in accordance with Treaty Article III must in no way subject Australia to treatment less favourable than is accorded to other states which, individually or collectively, conclude safeguards agreements with that agency.

[2] Together with a Protocol suspending the trilateral safeguards agreement between itself, the USA and the IAEA.

[3] Together with a Protocol on cooperation in the application of safeguards between Euratom and the IAEA.

[4] Entry into force is subject to notification that the requirements of Euratom and all states concerned (Belgium, Denmark, Federal Republic of Germany, Ireland, Italy, Luxembourg and Netherlands) for entry into force have been met.

[5] Together with a Protocol for states having minimal quantities of nuclear material.

[6] Covers the NPT and the Treaty of Tlatelolco.

[7] Agreements approved by the IAEA Board of Governors but not signed by 31 December 1973.

[8] Entry into force is subject to notification that the statutory and constitutional requirements for entry into force have been met.

[9] Together with a Protocol for states that have signed a Treaty of accession to Euratom.
[10] Together with a Protocol suspending the trilateral safeguards agreement between the IAEA, Denmark and the UK; and a Protocol suspending the trilateral safeguards agreement between the IAEA, Denmark and the USA.
[11] Notification of succession.
[12] The United States notified its non-acceptance of notification of signature and ratification by the German Democratic Republic.
[13] On signing the Treaty, the Federal Republic of Germany stated, *inter alia,* that it understood that its security shall continue to be ensured by NATO and that the Treaty shall not hamper European unification. It did not intend to ratify the Treaty before an agreement in accordance with Article III of the Treaty had been concluded between Euratom and the IAEA, and reaffirmed its view that, until the conclusion of the agreement between the IAEA and Euratom, the supply contracts concluded between Euratom and the parties to the Treaty shall remain in force.
[14] 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 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 under strict and effective international control.
[15] On signing the Treaty, Indonesia stated, *inter alia,* that the government of Indonesia attaches great importance to the declarations of the United States of America, 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. Its decision to sign the Treaty is not to be taken in any way as a decision to ratify the Treaty. Its ratification will be considered after matters of national security, which are of deep concern to the government and people of Indonesia, have been clarified to their satisfaction.
[16] On signing the Treaty, Italy stated, *inter alia,* that in its belief nothing in the Treaty was an obstacle to the unification of the countries of Western Europe; noted full compatibility of the Treaty with the existing security agreements; 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; and that pending the conclusion of the agreement between the IAEA and Euratom, the understandings reached on the matter of supplies between Euratom and the signatories to the Treaty would remain in force.
[17] On signing the Treaty, Japan stated, *inter alia,* that pending the ratification of the Treaty it would pay particular attention to developments in disarmament negotiations and progress in the implementation of the UN Security Council resolution on the security of non-nuclear-weapon states, and that the safeguards agreement to be concluded by Japan with the IAEA in accordance with Article III of the Treaty must not be such as would subject it to disadvantageous treatment as compared with the safeguards agreements which other parties concluded with the agency.
[18] A statement was made containing a disclaimer regarding the recognition of states party to the Treaty.
[19] 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 for the Prohibition of Nuclear Weapons in Latin America (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.
[20] Agreement was signed by the Netherlands for Netherlands Antilles and Surinam, covering the NPT and the Treaty of Tlatelolco, together with a Protocol for states having minimal quantities of nuclear material and a Protocol for the application of the Euratom NPT Agreement in the event of a declaration by the Netherlands that the Euratom Treaty becomes applicable. Entry into force is subject to notification that the statutory and constitutional requirements for entry into force have been met.
[21] On signing the Treaty, Switzerland stated that the Treaty would not be submitted to Parliament for approval until such time as a sufficient measure of universal support has been obtained by the Treaty.
[22] The Treaty was ratified in respect of the United Kingdom of Great Britain and Northern Ireland,

the Associated States (Antigua, Dominica, Grenada, Saint Christopher-Nevis-Anguilla and Saint Lucia) and Territories under the territorial sovereignty of the United Kingdom, as well as the State of Brunei, the Kingdom of Tonga and the British Solomon Islands Protectorate. The United Kingdom recalled its view that if a régime 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 régime by any other state. The provisions of the Treaty shall not apply in regard to Southern Rhodesia unless and until the government of the United Kingdom informs the other depositary governments that it is in a position to ensure that the obligations imposed by the Treaty in respect of that territory can be fully implemented. Cameroon stated that it was unable to accept the reservation concerning Southern Rhodesia. Also Mongolia stated that the obligations assumed by the United Kingdom under the Non-Proliferation Treaty should apply equally to Southern Rhodesia. In a note addressed to the British Embassy in Moscow, the Soviet government expressed the view that the United Kingdom carries the entire responsibility for Southern Rhodesia until the people of that territory acquire genuine independence, and that this fully applies to the Non-Proliferation Treaty.

Having become independent, Grenada is considered to be party to the NPT in its own right, as of 19 August 1974.

[23] Together with a Protocol relating to Article 13 of the Treaty of Tlatelolco.

[24] 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 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 the 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 NPT.

[25] On 26 February 1975, Sierra Leone deposited an instrument of accession to the NPT.

[26] On 26 March 1975, Western Samoa deposited an instrument of accession to the NPT.

The Sea-Bed Treaty

[1] On signing the Treaty, Argentina made an interpretative declaration. It stated that it interprets the references to the freedoms of the high seas as in no way implying a pronouncement or judgment 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 I, 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 seabed 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 seabed 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 seabed 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 seabed zone referred to in Article I and defined in Article II.

[4] The United States has not accepted the notification of signature by the German Democratic Republic.

[5] On signing the Treaty, the Federal Republic of Germany stated that its signature does not imply recognition of the German Democratic Republic under international law.

[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 sovereign 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 Sea-Bed 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 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.

[7] A statement was made containing a disclaimer regarding the recognition of states party to the Treaty.

[8] 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.

[9] Romania stated that it considered null and void the ratification of the Treaty by the Taiwan authorities.

[10] The instrument of ratification states that the Treaty is ratified in respect of the United Kingdom of Great Britain and Northern Ireland, the Associated States (Antigua, Dominica, Grenada, Saint Christopher-Nevis-Anguilla, Saint Lucia and Saint Vincent) and Territories under the territorial sovereignty of the United Kingdom, as well as the State of Brunei and the British Solomon Islands Protectorate. The United Kingdom recalled its view that if a régime 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 régime by any other state.

[11] On 25 Feburary 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, § 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 January 1975, the US Secretary of State presented the view of the USA concerning the Yugoslav note, as follows: "Insofar 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".

Insofar 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.

The BW Convention

[1] Considering the obligations resulting from its status as a permanently neutral state, the Republic of Austria declares a reservation to the effect that its cooperation within the framework of this Convention cannot exceed the limits determined by the status of permanent neutrality and membership with the United Nations.

[2] 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 in 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 medical or humanitarian nature and in conformity with the Charter of the United Nations. The statement was repeated at the time of the deposit of the instrument of ratification.

[3] Ireland considers that the Convention could be undermined if 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.

[4] 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 régime which has not been recognized by the Republic of Korea as a state or government.

[5] 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 Convention in respect of the said country.

[6] 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.

[7] Switzerland stated that the Convention would not be submitted to the parliamentary procedure of approval preceding ratification, until such time as the convention has obtained a measure of universal support, considered necessary by the Swiss government. Switzerland reserves the right to decide for itself which means fall under the category of weapons, equipment or means of delivery designed to use biological agents or toxins, to which the Convention is applicable. With regard to Article VII of the Convention, Switzerland has made a general reservation, namely, that its cooperation within the framework of the Convention cannot go beyond its obligations resulting from its status of permanent neutrality.

[8] The USSR stated that it considered the deposit of the instrument of ratification by Taiwan as an illegal act, because the government of the Chinese People's Republic is the sole representative of China.

[9] The United Kingdom recalled its view that if a régime 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 régime by any other state.

[10] The Convention was signed by Sweden on 27 February 1975, in London, Moscow and Washington.

[11] The instrument of ratification was deposited on 26 March 1975. On the same day, the convention entered into force.

16. Security aspects in the Law of the Sea debate

The present debate on the Law of the Sea concerns mainly the economic exploitation and distribution of sea resources, both renewable and non-renewable, marine environmental protection and related scientific research. Security considerations are being discussed only in connection with the status of international straits and, even then, principally in the context of great power interests. And yet, competition among maritime powers may lead to conflicts; nations may resort to arms in order to assert various kinds of authority on the seas.

Measures calling for restraint in military activities do not figure explicitly on the agenda of the Law of the Sea Conference, but they are inherent in the main theme of the conference—the peaceful use of ocean space. The purpose of this chapter is to examine how some minimum security requirements of coastal states could be incorporated in a new body of law.

I. *The high seas*

The reason usually given for the steady shrinkage of the area normally considered as high seas, open to all nations, is that modern technology has been continually providing more effective means to explore and exploit the resources of the oceans. An increasing number of coastal states have therefore been asserting sovereignty or special rights over large portions of the adjacent waters, and this development has been of crucial consequence. But it should be borne in mind that military uses of the oceans have also contributed to restricting the openness of the high seas. In particular, the great powers have been using parts of the high seas for large-scale military manoeuvres, for nuclear weapon tests and long-range missile re-entry tests, as well as for the emplacement of military installations and devices for tactical and strategic purposes. The air space over the high seas, outside the testing and military exercise zones, has not been entirely free either.

Military manoeuvres

It is generally considered lawful, in peacetime, for certain areas of the high seas to be declared temporarily dangerous for navigation while explosions connected with conventional naval target practice are taking place. The question is more complicated when it comes to large-scale naval manoeuvres and the testing of nuclear weapons or target accuracy of ballistic missiles. While most maritime nations engage in military manoeuvres at sea on the basis of reciprocity, only a few have been conducting nuclear and ballistic missile tests. In the latter case, danger zones are established for a longer time and are much larger than the zones set up for conventional exercises. A conventional exercise can be stopped immediately to avoid damage to an aeroplane or a ship entering the area by mistake or for other reasons. This may not prove feasible in the case of nuclear ballistic missile testing. In a few instances action was taken to inhibit and interfere with the presence of foreign vessels in the designated danger zones.

In the case of nuclear weapon explosions, there is an additional problem, that of environmental contamination by radioactive products. The 1958 Convention on the High Seas provides that measures should be taken to prevent such pollution of the seas (Article 25). In addition, the UN Declaration of 1970 requested states to prevent pollution and contamination of the marine environment, and the 1972 UN Conference on the Human Environment declared that the states have the responsibility to ensure that their activities do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction. Furthermore, a treaty prohibiting nuclear weapon tests in the atmosphere, outer space and underwater, has been in force since 1963. From the point of view of the Law of the Sea, the important fact is that some large-scale naval manoeuvres, as well as tests of nuclear weapons and ballistic missiles, impede free access to very large areas for fishing and maritime navigation and amount to a claim to appropriate parts of the high seas for exclusive use, albeit on a temporary basis.

It is likely that under the pressure of world public opinion, and as a result of progress in underground testing technology, nuclear tests in the atmosphere will eventually be brought to a halt. It would be less realistic to expect cessation of military manoeuvres and ballistic missile tests on the high seas. If anything, their frequency may increase in view of the increasing emphasis being placed on naval strategies, and because of the continuous development of missile guidance systems.

The danger zones for testing exercises on the high seas are usually activated and de-activated by notifications, issued on a voluntary basis. In addition, the USA and the USSR have established a common code of conduct for the commanding officers of their respective ships and aircraft engaged in naval operations, under a bilateral agreement of 25 May 1972 on the prevention of incidents on and over the high seas, and a protocol of 22 May 1973 to this agreement. The two powers have also undertaken to notify actions on the high seas which represent a danger to navigation or to aircraft in flight, and to exchange information between themselves concerning incidents between their ships and aircraft. But military exercises at sea can jeopardize the navigation of ships and aircraft of other states as well. Some exercises can also pose, or be perceived as, a threat to national security, interfere with the economic exploitation of the sea, or even cause damage. They should be subject, therefore, to strict, generally applicable international rules, binding for all.

A formula might be considered under which major military manoeuvres (the term "major" must be defined) and ballistic missile target practice, as well as any other military exercise presenting a danger to navigation or to aircraft in flight, should not be conducted in an area of international waters and international air space closer than, say, 200 miles from the coast of other states without their express authorization, and also outside this area where there is heavy international traffic. The state or states engaged in these exercises would be under an obligation to issue advance notification *ad omnes,* indicating the nature of the exercise, its estimated duration, including the estimated time of its beginning and end, and the geographical area involved. They would also be required to take all the necessary precautionary measures to avoid damage being caused to other states, or to their physical and juridical persons. If, notwithstanding the precautions, damage were caused, the state or states responsible for it should be liable to pay equitable compensation, according to procedures to be agreed separately.

Antisubmarine detection systems

Surveillance of foreign fleets has become a customary activity at sea and is limited only by international Rules of the Road under the 1960 "Regulations for Preventing Collisions at Sea", annexed to the Final Act of the International Conference on Safety of Life at Sea. The most disturbing development in surveillance operations is, however, in the field of antisubmarine warfare (ASW).

The characteristic feature of ASW lies in continuous dissemination in the ocean environment of systems of detection, the first necessary step towards identification, localization and eventual destruction of enemy submarines. The detection is carried out mainly by acoustic means which may be mobile or fixed. In mobile systems, aircraft and helicopters as well as surface ships and submarines are used.

Fixed antisubmarine detection systems consist of arrays of hydrophones deployed in an ocean basin, which are in communication with a shore-based computer, and can locate the submarine and track it. Arrays of bottom-mounted, upward-listening, interconnected sonars are emplaced along the coastlines of several nations. Other surveillance systems consist of sonars mounted on submerged towers. Yet another system now being developed consists of long-life sonobuoys, dropped from the air, which would moor to the bottom of the ocean and transmit information to receivers installed on satellites or aircraft. (For a detailed description of ASW equipment, see the 1974 SIPRI monograph, *Tactical and Strategic Antisubmarine Warfare.*)

Two types of mission are assigned to ASW forces. One mission consists of detecting adversary submarines entering certain large areas of the ocean, with a view to tracking them and keeping them under constant surveillance. Another mission consists in detecting adversary submarines in an area surrounding ships, both merchant and naval, with a view to protecting these ships and securing their safe passage. Both types of mission are probably unavoidable during war, especially all-out war, when the aim is to destroy any enemy craft, and when, in addition to the use of antisubmarine missiles, mines could be quickly laid at certain "choke points" in the oceans to destroy enemy submarines. However, in peacetime, the first type of mission does not seem to be essential or even desirable. Not only does it require ASW aircraft, helicopters and surface vessels, as well as attack submarines, called "hunter-killer" submarines, which are normally used for sea-lane defence, but it also requires fixed long-range ocean-surveillance systems.

To keep pace with the development of countermeasures, including technological improvements of submarines which are becoming faster and quieter and can remain submerged for long periods of time, ever more sophisticated acoustic-detection underwater installations may be emplanted on the ocean floor and impede peaceful activities in the high seas. From the military point of view, the installations in question may be helpful in any ASW operations, but for the second type of mission they do not seem indispensable. Moreover, inasmuch as it is also directed against ballistic missile-carrying submarines, large-area ASW detection combined with tracking activities can be extremely destabilizing for the strategic balance. It could be seen as an attempt to undermine the survivability of submarine forces, a keystone in the global strategy of the big powers, even though the likelihood of destroying all, or nearly all of these forces, simultaneously, and by a sudden attack, is remote.

A new important factor is that the range of submarine-launched ballistic missiles is constantly increasing. The present US Poseidon missiles have a range of 2 500 miles, while the range of Soviet missiles on "Yankee"-class submarines is 1 500 miles, and of missiles on new "Delta"-class submarines —4 200 miles. The future US Trident submarines will carry missiles initially with a range of 4 000 miles (C-4) and later probably 6 000 miles (D-5), while the recently test-fired Soviet missile, the SS-N-8, has already achieved about 4 900 miles.[1] Once submarine-launched ballistic missiles

[1] For the USSR, long-range submarine-launched ballistic missiles are especially important for geographical reasons: to reach the North Atlantic, Soviet submarines coming from the bases on the Kola peninsula have to cross the Greenland-Iceland-United Kingdom "barrier" which is under constant surveillance by US air and naval patrols and can by mined during wartime.

with a range exceeding 4000 miles are deployed in sufficient numbers by both sides, the area from which missiles can reach their vital targets will increase enormously. This will provide the strategic submarines with operational flexibility to select patrol areas where the effectiveness of acoustic ASW sensors is reduced, such as areas of prevailing seasonal storms, high biological noise or other phenomena. Submarines are becoming ever more versatile and elusive to ASW methods of warfare, but soon they may not even need to leave their closely guarded territorial or adjacent or internal waters to strike the enemy. The USA and the USSR will, in practice, have their own coastal ASW-free sanctuaries. Long-range surveillance systems in the oceans may then become dispensable. The feasibility of trailing nuclear missile-carrying submarines will be considerably reduced and the invulnerability of the sea-based deterrent will, thereby, further increase.

As long as no specific restraints concerning submarine and antisubmarine warfare have been agreed upon, a rule could perhaps be established proscribing the deployment of large, fixed ASW surveillance arrays in the high seas, so as to remove undesirable obstacles to navigation and the economic exploitation of the oceans, and also to curb the development of ASW strategic capabilities. As far as security is concerned, excessive transparency of the oceans may prove harmful. From the point of view of the Law of the Sea, national appropriations of the deep sea-bed as well as the resulting military control by maritime powers of the areas appropriated, are not compatible with the UN resolution declaring the ocean floor to be the common heritage of mankind.

II. *The continental shelf*

The legal status of the continental shelf, as determined in the Geneva Convention of 1958, is unclear. Article 2 of this convention states that the "coastal state exercises over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources". The emplacement of military devices on the shelf by the coastal state is neither expressly allowed nor expressly forbidden. One interpretation is that the coastal state does not have the right to use its shelf for military purposes or for purposes other than exploration and exploitation. Others claim that the coastal states are entitled to use the shelf for any purposes, as long as there is no impediment to navigation and fishing. One can, of course, argue that the right to explore and exploit implies the right to use means for the defence of these activities. It will be recalled that under Article 5 of the said convention, the coastal state is entitled to establish safety zones around the installations and other devices necessary for the exploration and the exploitation of its natural resources, and to take measures necessary for their protection, without causing interference to the use of recognized sea-lanes essential to international navigation. This right is likely to be maintained and perhaps even reinforced in a new Law of the Sea convention, in view of the proliferation of sea-bed installations for oil extraction in different parts of the world.

Another point at issue is whether states have the right to install devices unrelated to the exploration and exploitation of natural resources, and especially military devices, on the continental shelf of other states contrary to the wishes of the latter. Some countries, for instance Mexico, which regard the continental shelf as part of national territory, consider that any emplacement of weapons thereon by any other state is already prohibited by their own legislation. Canada holds the view that a coastal state has the right to verify, inspect or effect the removal of any weapon, structure, installation, facility or device emplanted or emplaced on the continental shelf, or the subsoil thereof, appertaining to that coastal state. A similar right was claimed by India at the time of its accession to the Sea-Bed Treaty, even though the treaty deals only with the prohibition of emplacement of weapons of mass destruction. The USA responded by insisting that the rights of coastal states over their continental shelves are limited by the Convention on the Continental Shelf and "other principles of international law."

Considering the recent ban on the emplacement of nuclear weapons and other weapons of mass destruction beyond a 12-mile sea-bed zone, and the much older restrictions on laying mines in peacetime outside territorial waters, it is difficult to see what kind of conventional weapons could be safely emplanted on the continental shelf of other states. Shore bombardment weapons and installations from which manned incursions could be mounted against a coastal state were mentioned in the debate on the Sea-Bed Treaty a few years ago. But the military value of such costly offensive systems would be doubtful, given their detectability and the need to protect them. More useful would appear to be devices monitoring communications of the coastal state and/or capable of disrupting them, submarine navigation systems, devices monitoring the entrance or exit of submarines to and from harbours, as well as instruments designed to render ineffective the surveillance and defences of another state. These devices and instruments would be more autonomous than weapon systems, but may still pose problems of information transmission and supply of power. They would also be sensitive to possible countermeasures. But technical difficulties can be overcome and the risks inherent in operations conducted far from the shores of the emplanting state might, perhaps, be found worth taking under certain circumstances.

Only a few states have the capability of carrying out, with required sophistication, significant submerged operations of military importance.

This is what they actually do on their own continental shelf. But it would be unjust to give them the right to use for military purposes the continental shelf of others, a right which in most cases could not be reciprocated. Military installations in the proximity of other states cannot be justified on the grounds that they serve the defence interests of the state emplacing them, even if the installations are not of a patently offensive nature. Moreover, the question of neutral rights and duties under the law of war could arise, if these activities were directed against a third state. It would seem useful therefore, to establish a sea-bed security zone adjacent to the coast, in which the coastal state would have the exclusive right to mount military equipment or other devices for military purposes (without obstructing international navigation) as well as to conduct research for such purposes. The zone would have to be sufficiently large to promote a sense of security among the smaller nations; preferably, it should cover the whole continental shelf. (The legal status of the superjacent waters must not be affected by the rules governing the sea-bed.)

Under the existing rules, consent of the coastal state is necessary even for peaceful ventures on the continental shelf, namely for research concerning the shelf and undertaken there. A consent régime for military ventures would certainly also be in order. In principle, the coastal state must have the right to allow another state to use its continental shelf for military purposes in the exercise of collective self-defence. In practice, however, certain countries would probably never exercise this right.

III. *International straits*

A different situation prevails in international straits. There, the problems are closely connected with the width of the territorial sea: a general extension of territorial waters to 12 miles, as has been proposed, would bring more than 100 straits, which have hitherto contained a high-sea band, completely under the sovereignty of the coastal states. In the existing conventions there is little to provide guidance for the solution of the difficulties which may arise. The rules relating to international straits are included in the 1958 Convention on the Territorial Sea and the Contiguous Zone in conjunction with rules governing so-called innocent passage through territorial waters in general. While in territorial waters innocent passage of foreign ships can be temporarily suspended, if this is essential for the protection of the security of the coastal state, such suspension is not allowed through straits which are used for international navigation between one part of the high seas and another part of the high seas or the territorial sea of a foreign state. Innocent passage has been described as not prejudicial to the peace, good order and security of the coastal state; submarines are required to navigate on the surface and to show their flag.

For most nations the right of passage through international straits is important from the point of view of merchant navigation. For major naval powers it is also important for military purposes. The USSR contends that its security depends on communications through international straits, and has indicated that it expected concessions on this issue in return for its agreement to a 200-mile economic zone. The USA has taken a similar line, insisting on air and sea mobility, and warning that it would not recognize a 12-mile limit as the breadth of the territorial sea, unless its postulates concerning straits were satisfied. In view of their global political and strategic aspirations these powers want to have complete freedom of transit through and over international straits, between one part of the high seas and another, including the right for submarines to transit submerged, instead of on the surface.

Another extreme position is represented, amongst others, by China, which considers a strait lying within the limits of the territorial sea to be an inseparable part of the territorial sea of the coastal state, and suggests that passage of foreign military ships be conditional on prior notification to or authorization by the authorities of that state.

A remarkable feature of the dispute over straits is that it is conducted more in legalistic than in practical terms. Not all international straits are of equal importance. Except when no other course is physically possible, as in Gibraltar or the Bosphorus and the Dardanelles, a strait may be a convenient but not an indispensable route for ocean transport. There may be a case for concentrating on those straits that are deemed vital for international navigation, instead of establishing a general principle. Specific agreements concerning transit through such straits could perhaps be concluded with due regard to the peculiarities of the region and the interests of the riparian countries, while in other straits an innocent-passage rule, as appropriately defined, would be applicable. There are already straits subject to special régimes under international treaties, and there is no noticeable tendency to sacrifice them in favour of some new uniform regulations.

Many nations consider the right of innocent passage as good enough. But the problem with innocent passage through territorial waters is that it has been very poorly defined in the Convention on the Territorial Sea and the Contiguous Zone and, for some states, straits used for international navigation, which are a part of the territorial sea of one or more states, fall under the same legal régime as that of any other portion of the territorial sea. A broad formula simply referring to the peace, good order and security of the coastal state is liable to subjective interpretation, and may be taken advantage of by the littoral states to the detriment of others. Attempts to work out a more precise definition seem to have been partly successful insofar as merchant shipping is concerned, but serious divergencies remain with regard to the passage of warships.[2] Some states contend that passage of warships cannot be innocent and do not allow entry of foreign naval vessals into their territorial waters without their consent. If such an interpretation persisted, the coastal state would be in a position to block passage of warships of some or all states, also through the strait under its control.

On the other hand, an unqualified right to free transit could be used abusively, either to exert political pressure on littoral or hinterland states by demonstrations of naval force, or even for surprise intervention from a convenient vantage point. But on this issue the major users of straits are willing to give a number of assurances. The United Kingdom, for example, has suggested that ships would not engage in any activities other than those incident to their normal modes of transit, and that they would refrain from any threat or use of force against the territorial integrity or political independence of states adjacent to straits. The USSR is prepared to provide that warships in transit through straits should not engage in any exercises or gunfire, use weapons of any kind, launch or land their aircraft, undertake hydrographical work or engage in other similar acts unrelated to the transit.

To minimize further the apprehensions of the coastal states, it might be useful to consider the introduction of an obligation to notify coastal states of forthcoming movements of major military vessels through international straits (the term "major" remaining to be defined). This would add to the *quid pro quo* concessions on the part of the users of the straits. And while in principle there should be no right to suspend passage through international straits, coastal states must be entitled to take measures with regard to foreign ships which refuse to comply with generally accepted regulations.

The problem of the submerged passage of submarines through international straits has assumed excessive importance. For tactical submarines, such passage in peacetime is not crucial. For strategic submarines with nuclear ballistic missiles on board, transit through straits in general, whether on or under the surface, is gradually becoming less essential in view of the increasing range of missiles. Moreover, not all important international straits may be deep enough to allow submerged passage of modern strategic submarines. There may soon be no need for ballistic-missile-carrying submarines to cross any international strait whatsoever in order to cover significant targets on the territory of the other side. This will probably happen sooner than the entry into force of any new Law of the Sea treaty.

The improvement in monitoring technologies is making it increasingly possible for coastal states to detect submarines. Nevertheless, passage of a submerged submarine close to the shore may be regarded as ominous in

[2] The term "warship" has been defined in some international documents, including the 1972 US-Soviet agreement on the prevention of incidents on and over the high seas, as meaning a ship belonging to the armed forces of a state bearing the external marks distinguishing such ship of its nationality, under the command of an officer duly commissioned by the government of that state and whose name appears in the appropriate service list, and manned by a crew who are under regular armed forces discipline.

view of its clandestine nature. It would, therefore, appear advisable to maintain in straits the same requirement for submarines as in the territorial waters outside straits, namely, to navigate on the surface and to show the flag, even though in certain instances submerged passage might be safer from the navigation point of view. Nothing could prevent a coastal state or states from allowing transit of submerged submarines, either generally, or in individual cases upon prior notification, notwithstanding the acceptance of the above principle.

Traffic safety regulations in the straits, especially with regard to nuclear-powered ships, tankers and ships with dangerous cargoes, are generally deemed indispensable to minimize incidents and risks of collision. Damage caused by violation of these regulations to states bordering the straits should entail international responsibility, irrespective of the type of vessel involved. Coastal states acting contrary to the existing regulations would have to be liable for damage caused to foreign ships.

As it is universally recognized that there is no right of innocent passage through the airspace over the territorial sea, detailed rules concerning aircraft would have to be worked out separately. The right of free overflight by military aircraft would have to be subject, *mutatis mutandis,* to similar restrictions aimed at ensuring the security of the coastal states as those regulating the passage of ships through straits.

IV. *Summary and conclusions*

A new system of rights and responsibilities in the oceans must take account not only of the aspiration of the international community to achieve a just distribution of marine resources, but also the states' natural right to security and self-preservation. With this in view, it is recommended that the future convention on the Law of the Sea should include provisions which would:

1. prohibit major military manoeuvres and ballistic missile target practice, as well as any other military exercise presenting a danger to navigation or to aircraft in flight, in certain specified areas of the high seas; require timely notification in the case of such exercises being conducted in other portions of the high seas, as well as equitable compensation for possible damage;

2. proscribe the emplacement of large ASW surveillance arrays on the ocean floor;

3. allow the establishment of a sea-bed security zone adjacent to the coast, in which the coastal state would have the exclusive right to install devices for military purposes and to conduct research for such purposes;

4. allow unimpeded passage of warships and military aicraft through international straits, subject to restrictions aimed at ensuring the security of

the riparian states, including notification of movements of major military vessels; and prohibit unauthorized submerged transit of submarines through international straits;

5. grant the coastal states the right to take measures with regard to all ships and aircraft refusing to comply with generally accepted regulations concerning passage through international straits.

The suggested measures should not be confused with arms control agreements, as they cannot, by themselves, significantly circumscribe the arms race. But they might help to meet the growing need for orderly development in the oceans.

17. Chronology of major events concerning disarmament and related issues

January–December 1974

1 January In a joint statement issued in New Delhi, the Prime Ministers of New Zealand and India express their opposition to the testing of nuclear weapons in all environments and their support for the objective of an immediate and permanent cessation of all test explosions of nuclear weapons.

9 January The President of Peru proposes that Peru and the neighbouring states freeze their arms purchases.

10 January The US Secretary of Defense announces that a change has taken place in the nuclear targeting strategy of the USA to provide selective options against different sets of targets, including military targets.

14 January Negotiations on the reduction of military forces in Europe resume in Vienna.

18 January An agreement on the disengagement of military forces is signed by Egypt and Israel.

20 February – 29 March The first session of the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts takes place in Geneva.

17–18 April The Political Consultative Committee of the Warsaw Treaty Organization (WTO) meets in Warsaw. The participants reaffirm their readiness to disband WTO simultaneously with NATO or, as an initial step, to liquidate their military organizations. They also declare that as long as NATO exists and effective disarmament measures have not been implemented, the WTO countries will consider it necessary to strengthen their defences and to develop close cooperation among themselves in this sphere.

30 April At the Conference of the Committee on Disarmament (CCD), Japan submits a draft convention on the prohibition of the development, production and stockpiling of chemical weapons and on their destruction.

18 May India explodes its first nuclear device. The Atomic Energy Commission of India explains that it is part of a programme for the study of peaceful applications of nuclear explosions with a view to possible uses of this technology in mining and earth-moving operations.

31 May An agreement on the disengagement of military forces is signed by Israel and Syria.

8 June A communiqué issued by the office of the President of France states that in view of the stage reached in carrying out the French nuclear defence programme, France will be in a position to pass on to the stage of underground explosions as soon as the series of tests planned for the summer of 1974 is completed.

12 June Following a discussion of recent developments in US targeting doctrine (see 10 January), the Ministers of Defence participating in the NATO Nuclear Planning Group welcome "the further insight given into the extent to which these developments enhance the credibility of deterrence against threats to NATO Europe and North America".

14 June The NATO Defence Planning Committee, meeting in ministerial session, states that recent developments in the US strategic nuclear targeting doctrine accord with the NATO strategy of flexibility in response. The participating ministers reaffirm the importance they attach to the principle that NATO forces should not be reduced except in the context of an agreement with the East.

14 June In a joint declaration, the US and Egyptian Presidents announce that the two governments will begin negotiation of an agreement for cooperation in the field of nuclear energy under agreed safeguards; that upon conclusion of such an agreement the United States will sell nuclear reactors and fuel to Egypt; and that pending this agreement a provisional agreement will be concluded for the sale of nuclear fuel to Egypt.

17 June In a joint statement, the US President and the Israeli Prime Minister announce that the two governments will negotiate an agreement on cooperation in the field of nuclear energy, technology and the supply of fuel from the USA under agreed safeguards, involving the purchase by Israel of nuclear power reactors; as an immediate step, Israel and the USA will reach provisional agreement on the further sale of nuclear fuel to Israel.

20 June – 29 August The first working session of the third United Nations Conference on the Law of the Sea takes place in Caracas, Venezuela.

25 June The Fifth Islamic Conference of Foreign Ministers held in Kuala Lumpur calls upon all nuclear-weapon states to undertake an obligation not to use or threaten to use nuclear weapons against any non-nuclear-weapon states.

26 June The Declaration on Atlantic Relations is signed in Brussels in the presence of heads of state and government. The members of NATO state that the strategic relationship between the USA and the USSR has reached a point of near equilibrium; that the alliance must pay careful attention to the dangers to which it is exposed in the European region; and that the European members who provide three-quarters of the conventional strength of the alliance in Europe, and two of whom possess nuclear forces capable of playing a deterrent role of their own contributing to the overall strengthening of the deterrence of the alliance, undertake to make the necessary contribution to maintain the common defence at a level capable of deterring and, if necessary, repelling all actions directed against the independence and territorial integrity of the members of the alliance. The USA reaffirms its determination not to accept any situation which would expose its allies to external political or military pressure and states its resolve to maintain forces in Europe at the level required to sustain the credibility of the strategy of deterrence. All members of the alliance agree that the continued presence of Canadian and substantial US forces in Europe plays an irreplaceable role in the defence of North America as well as of Europe and that similarly the substantial forces of the European allies serve to defend Europe and North America as well.

26 June A spokesman of the Foreign Ministry of Pakistan says that China has promised to continue to support Pakistan in its struggle in defence of national independence and sovereignty against foreign aggression and interference, including defence against nuclear threat and nuclear blackmail.

3 July The USA and the USSR sign a protocol to the ABM Treaty, providing for the limitation of each side to a single deployment area for anti-ballistic missile systems, and a treaty on the limitation of underground nuclear weapon tests. In a communiqué, issued in Moscow, the two powers conclude that the Interim Agreement on offensive strategic weapons, of 1972, should be followed by a new agreement on the limitation of strategic arms; express themselves in favour of increasing the effectiveness of the Non-Proliferation Treaty; agree to consider a joint initiative in the Conference of the Committee on Disarmament with respect to the conclusion, as a first step, of an international convention dealing with the most dangerous, lethal means of chemical warfare; and reaffirm that a world disarmament conference at an appropriate time can play a positive role. In another joint statement, the USA and the USSR advocate the most effective measures possible to overcome the dangers of the use of environmental modification techniques for military purposes.

19 July Czechoslovakia and the Federal Republic of Germany exchange the instruments of ratification of the treaty normalizing relations between the two countries, signed on 11 December 1973.

21 July In a speech in Warsaw, the General Secretary of the Central Committee of the Communist Party of the USSR says that it would be useful to agree on the withdrawal from the Mediterranean of all Soviet and US ships and submarines carrying nuclear weapons.

27 July The President of Portugal announces that his country is prepared to offer independence to its African territories—Angola, Mozambique and Portuguese Guinea.

8 September In a joint Pakistan-Sri Lanka communiqué, issued in Islamabad, the prime ministers of the two countries suggest that all littoral and hinterland states of the Indian Ocean should coordinate their efforts to realise their commitment to a policy of denuclearization which would entail the permanent renunciation of a nuclear-weapon option and the denial of the use of their territories, territorial waters and air space to nuclear weapons of other states.

23 September The French Minister for Foreign Affairs states at the UN General Assembly that France has taken steps to continue its nuclear-weapon programme by testing underground.

24 September The USSR submits to the UN General Assembly a draft convention "on the prohibition of action to influence the environment and climate for military and other purposes incompatible with the maintenance of international security, human well-being and health".

24 September–18 October A conference of government experts on weapons that may cause unnecessary suffering or have indiscriminate effects, meets in Lucerne, Switzerland, under the auspices of the International Committee of the Red Cross, to prepare a report on the technical, operational and legal possibilities of limiting the use of certain weapons.

6 October The General Secretary of the Central Committee of the Communist Party of the USSR, speaking in Berlin, reiterates his proposal for an agreement on the withdrawal from the Mediterranean of Soviet and US ships and submarines carrying nuclear weapons.

11 October The 61st conference of the Inter-Parliamentary Union, held in Tokyo, adopts a resolution calling for a complete ban on nuclear tests, a prohibition on the development and production of chemical weapons, and a reduction of military budgets of states.

17 October A joint Finnish-Soviet communiqué, issued in Helsinki, notes the importance and the topicality of the proposals put forward by Finland for the establishment of a nuclear-free zone in Northern Europe.

24 October The French President states at a press conference: ". . . as far as non-nuclear powers are concerned, I believe that France should neither use nor even threaten to use nuclear weapons."

25 October The Egyptian representative to the UN General Assembly states that Egypt is ready to ratify the Non-Proliferation Treaty, if Israel becomes party to it.

30 October In a joint Indo-US communiqué, issued in New Delhi, India affirms its policy not to develop nuclear weapons and to use nuclear technology for peaceful purposes only.

31 October At the Vienna talks on the reduction of forces in Central Europe, the socialist countries submit a modified version of their original proposal. It provides for the 11 direct participants in the talks to reduce their armed forces by 20000 in 1975, with the USA and the USSR making the first reductions.

5 November The UN General Assembly adopts a resolution urging all countries concerned to ratify or accede to the Non-Proliferation Treaty or finalize their safeguards agreements with the IAEA as soon as possible in accordance with the provisions of that treaty.

12 November The UN General Assembly notes with concern that there has been further radioactive contamination from nuclear weapon tests.

12 November The UN General Assembly commends the text of a convention on registration of objects launched into outer space and requests the Secretary-General to open it for signature and ratification.

24 November As a result of a meeting held in Vladivostok between the leaders of the USA and the USSR, it is decided that a new agreement between the two powers will include the following limitations of strategic offensive arms: (*a*) both sides will be entitled to have a certain agreed aggregate number of strategic delivery vehicles; and (*b*) both sides will be entitled to have a certain agreed aggregate number of ICBMs and SLBMs equipped with multiple independently-targetable re-entry vehicles (MIRVs).

1 December The President of Israel states that Israel has a potential for nuclear weapons development.

2 December The US President reveals the aggregate numbers of strategic offensive arms for the USA and the USSR, agreed upon during the US-Soviet summit meeting on 24 November: 2400 ICBMs, SLBMs and heavy bombers, of which 1320 can be armed with MIRVs.

7 December In a communiqué issued at the conclusion of an official visit to France by the General Secretary of the Central Committee of the Communist Party of the USSR, the two sides declare that the aim of their efforts in the field of disarmament is the attainment of general and complete disarmament under effective international control, the most important part of which is nuclear disarmament. France and the USSR support the idea of convening a world disarmament conference.

9 December Representatives of Peru, Bolivia, Venezuela, Panama, Argentina, Chile, Colombia and Ecuador, meeting in Lima, Peru, issue the

"Declaration of Ayacucho" in which they express their commitment to create conditions conducive to effective arms limitation, and to put a stop to the acquisition of arms for aggressive ends, in order to devote all possible resources to the economic and social development of each country. They also condemn the use of nuclear energy for other than peaceful purposes.

9 December The UN General Assembly adopts resolutions in which it urges the USA and the USSR to broaden the scope and accelerate the pace of their strategic arms limitation talks; condemns all nuclear weapon tests; initiates studies on the peaceful applications of nuclear explosions; appeals to France and the USA to ratify Additional Protocol I, and to the USSR—to ratify Additional Protocol II of the Treaty of Tlatelolco; reaffirms its call upon all states to consider Africa as a nuclear-weapon-free zone; endorses, in principle, the concept of a nuclear-weapon-free zone in South Asia; commends the idea of the establishment of a nuclear-weapon-free zone in the region of the Middle East; decides to undertake a comprehensive study of the question of nuclear-weapon-free zones in all its aspects; requests the littoral and hinterland states of the Indian Ocean to enter into consultations with a view to convening a conference on the Indian Ocean; invites all states to become parties to the 1972 Convention prohibiting the development, production and stockpiling of biological and toxin weapons, and the 1925 Geneva Protocol prohibiting the use of chemical and bacteriological means of warfare; urges all states to refrain from the production, stockpiling, proliferation and use of napalm and other incendiary weapons pending the conclusion of agreements on the prohibition of these weapons; requests the CCD to elaborate an agreed text of a convention prohibiting environmental means of warfare; endorses the enlargement of the composition of the CCD; and decides that the *Ad Hoc* Committee on the World Disarmament Conference should continue its work.

12 December The UN General Assembly adopts a charter of economic rights and duties of states, which provides, among other things, that a substantial portion of resources freed by effective disarmament measures should be allocated for the development needs of developing countries.

13 December In a communiqué issued in Brussels, the Foreign Ministers of the North Atlantic Treaty Organization reaffirm their commitment to the establishment of approximate parity in the form of an agreed common ceiling for the ground force manpower of NATO and the Warsaw Treaty Organization in the area of reductions.

14 December The UN General Assembly approves a definition of aggression. It recommends that the UN Security Council should take account of this definition as guidance in determining, in accordance with the Charter, the existence of an act of aggression.

16 December A communiqué issued at the conclusion of a meeting between the US President and the French President, in Martinique, states that the two leaders have explored how, as exporters of nuclear materials and technology, the two countries could coordinate their efforts to assure improved safeguards of nuclear material.

16 December The US Senate consents to the ratification of the 1925 Geneva Protocol prohibiting the use of chemical and bacteriological means of warfare, and the 1972 convention on the prohibition of the development, production and stockpiling of biological and toxin weapons and on their destruction.

20 December The International Court of Justice delivers a judgement in the case concerning nuclear tests in the South Pacific Region. It finds that, since France has announced its intention to cease the conduct of tests in the atmosphere, the objective of Australia and New Zealand in instituting proceedings against France has been achieved and the claim of the applicants no longer has any object.

Errata

World Armaments and Disarmament, SIPRI Yearbook 1974

Page 21, lines 6–7. For "urban counterinsurgency" read "urban insurgency or guerilla warfare".

INDEX

D

E

F

G

H

I

World Armaments and Disarmament

SIPRI Yearbook 1975

This is the sixth SIPRI Yearbook. The aim is to bring together information on world armaments and military expenditure and developments in efforts made to limit or reduce them. The first five Yearbooks attracted worldwide attention and were used extensively in the United Nations, the Geneva disarmament negotiations and in national political circles as an authoritative source of information.

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