

SIPRI Yearbook of World Armaments and Disarmament

1969/70

Stockholm International Peace Research Institute

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SIPRI

Stockholm International Peace Research Institute

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and Disarmament**

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PREFACE

The aim of the Yearbook is to produce a factual and balanced account of a controversial subject—the arms race and attempts to stop it—as it appears to an international staff working on neutral soil.

The authors are conscious of the problem of avoiding biases. Much of the material comes perforce from United States publications, notably Congressional records and technical journals. The Soviet Union and China publish little or nothing on these subjects. The smaller countries, including those in the West, are not nearly as free with information as the United States. No judgement is implied, therefore, in the almost exclusive use of United States examples, nor was United States material, or other material, used uncritically. Suggestions, corrections, comments and criticisms would be welcome.

The material was sent to the printer at the end of July this year. The main sections were brought up to date in September 1970.

All members of the staff had some hand in the preparation of the Yearbook. There was a considerable interchange of material and comments: for example, Milton Leitenberg provided reference material for a number of sections other than those for which he was particularly responsible. The work was directed and the Yearbook was edited by Frank Blackaby, assisted by Rosemary Proctor.

Below is a list of those responsible for the main sections:

Chapter 1.

World military expenditure	Ron Huisken
	Frank Blackaby
The arms trade	Eva Göransson

Chapter 2.

The main arms race: SALT	Robert Neild
	Milton Leitenberg
European security	Hans von Schreeb
	Frank Blackaby

Chapter 3.

The militarization of the deep ocean	Sven Hirdman
The sea-bed treaty	Jozef Goldblat

Preface

Chapter 4.

The CBW debate and other disarmament measures Jozef Goldblat

Reference material:

World military expenditure; military grant aid Ron Huisken
US estimates of Soviet expenditure on military research Randall Forsberg

World stocks of fighting vessels Ron Huisken
Frank Blackaby

Arms trade in major weapons; arms trade register Eva Göransson
Signe Landgren

Some Soviet missiles: US views; world stockpile of nuclear material Robert Neild
Milton Leitenberg

Nuclear weapons testing programmes Milton Leitenberg

Past proposals for disarmament and arms regulation in Europe Prvoslav Davinic

Chronology of major disarmament efforts, September 1969 to September 1970 Jozef Goldblat

List of states which have signed or ratified arms regulation treaties; list of United Nations resolutions on disarmament and conflicts Mirkku Vuorenkoski

The special article on the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco) was written by Dr Alfonso García Robles, Chairman of the Preparatory Commission which drafted the treaty.

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ABBREVIATIONS AND CONVENTIONS

For definitions of some of the weapon terms, see the Glossary, page 486. These abbreviations are used generally throughout the book.

Abbreviations

Anti-ballistic missile	ABM
Advanced manned strategic aircraft	AMSA
Advanced sea-based deterrent	ASBD
Anti-submarine warfare	ASW
Anti-submarine warfare environmental prediction system	ASWEPS
Ballistic missile ship	BMS
Chemical and biological warfare	CBW
Circular probable error	CEP
Counter-insurgency	COIN
Conference of the Committee on Disarmament	CCD
Cable-operated underwater recovery vehicle	CURV
Deep ocean technology	DOT
Deep ocean survey vehicle	DOSV
Deep submergence rescue vehicle	DSRV
Deep submergence systems project	DSSP
Deep submergence search vehicle	DSSV
Eighteen-Nation Disarmament Conference	ENDC
Fractional orbital bombardment system	FOBS
International Atomic Energy Agency	IAEA
Intercontinental ballistic missile	ICBM
Initial operating capacity	IOC
Intermediate-range ballistic missile	IRBM
Magnetic anomaly detector	MAD
Military Assistance Program	MAP
Multiple individually-targetable re-entry vehicle	MIRV
Medium-range ballistic missile	MRBM
Multiple re-entry vehicle	MRV
Manned underwater station	MUS
North Atlantic Treaty Organization	NATO
Non-Proliferation Treaty	NPT
Research and development	R&D
Strategic Arms Limitation Talks	SALT

Abbreviations and conventions

Submarine-launched ballistic missile	SLBM
Short take-off and landing	STOL
Undersea long-range missile system	ULMS
World War I	WWI
World War II	WWII

Country terminology

For the convenience of the reader, we have on occasion used the geographical rather than the formal official version for certain countries.

For example:

German Democratic Republic	East Germany
Federal Republic of Germany	West Germany
Democratic Republic of Viet-Nam	North Viet-Nam
Republic of Viet-Nam	South Viet-Nam
Democratic People's Republic of Korea	North Korea
Republic of Korea	South Korea
Republic of China	Taiwan

Conventions

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

Data not available	... or ..
Nil, or less than half final digit shown	—
Million	mn. or m.
Billion (a thousand million)	bn.
Kiloton	kt.
Megaton	mt.
Ton	t.
Fiscal year	FY
Nautical mile	nm. or n. mi.

Conversions

1 kilometer = 0.62 mile
1 meter = 39.37 inches
1 foot = 30.480 centimeters
1 nautical mile = 6 076.115 feet or 1 852 meters
1 ton = 2 000 pounds or 0.907 metric tons
1 kiloton = 1 000 tons
1 megaton = 1 000 000 tons
1 knot = 1 nautical mile per hour

Introduction, summary and guide

Une traduction de l'introduction en français se trouve à la page 489.

Die deutsche Übersetzung dieser Einleitung ist auf Seite 500 zu finden.

Перевод предисловия на русский язык находится на странице 511.

La introducción español se encuentra en la página 522.

There is an index at the back of the book

This is the second edition of the *SIPRI Yearbook*. The purpose remains the same: to provide a synoptic view of world armaments and military expenditure, and of the progress made, if any, in limiting or reducing them. The underlying values also remain the same: the belief that the world is devoting an excessive quantity of resources to preparations for mutual slaughter, and that this quantity could, with advantage, be reduced. This does not imply any simplistic view that armaments are the sole, or even the main, cause of war: it does imply a belief that the competition to acquire arms and develop new weapons is an exacerbating factor in international relations, creating suspicion and tension, threats and counter-threats.

The book begins with an examination of trends in world military expenditure. It then discusses the arms trade with third world countries—which is the main route for the spread of conventional sophisticated weapons round the world. It then concentrates on four fields: the nuclear arms race and the strategic arms limitation talks; the levels of troops and weapons in Europe, and the possible talks on arms limitations and force reductions which might accompany moves towards a European Security Conference; the militarization of the deep ocean and the denuclearization of the sea-bed; and the current discussions on the prohibition of chemical and biological warfare. In the chapter on the deep ocean and elsewhere, the book attempts to bring together material on weapons and military developments with discussions of disarmament proposals. These two subjects—weapons analysis and disarmament analysis—tend generally to be treated in separate publications; they should be treated as part of the same story.

There is one general caveat made last year which must be repeated this year. The vast bulk of material on weapons development is American. There is virtually nothing about it in the open literature in the Soviet Union. This may give the impression that the United States alone is advancing new wea-

pons technology—which is, of course, false. It is just that the United States is in the forefront of this technology, and that it publishes material about it. This makes it inevitable that US developments are given most attention. It is a fair assumption that other nations are moving in the same direction.

World military expenditure

World military expenditure, in real terms (that is, after removing the effect of inflation) did not rise in 1969. This followed three years in which it had gone up by 30 per cent. In 1970 it seems certain it will fall, perhaps by about 2 per cent. Military expenditure is budgeted to come down significantly in the United States, and to rise very little in the Soviet Union. In 1968 and 1969 the world was devoting about 7 per cent of its output to military uses. This year the figure should come down slightly.

In the United States, spending on Viet-Nam accounts for most of the rise and fall. The question was raised last year whether, as military spending in Viet-Nam went down, other spending on strategic forces or research and development would go up to take its place. So far, this has not happened. There are, however, a large number of new military projects in early development stages, and the second half of the reduction in spending in Viet-Nam is still to come. Other NATO countries have shown no rise in military spending for some years. The Soviet Union's military expenditure rose more than 35 per cent from 1965 to 1969—faster than that of the United States, in real terms. Other Warsaw Pact countries' expenditure—according to their budget figures—rose even faster.

Military spending in the underdeveloped countries is a very small part of the world's total. It has, however, been rising faster than in the developed countries. This is entirely due to the very rapid increase in spending in the Middle East. If this is excluded, the rates of rise in the two areas, developed and underdeveloped, become about the same.

Arms trade with underdeveloped countries

Identified deliveries of major weapons—ships, aircraft, tanks and missiles—to underdeveloped countries in 1969 totalled some \$1 1/2 billion (at 1968 prices). This was below the figure for the peak year 1967; it was the third highest in the post-war period.

The underlying trend in these arms supplies is still probably upwards. United States policy under the "Nixon doctrine" pronounced at Guam—that in most cases a threatened nation should itself assume the primary

responsibility for its defence—is likely to require an increase in military supplies to client states. In 1969, US arms supplies to Far Eastern countries—particularly Taiwan and South Korea—were higher than in any year since the mid-fifties. Supplies from the Soviet Union in 1969 were probably lower than in the two previous years. The bulk of the re-equipment of the UAR forces was over before the beginning of the year and supplies of anti-aircraft missiles to North Viet-Nam have fallen. India was the other big recipient of Soviet arms supplies in 1969. Other Soviet supplies have been going to South Yemen, Pakistan, Sudan, Mauritania, Nigeria and Libya.

Britain in 1969 delivered a good deal of military equipment to the oil-rich Middle East countries; there and elsewhere it is successfully selling refurbished Hawker Hunters. It has also received substantial orders from the naval build-up in Latin America. French major weapons sales fell in 1969, because of its embargo on arms to Israel; but sales seem likely to recover this year. Substantial new orders have been received from North Africa (Libya, Algeria), Latin America, and Greece.

The Middle East still takes the largest share of third world imports of major weapons. These are not simply supplies to belligerents in the Arab-Israeli war: Saudi Arabia, Iran and the Persian Gulf states have been purchasing substantially. Supplies to Far Eastern countries were very high last year. Latin American countries are continuing to turn to Europe rather than the United States for their purchases of sophisticated weapons: they made large orders for naval vessels, particularly submarines, last year.

Background to the strategic arms limitation talks

The chapter presents a comparison of the nuclear weapons with which the USA and USSR confront each other. It avoids the classification “strategic” and “tactical”, and gives estimates of all nuclear weapons, facing either East or West, distinguishing them according to whether they can hit any part of the main opponent’s country, the fringes of that country, or the territory of allies only.

The United States in the fifties and early sixties moved ahead very fast with nuclear weapons. As from around 1966 the Soviet Union began to catch up in land-based intercontinental missiles: but it still has far fewer bombers, and it is only just beginning to deploy Polaris-type ballistic-missile submarines. The Soviet missile much in the news—designated the SS-9 in the West—has been coming in at the rate of about 50 a year since 1964. There is some uncertainty about how many new sites for it are being started

now. A detailed analysis and reconstruction of US estimates of the number of SS-9s is given.

The USA is pushing ahead very fast with installing multiple warheads for missiles and developing new stand-off missiles for bombers—a programme which is designed to give it some 10 000 warheads on long-range weapons alone by 1975. It is also pressing ahead with a new long-range bomber and with the early stages of a new ballistic-missile submarine. The Soviet forward plans are not known. One of the motive forces behind the forward plans on both sides is the fear—certainly professed on the US side and probably entertained on the Soviet side as well—that the potential enemy is trying for a first-strike capability. This fear seems fanciful.

The balance of terror is not delicate: quite substantial changes in the numbers of warheads on one side or the other would not effectively alter the power balance. There is consequently a wide range of possible agreements on numbers on either side which would leave both sides with a second-strike capability, and neither side with a first-strike capability—which is the apparent condition of stability.

European security and disarmament

It is possible that, in some form, some dialogue might begin between NATO and Warsaw Pact powers on some form of disarmament or arms regulation in Europe. (This chapter is only concerned with the disarmament aspect of European security questions.) There has been a certain convergence of NATO and Warsaw Pact proposals.

If such a dialogue does take place, it seems probable that it would start with troops and weapons in the Central Region—that is, West Germany and Benelux on the one hand, and East Germany, Poland, Czechoslovakia and perhaps Hungary on the other. There is no obvious stopping-place between discussions of forces in these areas, and discussions of all troops and weapons of all NATO and Warsaw Pact powers wherever deployed.

The chapter discusses at length the estimates of the forces on either side, and their assessment. The prevalent military view expressed in the West is that NATO conventional forces are much inferior, and that if the Warsaw Pact launched a conventional attack, it could be held for at most ten days. This view has been questioned: and the chapter sets out the various arguments—about counting divisions or counting the numbers of troops, about reinforcement possibilities, about the significance of the Warsaw Pact superiority in tanks, about the relative merits of the different air forces in Europe, and so on.

Because of their belief in their conventional inferiority, the NATO powers

have indicated that if there were a conventional war, they would at some point be prepared for the “sample” first use of a nuclear weapon. The chapter gives a summary of NATO’s current policy about the use of nuclear weapons, and sets out some of the criticisms of it.

Various points arise from this discussion of weapons and troops, as background to any disarmament discussions. Because an offensive force needs a marked degree of superiority over a defensive force if it is to have a chance of success, an agreement on exact parity of forces is not necessary for security. There are a large number of past plans for force reductions which might be re-examined, mainly proposals from the Soviet Union or other East European countries, which were rejected by the Western powers when they were insisting on the reunification of Germany as a precondition of any agreement. There are a number of ancillary proposals also—for example, for ground observation posts or for limitations on manoeuvres—which could be disinterred. Further, it should be possible at least to reduce the enormous number of nuclear weapons held in Europe, particularly on the Western side.

The militarization of the deep ocean: the sea-bed treaty

This chapter presents a juxtaposition of material on armaments and disarmament. The deep ocean was chosen for two reasons: first, this is an area where military technology is expanding rapidly, and secondly, there is a draft treaty being considered which bans weapons of mass destruction from the sea-bed.

The chapter begins with a discussion of the factors leading to the militarization of the deep ocean—in particular the advantages the ocean provides for concealment: it considers the disadvantages too, such as the problem of communications. It then looks in particular at anti-submarine warfare: the means of detection, the weapons systems used in the detection process, and the means of attack.

The next section deals with the new technologies and the new developments on the ocean floor. On new technologies, it concludes that the technology already exists for operations on the continental shelf, and that operations down to a depth of 20 000 feet—comprising virtually the whole of the ocean—will be possible by the year 2 000.

Advanced undersea mobile systems are being developed very rapidly. Free-swimming submersibles already operate at depths of 7 000 feet; and the next generation of military submarines, if they are developed, are likely to be

Introduction

able to do the same, and may be serviced entirely from undersea installations. Bottom installations at the moment consist mainly of anti-submarine detection systems: later manned underwater stations may become operational. Fixed missile installations on the sea bottom were not seriously contemplated, even before the sea-bed became a disarmament issue in 1967.

The sea-bed is the subject of a draft treaty and the chapter contains a comprehensive account of the negotiations on the treaty up to September 1970. There was originally a Soviet proposal for a comprehensive treaty, prohibiting the use of the sea-bed for all military purposes. The United States counter-proposed a treaty for preventing the use of this environment for the emplacement of weapons of mass destruction. Following major concessions by the Soviet Union, a joint treaty was tabled which was basically the United States proposal, limited to weapons of mass destruction. The changes made to the draft treaty between the first and fourth versions have not changed its essence.

The significance of the draft treaty is low. It amounts to the banning of something which does not exist and which even without the treaty was not likely to develop. In its present form it will not do much to limit the military uses of the sea-bed, still less those of the deep ocean. The treaty assumes that the sea-bed is an area which can be dealt with separately from the rest of the deep ocean: this is not so.

Chemical and biological warfare

In 1969 and 1970 the debate on chemical and biological warfare has been more active than at any time since World War II. The chapter discusses first the pressure to bring about universal adherence to the 1925 Geneva Protocol. This was mainly directed towards the United States, the only big power not yet party to the Protocol.

On 25 November 1969 the President of the United States said he would submit the Protocol to the Senate. In the same statement he renounced the use of lethal biological agents, and said that biological research in this field would be confined to defensive measures and that existing stocks of bacteriological weapons would be disposed of. It was later made clear that this renunciation embraced toxins. The President also renounced the first use of lethal and incapacitating chemical weapons: but it was made clear that this did not include harassing chemicals, such as tear gas or anti-plant agents. The Protocol was submitted to the Senate for ratification on 19 August 1970. The chapter sets out the arguments on either side on whether tear gas and anti-plant chemicals are banned by international law.

Both the Geneva Disarmament Conference and the United Nations extensively discussed whether chemical and biological weapons should be treated separately or jointly. The chapter gives a comprehensive account of the arguments presented on either side. It summarizes the discussion on the British draft convention on biological weapons, and the nine Socialist countries' draft convention prohibiting both chemical and biological weapons.

The chapter concludes that the prospects of agreeing on a convention prohibiting the production and stockpiling of both chemical and biological weapons are not good: the United States has declared that to insist on a single agreement covering both biological and chemical weapons would be to accept that there would be no concrete advance for a long period of time. On the other hand, a treaty banning biological weapons only would not have much more value than a unilateral renunciation, if this were forthcoming from all the major powers.

Another possibility is a treaty which would ban biological weapons and provide for a cut-off of production and non-transfer between countries of at least the most lethal chemical agents, suitable only for use in war. This would be an intermediate step towards a total prohibition.

Other disarmament measures

No noticeable advances were made on other disarmament fronts. The Non-Proliferation Treaty came into force on 5 March 1970. However, a number of states with advanced nuclear technology—Israel, South Africa, India, Pakistan, Brazil and Argentina—have not signed the treaty. For other states, the problem now is to work out control procedures to prevent the diversion of fissile material from civil to military uses. At the latest by March 1972, two years after the coming into force of the treaty, the first safeguards agreements must be ready for application. An IAEA committee has drawn up a model agreement of this kind.

Little progress was made towards the cessation of underground nuclear testing. The General Assembly requested the Secretary-General to enquire of member nations whether they were willing to co-operate in the exchange of seismic data, and if so to report what equipment they had; the object was to facilitate agreement on the verification of a comprehensive test-ban treaty. At the UN's request, the Geneva Disarmament Conference agreed to consider the military aspects of radiological and laser technology. Finally, the UN General Assembly declared the decade of the 1970s a Disarmament Decade, and efforts are being made to elaborate a long-term disarmament programme.

Special article

There is a special article on the Latin American nuclear-free zone. This is the first and only such zone in populated territories of the world. The article describes the negotiations which set up the treaty, and the nature and functions of the body which supervises it. The article was written by Dr Alfonso Garcia Robles, who was the Chairman of the Preparatory Commission which drafted the treaty.

Reference material

There is a full set of military expenditure figures for a run of twenty years, at current and constant prices. In addition, this year estimates are given of the value of Western powers' military grant aid. For some purposes, it is more sensible to look at the total amount devoted to military purposes in recipient countries—whether from the country's own resources or from grant aid. The grant aid series makes this possible.

Recently, official US estimates have been published of the upward trend in Soviet military research and development expenditure. A short section examines the US material which attempts to quantify this expenditure, and concludes that it is impossible to make good estimates either of the level or the trend from published Soviet data.

The *Yearbook* presents estimates of the world's stock of fighting vessels, for five years—1950, 1955, 1960, 1965, and 1968. It is the first of a series of world weapon stock tables. The tables show the fall in the number of major vessels and the rise in the number of minor ones. A valuation system is used to make a single estimate for the main countries and areas and for the world as a whole. The calculation suggests that the world's stock of fighting vessels is rising at a rate of about 5–6 per cent a year at constant prices. This rate of rise is about the same for the developed and for the underdeveloped countries. However, in the underdeveloped countries it is mainly an increase in numbers: in the developed countries it is due, not to an increase in numbers, but to product improvement. The comparison suggests that NATO's stock of fighting vessels is about twice as great as that of the Warsaw Pact. If the value of naval bases were added into the calculation, the difference between the two blocs would be greater.

The estimates of the value of the arms trade in major weapons with third world countries are brought up-to-date for 1969: and there is an Arms Trade Register of all major identified transactions with third world countries for 1969, with a provisional register for the first half of 1970.

As background to SALT, the *Yearbook* gives a detailed analysis of United States official statements about deployment of the Soviet missile designated SS-9 and the Soviet Polaris-type submarine. It provides a brief on world stocks of nuclear weapons which indicates the vast amount of lethal power, equivalent probably to some 15 tons of TNT for every person in the world, now stocked in the arsenals of the two great powers. The figures for nuclear-weapons tests are brought up-to-date: 1970 shows every sign of being a very high year, with a large number of United States tests. Nine or ten United States underground tests have vented—that is, released radioactive material to the atmosphere—in the last eighteen months. France has conducted a series of atmospheric tests.

As background material to possible discussions of European disarmament, there is a full account of past proposals for disarmament in Europe—proposals for force reductions or disengagement, for measures to prevent surprise attack, and for the development of nuclear-free zones. This history shows how past proposals tended to founder because of their intricate relationship to the problem of the reunification of Germany.

Background material is presented to the sea-bed treaty—including a table showing the extent of selected countries claims for territorial waters; and to the discussions of disarmament in the field of chemical and biological warfare. There is a chronology of major disarmament efforts during the last twelve months. Lists of signatories of the treaties concerning disarmament are brought up-to-date to the end of August 1970. There are lists, with summaries, of United Nations resolutions on disarmament and conflicts.

Part I. Account of 1969/70

Chapter 1. World military expenditure and the arms trade¹

Part I. *World military expenditure, 1969/70*

1969 was a year of rather more rapid price inflation than usual in Western countries. The discussion of changes in military expenditure in money terms, therefore, is not very meaningful—particularly when comparisons are being made with changes in previous years. All the changes and trends described below, therefore, are in real terms—that is, the price element has been taken out—unless otherwise stated.

World military expenditure, in real terms, stopped rising in 1969. This followed three years in which it has gone up by 30 per cent.² In 1970 it seems certain that it will fall, perhaps by about 2 per cent. Military expenditure is budgeted to come down significantly this year in the United States,

¹ The longer-term twenty-year trends in both military expenditure and the arms trade were discussed in the *SIPRI Yearbook 1968/69*. This material is not repeated here.

² Another set of figures for world military expenditure is compiled by the United States Arms Control and Disarmament Agency, (*World Military Expenditures, 1969*). This shows the same general pattern for world expenditure—a sharp rise from 1965 to 1968, and then a flattening out. However, the ACDA estimate of the size of the rise from 1965 to 1968 is lower. This is almost entirely because it has a much lower figure for the increase in Warsaw Pact expenditure. Some of this difference is due to a bigger price correction: but most of it shows up in the current price figures as well as in the constant price figures. The SIPRI current price figures are taken from the state budgets of the countries concerned: the ACDA figures therefore seem to imply that, in ACDA's view, the published budgets overstate the rise in Warsaw Pact expenditure.

Per cent change in the volume of military expenditure, at constant prices

	1965-68	1968-69
World		
SIPRI	+30	+0.2
ACDA	+20	+0.5
NATO		
SIPRI	+30	-5.0
ACDA	+29	-2.0
Warsaw Pact		
SIPRI	+30	+6.6
ACDA	+7	—
Others		
SIPRI	+24	+7.3
ACDA	+19	+12.0

Table 1.1. Long and short term trends in the volume of world military expenditure

Based on constant price figures

	Average per cent change per year					Budgeted change in 1970	Size of military expenditure in 1969 US \$ bn, current prices and exchange-rates
	Long-term trend ^a 1949-69	Year-to-year changes					
		1965-66	1966-67	1967-68	1968-69		
USA	+ 7.0	+19.2	+15.4	+ 2.5	- 6.1	- 7.5	79.8
Other NATO	+ 4.9	+ 0.9	+ 4.4	- 3.0	- 0.4	+ 1.3	25.3
Total NATO	+ 6.5	+14.1	+12.7	+ 1.2	- 4.8	- 5.5	105.1
USSR	+ 4.1	+ 4.7	+ 8.0	+15.5	+ 5.9	+ 0.9	42.1 ^b
Other Warsaw Pact	+ 7.5	+ 7.2	+ 7.4	+18.5	+11.2	[+7.8]	7.0 ^b
Total Warsaw Pact	+ 4.2	+ 5.0	+ 7.9	+15.9	+ 6.6	[+1.8]	49.2^b
Other European	+ 5.0	+ 3.1	- 0.3	+ 3.4	+ 1.0	..	2.6
Middle East	+13.2	+12.5	+27.3	+17.7	+18.9	[18.9]	3.4
South Asia	+ 4.9	+ 1.9	-11.9	+ 3.6	- 0.4	..	2.0
Far East (excl. China)	+ 7.2	+ 4.3	+ 7.0	+13.8	+16.7	..	4.6
Oceania	+ 7.2	+18.9	+18.2	+ 7.5	+ 1.2	..	1.4
Africa	+ 9.6 ^c	+ 5.9	[+ 6.7]	[+ 4.2]	[+ 5.0]	..	1.2
Central America	+ 3.1	+ 4.9	+10.5	+ 1.1	[+ 2.1]	..	0.5
South America	+ 2.8	- 0.8	+10.8	- 4.0	[+ 3.4]	..	2.2
World^d	+ 5.7	+10.4	+10.7	+ 6.1	+ 0.2	..	180.1

Source: The reference section, p. 266. Bracketed figures are estimates.

^a 1957-69 for "Other Warsaw Pact" and Far East, excluding China; 1949-68 for Central and South America.

^b At Benoit-Lubell estimated defence purchasing-power-parity exchange-rates. See reference section, p. 263.

^c 1962-69.

^d Including an estimate for China of \$7.8 bn in 1969.

and to rise very little in the Soviet Union. The movement in these two countries virtually determines the movement for the world as a whole (table 1.1).

In 1968 and 1969, the world was devoting about 7 per cent of its product to military expenditure. This year the figure should come down, to around 6 1/2 per cent. This is still equivalent to the total income of the poorer half of the world's population.

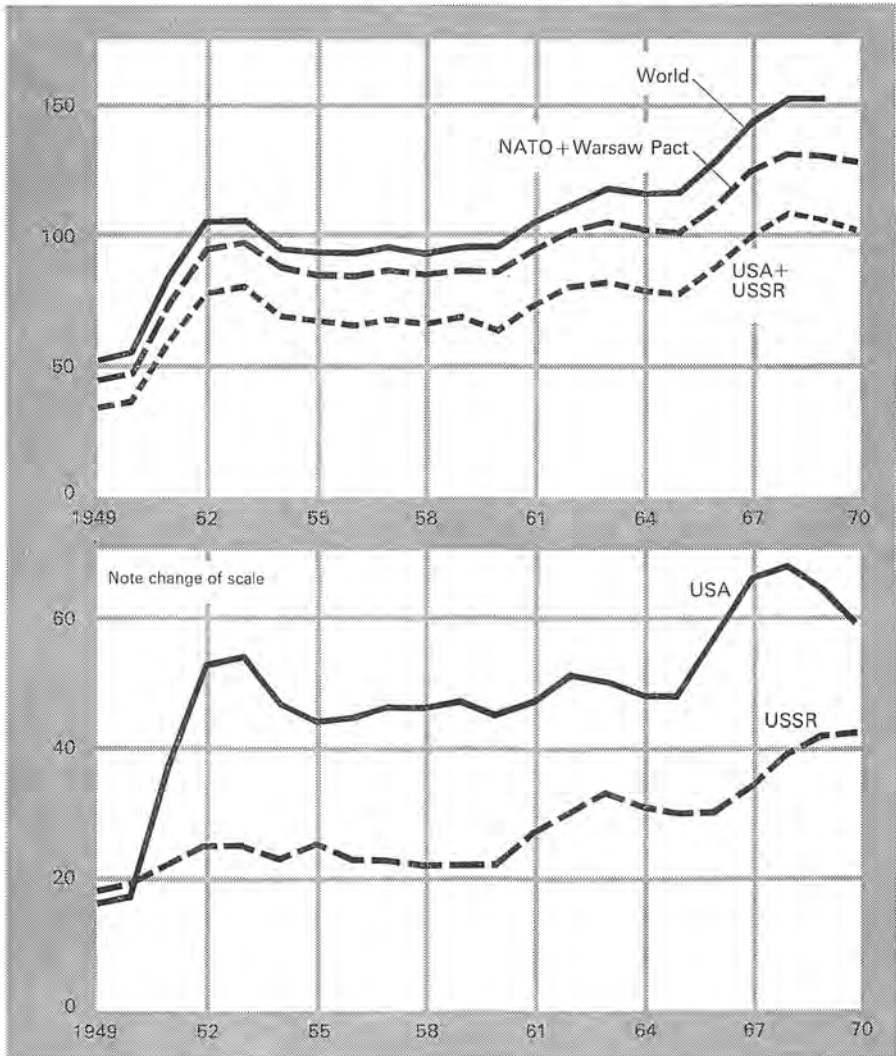
United States

United States military expenditure rose, in real terms, some 40 per cent between 1965 and 1968: it then fell a little in 1969, and is likely to fall rather more sharply in 1970. How far does the course of the Viet-Nam War explain its movement? The answer is that most of it is explained in this way.

There is no unambiguous definition of "the cost of the Viet-Nam War".

Chart 1.1. World military expenditure, 1949 to 1970

US \$ bn, at constant (1960) prices and 1960 exchange-rates



Source: The reference section, p. 266.

First of all any figures given are estimates. There are no accounting records to identify war costs. Secondly, two estimates are now given. One is the full cost of the war: the other the incremental cost.³ The full cost covers all

³ The figures of "incremental costs" have only been given after discussion had started in the United States about the "peace dividend"—that is, the quantity of resources which might be released if the Viet-Nam War were ended. On an "incremental cost" basis, this figure is of course lower. Previously, the only cost figures given had been the "full cost" figures, which suggested that there had been no rise in military expenditure in real terms between 1965 and 1968 other than that incurred over Viet-Nam.

operating costs in the theatre plus necessary support costs such as transportation, supply, equipment maintenance, training and medical services. For example, all aircraft operating costs are included in these full costs—this includes fuel, parts consumption, depot maintenance, base operations, and other items.

The incremental cost is the additional cost of the war over and above what would be spent in peacetime for the base-line units involved. It is not, therefore, a hard-and-fast concept, since there is no knowing precisely what “base-line” forces would have been in the absence of the Viet-Nam War. The following example, given by the Secretary of Defense in testimony to Congress,⁴ illustrates the difference between full costs and incremental costs:

Take the 3d Marine Division which we moved out of Vietnam and placed back in Okinawa. Okinawa was the original basing point for the 3d Marine Division that went into Vietnam. The costs of this unit were considered a part of the full cost of the war when it was in Vietnam. We moved the 3d Marines back to Okinawa where they were prior to the war; and even though we re-deployed them, we do not get the full savings because we still have the expense of maintaining the 3d Division in Okinawa. We do, however, realize some savings, and an obvious one would be the ammunition which they were using in Vietnam.

Now we are going to realize the full saving from the 5th Marine Division which we are inactivating, but we do not get as great a saving from the 3d division that we are re-deploying, but retaining in the base line force.

To take another example, it is estimated that: “Air Force aircraft used a certain amount of aircraft fuel in the theater. The baseline units involved would have consumed about 37% of that amount in normal peacetime operations. Therefore, the incremental war costs for fuel are equal to 63% of the full costs. This represents the cost of (a) the extra hours flown by baseline units, above what they would fly in peacetime, and (b) *all* the hours flown by non-baseline units, which would not be in the force in peacetime.”⁵

Table 1.2 shows both sets of figures for Viet-Nam set against total United States military expenditure; and it gives the figures both in current and constant prices. For most purposes, the constant price figures are the more sensible ones to use.

The main points are these:

1. On either basis—taking Viet-Nam incremental or full costs—the Viet-

⁴ Department of Defense Appropriations for 1971. Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives, 91st Congress, 2nd session. Part 1. Washington, 1970, page 412.

⁵ *Ibid.* page 461–62.

Table 1.2. The Viet-Nam War^a and United States military outlays^b

US \$ bn, fiscal years ending in June of the year given

	1965	1966	1967	1968	1969	1970 ^c	1971 ^{d, e}
Constant (1961) prices^f							
Total military outlays	42.9	49.3	59.5	66.2	65.4	60.1	54.7
Viet-Nam full costs	0.1	5.3	17.8	22.7	24.1	18.3	[11.5]
Other military outlays	42.8	44.0	41.7	43.5	41.3	41.8	[43.2]
Total military outlays	42.9	49.3	59.5	66.2	65.4	60.1	54.7
Viet-Nam incremental costs	0.1	4.0	13.3	17.0	18.1	13.7	[8.6]
Other military outlays	42.8	45.3	46.2	49.2	47.3	46.4	[46.1]
Current prices							
Total military outlays	46.2	54.4	67.5	77.4	78.0	76.3	71.1
Viet-Nam full costs	0.1	5.8	20.1	26.5	28.8	23.2	[15.0]
Other military outlays	46.1	48.6	47.4	50.9	49.2	53.1	[56.1]
Total military outlays	46.2	54.4	67.5	77.4	78.0	76.3	71.1
Viet-Nam incremental costs	0.1	4.3	15.1	19.9	21.6	17.4	[11.2]
Other military outlays	46.1	50.1	52.4	57.5	56.4	58.9	[59.9]

Source: The Budget of the United States Government, FY 1967 to 1969; and Statement by Secretary of Defense on the FY 1971 Defense Program and Budget.

^a Includes "special expenditure" in other South-East Asian countries.

^b These are actual or estimated expenditure figures, not appropriations or obligational authority. The figures include expenditure incurred by the Department of Defence only; it excludes military assistance, military expenditure by the Atomic Energy Commission, and certain other defence-related activities, which are included in the general reference tables (p. 266). The inclusion of these would not alter the general relationship of spending in Viet-Nam to other spending.

^c Estimates. ^d Budget forecast, subject to revision.

^e The Viet-Nam costs in 1971 are unofficial forecasts.

^f Deflated by the defence price index.

Nam War explains most of the movement in United States military expenditure since 1965.

2. Taking Viet-Nam full costs, other military expenditure, in real terms, changed very little over the six years shown, and is budgeted to be about the same in FY 1971 as it was in FY 1965.

3. Taking Viet-Nam incremental costs, other military expenditure rose some 15 per cent between 1965 and 1968: and is budgeted to fall some 6 per cent from 1968 to 1971—so that in that year it would be, on this basis of calculation, some 8 per cent higher, in real terms, than it was in 1965.

Last year the question was raised in the *SIPRI Yearbook 1968/69* whether, as military spending in Viet-Nam came down, other military spending would rise to take its place: it seemed, on the basis of the budget left by the previous administration, that this might happen. So far it has not happened, on either basis of calculating Viet-Nam expenditure: the pressures for economies in military spending have been sufficiently strong to prevent it.

The expenditures which might have been expected to rise were those on the strategic forces and on research and development. The 1971 budget for

Table 1.3. Trends in the volume of United States military expenditure

Index numbers of volume,^a FY 1965 = 100, fiscal years

	1965	1968	1971 forecast	<i>Value in 1971 current \$ mn</i>
Strategic forces	100.0	104.9	101.5	7 947
General purpose forces	100.0	160.5	114.1	24 731
Intelligence and communications	100.0	116.5	100.0	5 238
Airlift and sealift	100.0	129.6	101.6	1 481
Research and development	100.0	86.3	96.2	5 402
All other ^b	100.0	152.5	147.4	28 141
Total	100.0	139.2	119.4	72 941

Source: Department of Defense Appropriations for 1971. Hearings of the Committee on Appropriations, House of Representatives, 91st Congress, 2nd session. Part 1, p. 485.

^a All figures were divided through by the defence-price index: a forecast of this was made for 1971.

^b Guard and reserve forces, central supply and maintenance, training, medical and other general personnel activities, administration, support of other nations.

strategic forces is lower, in real terms, than that for 1968. Expenditure on research and development is expected to go up from the 1968 figures—but still to be lower than it was in 1965 (table 1.3).

The second half of the reduction in military spending in Viet-Nam is still to come, of course. A large number of major new weapon systems are waiting in the wings—further extensions of the anti-ballistic missile system (page 50), a new bomber (page 50), the undersea long-range missile system (page 131). It is still an open question, whether or not military spending in the United States will in fact fall to the full extent of the reduction in spending in Viet-Nam.

Tables 1.4 to 1.9 and accompanying charts showing regional and country trends in the volume of military expenditure are given on pages 28–35.

Other NATO countries

Military expenditure in NATO countries apart from the United States has been falling since 1967 (table 1.1). The 1968 estimates have been revised downwards for a number of countries, so that it now appears that there was a 3 per cent fall in that year. There was a further small fall in 1969. The budgets for the year had suggested that there would be a rise: but, partly because of underspending and partly because of an inflation which was more rapid than expected, there was a small fall instead.

These are the main individual country points:

1. Of the major “other NATO” powers, Canada and the UK have cut defence spending most since 1967—Canada by 9 1/2 per cent and the UK by 8 per cent.

2. French military spending, which had been on a fairly marked upward trend in the five years up to 1967 (with a 13 per cent rise) stopped rising in that year and has since been held at the 1967 level.

3. West German military spending fell sharply in 1968: it rose in 1969 and the budget provides for a further increase in 1970. If the rise materializes, it would bring the figures back to the 1966 level.

4. Norway is one of the few NATO countries which has been steadily increasing its military spending: expenditure in 1970 is expected to be some 30 per cent higher than in 1965.

5. Denmark budgeted for a large increase in military spending in 1969, of over 10 per cent. In the event—according to NATO expenditure figures—there was a small fall.

6. Portugal's military spending, after increasing very rapidly from 1965 to 1968, dropped sharply last year: the budget provides for a further drop this year.

7. Greece's military spending rose over 80 per cent in the last four years, from 1965 to 1969.

The budgets for the next financial year—when adjusted to the calendar year and corrected for the probable rise in prices—suggest a small rise in "other NATO's" military spending in 1970. However, in the light of past experience, it is unlikely that this rise will in fact materialize.

Warsaw Pact countries

The *level* of Warsaw Pact military expenditure, in comparison with that of other countries, is a much disputed point: the question is discussed in the reference section, page 263. Here the comment is not about the level but about the trend in expenditure: the trend shown by the official budget figures is usually accepted by most commentators.⁶

There is, however, the problem of price correction, to make the figures comparable with the "real terms" series shown for other countries. Other countries' figures are corrected for the rise in prices with the consumer price index. Only four of the seven Warsaw Pact countries have a price index of this kind: and these indicators show very little movement. There is no consumer price index for the Soviet Union. Consequently the changes "in real terms" for Warsaw Pact countries are virtually the same as the changes in current prices. It is possible that the increases are overstated in this way: but in the absence of more information there is no way of knowing whether

⁶ The ACDA figures are an exception: see footnote 2, page 2.

this is so or not. There is little choice but to accept the figures set out in table 1.5 as the best estimates that can be made on present information.

In the first two years of substantial United States engagement in the Viet-Nam War—in 1966 and 1967—Warsaw Pact spending was rising more slowly than that of NATO, and Soviet spending was rising more slowly than that of the United States. In the next two years NATO spending began to rise more slowly, and then fell: Warsaw Pact expenditure continued to rise. Over the whole period, therefore, from 1965 to 1969, Soviet military expenditure rose faster than United States expenditure—by 38 per cent as against 32 per cent: and total Warsaw Pact expenditure rose much faster than total NATO expenditure—by 40 per cent as against 24 per cent.

Soviet military spending is budgeted to level off this year, with only 1 per cent rise. Military spending in other Warsaw Pact countries, however, is due to increase a further 8 per cent—making in all an increase of over 60 per cent in the last five years for Warsaw Pact countries other than the Soviet Union. It is not clear why there was this formidable rate of rise. It is possible that in some of the countries increased payments have been negotiated for the stationing costs of Soviet troops; and it is possible also that the cost of supplies of Soviet weapons has risen. The Soviet Union, like the United States, is quite possibly putting pressure on its partners to take a larger share of the burden of military spending. There is no evidence of any substantial rise in the numbers in the armed forces in these countries. Further, the total size of “other Warsaw Pact” military budgets is still less than half that of the total of “other NATO” military budgets (see pages 29 and 30).

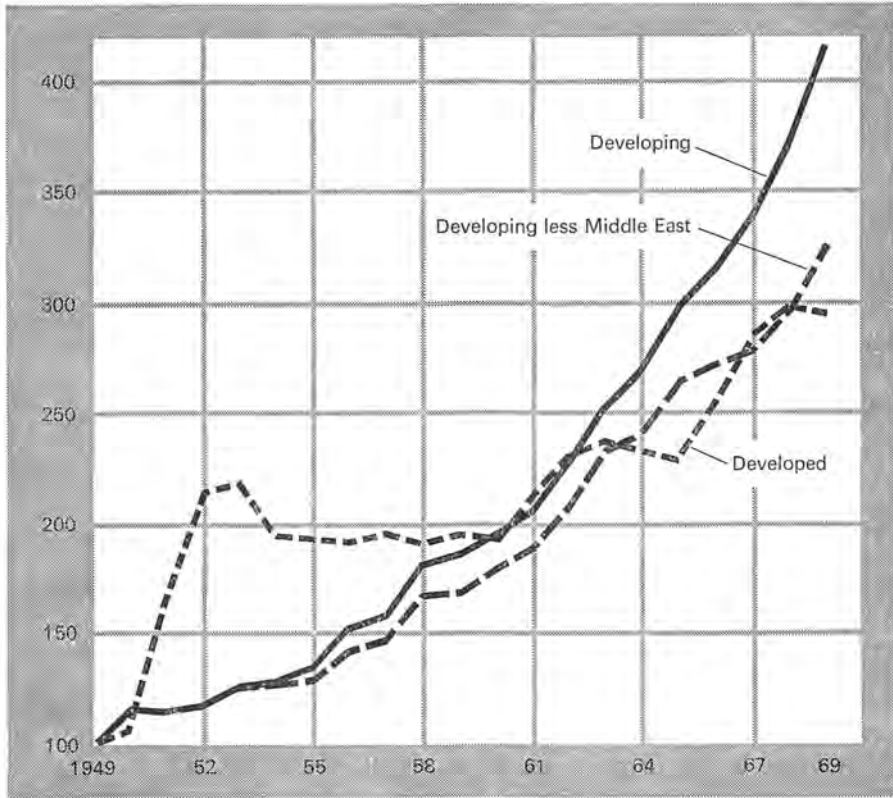
Other developed countries

All seven of the countries in the “other European” group showed very little change in their military spending, in real terms, in 1969: this is in line with their long-term trend of only a gradual rise. 1970 is not likely to show much change either. The Swedish budget suggests that there will be a 2½ per cent fall in Swedish military spending, in real terms, this year—and Sweden represents rather more than a third of the total.

In Australia and New Zealand, military spending levelled off in 1969, after a number of years in which it had been going up fast. Here again, there does not seem likely to be much further rise in 1970. The Australian budget provides for a 2 per cent increase, in real terms. In Japan, on the other hand, military spending is moving up quite sharply—by 8 per cent in 1969—and with a budgeted rise of 14 per cent this year. Japanese military spending is still very low in relation to the country’s wealth, with only 1 per cent of the national product going to military uses.

Chart 1.2. The rise in military expenditure: developed and developing countries compared^a

Index numbers 1949=100



Source: The reference section p. 270.

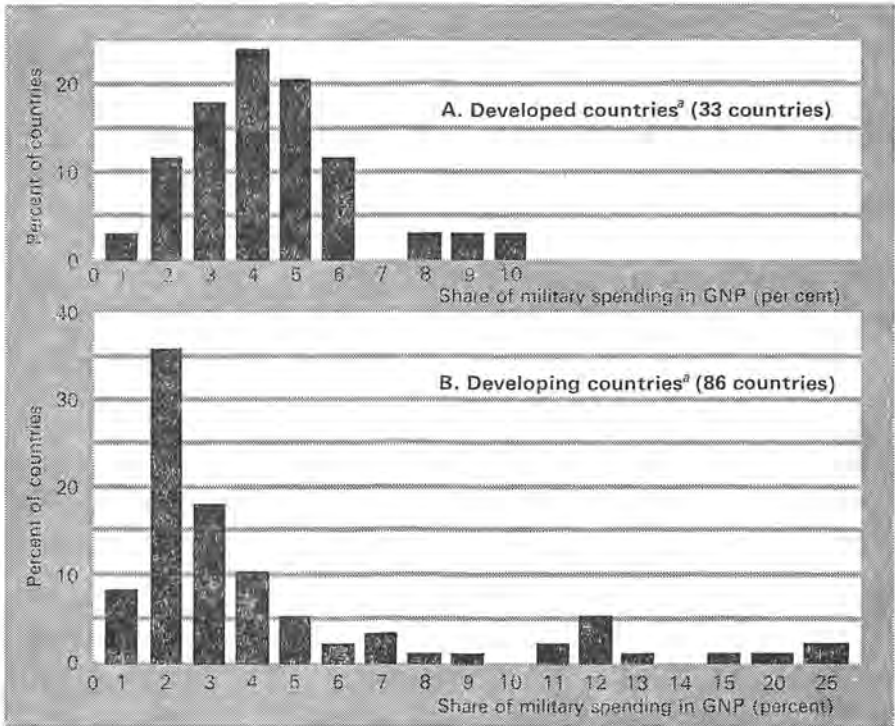
^a Developed countries are defined as NATO, Warsaw Pact, Other Europe, Oceania, Japan and South Africa. Developing countries are the rest of the world. China is excluded throughout.

Developing countries

Military expenditure in developing countries is an insignificant part of total world military expenditure—less than 10 per cent. It has, however, been rising faster than military expenditure in the developed countries. This is true both in the long term—over the last twenty years—and in the short term as well.

There are, however, very big differences from region to region. There are two regions where military expenditure has been rising very fast—the Middle East and the Far East. Indeed, if the Middle East figures are excluded, then the increase in military expenditure in the rest of the developing world is much the same as in the developed countries as a whole (chart 1.2). There are three regions—Latin America, Africa and South Asia—where the rise has been much more moderate.

Chart 1.3. Military expenditure as a share of gross national product: distribution of countries according to the size of this share: 1967



Source: SIPRI military expenditure figures. GNP estimates taken from *World Military Expenditures, 1969*, published by the US Arms Control and Disarmament Agency.

^a Developed countries are defined as NATO, Warsaw Pact, Other Europe, Oceania, Japan and South Africa. Developing countries are the rest of the world. China is excluded throughout.

In the *Middle East*, the extremely rapid increase continues; it is most marked since 1967 for the countries involved in the Six-Day War. Both Israel and the United Arab Republic have budgets which show a 20–25 per cent rise for 1970 (table 1.6).

In the *Far East*, there were big increases in both 1968 and 1969 in South Viet-Nam and South Korea: figures for North Viet-Nam and North Korea are not available. Military expenditure also seems to be rising again in Indonesia—though the figure here is suspect, because of the difficulty of establishing a reasonable price correction. The Malaysian budget provides for a large rise in 1970. No figures are available for China (table 1.7).

In *South Asia*, the changes have been fairly small in the last two years—with a slightly more rapid increase for Pakistan than for India (table 1.7). Recent figures for *Africa* are scanty: expenditure is rising fast in Libya, Ghana and Tanzania (table 1.8). In *Latin America*, such figures as there are

show a mixture of rises and falls—with fairly rapid rises in Argentina, Colombia and Mexico, and falls elsewhere (table 1.3).

This disparate experience, as between Middle East and Far East countries and the rest of the developing world, shows up also in the analysis of the shares of gross national product devoted to military expenditure in the developing countries as against the developed. Chart 1.3 presents a frequency distribution of the proportions of national product given to military expenditure in the two groups of countries: it shows, for example, that 3 per cent of the developed countries devoted between 0 and 1 per cent of their national product to the military: 12 per cent devoted between 1 and 2 per cent, and so on.

For developed countries, the largest single category consists of those which devote 3–4 per cent of their national product to military uses: and there is no country which devotes over 10 per cent. For developing countries, the distribution is different. Here the largest single category consists of those countries which devote only 1–2 per cent of their product to the military. On the other hand, 14 per cent of the total number of countries give over 10 per cent of their gross product to military uses.

Part II. *The third world: the trade in major weapons*

The value estimates in this section are derived in the way described in the reference section, page 331. They should be treated as indicating orders of magnitude, not as precise figures.

Introduction

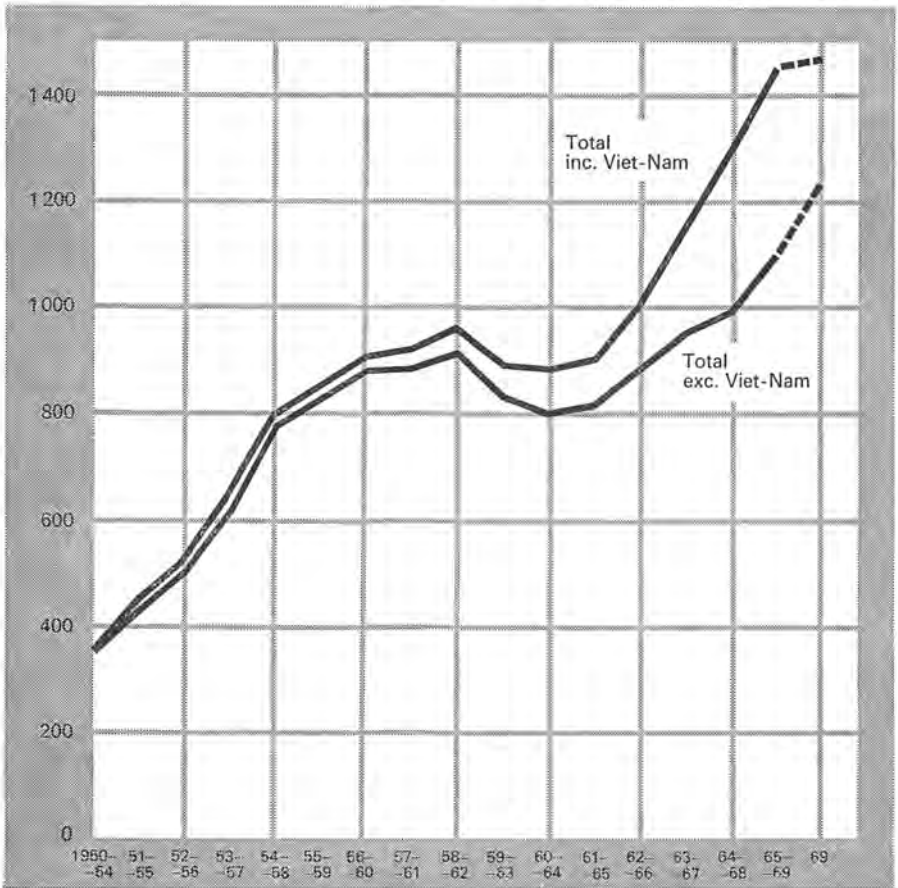
The value of major weapons supplied to third world countries amounted to \$1.5 billion in 1969.⁷ This is lower than the peak year, 1967, when they amounted to \$1.8 billion.

However, year-to-year movements are erratic: and the trend, as measured by a five-year moving average (chart 1.4), is upwards. The fall between 1967 and 1969 is due to the reduction in Soviet supplies to the Middle East and North Viet-Nam. The re-equipment of the Arab armies after the Six-Day War is almost complete. Since the United States halted the bombing of

⁷ Major weapons include aircraft, ships, missiles and tanks. They do not include small arms. A more detailed comment on the trends in major weapons supplies, and on the sources and methods used in arriving at these figures, can be found in the *SIPRI Yearbook 1968/69*. The figures have been extensively revised this year, but the conclusions concerning long-term trends are not substantially altered.

Chart 1.4. Major arms imports to third world countries

US \$ mn, at constant (1968) prices, five-year moving averages



Source: The reference section, p. 340.

North Viet-Nam, there has probably been a drastic cut in the Soviet supply of anti-aircraft missiles to that country.

Despite the fall in Soviet supplies, the Middle East still accounts for the largest share of major weapons imports to third world countries: over a third. There has been an increase in both US and British supplies. The Far East, excluding Viet-Nam, accounts for a further 20 per cent of major weapons imports; and Viet-Nam accounts for 15 per cent. During 1969, there was a rapid increase in the supply of surplus US weapons to the local forces in the area.

The events of 1969 illustrate the tenuousness of the conventional distinction between the supply of weapons and the supply of troops. The supply of weapons to one side or another should in many cases be seen as an indirect use of force in a conflict; the supplying country becomes

identified with that side and vitally concerned with its success or failure. This occurs in two quite different ways. In one case, as in South East Asia, participation in the conflict is intended. President Nixon's policy of Vietnamization is an explicit attempt to substitute the supply of weapons for the more unpleasant and politically unpopular task of supplying troops. In this situation, the supply of weapons is a consequence of identification with one party to a conflict. In other cases, this identification may be a consequence of supplying weapons for political gain. Once a supplying country has become identified with one side in a conflict, then it may become necessary to supply manpower as well as weapons to ensure that its side does not lose. Such a defeat might involve the loss of all the political capital gained through supplying weapons. In the Middle East, for instance, the Soviet Union has become identified with the Arab cause. Another defeat on the 1967 scale would be bad for Soviet standing in Arab eyes. In 1969, there was a large increase in the numbers of Soviet personnel serving in Egypt. The supply of weapons is leading on to the supply of men.

The supplying countries

Despite the growth of defence industries in a number of smaller countries, the export of major weapons to the developing world is still dominated by four countries. In 1969, the United States, the Soviet Union, Britain and France accounted for 95 per cent of major weapons supplies to third world countries.

The United States

The United States is responsible for the largest share of these exports, supplying nearly half the total in 1969. This represents a substantial increase on 1968. Major weapons exports from the United States have nearly doubled. The areas primarily responsible for this increase are the Middle East and the Far East.

In the Middle East, the United States has become the primary supplier to Israel after the French embargo. US major weapons supplies to Israel in 1969 amounted to \$110 million. The United States has also increased arms supplies to Jordan, after indications that Jordan might turn to the Soviet Union if its demands could not be met from the West.

In the Far East, the increase in the supply of weapons to local forces is quite clearly related to the Viet-Nam War. First, equipment which was originally promised to Thailand and South Korea in order to help persuade these countries to participate in the Viet-Nam War has been provided. In 1969, Thailand received Hawk missiles and South Korea received 50 Phan-

tom aircraft. Secondly, in accordance with the Nixon Doctrine, equipment has been provided in the hope that local forces can carry on the Viet-Nam War, and permit US troops to withdraw. In President Nixon's words, "we shall look to the nation directly threatened to assume the primary responsibility of providing the manpower for its defence".⁸ This involves placing "more emphasis on furnishing our allies with appropriate military and economic assistance".⁹ In 1969, arms supplies to the Far East reached their highest level since 1960. For FY 1971, the US Air Force plans to purchase more aircraft for the Military Assistance Programme than for its own needs; of 390 planned purchases, only 177 are intended for use by US forces.

There is considerable Congressional opposition to the programmes of military aid, credit and sales. This is linked to the general criticism of US overseas commitments.¹⁰ There were several important cuts in the budget for FY 1970. Congress refused to pass a \$54.5 million appropriation to supply Phantom fighters to Taiwan. A provision in the defence budget to enable Northrop to develop an improved version of the F-5, especially designed to meet the needs of South East Asian forces, was cut from \$62 million to \$28 million. There has also been a tendency to use the Military Sales Bill as a vehicle for influencing policy. House amendments to an extension of the Military Sales Bill in March 1970 encouraged the President to seek ways to control the international trade in arms, cautioned the President against the sale of arms to military governments that deny "social progress" or "fundamental rights" to their people, and called for negotiations with the Soviet Union on a Middle East arms limitation. Senate amendments, in June 1970, went even further and included a provision that no further funds should be authorized for the United States or any third country to fight in Cambodia after 1 July 1970.

The transfer of surplus US weapons has become an increasingly important way for the administration to evade Congressional limitations. The sale or gift of such weapons is not subject to Congressional authorization. The Department of Defense merely reports annually to Congress. In 1969, for instance, Taiwan received surplus arms worth \$157 million.¹¹ These included 20 F-104 Starfighters and 35 F-100 Super Sabres. Greece received nearly \$26 million in surplus arms, in addition to the \$37.5 million authorized by Congress. This included five F-104 Starfighters.

⁸ United States Foreign Policy for the 1970s. A New Strategy for Peace. A Report by President Richard Nixon to the Congress, February 18, 1970.

⁹ Statement by Secretary of Defense Laird, in Department of Defense Appropriations for 1971. Hearings before a subcommittee of the Committee on Appropriations, House of Representatives, 91st Congress, 2nd session. Part 1. Washington, 1970.

¹⁰ The background to this debate can be found in the *SIPRI Yearbook 1968/69*.

¹¹ These surplus military items are valued at their "utility value", which is 30 per cent of their acquisition cost and often lower than their market value.

The Soviet Union

The Soviet Union is the second largest supplier of major weapons, accounting for roughly 20 per cent of the total. Soviet supplies of major weapons have fallen by half since 1967, when they were higher than those from the United States. This was due to a fall in supplies to the Middle East and North Viet-Nam.

In the Middle East, the Soviet Union has completed the extensive re-equipment programme following the Six-Day War in 1967. Nevertheless, supplies of major weapons to the UAR are still higher than they were before 1967: an estimated \$140 million in major weapons were supplied during 1969. A further increase is expected in 1970. So far the UAR has received the new SA-3 missiles, with associated radar and other ground equipment, and more sophisticated versions of the MiG-21. These weapons were accompanied by a large number of Soviet personnel. Apart from the UAR, only South Yemen, in the Middle East, received major weapons from the Soviet Union. The fear of dependence on the Soviet Union may be another explanation for the fall in Soviet supplies to the area. This dissatisfaction has been made explicit in Algeria, where ties with France are being rebuilt. In Iraq there has been no evidence of major weapons imports from the Soviet Union since 1967. Since the end of the Yemen War, the Yemen republican regime has been making overtures to Western countries for aid.

An interesting feature of Soviet major weapons exports is the concentration on a few countries. India and the UAR together accounted for over 90 percent of total Soviet supplies during 1969. India now gets the bulk of its weapons from the Soviet Union. Other countries which received major weapons from the Soviet Union during 1969 were South Yemen, Pakistan, Sudan, Mauritania and Nigeria.

Other supplying countries

British exports of major weapons show a continuation of the upward trend started in 1965. Large shipments have gone to the oil-rich countries of the Arabian Peninsula. In 1969, Kuwait and Saudi Arabia received Lightning fighters, ordered in 1965 and 1966. The increase in British arms exports is also partly a consequence of the British decision to withdraw forces from east of the Suez Canal by 1971. Many small countries which previously relied on the UK for their external defence are now establishing armed forces. Singapore, for instance, will be taking over the Bloodhound missiles, presently being operated by the RAF.

The sale of refurbished Hawker Hunters, as they are phased out of the

RAF and other European air forces, is also proving to be a lucrative business. Chile, Singapore, Jordan, Abu Dhabi and Qatar are all purchasing these types, often in preparation for the purchase of more sophisticated planes.

British naval exports have always been an important component of British arms supplies, and these show no signs of diminishing. On the contrary, British shipyards are making gains from the naval build-up in South America.

French major weapons supplies showed a decline in 1969. This is due to the embargo on arms to Israel. Before 1967, Israel was France's most important third world customer. France, however, will soon be able to compensate for the embargo. There has been a determined expansion of markets, particularly in the Mediterranean area. In 1969 and 1970, Mirage orders were received from Libya and Spain. Greece recently purchased missile-equipped gunboats from France. French relations with North African countries have also improved. Algeria, previously dependent on the Soviet Union for arms, has purchased a large number of Magisters and is receiving French assistance in setting up a school for pilots. Tunisia is also receiving French military assistance. A Moroccan air force mission recently visited Paris. There are indications that this might involve a purchase of Mirages, in addition to the Magisters received in 1968.

France has also been making inroads in the South American market. In addition to the sale of Mirages to Peru and of tanks to Argentina and Peru, France has recently concluded a deal for Mirages with Brazil.

Recipient countries

South America

Major weapons imports to South America have shown a steadily rising trend for some years, although they are still not as high as they were during the years 1955 to 1961. Most of the increase consists of sophisticated weapons from Europe: combat aircraft and naval vessels. The US share of exports to Latin America rose from one-sixth in 1968 to one-third in 1969. It consists mainly of equipment suitable for counter-insurgency and transport aircraft. In 1969, for instance, Brazil and Argentina together ordered or received 40 helicopters, almost exclusively from the United States.

The US policy of encouraging the purchase of counter-insurgency equipment and discouraging the purchase of more sophisticated weapons led Latin American countries to seek other sources of supply. Argentina, for instance, has launched the Europa plan, a plan to build up her domestic

defence industry with assistance from Europe. Reluctant to accept these European intrusions into the Latin American market, the United States has been drawn into the competition to supply sophisticated weapons.

THE QUEST FOR SUPERSONIC FIGHTERS¹²

In 1965, Argentina ordered 50 A-4 Skyhawks to be delivered in two batches. The second batch was held up due to shortages of this type of plane in Viet-Nam, and was finally released in the spring of 1970. In the autumn of 1969, Argentina made a detailed evaluation of the British Harrier for use on its newly acquired aircraft carrier. But in May 1970, Argentina was reported to have purchased 16 more Skyhawks for this purpose. In 1967, both Peru and Brazil opened negotiations with France for the purchase of the Mirage. Peru ordered the Mirage in October 1967. Brazil, after several months of vacillation, did not place an order. Following the Peruvian order, the United States reversed its earlier decision not to supply supersonic fighters before 1970 and offered the F-5 to Argentina, Brazil, Chile, Peru and Venezuela. None of these countries has purchased the plane.

Brazilian interest in supersonic fighters was believed to have faded and early in 1969, Brazil purchased 15 Skyhawks. In January 1970, however, BAC confirmed that Brazil had shown an interest in the Lightning: a \$40 million deal was reported to be imminent. On 15 May 1970, a deal was concluded in Paris for the supply to Brazil of 12 Mirage III fighters and four Mirage trainers.

THE NAVAL BUILD-UP

A new feature of the South American arms race is the purchase of naval vessels. In 1968, Argentina purchased the ex-Dutch aircraft carrier, *Karel Doorman*, now re-named *25 de Mayo*. This was followed in early 1969 by orders for two advanced guided-missile destroyers from Britain worth \$72 million. The second of these will be assembled in Argentina. Argentina also ordered two submarines from West Germany. These will also be assembled in Argentina, thus circumventing the prohibition on the export of submarines heavier than 450 tons from West Germany, without the prior approval of the Western European Union. Brazil is to receive two "Oberon" class submarines from Britain and minesweepers from West Germany. Brazil is also negotiating with a British firm, Vosper, for six guided-missile destroyers, but problems have arisen over delivery dates and the order may go to West Germany.

¹² The background to this story can be found in *SIPRI Yearbook 1968/69* pages 58-60.

In November, 1969, a deal was concluded between Chile and Britain worth \$58 million. The deal includes two "Oberon" class submarines and two "Leander" class frigates.

Central America

Major weapons imports have been falling steadily since the early 1960s, the period of the Cuban arms build-up. In 1969, major weapons imports to Central America were lower than in any year since 1950. The six F-51 Mustangs delivered to El Salvador, in 1968, were lost in the so-called Football War with Honduras. But they were all replaced within a month. Both Soviet and Western sources mention Soviet military aid to Cuba in 1969. A new arms deal is believed to have been discussed during Marshal Grechko's visit to Cuba in November 1969.

The Middle East

Although major weapons imports have fallen since the peak year, 1967, the Middle East still accounts for the largest share of third world imports. The arms race between the UAR and Israel still dominates the Middle East. These two countries accounted for one-half of the total imports to the Middle East. Nevertheless, this is not the only arms race in the Middle East. Build-ups are also taking place in the Arabian Peninsula and in North Africa.

ISRAEL

As a result of the French embargo on arms to Israel, the United States has become the main supplier of weapons to Israel. At a press conference in July 1969, President Pompidou indicated that he might be prepared to allow a return to the selective embargo, which had been in operation before January 1969.¹³ Throughout 1969 France continued to supply spare Mirage parts to Israel. These, however, were halted after Israeli sailors smuggled six gunboats out of Cherbourg on Christmas Day, 1969. By May 1970 Israel had received most of the 70 A-4 Skyhawk fighters and three trainers ordered in two batches from the USA in 1966 and 1968. Forty of the 50 F-4 Phantom fighters and six reconnaissance aircraft ordered in December 1968 had also arrived. For these Phantoms Israel is paying \$300 million. Israel is also pressing Washington to release another 100 Shyhawks and 25 Phantoms. The last ten of the Phantoms have been slightly delayed due to the installation of an optical gunsight fire-control system for interception following the recent inflow of Soviet weapons to the UAR. For commando opera-

¹³ For background on the French embargo, see *SIPRI Yearbook 1968/69*.

tions, like the capture of the Egyptian air defence radar unit in December 1969, Israel is now using the Sikorsky CH-53 heavy-lift helicopter. This helicopter has previously only been sold to two other countries outside the USA: West Germany and Austria. A report in *Al Ahram*, the Egyptian semi-official daily, that Israel had been promised 130 of these helicopters, was denied by the US Department of State, which confirmed that seven had been delivered.

THE UNITED ARAB REPUBLIC

During 1969 and 1970, Soviet supplies to the UAR have been concentrated on improving its air-defence system. An agreement for 200 MiG-21s was signed early in 1969, no doubt partly as a response to the US decision to supply Phantoms to Israel in December 1968. Deliveries of these planes have continued in 1970. In the spring, it was reported that they included 150 MiG-21Js, the radar-equipped all-weather version for night interception. Some 70 MiG-21s of the Egyptian Air Force were reported to have been modified in 1970 for strike duties. About 20 Sukhoi Su-7 fighters were delivered in 1969 and an additional 16 in 1970. The UAR is also reported to have acquired a number of Tu-16 bombers. This is, however, difficult to ascertain, as Tu-16s are apparently flown on Soviet reconnaissance missions in the Mediterranean. Some Soviet sources suggest that the Soviet Union is unwilling to supply offensive aircraft to the UAR Air Force.

About 200 pilots who had been training in the Soviet Union returned to the UAR in the autumn of 1969. President Nasser explained in an interview in Cairo in February 1970 that, although accelerated pilot-training courses for Egyptian pilots had been set up, the UAR still had a long way to go to catch up with Israel. The Israelis, he said, have three pilots per aircraft, enabling each aircraft to undertake nine sorties a day. The number of Egyptian pilots does not enable Egypt to undertake more than three sorties in a day.

The Israeli air offensive against the UAR SA-2 surface-to-air batteries in the autumn of 1969 is reported to have led to the destruction of 70 per cent of these sites. When replacements started to arrive early in 1970 they included SA-3 missiles, a more advanced version with the capability to intercept low-flying aircraft. The SA-3 missiles have been accompanied by advanced radar and other ground equipment and by Soviet technicians who install the missiles and teach the Egyptians to operate them.

JORDAN

The possibility that Jordan might acquire Soviet weapons speeded up the delivery of British and US weapons to Jordan. Jordan has now received 21

Hawker Hunters and 100 Centurions from the UK. Four more Hawker Hunters are expected. The United States has supplied 18 of the promised 36 F-104 Starfighters. A *Tass* report, that an arms deal had been signed between the Soviet Union and Jordan on 21 January 1969, may be one reason why the United States agreed to supply Hawk anti-aircraft missiles to Jordan in the spring of 1970. In fact, an arms deal with the Soviet Union for the supply of anti-aircraft guns, light machine guns and rifles was also reported in January 1970.

SYRIA

While Jordan has played the Soviet card to increase arms supplies from the West, Syria appears to have played the Chinese card to increase arms supplies from the Soviet Union. Syrian dissatisfaction with Soviet military aid was reflected by the sudden cancellation of a visit to the Soviet Union by the Syrian President. A military mission headed by the chief of staff Major General Mustafa Talas arrived instead in Peking on 15 May 1969 and Syria was promised Chinese weapons worth \$15 million. In July, President Atassi went to Moscow where he was promised \$200 million in military aid repayable over ten years at a low rate of interest. Late in 1969, Syria was reported to be receiving MiGs and other heavy weapons and was said, in 1970, to have been promised SA-3 missiles.

THE ARABIAN PENINSULA

The countries on the Arabian Peninsula and Iran have all, in recent years, used their oil revenues to build up their armed forces. Kuwait and Saudi Arabia have provided loans for Jordanian purchases of arms; they have both taken delivery in 1968-1969 of British Lightning fighters. The delivery of Phantoms to Iran has also been completed.

Not having been able to reach an agreement on a federation, the small states are now building up their forces in anticipation of a British withdrawal and the expected ensuing internal and external disputes and search for leadership. Both Abu Dhabi and Qatar have ordered Hunters from Britain and Qatar is also purchasing the Tigercat surface-to-air missile.

North Africa

The striking feature of major weapons imports to North Africa is the increase in French supplies. The announcement in January 1970 that Libya was to buy 110 Mirages was perhaps the most dramatic arms-trade event of the year. Before the Libyan coup in September 1969, Libya relied mainly on Britain and the United States for arms. In 1968, Libya ordered 18 F-5s from the United States. Ten were received before the coup. In April 1968 a con-

tract was signed with BAC for the supply of a complete air-defence system including Rapier and Thunderbird surface-to-air missiles and radar. The contract was worth more than \$300 million. Libya also ordered various ships from the UK, including three patrol boats equipped with French SS.12 missiles and a frigate. In April 1969 a contract was signed for about \$100 million worth of Chieftain tanks and Abbott self-propelled 105 mm guns. After the coup, the new Libyan regime began to reconsider its ties with the West. The withdrawal of US and British troops from their bases in Libya was negotiated for March and June 1970. The BAC air defence package was cancelled in December 1969, after Libya had ceased paying instalments. It is not clear what has happened to the orders for Chieftain tanks and Abbott guns. Deliveries of Soviet tanks and other military equipment were made in July 1970; this makes deliveries of British equipment less likely.

The French deal includes 110 Mirages and 20 Magister trainers. It is reported to be part of a wider commercial deal. It is worth approximately \$150 million and deliveries will take place between 1970 and 1974. At the time the deal was signed, Libya had only nine trained pilots. Two hundred pilots and six hundred technicians will be required to fly the new planes.

In July 1969, Algeria, previously dependent on the Soviet Union for arms, signed an agreement with France for the purchase of 28 Fouga Magisters. These planes were repurchased by Sud-Aviation from the West German Luftwaffe and refurbished. The French are also providing assistance for a flying school at Bou Sfer, the sole French base retained under the 1962 Evian agreement. The school will also be used by personnel from Libya, Tunisia, and Morocco. Algeria is getting more directly involved in the Middle East War: aircraft from the UAR are being stationed on its soil. Egyptian SA-2 missiles have been transferred to Algeria to protect these air bases.

South Africa

Since the British embargo of 1964, South Africa has relied on France and Italy for weapons. During 1969, South Africa received from France Puma and Alouette helicopters, C-160 Transall transports and the first of three "Daphne" class submarines. On 2 May 1969, the South African Defence Minister, Mr. Botha, announced that an all-weather surface-to-air weapon system was under development by French companies for the South African Government. The system is known as Cactus in South Africa and Crotale in France. Matra is responsible for the development and manufacture of the missile, while Compagnie Electronique Thompson Houston-Hotchkiss Brandt is responsible for the ground equipment. The French Government has helped finance the project. The missile can be transported on South

Africa's C-130 Hercules and C-160 Transall transports. The initial deliveries are expected in early 1971. The first export offers for this system come from Lebanon. The deal with Lebanon has been subject to criticism in South Africa, where there is some sympathy for Israel.

South Africa is also continuing to build up its own defence industry. The production of the Italian MB.326 Impala armed trainer is the biggest project currently being undertaken. There have been minor evasions of the embargo in both the United States and Britain. According to figures provided by the Department of Defense, the United States sold \$35.5 million worth of military equipment to South Africa during fiscal years 1962-1968 and \$3.1 million during fiscal year 1969. In 1969, Britain sold South Africa three HS-125 VIP transports, but the British claim that they are for civil purposes only. New sales by Britain are expected since the new Conservative government came to power in June 1970.

Sub-Saharan Africa

Major weapons imports into the whole of the rest of Sub-Saharan Africa were equivalent to only 60 per cent of the major weapons imports received by South Africa alone. This section deals only with a few selected countries.

TANZANIA AND ZAMBIA

Both Tanzania and Zambia are now arming because they fear clashes with their southern neighbours. Tanzania is terminating its five-year agreement with Canada, under which Canada has supplied instructors to the Tanzanian armed forces. The agreement extended to December 1969. President Nyerere said in a radio interview in October 1969 that in future Tanzania would rely on Chinese instructors. Both Tanzania and Zambia feel the need for an air-defence system to prevent Portuguese and Rhodesian air incursions. Zambia has been negotiating with BAC for the purchase of Rapier surface-to-air missiles. It is uncertain whether the deal has been finally concluded, the main obstacle being finance. In January 1969, the Zambian Government gave the UK a statutory year's notice of the cancellation of the British Joint Services Training Agreement. The task of training the Zambian Air Force has been taken over by Italy. This is part of a package deal between Italy and Zambia which includes the construction of a new jet base at a cost of \$11.2 million, the purchase by Zambia of five Agusta-Bell Iroquois helicopters and an unspecified number of MB.326 trainers.

NIGERIA

Arms supplies to Nigeria and Biafra were reported throughout the war from a multitude of sources. It is difficult to establish the facts.

For most of the war Biafra depended on private sources of supply. Some were based on private initiatives like that of the Swedish Count von Rosen who, together with four other Swedish pilots, was flying for the Biafran Air Force in MFI-9Bs. These small trainers were transported from Sweden, or possibly from West Germany where they are being produced under licence, to Biafra, having first been equipped in France with rockets for ground-attack operations. Nineteen of these planes were supplied to Biafra. Other supplies came from commercial arms dealers operating from Portugal. An example of the prices which had to be paid for these weapons is the purchase of two Douglas C-47s which were initially sold by the West German Luftwaffe to a charter company in Luxembourg, for \$5 000 each. When they finally reached Biafra, equipped with bomb racks and extra fuel tanks, they cost \$45 000 each. From mid-1968 Biafra was purchasing arms from Gabon, originally bought from the French Government and resold at cost. The supply of these French weapons reached a peak at the end of 1968 and then fell. In June 1969, at the time of Count von Rosen's expedition, French arms supplies were reported to have been resumed. However, in November 1969, President Pompidou called for a cooling of relations with Biafra. Restrictions were imposed on private and unofficial supplies. When Biafran resistance crumbled in January 1970, six NA T-6 trainers and 18 of the MFI-9 Mili-Trainers were reported to be on hand. Of the two Gloster Meteors purchased, one was lost in an accident on the way to Biafra and the other remained in Guinea Bissau, where it was being repaired.

Nigeria depended on the Soviet Union and the UAR for its air equipment and on Britain for its ground equipment. By January 1970, 30 MiG-17s were reported to be on hand. In June 1969, two MiG-19s were identified. They were believed to have come from East Germany. Some months later most of the Egyptian MiG pilots were said to have been replaced by East Germans. The arrival, in June 1969, of Su-7 fighters was reported and cannot be entirely ruled out, although this is a very advanced fighter. An analysis of Nigeria's trade figures shows an increase of British arms supplies from £80 000 in 1966 to £2.8 million in 1968. The British Foreign Secretary, Mr Stewart, stated in the House of Commons on 17 November 1969 that the increase in British supplies was due to the expansion of the Nigerian Army (which increased from 10 000 men in early 1967 to 120 000 in January 1970). During the course of the war, British arms supplies remained (according to Mr Stewart) at the level of 15 per cent of Nigeria's total arms imports. Nigeria also had resort to private arms suppliers. DC-3s were bought from Sabena airlines in Belgium. Nigeria also converted some of the Nigerian Airways' DC-3s for bombing and transport missions earlier in the war.

SUDAN

Sudan has been offered arms by the Soviet Union on several occasions since 1956. A major deal was finally concluded in 1967. Deliveries have now begun and include T-55 tanks, MiG-21s and the heavy An-12 transport aircraft.

The Indian sub-continent

Major weapons supplies to the Indian sub-continent fell slightly in 1969 but this does not indicate a reversal of the long-term upward trend. India now receives most of her weapons from the Soviet Union. In 1969 these included a large number of naval vessels, including two of the four "F" class submarines on order and Su-7 interceptors. A second batch of 100 Su-7s was ordered in 1969.

India is also attempting to expand her domestic defence industry. In addition to the MiG-21s and air-to-air missiles now being produced in India, the Soviet Union agreed in 1969 to licence the production of MiG-21Ms, believed to be a STOL version. An agreement has also been concluded with France for the production of air-to-surface and surface-to-surface missiles.

Despite Indian protests, the Soviet Union signed an arms agreement with Pakistan in July 1968. Deliveries in 1969 included a number of tanks and spare parts for the planes received from China during the years 1965-1966.

The Far East

There has been a dramatic increase in arms supplies to the Far East. These come primarily from the United States.

TAIWAN AND SOUTH KOREA

Taiwan and South Korea account together for more than 80 per cent of the arms imports to the Far East in 1969. There has been a massive inflow of very sophisticated equipment to both of these countries. South Korea has received the Phantoms promised in February 1968. Taiwan had also requested the Phantom but this was vetoed by Congress. However, during 1969, Taiwan received \$157 million worth of arms from US surplus stocks. The supplies to Taiwan included four 20-year old destroyers, 35 F-100 Super Sabre fighters, 20 F-104 Starfighters, more than 30 C-119 Packet transports, about 50 medium tanks, 120 howitzers and thousands of M-14 rifles. Taiwan also received 70 Northrop F-5 fighters.

CAMBODIA

Before the overthrow of Prince Sihanouk in March 1970 Cambodia was receiving arms and military aid from France, the Soviet Union and China.

Shortly after the coup a deal was concluded with South Viet-Nam for the transfer of arms. In the middle of April a general appeal for arms aid was issued by the new government and less than a week later a personal appeal was made to President Nixon. The USA expressed its readiness to supply 1500 AK-47 automatic rifles at once and 4 000 to 5 000 more within two or three weeks. These arms were from China and had been captured in Viet-Nam. In May a Department of State official said that a large number of M-2 carbines had been sent to Cambodia. The Lon Nol regime was promised further US military aid after the US withdrawal on 30 June.

THAILAND AND LAOS

Both Thailand and Laos have requested more US aid. They are at present receiving aircraft and other equipment for counter-insurgency. Thailand has received Hawk missiles, in return for increased participation in the Viet-Nam War.

MALAYSIA AND SINGAPORE

Both Malaysia and Singapore are arming to compensate for the British withdrawal from east of Suez. Both are receiving assistance from Australia. Malaysia's quest for fighters ended temporarily with the Australian promise of ten Sabre fighters on a grant basis. Singapore has purchased Hunters and the BAC167 ground attack aircraft, and the Bloodhound surface-to-air missile system now being operated there by the RAF.

VIET-NAM

President Nixon's policy of "Vietnamization" has had a considerable impact on the level of arms supplies to South Viet-Nam. Secretary of Defense Laird requested an additional \$156 million, over and above the \$1 087 million already obligated for FY 1969 and FY 1970, to enable the South Vietnamese forces to take over the functions of the withdrawing US troops. Large transfers of weapons, especially counter-insurgency equipment, took place in 1969. These include deliveries of Cessna A-37 ground attack planes, 300 helicopters and several hundred patrol boats.

Agreements were signed in November 1968 and October 1969 between North Viet-Nam and the Soviet Union for the supply of arms, ammunition and other supplies and materials "needed for strengthening the defence capacity of the Democratic Republic of Viet-Nam".¹⁴ Very little else is known about North Vietnamese arms imports in 1969. According to official US sources, Soviet military aid has dropped considerably in recent months

¹⁴ *Tass*, 15 October 1969 (quoted in *New York Times*, 16 October 1969).

and is now approximately half the peak level of \$500 million in 1967. The decline is attributed to the fact that, since the end of the bombing, North Viet-Nam no longer needs expensive anti-aircraft missiles, radar, and anti-aircraft guns.

There were reports that China had increased the supply of weapons to North Viet-Nam, following the US invasion of Cambodia.

Europe

GREECE

The United States selective embargo on Greece appears to affect only the supply of F-5 fighters. Sixteen of the 56 aircraft ordered in 1964 are still being withheld. However, the remaining 40 were released in 1969 together with five Starfighters. The United States also agreed to renew a loan of six warships.

Other NATO allies are proving even more loyal. France is supplying ship-to-ship missiles and fast gunboats. Negotiations were started for the purchase of the Mirage, but no order has yet been given. (Negotiations may have been aimed at putting pressure on the United States to lift the embargo.) From West Germany, Greece has received under the Military Assistance Programme 40 Noratlas transports. Greece has also ordered four West German submarines. Since these weigh 1 000 tons, their delivery is subject to the approval of the Western European Union. Criticism of the sale has been voiced by some members of the WEU.

PORTUGAL

West Germany and France were responsible for the bulk of Portuguese major weapons imports in 1969. France is aiding the Portuguese war effort by the supply of large numbers of helicopters. After criticism of the proposed sale of 20 ex-Luftwaffe Dornier Do-27 light transports to Nigeria, these were diverted to Portugal. Together with a number of corvettes purchased from West Germany, they might also prove useful in Africa.

Table 1.4. NATO: Long and short term trends in the volume of military expenditure

Based on constant price figures

	Average per cent change per year					Budgeted change in 1970	Size of military expenditure in 1969 US \$ bn, current prices and exchange-rates
	Long-term trend 1949-69	Year-to-year changes					
		1965-66	1966-67	1967-68	1968-69		
USA	+ 7.0	+19.2	+15.4	+ 2.5	- 6.1	- 7.5	79.8
Canada	+ 6.0	+ 2.6	+ 7.6	- 5.8	- 3.6	[- 2.5]	1.8
Belgium	+ 5.1	+ 0.9	+ 5.1	+ 5.7	+ 1.4	—	0.6
Denmark	+ 5.7	- 1.4	+ 0.5	+ 6.9	- 0.4	+ 5.6	0.3
France	+ 4.6	+ 2.8	+ 5.3	- 0.1	- 0.8	—	5.7
Germany, West	+ 5.6 ^a	- 1.8	+ 4.1	-11.3	+ 4.3	+ 5.0	5.6
Greece	+ 6.4	+ 8.8	+28.6	+16.7	+12.1	—	0.4
Italy	+ 4.8	+ 8.1	- 2.3	+ 1.9	- 0.9	- 1.0	2.3
Luxembourg	+ 4.3	—	-22.3	-14.3	+16.7	—	0.008
Netherlands	+ 4.8	- 2.6	+11.1	- 1.4	+ 4.8	+ 7.2	1.0
Norway	+ 5.8	- 0.5	+ 3.2	+ 5.8	+10.6	+ 6.5	0.4
Portugal	+ 7.6	+ 4.9	+22.9	+ 2.3	-14.5	- 4.3	0.3
Turkey	+ 4.9	- 3.2	+ 0.3	+ 7.8	+ 6.4	..	0.6
UK	+ 1.6	- 1.0	+ 3.0	- 2.9	- 4.8	+ 0.8	5.5

Source: The reference section, p. 266.

^a 1953-69.

Table 1.5. Warsaw Pact: Long and short term trends in the volume of military expenditure

Based on constant price figures

	Average per cent per year					Budgeted change in 1970	Size of military expenditure in 1969 US \$ bn, current prices and exchange-rates	
	Long-term trend 1957-69 ^a	Year-to-year changes					(b)	(c)
		1965-66	1966-67	1967-68	1968-69			
Albania ^d	..	- 5.5	—	+11.6	+37.7	..	0.01	0.03
Bulgaria	+ 5.5	+ 3.7	+10.3	—	+14.4	..	0.3	0.1
Czechoslovakia	+ 3.5	+ 5.4	+11.9	+ 5.8	+ 7.5	+ 7.1	1.6	1.0
Germany, East	+13.3	+17.9	+ 9.1	+61.0	+ 9.5	+ 6.2	1.9	1.5
Hungary	+12.0	- 0.4	+ 6.2	+18.4	+22.8	..	0.5	0.3
Poland	+ 8.5	+ 5.4	+ 3.7	+ 8.8	+ 8.1	+10.0	2.0	1.3
Romania	+ 4.4	+ 5.8	+ 4.1	+ 3.8	+23.5	+ 9.3	0.7	0.4
USSR	+ 4.1	+ 4.7	+ 8.0	+15.5	+ 5.9	+ 0.9	42.1	19.7

Source: The reference section, p. 268.

^a USSR 1949-69 (1957-69, 5.2 per cent); East Germany 1958-69.

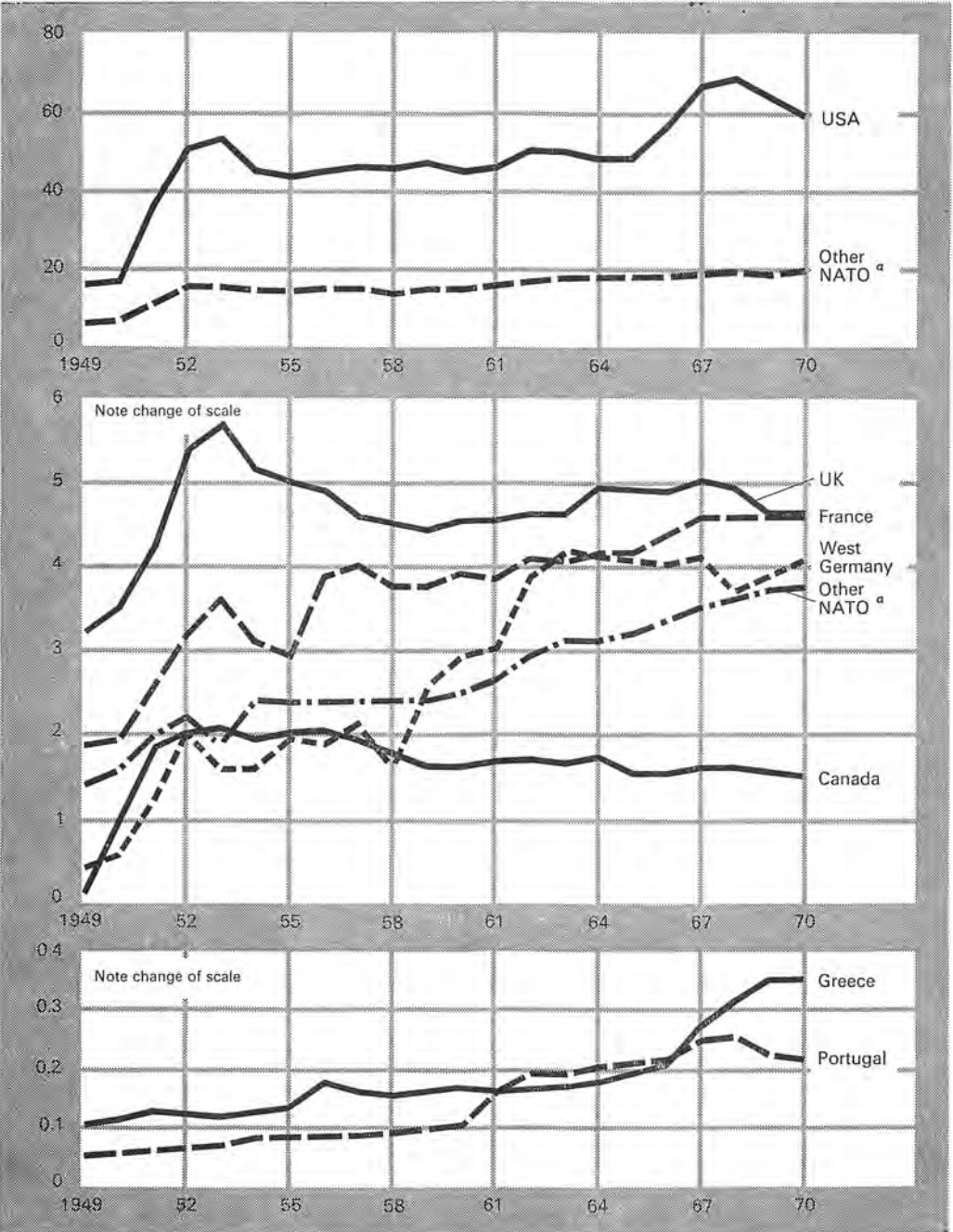
^b Benoit-Lubell exchange-rates.

^c 'Non-commercial' rates, except for the USSR, for which there is only a basic rate. See *UN Statistical Yearbook 1969*, p. 568.

^d Albania is included, as it was in the Warsaw Pact during most of this period.

Chart 1.5. Military expenditure in NATO countries

US \$ bn, at constant (1960) prices and 1960 exchange-rates

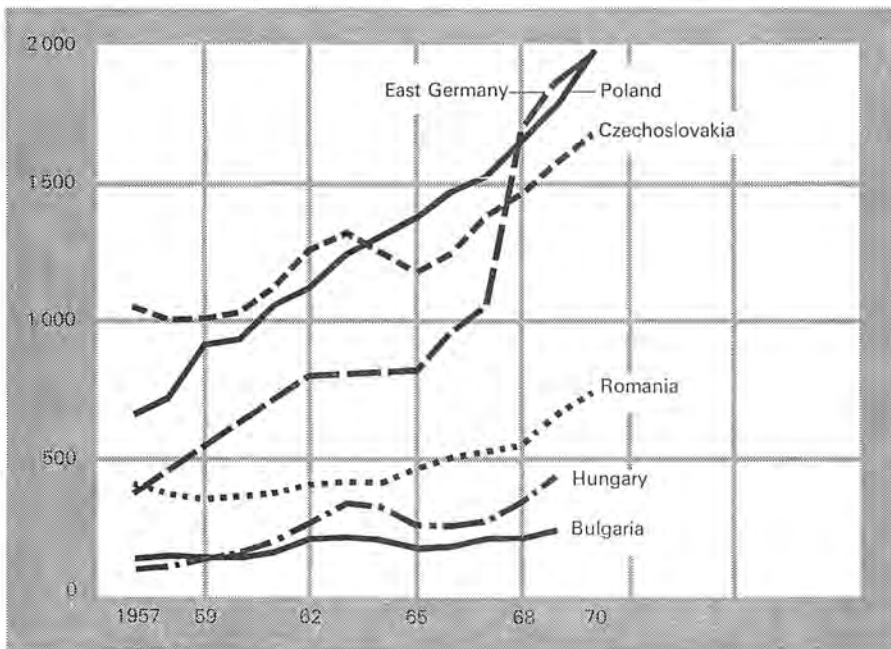


Source: The reference section, p. 266.

^a Belgium, Denmark, Italy, Luxembourg, Netherlands, Norway, Turkey.

Chart 1.6. Military expenditure in Warsaw Pact countries, other than the USSR

US \$ mn, at constant (1960) prices and Benoit-Lubell exchange-rates



Source: The reference section, p. 268.

Table 1.6. Middle East: Long and short-term trends in the volume of military expenditure^a

Based on constant price figures

	Average per cent change per year					Budgeted change in 1970	Size of military expenditure in 1969 US \$ mn, current prices and exchange-rates
	Long-term trend 1949-69	Year-to-year changes					
		1965-66	1966-67	1967-68	1968-69		
UAR	+11.2	+ 3.0	+23.2	+27.4	+27.5	+19.9	982.1
Israel	+17.7	+22.1	+28.6	+26.3	+27.7	+26.7	790.0
Iran	+11.7	+34.4	+21.0	+ 6.7	+ 4.6	+32.5	531.4
Saudi Arabia	+18.0 ^b	- 0.9	+107.6	+ 9.0	+ 3.8	+ 9.5	343.3
Iraq	+13.7	+ 8.4	- 0.1	+ 5.9	- 2.0	..	292.6
Syria	+13.2	-18.1	+44.6	+20.7	+26.3	..	193.7
Jordan	+11.2	+19.7	+ 5.8	+17.4	+61.8	- 1.5	126.0
Kuwait	+19.1 ^c	+18.2	+65.4	+ 7.0	+ 9.2	..	70.3
Lebanon	+ 9.9	+23.1	+ 8.2	+ 2.2	+13.7	+ 4.3	49.2

Source: The reference section, p. 270.

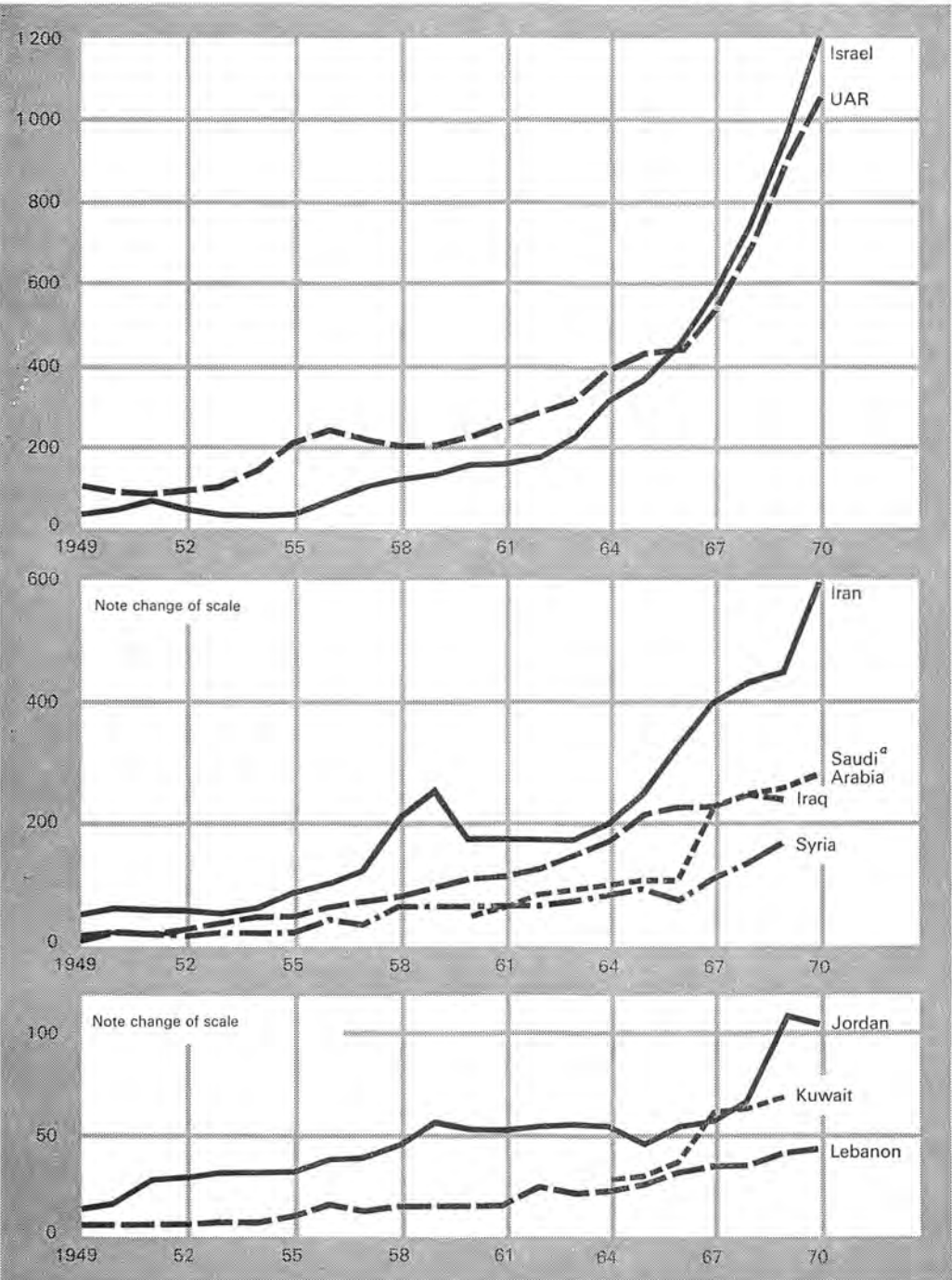
^a Figures are given only for countries whose military expenditure in 1969 exceeded \$10 million (at current prices and exchange-rates).

^b 1961-69.

^c 1964-69.

Chart 1.7. Military expenditure in Middle East countries

US \$ mn, at constant (1960) prices and 1960 exchange-rates



Source: The reference section, p. 270.

^a Figures not available before 1961.

Table 1.7. Far East and South Asia: Long and short-term trends in the volume of military expenditure^a

Based on constant price figures

	Average per cent change per year					Budgeted change in 1970	Size of military expenditure in 1969 US \$ mn, current prices and exchange-rates
	Long-term trend 1949-69	Year-to-year changes					
	1949-69	1965-66	1966-67	1967-68	1968-69		
Far East							
Japan	+ 3.6 ^b	+ 5.6	+ 9.4	+ 4.2	+ 8.0	+14.1	1 305.7
Viet-Nam, South	+12.4 ^c	-27.5	-18.1	+75.8	+37.3	..	668.9
Taiwan	+ 8.8 ^d	-17.3	- 1.4	+ 1.2	..	..	300.0 ^g
Korea, South	+12.1	+23.5	+ 6.9	+21.5	+11.8	..	282.6
Thailand	+10.1	+ 6.6	+19.7	+22.6	+ 9.2	..	179.2
Malaysia	+19.8	+23.2	- 7.3	+ 3.3	+ 9.4	+30.3	132.7
Philippines	+ 6.4 ^e	+19.8	+11.8	+18.1	+20.0	..	119.1 ^g
Burma	+ 9.4	- 3.0	- 2.3	+ 4.3	+ 3.8	..	111.4
Indonesia	+ 0.5 ^b	[+ 9.6]	[+15.2]	[-21.2]	[+110.0]	..	[211.6] ^h
Cambodia	+ 2.0 ^f	+ 1.2	+13.9	+ 0.4	..	..	64.3 ^g
Laos	- 3.8 ⁱ	+15.5	+ 0.5	+ 1.6	- 1.1	..	41.2
South Asia							
India	+ 5.2	- 2.9	- 9.8	+ 2.5	- 1.5	+ 0.2	1 429.0
Pakistan	+ 4.4	+19.6	-18.9	+ 7.3	+ 3.1	..	527.1

Source: The reference section, p. 272. Bracketed figures are estimates.

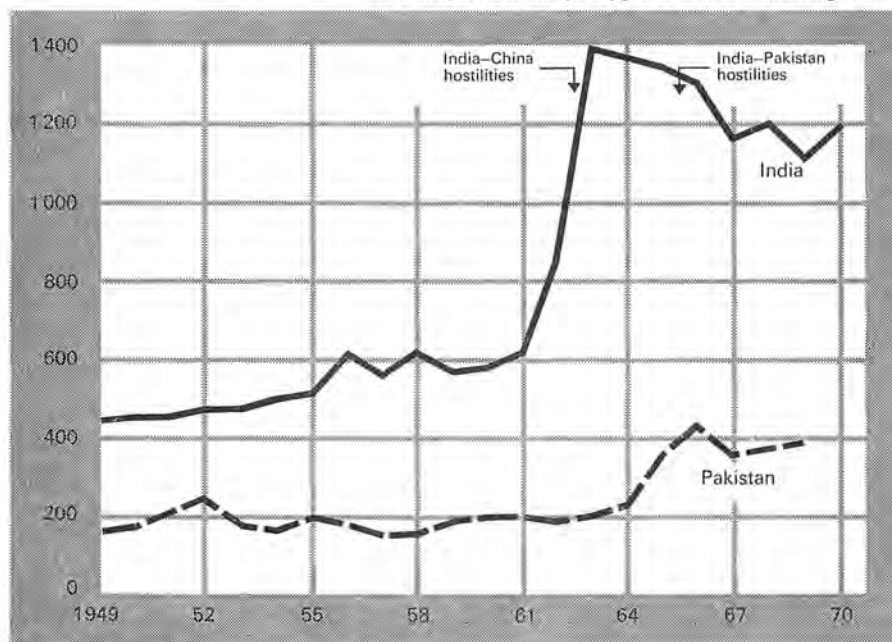
^a Figures are given only for countries whose military expenditures in 1969 exceeded \$30 million (at current prices and exchange-rates).

^b 1951-69. ^c 1960-69. ^d 1953-68. ^e 1949-68. ^f 1961-68. ^g 1968.

^h The figures for Indonesia probably have a fairly wide margin of error due to the very rapid rate of inflation in that country. ⁱ 1962-69.

Chart 1.8. Military expenditure in India and Pakistan

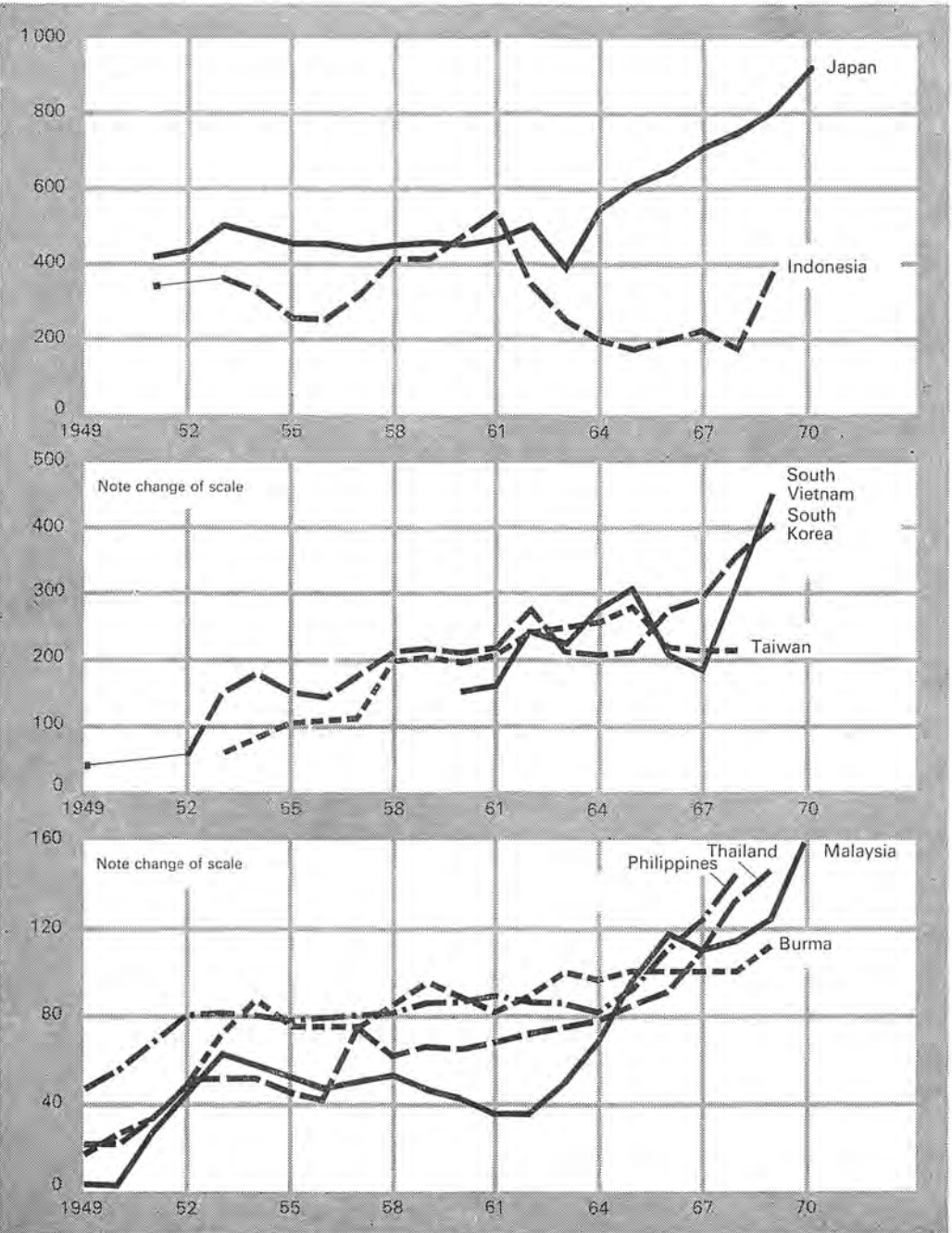
US \$ mn, at constant (1960) prices and 1960 exchange-rates



Source: The reference section, p. 272.

Chart 1.9. Military expenditure in Far East countries (excl. China)

US \$ mn, at constant (1960) prices and 1960 exchange-rates



Source: The reference section, p. 274.

Table 1.8. Africa: Long and short term trends in the volume of military expenditure^a

Based on constant price figures

	Average per cent change per year						Budgeted change in 1970	Size of military expenditure in 1969 US \$ mn, current prices and exchange-rates
	Long-term trend 1949-69	Short-term trend 1965-69	Year-to-year changes					
			1965-66	1966-67	1967-68	1968-69		
North Africa								
Algeria	+ 2.7 ^b	+ 0.6	+ 2.3	—	—	[—]	[—]	99.2
Morocco	+11.9 ^c	+13.0 ^k	+ 0.4	+ 7.2	+34.0	[—]	..	148.2 ^m
Libya	+14.1 ^b	+14.2	+ 5.4	+20.6	+ 7.6	+24.2	+11.3	40.0
Tunisia	+12.6 ^d	+ 5.7	+14.9	- 7.3	+22.0	- 4.0	..	20.0
Sub-Saharan Africa								
South Africa	+10.4 ^f	+ 2.3 ^k	+ 9.1	- 0.2	- 1.6	- 7.3	..	353.3 ^m
Congo, Kinshasa	+12.1 ^b	- 2.7	+39.4	-14.5	-18.9	- 6.3	..	121.1 ^m
Nigeria	+20.0 ^e	+14.1 ^k	- 2.8	+50.1	+ 1.8	..	..	91.0 ^m
Sudan	+15.7 ^f	+20.0 ^k	+41.6	+ 1.9	+20.8	..	..	55.3 ^m
Ethiopia	+ 6.9 ^g	- 0.5	+ 9.0	+ 2.6	- 3.8	- 8.7	..	37.5
Ghana	+11.6 ^h	+11.5	- 7.7	+30.3	+10.4	+16.6	..	48.2
S. Rhodesia	..	+ 8.4 ^k	- 7.6	+19.9	+14.9	..	..	21.2 ^m
Zambia	..	+ 2.8 ^k	+27.0	- 3.1	-11.6	..	..	19.6 ^m
Kenya	+ 7.6 ^d	+11.0	+25.6	+24.8	+ 2.8	- 5.5	..	16.2
Ivory Coast	..	+11.4 ^l	- 0.9	+24.3	..	..	..	16.7 ⁿ
Cameroon	+ 3.3 ^o	+ 2.3 ^l	+ 2.5	- 0.8	—	..	..	16.2 ⁿ
Madagascar	..	+ 8.0 ^l	+ 4.4	+ 7.4	..	..	..	12.2 ⁿ
Tanzania	+33.0 ^j	+12.0	+13.8	+16.2	+ 7.0	+10.9	..	12.3

Source: See the reference section, page 276.

^a Figures are given only for those countries whose military expenditure in 1969 exceeded \$10 million (at current prices and exchange-rates).

^b 1963-69. ^e 1961-68. ^h 1957-69. ^k 1965-68. ⁿ 1967.

^c 1958-68. ^f 1949-68. ⁱ 1960-69. ^l 1964-67. ^o 1960-67.

^d 1956-69. ^g 1960-69. ^j 1962-69. ^m 1968.

Table 1.9. Latin America: Long and short-term trends in the volume of military expenditure^a

Based on constant price figures

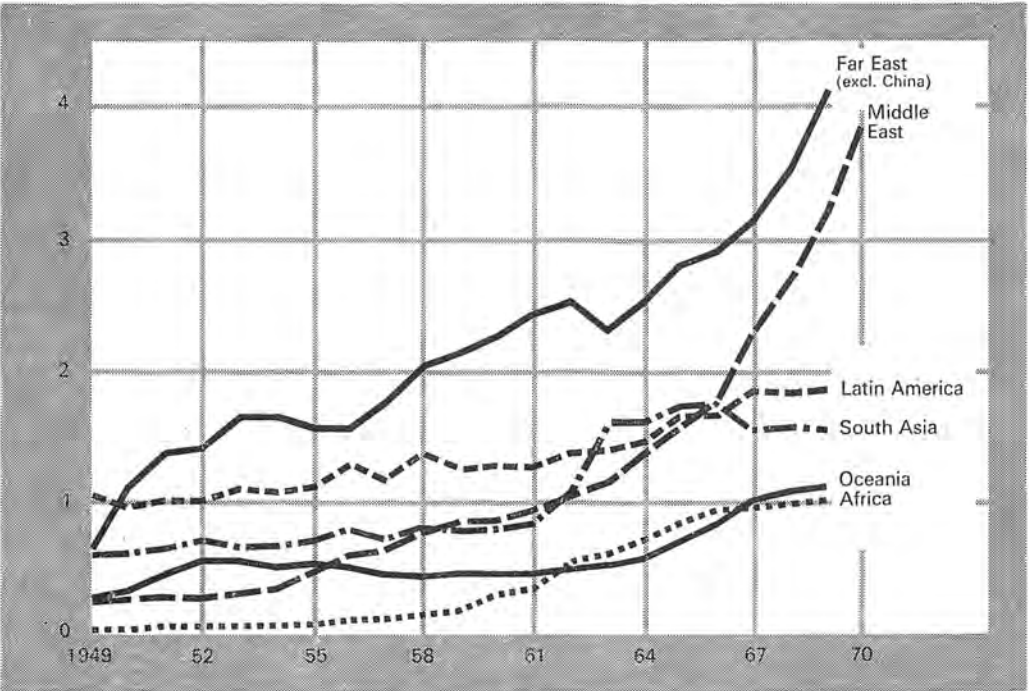
	Average per cent change per year					Budgeted change in 1970	Size of military expenditure in 1969 US \$ mn, current prices and exchange-rates
	Long-term trend 1949-69	Year-to-year changes					
		1965-66	1966-67	1967-68	1968-69		
South America							
Brazil	+ 3.4 ^b	-16.3	+40.6	-12.1	..	..	1 099.5 ^c
Argentina	- 1.1	+12.6	-20.6	+ 5.6	+18.1	..	435.1
Venezuela	+ 8.6	+ 5.8	+10.8	- 1.3	- 1.3	..	197.5
Peru	+ 6.0	+ 3.4	+28.5	—	- 8.6	..	149.0
Columbia	+ 8.5	—	+ 3.2	+ 1.7	+17.8	..	162.2
Chile	+ 3.0	+ 4.1	+10.1	+ 1.2	- 5.5	..	110.7
Central America							
Mexico	+ 5.4	+ 3.9	+16.6	+ 4.0	+ 8.8	..	204.8

Source: The reference section, page 278.

^a Figures are given only for countries whose military expenditure in 1969 exceeded \$100 million (at current prices and exchange-rates). Cuba is not included because reliable figures are not available for most of the period. ^b 1949-1968. ^c 1968.

Chart 1.10. Military expenditure in major regions outside Europe, North America and China

US \$ bn, at constant (1960) prices and 1960 exchange-rates



Source: The reference section, p. 270.

Chapter 2. The main arms race: SALT and European security

Introduction

This chapter analyses the present state of the arms race between the United States and the Soviet Union and between their alliances in Europe. Two-thirds of the world's military spending is concentrated here. "SALT" (the Strategic Arms Limitation Talks) and "European security", the two current approaches to check the arms race, are then considered.

SALT and European security are analysed in the same chapter since the problems they deal with are intertwined. They may be separately negotiable but they cannot be neatly isolated. There is one spectrum of weapons, ranging from long-range missiles with nuclear warheads to rifles firing conventional bullets. It is usually not possible to see the implications of changes in policy with respect to one part of the spectrum without looking at the whole: and many weapons, for example aircraft, can be used for many different purposes. Similarly, it is misleading to call some nuclear weapons strategic and others tactical, as if the nature of the weapon dictated the nature of its use and as if these terms now had any clear meaning. The word strategic, which used to mean the art by which a general so moved his forces as to impose upon the enemy the place, time and conditions of fighting preferred by himself,¹ came to be used, rather euphemistically, in the Second World War to describe bombing designed to disorganize the enemy's internal economy and to destroy morale: that is, bombing directed against civilians. Nowadays even this meaning is stretched. For example, in official Western analyses of the "strategic balance" and in many background articles on SALT, the term strategic weapons is used to mean ICBMs (intercontinental ballistic missiles) and other weapons, such as long-range bombers and SLBMs (submarine-launched ballistic missiles), with which the Soviet Union and the United States can threaten one another without using the territory of their allies. A definition of this kind can easily lead to the view that the thousands of nuclear weapons in Europe are all "tactical", whatever

¹ Both the *Concise Oxford Dictionary* and *Webster's New World Dictionary* give definitions along these lines.

that may mean, and to the implication that the destruction of Europe is a "tactical" matter. Part of the difficulty stems from applying the terms strategic and tactical to weapons rather than to the policies of their users.

In order to avoid troubles of this kind, the words strategic and tactical will be avoided here so far as possible.

The analysis is complicated by the fact that in an arms race biased perceptions are inevitable, as they are in any conflict or political problem. That is, the different parties will see the situation in different terms, coloured by fear, by self-justification and by other factors. These biases may be conscious at the stage where people who are interested—politicians, the military, scientists, industrialists and journalists—are composing the arguments and selecting the evidence they will use in the advocacy of a particular policy. But commonly they will be unconscious. They will occur because people select and read into information—or the absence of information—what fits their preconceptions. Those preconceptions will be formed by the interests and values of the group to which the individual belongs. Frequent repetition and lack of contrary views within the group will give those preconceptions a strong hold on people's minds.

In each nation the groups who govern policy are likely, on average, to have a hostile perception of the other nation or nations engaged in an arms race. But within each nation there are likely to be different groups with different views. Thus, to use the popular American terms, the "hawks" in any nation will tend to attribute aggressive intentions to the other side and will typically exaggerate the number and capabilities of its forces and weapons. They will put an adverse interpretation on a particular weapons decision by the other side, and will argue from this that they should be given more forces and weapons. On the other hand, the "doves" will attribute relatively peaceful intentions to the other side and will play down the numbers and capabilities of its forces. Both views may be far removed from the truth; and the truth may not lie at the mid-point between them. This is a basic example. Biases will often be more complex.

It is important to try to detect and correct these biases. They are a major obstacle to negotiation and to a realistic assessment of the situation.

The problem is compounded by the fact that all the published information about levels of forces and weapons comes from one side only—the West. It has been impossible to find such information from Soviet or East European sources.

No attempt is made to analyse aspects of the competition between the two super powers other than the arms race, for example, political and economic competition. Nor are the economic and social forces that influence the arms race within each country analysed here.

Part I. *The Strategic Arms Limitation Talks*

Square-bracketed references, thus [1] refer to the list of sources on page 89.

Nuclear arms race

Several points about the information need to be noted. First, reliability:

As a result of the development of reconnaissance satellites, Western estimates of actual numbers of Soviet launchers deployed are now probably rather reliable. For example, the cameras carried in reconnaissance satellites are reported to be capable of a resolution of less than 1 foot. [1]

Estimates of how many missile silos are under construction or how many submarines have been launched and are in the water, based on satellite reconnaissance, are likely to be quite reliable. They will indicate how many launchers will be operational within a year or two. Longer-term projections are unlikely to be at all reliable. The Soviet Union, unlike the United States, does not publish its plans; and its plans anyway are likely to be dependent on the outcome of SALT. In the absence of information, policy-makers may make projections, i.e., they may assume that the Soviet Union will continue to deploy a new weapon at, say, the same rate in the future as in the past. The word "projection" then means assumption, no more.

The fact that the size of the nuclear forces is examined here does not mean that small, or even large, changes in the balance between the different sides should be regarded as important. An appraisal is given on page 55.

Secondly, measurement. There are several ways of trying to assess stocks of nuclear weapons. For example, one might be interested in total worldwide destruction, including radioactive fallout and its effects. In the debates on nuclear deterrence, which are the heart of the arms race, the aim usually is to estimate the damage you could inflict on your enemy in a second strike, i.e., your assured destruction capability. In the United States this is "calculated" in terms of the proportion of the population and industrial capacity of the other side that could be killed or destroyed by direct effects of a second strike with nuclear weapons. The secondary effects through radioactive fallout and economic and social dislocation are ignored.

Even then vast destruction is provided for. "Our calculations indicate that the U.S. strategic forces programmed over the next few years, even against the highest Soviet threat projected in the NIE [National Intelligence Estimate], would be able to destroy in a second strike more than two-fifths of the Soviet population and about three-quarters of their industrial capacity." [2] Nothing is known of Soviet calculations of this kind.

To arrive at these estimates of capacity to inflict death or damage in a

second strike, it is necessary to take into account many variables: total numbers of delivery vehicles, numbers of warheads, their megatonnage, the proportion normally out of range or unservicable, response time, vulnerability, reliability, accuracy, ability to penetrate defences and so on. And it is necessary to make assumptions about many of these variables for your opponent's force in order to calculate how many of your weapons he might destroy in a first strike; the probability of human failures and disorders ought to be taken into account too. The combining of unbalanced assumptions for these variables in so-called "worst-case analysis" has been one of the ways in which successive steps in the arms race have been justified. Indeed, that is how the official United States calculations of assured destruction capability have been made. [3] Knowledge about many of the variables in these calculations, and of the relationships by which they are linked together into an overall picture, is so theoretical and sketchy that the scope for error is very great. Nobody can know at all precisely what a nuclear exchange would be like.

The aim here is to get a general indication of what is happening in the arms race. For this purpose a few indicators can be used, each subject to qualification.

Megatonnage

When there were only fission bombs, the quantity of enriched uranium and plutonium was a fair, though not a precise, indicator of the explosive power of the bombs a nation could produce. The destructive potential depended on warhead size, on the nature of the target and the method of delivery. But with fusion bombs, which are operational or under development in all five nuclear powers, there is no longer any precise relationship. Fissile material is used only as a trigger for fusion bombs. They can be made of almost any size, simply by varying the quantity of the other, relatively cheap, ingredients. During the 1960s private estimates of the explosive power of the world's stock of nuclear weapons have ranged from the equivalent of 30 thousand million tons to 300 thousand million tons of TNT. The higher figures appear to be based on rather extreme assumptions about the kinds of warheads into which the fissile material was manufactured. The lower figure dates back to the early 1960s.

Since the early to mid-1960s the explosive power of the total stock of warheads may have been coming down. With multiple warheads and with higher accuracies generally, small warheads will do more damage than their large precursors would have done with poorer accuracies. The information available on stocks of fissile material and megatonnage is set out in the reference material, page 376.

Accuracies

Accuracies have increased extremely rapidly since ballistic missiles were introduced. In 1944 the German V2 had an accuracy of about 4 miles over a range of 200 miles. Ten years later US ICBM accuracies were estimated at 5 miles over a range of 5 000 miles, a twenty-fold improvement in the ratio. [4] Since then, US test accuracies over a 5 000 mile range appear to have come down to less than a mile and similar accuracies tend nowadays to be attributed, rightly or wrongly, to Soviet missiles, now or in the near future. Accuracies continue to increase. The significance of this is that the ability to destroy a hardened missile silo with a given warhead is extremely sensitive to the distance of its explosion from the silo: the probability of destroying a Minuteman silo (built to withstand a pressure up to 300 pounds per square inch) with a warhead of 200 kilotons is normally given in US sources as 12 per cent with a CEP of half a mile and 40 per cent if the CEP could be reduced to a quarter mile. With a 5-megaton warhead the corresponding figures are 68 per cent and 99 per cent. The CEP measures the accuracy of the missile: it is the radius of a circle within which the missile has a 50 per cent probability of landing.

Number of delivery vehicles

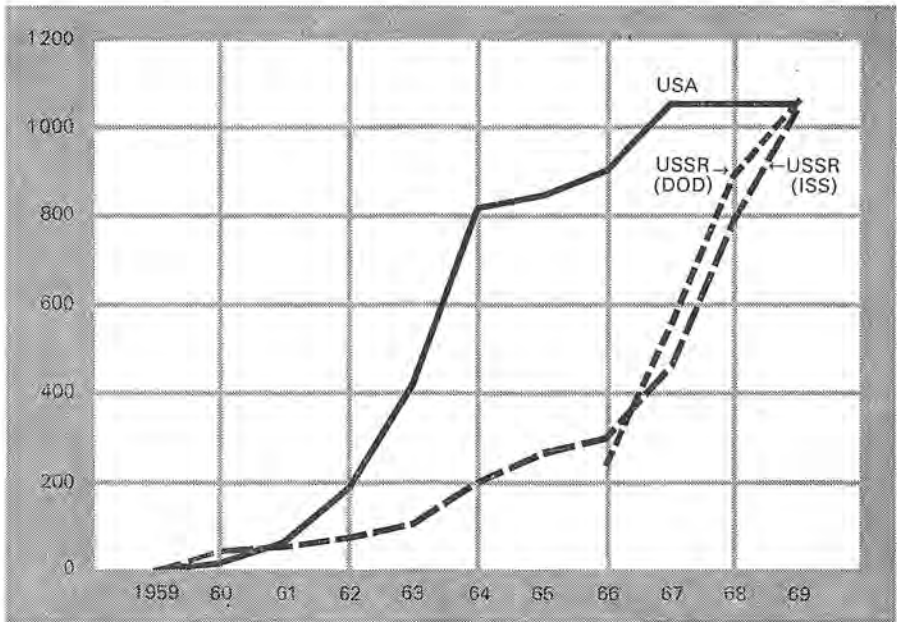
The number of delivery vehicles—missiles, aircraft, artillery pieces and so on—is another indicator of nuclear forces. It too is imperfect. Many delivery vehicles, notably aircraft, can also deliver conventional weapons or perform other functions, for example reconnaissance, and they may be able to deliver several warheads at once or in quick succession. All delivery vehicles can vary greatly in vulnerability, accuracy, reliability, penetration aids and so on. Overall the total number of nuclear delivery vehicles appears still to be rising.

Number of warheads

The number of warheads is increasingly important as multiple warheads are introduced on long-range missiles, and as more and smaller air-to-ground missiles of higher accuracy are installed in aircraft. The military attractions of multiple warheads are two: they will tend to do more damage than large single warheads because of the better target coverage they will achieve, and the chances of penetrating ABM defences will be greater than with single warheads. MRVs (multiple re-entry vehicles) which scatter in a fixed pattern are the simplest type of multiple warhead. MIRVs (multiple independently-targeted re-entry vehicles) which can be individually guided at separate targets are more sophisticated. MRVs have been deployed in some types of US missiles since 1966 and the first MIRVs became operational on US mis-

Chart 2.1. USA and USSR: numbers of intercontinental ballistic missiles

Numbers



Sources: The Military Balance, 1969-1970, Institute of Strategic Studies, London, p. 55. (ISS) Fiscal year 1971 Defence Program and Budget, A Statement by Secretary of Defence Melvin R. Laird, 25 February 1970, pp. 102-3. (DOD)

siles in June 1970.² The United States authorities have reported that the Soviet Union has been testing multiple warheads and are speculating as to when they will become operational in the Soviet Union. More information on warheads is given below.

Size of forces

Discussion about SALT is normally focussed on long-range delivery vehicles—ICBMs, SLBMs and long-range bombers belonging to the Soviet Union and United States.

The growth of ICBM numbers over the past decade, according to Western estimates, is shown in chart 2.1. The United States acquired a huge lead in the early 1960s, and then kept its numbers steady after 1966. The Soviet Union caught up rapidly after 1966: its rate of increase in ICBMs from 1966 to 1969 was about the same as the rate of increase in the United States from 1961 to 1963.

That there has been a rapid increase in Soviet missile strength was indicated by the Soviet Defence Minister in November 1969, when he said: "In recent years the Strategic Missile Force has developed at a particularly

² See *SIPRI Yearbook 1968/69*, page 103.

Table 2.1. US estimates of Soviet ICBMs operational

	Number	Increase
Mid-1966	250	
Mid-1967	570	320
1 Sept. 1968	900	330
1 Sept. 1969	1 060	160
<i>Projection</i>		
Mid-1970	≥ 1 250	≥ 200

Source: Department of Defense Appropriations for 1971. Hearings before a Subcommittee of the Committee on Appropriations. House of Representatives, 91st Congress, 2nd session. Part 1. Washington, 1970, p. 35 and 102-3.

rapid rate.” [5] The rate of increase for 1969 and the estimated increase to mid-1970, given in the United States “posture statement” presenting the defence budget for the fiscal year 1971, is considerably less than that for the two preceding years, but it is still substantial. The numbers given there are shown in table 2.1.

The growth of numbers of SLBMs in the US Polaris class submarines and in the equivalent Soviet class, designated the Y-class submarines in the West, is shown in chart 2.2. Polaris started to come into service slowly at the beginning of the 1960s and then with a rush in the mid-1960s.³ By 1967 there were 41 submarines, carrying 656 missiles. The A-3 missile was fitted to the last 23 boats and five early boats were refitted with it too.³ All or many of these A-3 missiles carry three MRV warheads. If, as has been reported [6, 7], all 28 boats carry these multiple-warhead missiles, while the 13 others carry the single-warhead missile, the total warheads in all the 41 Polaris submarines is 1552.

The available evidence on the Soviet Y-class submarine is set out in the reference section, page 142. From the time of launching it can take a year or two for new submarines like this to be fitted out, to complete trials, to be shaken down and finally to go on station. US and British experience shows this.

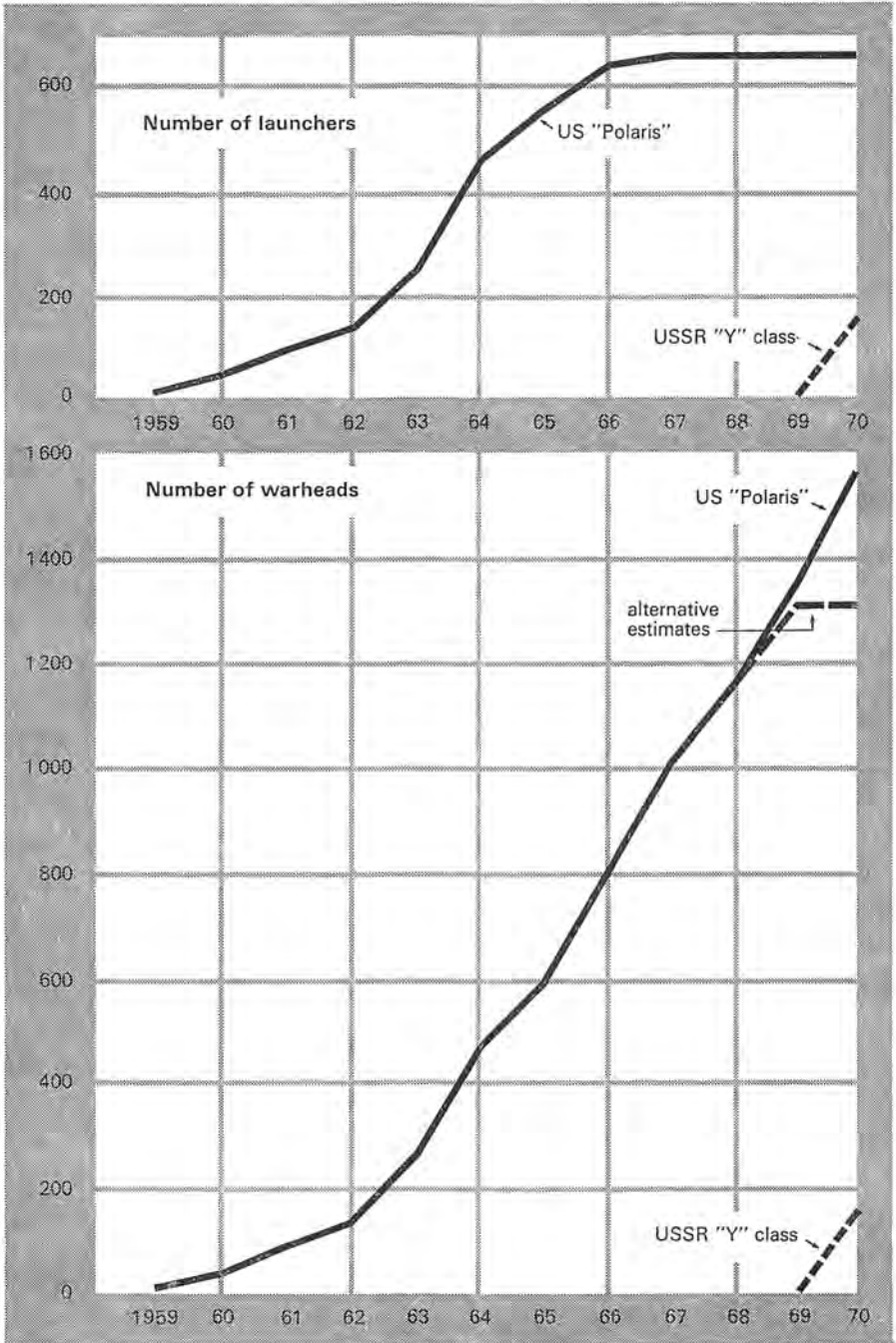
The evidence suggests that more than ten Y-class submarines have been launched, but that few are yet operational. Conflicting statements have been made about the number operational. On April 20, Mr Laird, in an alarming speech, indicated a figure of ten or more. But a few days later a United States Department of Defense spokesman indicated that one Y-class submarine might be on regular station in the Atlantic.

For these reasons only a dotted line has been used for Y-class SLBMs in chart 2.2.

³ For a detailed description of submarine-launched ballistic missiles, see *SIPRI Yearbook 1968/69*, pages 96-111.

Chart 2.2. USA and USSR: Polaris-type submarine-launched ballistic missiles

Numbers. Dotted lines indicate estimates



Source: SIPRI Yearbook 1968/69, and reference material, p. 371.

As noted in the text, there is some uncertainty about whether "many" or "all" Polaris A-3 missiles are now fitted with MRV's. Two lines, representing often quoted sums for 1969-70 (1552 and 1328) are therefore shown.

In Western appraisals the Y-class submarine is usually credited with a missile launched from below the surface with a range of 1 500 nautical miles, tests of which had been observed. Recently, it has been reported in the United States that tests had been observed of a submarine-launched missile with a range of 3 000 miles. [8] The sequence, but not the timing, is the same as that followed with Polaris: the Polaris A1 and A2 had ranges of 1 200 and 1 500 nautical miles; the A3 had a range of 2 500 nautical miles. But whereas the Polaris A3 carried three MRV warheads, the Soviet Y-class missiles are not believed to do so. The difference in warhead numbers shown in the lower part of chart 2.2 is therefore vast.

In addition to the missiles carried by the Y-class submarines, the Soviet Union is estimated to have 45 surface-launched ballistic missiles of older types carried by nuclear-powered submarines. These and other earlier Soviet missiles carried on submarines, which are relatively vulnerable and are believed by Western authorities to be aimed at Eurasia or at ships, are dealt with in the reference material, page 368.

In long-range bombers, the United States has a roughly three-fold superiority in numbers and also has bombers of much greater range and payload than the Soviet Union. Some of the United States bombers are assigned to Viet-Nam. On the Soviet side it is doubtful if many, or possibly any, of their bombers are assigned to long-range nuclear attack against land targets. There are many reports of their being assigned to maritime reconnaissance and to anti-submarine and anti-carrier roles. [9]

The United States has a big lead if these three groups of nuclear weapons—ICBMs, SLBMs and long-range bombers—are taken together. The Soviet Union has just caught up and is moving slightly ahead in numbers of ICBMs; it is still far behind in SLBMs and in long-range bombers.

In assessments of the nuclear position, attention is often confined to these three groups of weapons, ICBMs, SLBMs and long-range bombers belonging to the Soviet Union and the United States, and they are described as "strategic weapons". This is not surprising. These are the only weapons that could hit the United States, the country from which all the information originates; and they are weapons in which big new developments take place.

But the exclusion of all the other weapons means both that the total size of today's nuclear arsenals is understated and that the sense of a close or precarious balance may be enhanced.

An attempt has therefore been made to indicate on a wider basis the number of nuclear weapons belonging to each of the five nuclear powers. The figures are a summary of the information it has been possible to find in published sources. They are presented in table 2.2.

The table shows, by broad types, the number of nuclear-weapon delivery

vehicles belonging to each nuclear power that might hit the territory of its potential enemies. Nuclear weapons designed to destroy other weapons, e.g., anti-aircraft, ABM, or anti-submarine weapons, are excluded. The entries for the United States include aircraft, short-range missiles, or other weapons manned by its NATO allies which could deliver warheads maintained under United States control.

As between the two main alliances, the weapons are graded in the columns of the table according to the parts of potential enemy territory they can hit—the opposing super power, the edges of its territory only, or its allies.

The figures are subject to considerable qualification:

The estimates all come from Western sources. The basic source that has been used where possible is the United States defence posture statement in which the main estimates are for September 1969. In places, estimates have been made from various published figures. A larger study covering a number of years is in preparation.

The total number of weapons in service is generally shown. At any time, some will be on alert, some will be in reserve, some will be unservicable and so on. With missile-firing submarines, a considerable proportion will not be “on station”, in a position to attack the enemy. They will be travelling to or from their bases, or at them.

What is usually shown are numbers of missiles based on land or at sea, and numbers of aircraft. The aircraft may often carry more than one bomb or air-to-ground missile; some Western missiles already have multiple warheads; some aircraft might fly several sorties in a short time.

The aim has been to include all types of weapons which have been designed or adapted to carry nuclear warheads against the territory of an opponent, even if it is known that some of them may at the moment be performing some other task. Assymetrical assessments are often made by deducting from your own side weapons, for example, aircraft, that are assigned to other tasks for the moment, while failing, through bias or lack of information, to make a similar adjustment to the figures for the other side. The fact that the weapons system could readily be used to deliver nuclear weapons against you is significant: indeed, it is what leads to the inclusion of them when counting the other side's weapons. As already noted, United States and, to a greater extent, Soviet long-range bombers appear partly to be assigned to other tasks. Shorter-range aircraft may perform various roles, but it is known that large numbers of them in Europe, especially on the Western side, are designed for attack and can carry nuclear weapons.

As between the Soviet Union and the United States and their respective allies, the situation is geographically assymetrical. The Soviet Union is adjacent to its Warsaw Pact allies and not far from NATO territory, whereas

Table 2.2. Western estimates of nuclear weapons, September 1969

Western

Nation and weapon	Number	Capable of hitting:		
		all or most of USSR	limited parts of USSR	other Warsaw Pact countries
USA				
ICBM	1 054	×		×
Long-range bombers	581	×		×
Polaris SLBM	656	×		×
Carrier-based aircraft ^a	low hundreds/ 1 thousand ^f		×	×
Cruise missile launchers on land ^a	less than 100		×	×
Short-range missiles ^a	1 thousand or more		some	×
Medium and short-range aircraft ^a	1 thousand/ 2 thousand ^f		×	×
United Kingdom				
Polaris SLBM ^b	64	×		×
Longish-range V-bombers ^c	80	×		×
Medium and short-range aircraft ^c	240			×
France				
Medium-range Mirage bombers ^d	62		×	×
Carrier-based and other aircraft ^d	less than 100		×	×

China.

A "limited number of TU-16" medium-range bombers. Enough U²⁸⁵ for only a few dozen weapons of any type.

the United States is far away from both its NATO allies and from the Soviet Union and other Warsaw Pact allies. For this and other reasons, the Soviet Union is vulnerable to attack by many more weapons than the United States. The Soviet population is not as highly concentrated in big cities as is the US population.

As shown in table 2.2, the weapons which might hit the United States include over 1 000 ICBMs and those submarine-launched missiles carried by the several Y-class submarines that are believed to be already operational. There are then up to 150 long-range bombers, as well as the surface-launched ballistic missiles of short range on submarines, and the several hundred cruise missiles on submarines and warships. It is believed that many of this latter group are targeted elsewhere.

On the other side, the Soviet Union is vulnerable to the following United States weapons: over 1 000 ICBMs, 656 submarine-launched missiles from

Soviet

Nation and weapon	Number	Capable of hitting:		
		all or most of USA	limited parts of USA	other NATO countries
USSR				
ICBM	1 100	×		×
Long-range bombers	150	×		×
"Y-class" SLBM	64	×		×
Earlier SLBM ^e	115		×	×
Cruise missiles on submarines ^e	270		?	×
Cruise missile launchers on ships ^a	about 60		?	×
Medium-range missiles	700			×
Short-range missiles	unknown			×
Medium-range aircraft	700			×
Short-range aircraft	unknown ^g			×

Sources: Fiscal Year 1971 Defense Program and Budget. Statement by Secretary of Defense Melvin R. Laird before a Joint Session of the Senate Armed Services and Appropriations Committees. 20 February 1970.

^a SIPRI work sheets.

^b *Jane's Fighting Ships, 1969-70*. London: Sampson Low, Marsten, and 1970, p. 316. *Daily Telegraph*, 8 May 1970.

^c International Air Forces and Military Aircraft Directory. Aviation Advisory Services, May 1969, p. 60.

^d International Air Forces and Military Aircraft Directory. Aviation Advisory Services, January 1969, pp. 40-43; February 1969, pp. 44-46. *Aviation Week & Space Technology* 80 (1), 16 March 1964.

^e See the reference section, p. 152.

^f The high figure is the number in different parts of the world that are physically capable of delivering nuclear weapons; the low figure is the estimated number that may be assigned to this role.

^g The Soviet Union and its Warsaw Pact allies are believed to have more than a thousand light bombers and ground attack aircraft but there is no sure evidence that these carry nuclear weapons.

Polaris submarines, all or most with MRV warheads, and up to 580 long-range bombers. There are about 1 000 carrier-based planes that are physically capable of delivering nuclear weapons and about 4 000 shorter-range land-based aircraft with this capability. But the available published information suggests that only a fraction of these are assigned to delivery of nuclear weapons. The figures at the lower end of the ranges given in table 2.2 are rough estimates of what is fairly readily available for attack on the target areas shown. Finally, the fringes of the Soviet Union might be hit by some of the United States short-range missiles based in Europe.

Exchanges of nuclear weapons between the Soviet Union and the United States might take place at short range in Asia as well as in Europe. United

States aircraft based on land and on carriers in Asia are quite close to Soviet territory in Asia. On the other side, the rather barren target of Alaska, as well as US bases in Asia, presumably are vulnerable to any weapons of appropriate range stationed at the extremities of Soviet Asia. But these must be second-order problems.

The Soviet Union is vulnerable to Britain's 64 Polaris missiles, each with three MRV warheads, and to its bombers, land-based and carrier-based, as well as to perhaps 100 or so French aircraft, land-based and carrier-based.

Many of the shorter-range weapons can hit only the fringes of the Soviet Union, and the older Soviet submarine-launched missiles could hit only the coastal fringes of the United States. In both countries these are some of the most highly populated and highly industrialized areas.

The number of nuclear weapons that could hit the European allies of the two big powers is very large but hard to assess at all precisely. Some Western SLBMs or ICBMs may be targeted at Warsaw Pact allies. Some Soviet SLBMs are believed to be assigned to targets in Eurasia. Apart from that, the numbers attributed to the Soviet Union are 750 medium-range missiles, an unknown number of small missiles and a relatively small number of short-range aircraft carrying nuclear weapons. The Soviet air force in Europe is believed to include many interceptors and, compared with the West, few attack aircraft which could have a nuclear role.⁴ On the Western side, there is a variety of missiles deployed in Europe. The total probably exceeds a thousand. And there are so-called "tactical" attack aircraft numbering one or two thousand.

The total number of United States nuclear warheads in Western Europe was stated by Mr. Clifford in 1968 to be 7 200. [10] This appears to include artillery warheads, spares, re-load bombs for second sorties and so on.

Finally China, which is set out separately in table 2.2, has a nuclear force which is still infinitesimal compared with that of the larger nuclear powers. According to the US authorities, China has a number of bombers acquired from the Soviet Union many years ago and enough U²³⁵ for "a few dozen weapons of any type". [11]

There are a number of qualitative differences in the nuclear armouries. Some have been noted. Generally speaking, the United States appears to be the pace-setter in the large-scale incorporation of new technologies into its armoury.

In whatever way the nuclear situation is examined, the inescapable feature is what enormous quantities of weapons have been amassed. The increase continues.

⁴ See page 78.

United States trends

Broadly speaking, the United States is rapidly introducing multiple warheads and, less rapidly, the ABM: while not now deploying more long-range delivery vehicles, it is going ahead strongly with the development of new types. The Secretary of Defense has declared his belief that the United States should go ahead and procure them unless SALT produces results soon. The defence budget was presented as a budget of moderation pending the outcome of SALT. Later it was reported that Mr Laird, after giving a NATO meeting an alarming account of the Soviet nuclear programme, had said that: "Unless progress develops in the strategic arms limitation talks in the next 12 to 18 months, the Administration will have to consider expansion and acceleration of its nuclear arms program." [8]

The changes already under way are the introduction of three independently targeted MIRV warheads on the Minuteman missiles, now planned for most but not all of these land-based missiles, and secondly, the refitting of the thirty-one submarines now carrying Polaris A3 missiles with Poseidon missiles. These are larger and more accurate and each carries ten MIRV warheads. Thus, each of these thirty-one submarines will be able to deliver 160 independently-targeted warheads. The first Poseidon missiles are expected to become operational in January 1971. There are plans—though there seems to be some uncertainty about their date of implementation—to convert the remaining ten nuclear submarines, which now carry Polaris A2 missiles with single warheads, to the A3 with three MRV warheads.

The introduction of MIRV has been going ahead unexpectedly fast. It had been expected that the testing of multiple-warhead systems for the Poseidon and Minuteman III missiles would be completed in June 1970 and that operational deployment would follow. [12] On March 10 the Secretary of the Air Force, Mr Seamans, told a Congressional committee that they would start "fielding the Minuteman III in June". On 19 June 1970, it was announced by the US Air Force that: "We can now say that the Strategic Air Command has assumed responsibility for the first flight of these missiles. . . . The first flight consists of ten missiles and one launch control facility." [13]

The United States is also going ahead with the development and procurement of a new air-to-ground missile designated SRAM, carried by long-range bombers. It carries a nuclear warhead and it is reported that each long-range bomber (B-52) will carry twenty of them and that the B-1 is being designed so that it could carry twenty-four if it carried nothing else. [14-15] Further ahead there is SCAD, a "decoy" with a nuclear warhead. As with MIRV warheads on missiles, there is a move to far more warheads per delivery vehicle, each probably smaller in yield but with improved penetra-

Table 2.3. Number of warheads on US missiles and bombers

		<i>Now</i>	<i>With MIRV</i>
a)	<i>Missiles</i>		
	Minuteman I	1 × 1 or 2 mt	
	II	1 × 2 mt	
	III		3 × 200 kt
	Polaris A2	1 × 1 mt	
	A3 (MRV)	3 × 0.3/0.5 mt	
	Poseidon		10 × 50 kt
b)	<i>Bombers</i>	<i>Now</i>	<i>With SRAM</i>
	2-4 bombs ×	1 to 24 mt	4 bombs × 1 + mt
	+ 2 Hounddog ×	4 mt	+ 20 SRAM × 200 kt
	<i>For comparison:</i>		
	Hiroshima	1 × 14 kt	
	Nagasaki	1 × 21 kt	

Sources: Lapp, Ralph E. Kill and Overkill. New York, 1962. Lapp, Ralph E. Nuclear Weapons: Past and Present. *Bulletin of the Atomic Scientists* 26 (6): 103-106, June 1970. Brown, D. A. SRAM Production Expected in Mid-1970. *Aviation Week & Space Technology* 91 (22): 47-48, December 1969. Stone, Jeremy. Containing the Arms Race, Some Specific Proposals. Cambridge, Massachusetts, 1966, page 7. See also, *SIPRI Yearbook 1968/69*, pages 102-3.

tion and probably improved accuracy too. The changes in number of warheads per missile and bomber resulting from all this, and the reported sizes of those warheads, is shown in table 2.3.

In 1969 the administration announced its intention to go ahead with the ABM in the "Safeguard" version, slightly different from the previous administration's Sentinel version. In the face of remarkable opposition, the administration asked for and got the approval of the Senate by one vote to start work at two defensive missile sites out of the twelve eventually planned. Early in 1970 the administration asked for funds with which to start work on a third site, the cost being \$920 million in the year beginning 1 July 1970. [16] Congressional approval was again obtained. [70]

The administration is also going ahead with development of two new major delivery systems, the B-1 manned bomber (also designated AMSA—advanced manned strategic aircraft) and the ULMS, a new missile submarine with greatly increased range and other innovations.

Before the present administration decided to go ahead with it, the proposal for a new manned bomber had been advocated by the Air Force and rejected by previous administrations over a long period of years. The posture statement indicated that \$64 million carried over from earlier years, plus a further \$100 million from the new budget, would be spent on engineering development of the B-1. [11] In early June 1970, contracts for the design, development and test-flying of five prototypes were announced at a total cost of about \$2 billion. [17] Congressional approval of future funding for

Table 2.4. Projections of numbers of US and Soviet nuclear warheads in long-range delivery systems

Author	When	ICBM	SLBM	Bombers	Total
USA					
Senate Foreign Relations Committee staff, 1969 ^a	After MIRV	3 000	5 120	646	8 766
York, Aug. 1969 ^b	After MIRV	about 3 000	over 5 000	about 500	nearly 9 000
Rathjens and Kistiakovsky, Jan. 1970 ^c	After MIRV	3 000	5 120	2 144	10 264
Institute for Strategic Studies, early 1970 ^d	By 1975	over 2 000	over 5 400	over 3 500	about 11 000
Lapp, early 1970 ^e	1975	2 000	5 440	2 160	9 600
USSR					
Senate Foreign Relations Committee, March 1969 ^a	After MIRV	4 500	500	150	5 150
York, Aug. 1969 ^b	After MIRV	4 500	500	150	5 150
Rathjens and Kistiakovsky, Jan. 1970 ^c	After MIRV	4 050	1 645	600	6 295
Institute for Strategic Studies, early 1970 ^d	By 1975	Increase by "similar percentage" as USA ^d			
Lapp, early 1970 ^e	1975	..	..	..	3 500/5 500

Sources:

^a Strategic and Foreign Policy Implications of ABM Systems. Hearings before the Subcommittee on International Organization and Disarmament Affairs of the Committee on Foreign Relations. Part I. US Senate, 91st Congress, 2nd session. March 1969, pp. 300-301.

^b *Scientific American* 221 (2): 18-20, August 1969.

^c *Scientific American* 222 (1): 20, January 1970.

^d Strategic Survey 1970. London: Institute for Strategic Studies, 1970. The Strategic Survey puts the present number of Soviet warheads at 1880, including 450 in bombers, and says: "The Soviet Union ... could presumably increase its numerical strength by some similar percentage [as the USA]." The figure implied is just below 4 900 Soviet warheads by 1975.

^e Lapp, Ralph E. ABM, MIRV and SALT. Address to the American Physical Society, 28 April 1970. (manuscript).

these contracts will be required. The posture statement said that no production decision need be made at this stage. Nevertheless, the project is now alive. It has been reported in the aerospace press that the Air Force "hopes to order at least 250 operational aircraft" and to attain an "initial operational capability with the advanced bomber in 1978". [18]

The new submarine, which would take longer to develop and come into operation than the bomber, is described on page 131.

Another development of importance in the pipeline is the development of terminal-guidance systems whereby individual warheads could be steered onto their targets. In this context, reference is often made to the techniques of "map-matching" whereby a sensor in the nose of the warhead would scan the ground; the image it obtained would be compared automatically

The main arms race

with a map of the target area previously obtained by satellite or aerial reconnaissance, and a steering system would be linked up. Terminal guidance, if introduced, will produce further increases in accuracy.

Of these developments the one with the most obvious effect on destructive power will be the deployment of multiple warheads. Five published Western projections of the resulting total number of United States warheads on ICBMs, SLMBs and long-range bombers are shown in table 2.4. The figures indicate that the United States is likely to have about 10 000 warheads on long-range delivery vehicles by 1975. The earlier projections for the United States assume that all Minuteman missiles will in the end be MIRV'd; the later ones assume that by 1975 only half, or a few more than half, will be MIRV'd. That seems consistent with present plans, but they could change. The later estimates for the United States show much higher figures for the number of warheads per bomber than the earlier ones. They make provision for the introduction of the new air-to-ground missiles.

Soviet trends

There are great difficulties in saying anything about Soviet trends in nuclear weapons procurement and the future Soviet nuclear armoury. Because of the lack of Soviet information on these subjects, it is necessary to use US information. This information has often been presented in, or around, political debates the object of which is to get public and Congressional approval of US nuclear weapons programmes. In such a context the likelihood of bias in the information and its presentation is bound to be high. Over the past two years, during which the ABM and other programmes have been pushed through against strong opposition, it is clear that Mr Laird and his spokesmen at the Department of Defense have been presenting a more alarming view than is held by the experts in the "intelligence community". The central proposition put forward by the administration and, in most acute form, by Mr Laird, has been that the increase in total Soviet missile strength, combined with the continued increase within that total in the numbers and qualities of the large Soviet missile designated SS-9, constitute a potential threat to the United States deterrent, meaning that the Soviets might be developing a "first-strike capability". Thus in early 1969, Mr Laird, referring to the SS-9, gave his view in the most direct terms: "Well, we were and still are going for a second strike capability, as you know. With the large tonnage the Soviets have they are going for our missiles and they are going for a first strike capability. There is no question about that." [19]

Defence against such a first-strike capability is the first of the three objectives claimed by the present administration for the ABM. [20]

Many people have challenged the proposition that any Soviet leader could conceivably believe that in launching a first strike he could destroy so many of the nuclear delivery vehicles and warheads of the United States and its allies, including those on submarines, in bombers and in Europe, that the Soviet Union would not suffer intolerable damage in a retaliatory strike; and some have challenged, though perhaps with less emphasis—relatively few experts like to challenge the premises of the arms race—the idea that he could see any political advantage in doing so.

What concerns us here, however, is what new evidence, if any, has been adduced about Soviet trends.

The key paragraph in this year's posture statement says that the experts believe that it is impossible to offer a view of future Soviet ICBM numbers or possibly of numbers of any Soviet missiles. The words are rather ambiguous. The view offered instead is a personal one by Mr Laird, consisting of the assumption that the Soviets will continue to increase their ICBM strength at the same average rate as over the past several years. The fact that the rate of increase has slowed down in the past two years is ignored, so that the projection implies a renewed acceleration. The passage reads as follows:

It is estimated that the number of operational ICBMs will continue to increase through mid-1971. Beyond mid-1971 the projections become less firm. The 1969 projection was that the Soviet ICBM forces would continue to grow, but at a considerably slower rate than previously, leveling off by mid-1974. This year, there is no agreed figure within the intelligence community for the upper level of the range of estimates. The intelligence community believes that it is impossible to estimate, with any high confidence, or to make projections of Soviet force level objectives at this time. I would note that if Soviet deployment continues at the average rate of the past several years, the figure of 2 500 launchers that I referred to last spring could be attained by the mid-1970s. However, I am not offering that figure as a forecast, but rather as a possibility which I, as Secretary of Defense, must take into account in planning. [11]

He also states that the projections of Soviet "ICBM and SLBM strengths for mid-1970 and mid-1971" have had to be revised upwards in each of the past five years as new information on Soviet missile deployment came in. This presumably refers to the combined total of ICBMs and SLBMs and chiefly reflects under-estimation of ICBM numbers: the figure for Y-class submarines operational is still so low at mid-1970 that it seems unlikely that it has been revised upwards five times.

All the five authors who made projections for the United States shown in table 2.4 made projections for, or some remarks about, the Soviet Union. But these cannot be based on evidence. It looks as if most of the authors assumed that the Soviet Union would build up its land-based missile force

a little further and would add three MIRV warheads to each by 1975. But each author may have been influenced by his predecessor so that he may have been inadvertently perpetuating a kind of conventional fiction.

In short, it is impossible to say what policy as regards the acquisition of strategic weapons the Soviet Union will follow. In any case, its policy is likely to be influenced by the outcome of SALT.

As regards immediate trends, with respect to which there can be evidence of work started, there is estimated to be quite a number of Y-class submarines in the pipeline: about ten or so launched and perhaps about the same number laid down (see reference material, page 371). At a news conference, Mr Laird has recently stated that new starts of ICBM silos are continuing, but he gave no numbers. [21]

As regards the SS-9 missile, which has figured so prominently in the ABM and other US nuclear-weapon debates over the past two years, the administration has claimed that if 500 SS-9 missiles with three independently-targeted warheads—MIRV—were deployed (the USA reckons the SS-9 to be capable of carrying one 25-megaton warhead or three 5-megaton warheads) this would constitute a “first strike” threat to the 1 000 Minuteman ICBMs in the United States. It is a truism that if this, or any missile, had a sufficiently good combination of yield (i.e., explosive power), accuracy, reliability, and other attributes, 500 of them with three warheads each could be expected to hit a high proportion of 1 000 fixed targets. As noted below, the development of MIRVs and increasing accuracies means that both sides are likely simultaneously to see first-strike capabilities on the other side—and on their own side if they look at the problem symmetrically—as regards land-based missiles and other immobile weapons whose location is accurately known.

The point about the SS-9 is that the possibility of developing a first-strike capability soon, and the express desire to achieve it, have been attributed to the Soviet Union. The available evidence on the SS-9 is examined in some detail in the reference material, page 358. The rate at which the US authorities apparently estimate that the SS-9 has been deployed is shown in table 2.5. The evidence seems less alarming from the standpoint of the United States than some of the statements made about it. The SS-9 has been coming into operation slowly since 1966; it does not yet have MRVs, let alone MIRVs, fitted to it, though some testing has taken place. It is estimated that 220 were operational early in 1970; 60 were under construction, implying no quick increase or decrease in the rate of completions. It is not known at what rate new missile silos have been started since the summer of 1969. According to some US reports there was a pause between late 1969 and the summer of 1970. (See page 361.) Since the Soviet authorities re-

Table 2.5. US estimates of numbers of SS-9 missiles

	Spotted (= started)		Operational (= completed) at end year	Under construction at end year
	During year	Cumulative total at end year		
1964	42	42	0	42
1965	66	108	0	108
1966	54	162		
1967	30	192		
1968	36	228		
1969	54	282	222	60
April 1970	more than 280			
Average per year 1964-69	47			

Source: See the reference section, p. 363.

mained silent, the nature and significance of this reported pause is a matter of guesswork.

Appraisal

The general picture is this:

The United States went ahead very fast in developing vast numbers of long-range nuclear weapons in the early 1960s.

The Soviet Union began, with a large delay, to catch up. It also began to deploy an ABM system, but apparently stopped.

The United States held its numbers of long-range launchers constant but made many qualitative improvements.⁵ It has begun rapidly to introduce multiple warheads and has started on an ABM of its own.

The Soviet Union, apparently behind in multiple warheads, is still going ahead introducing more launchers. It has overtaken the United States in the number of land-based launchers; it is beginning to produce Polaris-type submarines at something like the rate that the United States achieved about ten years ago. The United States in the end produced forty-one.

The United States is proceeding with the development of new delivery systems, notably the new submarine (ULMS) and new long-range bomber (B-1) and the Secretary of Defense has declared his view that it will be necessary to go ahead with these if SALT does not produce results fairly soon.

On the United States side, the view presented in justification of the new weapons programmes, notably the ABM on which the debate has been focussed, is that they are needed in order to prevent the Soviet Union from

⁵ See *SIPRI Yearbook 1968/69*, pages 39-42.

achieving a “first-strike” capability or strategic superiority in some other sense.

The introduction by one country of MIRV warheads will always tend to appear as a potential first-strike capability to the land-based missiles of an adversary if number and types of launchers are at all equal, because of the disproportion between launching points and targets that can be attacked: a missile coming from one silo on the other side can aim separate warheads at several of your missile silos. If, as tends to happen, it is assumed that all or most of the warheads will hit the target—probably a most unrealistic assumption—that means all your missiles are at risk.

Thus on one side the United States administration reads the intention to produce a first strike into the combination of accuracy, yield and numbers which it fears the Soviet SS-9 force may acquire in the future if it is fitted with MIRV warheads and if the number of missiles continues to be increased. On the other side, comparable people in the Soviet Union seem bound to make a similar interpretation of the vast numbers of MIRV warheads which they know are being installed in the United States and of the further increases in accuracy through terminal-guidance systems, known to be under development. It is true that, on 29 December 1969, President Nixon said that “there is no current United States program” to develop a “hard-target” MIRV capability, meaning an ability to knock out missile silos. This was a statement reportedly intended to reassure the Soviet authorities. It came after General Ryan, Chief of Staff of the United States Air Force, had told a Congressional committee in October that: “We have a program we are pushing to increase the yield of our warheads and decrease the circular error probable so that we have what we call a hard-target killer, which we do not have in the inventory at the present time.” [22]

It is difficult to assume that many Soviet experts will be influenced by US statements of innocent intention, and will not proceed by extrapolating trends in weapons and assuming bad intentions. That is the practice which leads the United States authorities to their propositions about first-strike threats.

Soviet fears might be enhanced by the fact that the United States is putting a very large number of its MIRV warheads on submarines where they are hidden and invulnerable. The Soviet Union, by contrast, still has most of its missiles on land, where they are vulnerable. It is perhaps not surprising that it is putting a major effort now into the development of its Y-class submarines, similar to the US Polaris. It has been suggested by various experts in the West [23, 24, 25] that with the development of the MIRV and increased accuracies, immobile missiles have become so vulnerable that they should be scrapped, reliance in future being placed on submarine missiles

only. Certainly the arms race seems to be moving increasingly under water. (See chapter 3.)

During the ABM and other debates in the United States the spectre of a "first-strike" threat was conjured up and often disputed in technical terms. However, some highly respectable people, including those who previously had been within or close to the strategic community, have questioned the premises of this kind of analysis. Probably the most important was Mr McGeorge Bundy who, in an article on the background to SALT, said:

There is an enormous gulf between what political leaders really think about nuclear weapons and what is assumed in complex calculations of relative "advantage" in simulated strategic warfare. Think-tank analysts can set levels of "acceptable" damage well up in the tens of millions of lives. They can assume that the loss of dozens of great cities is somehow a real choice for sane men. They are in an unreal world. In the real world of real political leaders—whether here or in the Soviet Union—a decision that would bring even one hydrogen bomb on one city of one's own country would be recognized in advance as a catastrophic blunder; ten bombs on ten cities would be a disaster beyond history; and a hundred bombs on a hundred cities are unthinkable. Yet this unthinkable level of human incineration is the least that could be expected by either side in response to any first strike in the next ten years, *no matter what happens to weapons systems in the meantime*. Even the worst case hypothesized in the ABM debate leaves at least this much room for reply. In sane politics, therefore, there is no level of superiority which will make a strategic first strike between the two great states anything but an act of utter folly. [26] (*Italics in original.*)

The fact of the matter is that even if the whole Minuteman force were wiped out at a stroke—which is not now technically credible—there would remain huge United States and allied nuclear forces capable of delivering tens of thousands of warheads. (See tables 2.2 and 2.4.) Almost all these warheads are bigger, sometimes many times bigger, than the single warhead that fell on Hiroshima. The idea that Minuteman might in some sense become technically vulnerable does not mean that there is any political reality in such a threat.

It is curious that the prospect that China may in a few years possess a few ICBMs seems to alarm the politicians.

If at the SALT talks the Soviet Union and the United States had to reach a close balance of all the weapons they possess, the prospects for the talks would be poor. The variety of weapons, the number of variables influencing their performance and the differences in geographic, political and military conditions are such that the precise definition and measurement of balance would be impossible and the scope for argument great.

If the aim for the time being is that both sides should have an assured second-strike capability, then there is a wide range of numbers that would

fit that requirement. The overkill on both sides is so vast that substantial imbalances measured by this or that dimension—numbers of delivery vehicles, numbers of warheads and so on—are not significant. The balance of terror is not delicate.

SALT

The origins of SALT were described last year.⁶ The proposal for a verified freeze on “strategic” nuclear offensive and defensive missiles was first made in 1964 by President Johnson. The Soviet Union, which then had far fewer long-range missiles, rejected the proposal saying that it did not entail any disarmament. In 1967 the United States renewed the proposal in rather more open terms and President Kosygin in March agreed to bilateral discussions on “means of limiting the arms race in offensive and defensive missiles”. After long delays before one side replied to the proposals of the other, it was eventually agreed that talks should start on 17 November 1969 in Helsinki.

The SALT talks are the means by which the super powers are expected to fulfil their treaty obligation under Article VI to the Non-Proliferation Treaty “to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament. . . .”⁷ Progress or lack of it at the SALT talks may determine the success or failure of the Non-Proliferation Treaty.

The talks were opened in Helsinki on 17 November 1969. The two sides then met two or three times a week, in working sessions, each session lasting usually about an hour and a half. Allowing for consecutive translation, this must mean about three quarters of an hour of effective working time at each session. This round of meetings ended on 22 December when it was announced that negotiations would be resumed in Vienna on 16 April 1970 and a communiqué was issued which included the statement:

The preliminary exchange of views which took place concerning the limitation of strategic arms was useful to both sides. As a result of that exchange, each side is better able to understand the views of the other side with respect to the problems under consideration. An understanding was reached on the general range of questions which will be the subject of further US-Soviet exchanges. [27]

Negotiations were resumed in Vienna on 16 April. The sessions continued to be infrequent and short. It has been reported that there have also been informal chats between experts at a lower level. The negotiations within

⁶ *SIPRI Yearbook 1968/69*, pages 188–192.

⁷ For the complete text of the Non-Proliferation Treaty, see the *SIPRI Yearbook 1968/69*, pages 349–54.

national capitals between the various factions and departments of government may be more important than the exchanges of messages in Vienna.

The Vienna round of negotiations ended on 14 August. Thirty-two meetings had been held in four months. A joint communiqué issued at the end of the talks said:

In the course of the negotiations a wide range of questions dealing with the problem of limiting strategic offensive and defensive armaments was thoroughly considered. The exchange was useful for both sides and made it possible to increase the degree of mutual understanding on a number of aspects of the matters discussed.

Both Delegations expressed their determination to pursue the negotiations with the aim of limiting strategic armaments. Agreement was reached that negotiations between the US and the USSR Delegations will be resumed on November 2, 1970, in Helsinki, Finland.⁸

The United States Government placed great emphasis on the flexibility of its preparations for the negotiations, avoiding prior commitment to particular positions, and relying instead on the preparation of "building blocks" so that the United States could react flexibly to positions taken by the Soviet Union. It seems also to have meant that decision of the issues disputed between different factions within the government could, up to a point, be postponed. The approach was described at some length in the President's message on foreign policy for the 1970s. [20] Emphasis was also placed on verification.

As the talks were approached and then joined, two of the main issues in the background were "linkage" and the possibility of a moratorium embracing MIRV. The two issues are related.

Since the early days of the administration there have been indications that the United States President believed in linkage, meaning that to go slowly in its approach to the SALT talks would be a way of persuading the Soviet Union to help the United States towards satisfactory settlements in the Middle East and Viet-Nam. Whatever the philosophy behind this idea, it must have rested, at least implicitly, on the assumption that the Soviet Union could exert influence in these areas and on the assumption that they wanted a halt to the arms race more than the United States did.

On the Soviet side there were quite strong reactions to the theory of linkage after it was first propounded in early 1969:

A "theory" alleging that the USSR is interested more than the USA in putting an end to the uncontrolled arms race and, so, certain concessions could be wrested from it in other spheres, too, is being spread. The idea here is rather transparent: on the one hand, to interfere with the Soviet Union's struggle against

⁸ ACDA press release, 14 August 1970.

the arms race (the aim of this version is to make every constructive step of Soviet diplomacy out as a manifestation of "weakness") and, on the other, to cool the Americans' aspiration to talks and agreement and to urge them to advance demands and go in for a diplomatic haggle that will prevent all progress. [28]

As regards a moratorium, there was substantial political pressure in the United States before the talks started that the government should go quickly for a stop to testing and deployment of MIRVs before testing of them had been completed. Abstention from testing would then be a sufficient means of monitoring non-deployment; on-site inspection would not be needed.

On 9 April the US Senate, by seventy-two votes to six, passed a resolution urging that the President "should propose to the Soviet Government an immediate suspension by the United States and the Soviet Union of the further deployment of all offensive and defensive strategic weapons systems, subject to national verification or other measures of observation and inspection as may be appropriate." [29] At almost the same time, the national advisory committee to ACDA, under the chairmanship of Mr McCloy, recommended, with only one out of fourteen members dissenting, that the administration propose a moratorium on deployment of strategic weapons and an immediate suspension of testing of multiple warheads. [30] The administration opposed a moratorium and appears not to have proposed one in Vienna. As noted earlier, the US Air Force, rather than slowing down the testing and installation of MIRVs in order to await results from SALT, has pushed ahead with unexpected speed and in June deployed the first group of Minuteman III missiles with MIRV warheads. It tends to be assumed that this is a point of no return: that on-site inspection is unacceptable and that non-deployment of MIRV cannot be verified without it. It is certainly doubtful whether on-site inspection of missiles would be acceptable to either side. A partial technical solution which would reduce the intrusiveness of inspection has been suggested—the use of a neutron-detecting apparatus that could be applied to a missile covered in a shroud so that the number of warheads could be known without more being seen. [31] But the real obstacle is probably political.

It is possible that continuing visible testing is required and that even now a moratorium would be effective. In June 1970 a Pentagon official told a Congressional committee that the United States administration would be ready to reverse its decisions to deploy ABM defences and MIRV warheads, if an agreement to this effect were reached at SALT. He declined to say whether on-site inspection would be required to check on MIRV deployment. [32]

The Soviet Union does not appear to have made public its views on a moratorium but various articles appeared early in 1970 saying that the

United States decision to go ahead with MIRV deployment, to proceed to the second stage of the ABM and to develop other new weapons “seriously threatened” the SALT talks. [33, 34, 35] Earlier background articles had welcomed the talks and, while declaring the Soviet Union had consistently sought disarmament, had analysed the US background in terms of an evolving balance between military circles and their critics, or those who sought military superiority and those who saw the futility of such an endeavour. The March articles spoke of attempts by the United States to negotiate from strength. In mid-April Party Secretary Brezhnev, in a foreign policy speech, stated that the Soviet Union would have to answer any “attempts by anyone to ensure military superiority over the USSR” with “a proper increase in military might, guaranteeing our defence”, but that if the United States wanted agreement and overcame its militarists, the prospects were good. The Soviet Union would “do its utmost to make these talks useful”. He said he wished particularly to emphasize this because “American circles that are interested in the arms race” had become particularly active and were “resorting to slanderous assertions to the effect that the Soviet Union allegedly was going to build up the production of armaments in any case”. “This,” he continued, “is an old subterfuge of the militarists who have always tried to intimidate the public in order to get bigger appropriations for war preparations.” [36]

So as the second round of talks started, people on each side were seeing, or claiming to see, threats from the other side.

Attitudes of other countries

At the UN General Assembly in the autumn of 1969 a draft resolution was put forward by twelve powers on the initiative of Mexico. The operative paragraph read: “Appeals to the Governments of the USSR and the US of America to agree, as an urgent preliminary measure, on a moratorium of further testing and deployment of new offensive and defensive strategic nuclear-weapon systems.” [37]

Both the United States and the Soviet Union, supported by some of their closer allies, objected to this interference in the Helsinki negotiations and proposed an amendment which removed all reference to a moratorium. The amended version, supported by all four nuclear powers which are members of the United Nations, was voted down 50–40 with 16 abstentions. The original was adopted 67–0 with 40 abstentions, including those of the four UN nuclear powers. This provides some indication of the attitude of the non-nuclear countries.

The attitudes of the three nuclear countries not present at Helsinki is indicated by the following statements.

Under the heading "Intensified US-Soviet collaboration against China", the *Peking Review* of 14 November 1969 said:

This is a big plot. It shows that the United States and the Soviet Union are contending with each other, each seeking to maintain its own nuclear superiority by restricting the other, while at the same time both are colluding with each other in a futile effort to further develop their nuclear military alliance so as to maintain their nuclear monopoly, which has gone bankrupt, and continue to carry out their nuclear threat against the people of the world. It is also a new move by the United States and the Soviet Union to step up their joint opposition to China. . . . Following the conclusion of the "partial nuclear test ban treaty" and the "nuclear non-proliferation treaty," the U.S.-Soviet talks on so-called "strategic arms limitation" are aimed at further developing their nuclear military alliance. They vainly hope to maintain their nuclear monopoly and carry out nuclear blackmail and nuclear threats against the Chinese people and the people of the world. Nixon blatantly told a press conference on March 14 this year that U.S.-Soviet nuclear talks were designed to jointly cope with what he called the "potential Chinese Communist threat". Rogers also said on October 25 that it would be to the "advantage" of both the United States and the Soviet Union if an agreement was reached on "strategic arms limitation". He openly stated that "if we can work out something that is constructive from the standpoint of the two superpowers then we can deal with China's problem later on". These ravings by Nixon and Rogers have exposed the criminal designs of U.S. imperialism and social-imperialism in conducting the nuclear talks. [38]

After a meeting of the Council of Ministers on 19 November 1969 the spokesman of the French Government, Monsieur Léo Hamon, made the following statement:

La France considère avec intérêt et sympathie les conversations américano-soviétiques d'Helsinki qui porte sur la réduction des armements de ces deux pays et non sur la réduction des armements des autres: il souhaite que ces conversations aient une issue favorable.

During a debate in the House of Commons on 4 and 5 March 1970 on a motion to approve the Statement on the Defence Estimates, 1969, the Defence Secretary, Mr Healey, said:

I believe that every country in the world has a direct and powerful interest in the success of these talks between the super-Powers. If they were to fail, it would be a sombre outlook for mankind, because to the risks presented by the new possibilities which weapons technology creates, we must add the fact that the economic costs of the new technological weapons options might produce changes in the pattern of military spending by the super-Powers which could dislocate the alliances to which they now belong.

The possible approaches that might be adopted at SALT—set out in order of importance—are:

1. Simply to exchange views about current and future developments and about strategic concepts in the arms race without seeking to reach agreement on any limitations. It is unclear whether such a procedure would slow down or speed up the arms race. As each side through discussion came to see the strengths and weaknesses of the other side more clearly the result might go in either direction or nowhere.

2. To agree to limit on each side the total number of offensive delivery vehicles within some broad category: all long-range vehicles, all vehicles capable of hitting one another's territory, or some other broad definition. If the total of delivery vehicles only is limited, one element in the arms race will be checked, but unless further steps are taken at the same time or soon afterwards the arms race will go on in other forms: substitution within the fixed total of one type of vehicle for another (e.g., submarine-launched missiles instead of land-based missiles or bombers) or new generations of a given type of vehicle in place of old ones (e.g., the new US submarine and bomber now under development); the introduction of multiple warheads; improvements in accuracy; and so on.

3. Abolition or limitation of ABM (or other defences) in order to avoid or reduce an offence: defence race.

4. To agree not to introduce specific technical improvements. The most important immediate step would be to agree to ban MIRVs. But to proceed by stopping particular technical advances always leaves the opportunity for each side to divert resources into alternative lines of advance.

5. To agree not only on the number but also on the characteristics of each side's deterrent force, thus stopping technical advance by freezing designs.

6. To agree to stop tests of all nuclear warheads and of new weapons (e.g., MIRVs) and to cut research and development expenditure.

7. To reduce numbers of nuclear weapons. Combined with a freeze on characteristics, this would produce a "minimum deterrent". This idea has a long and respectable history. It would be the right prelude to the eventual abolition of nuclear weapons by all nations in a wider forum.

The latter proposals will be more difficult to agree upon, for a mixture of political and technical reasons, than the former.

There have been many newspaper reports, all US or Western, about what has been happening at the talks. These suggest that talks have largely been devoted to a freeze on numbers of launchers and ABMs (2 and 3 above), and that they have gone beyond (1) above.

Any agreement on these lines would be a major achievement. It would be the first direct agreement by the two nuclear powers to check the deployment of nuclear weapons. But unless steps are soon taken to stop research

and development and to stop the deployment of technical improvements and new weapons, the arms race will go on. Its dynamo will not have been stopped.

The fate of the Partial Test Ban Treaty is a reminder that disarmament efforts can peter out if a single treaty is hailed as a triumph and not followed up. Nuclear testing was only diverted underground where it has continued unabated. A limited first step can be very important—if it is followed by more steps.

Part 2. European security and force reductions in Europe

Introduction

It is now possible—it would be going too far to say probable—that serious negotiations about reducing—or freezing—levels of forces or weapons in Europe might begin in the next year or two. There is some slight movement in that direction. It seems more possible now than it did a year ago that a European Security Conference will in fact be held. The main items proposed for its agenda are, it is true, not disarmament questions: however, the possibility is mooted that the Conference might set up a separate body which would consider force reductions. If the SALT talks are successful, the pressure for doing something about forces in Europe may increase.

This section begins by outlining briefly the recent moves made towards calling a European Security Conference; it is not, however, concerned with the wider political questions which might be raised at such a conference, but with disarmament. It then discusses the level of conventional forces in Europe, and the various problems of definition and capability which would arise in discussions of disarmament or arms regulation for that area. (The nuclear weapons in Europe are considered on page 46.) Finally, the section briefly reviews some of the proposals for arms regulation and disarmament in Europe made in the past, putting special emphasis on those which may still be relevant now. A full description of these proposals is given in the reference material, page 388.

European Security Conference and recent NATO proposals

In the early 1960s, when the Warsaw Pact countries were advocating a European Security Conference, they usually coupled this with suggestions for measures of European force reduction or other forms of disarmament at the same time. (See pages 388 to 401.) The Western powers were then unresponsive. Since around 1967, there has been to some extent a reversal of

roles. In recent Warsaw Pact Security Conference proposals, there has not been much mention of troop reductions. On the other hand, the NATO powers have begun to express their interest in this. The longer history of these various moves is given in the reference section on page 388: here only the recent threads are picked up.

On the Warsaw Pact side, the Political Consultative Committee of the Pact, meeting at Budapest on 17 March 1969, issued a "Message from Warsaw Pact states to all European countries", which proposed "a meeting at the earliest possible date of all interested European states for the purpose of establishing, by mutual agreement, both the procedure for convening the conference and the questions on the Agenda". [39]

This was followed in May by a Finnish initiative in a note addressed to all European states as well as the USA and Canada in which it offered its capital city as a suitable place for a security conference and a possible preliminary round of talks. Thirty-five invitations have been issued: and virtually all countries invited have responded positively, either in writing or orally, though many had qualifications or reservations.

The next move on the Warsaw Pact side came at the Foreign Minister's conference of Warsaw Pact states in Prague at the end of October 1969. The conference welcomed the initiative of the Finnish Government, and proposed that the following questions be included on the agenda of such a conference:

1. The ensuring of European security and renunciation of the use of force or threat of its use in the mutual relations among states in Europe;
2. Expansion of trade, economic, scientific and technical relations on the principle of equal rights aimed at the development of political co-operation among European states. [40]

Early in 1970 the Soviet Government directly and explicitly confirmed that it had a favourable attitude towards United States and Canadian participation in a European Security Conference.

Meanwhile, NATO nations, no doubt partly because they were aware of the pressure in the United States for reducing the number of US troops in Europe, have been proposing a consideration of mutual force reductions. At their meeting in Reykjavik in June 1968, NATO country ministers had before them a report which included, amongst other items, an analysis of the possibility of balanced force reductions as between East and West. They agreed "that it was desirable that a process leading to mutual force reductions should be initiated. To that end they decided to make all necessary preparations for discussions on this subject with the Soviet Union and other countries of Eastern Europe and they call on them to join in this search for progress towards peace." [41]

At a Washington meeting in April 1969, NATO ministers referred to the Warsaw Pact proposal for a European Security Conference. They said:

The Allies propose, while remaining in close consultation, to explore with the Soviet Union and the other countries of Eastern Europe which concrete issues best lend themselves to fruitful negotiation and an early resolution. Consequently, they instructed the Council to draft a list of these issues and to study how a useful process of negotiation could best be initiated, in due course, and to draw up a report for the next meeting of Ministers. It is clear that any negotiations must be well prepared in advance, and that all Governments whose participation would be necessary to achieve a political settlement in Europe should take part. [42]

Further references to the Warsaw Pact proposal were made at a NATO meeting in December 1969; arms control and disarmament, Germany and Berlin, and economic, technical and cultural exchanges were suggested as possible subjects lending themselves to discussions or negotiations. The communiqué also said that progress in the bilateral and multilateral negotiations which had already begun—referring in particular to West German negotiations with the Soviet Union and Poland—“would help to ensure the success of any eventual conference”. [43]

Then in May 1970, NATO ministers meeting in Rome set out their views in more detail. Their communiqué states:

In so far as progress is recorded as a result of these talks and in the on-going talks—in particular on Germany and Berlin—the Allied Governments state that they would be ready to enter into multilateral contacts with all interested governments. One of the main purposes of such contacts would be to explore when it will be possible to convene a conference, or a series of conferences on European security and co-operation. The establishment of a permanent body could be envisaged as one means, among others, of embarking upon multilateral negotiations in due course.

Among the subjects to be explored, affecting security and co-operation in Europe, are included in particular:

- (a) the principles which should govern relations between states, including the renunciation of force;
- (b) the development of international relations with a view to contributing to the freer movement of people, ideas and information and to developing co-operation in the cultural, economic, technical and scientific fields as well as in the field of human environment.

In addition, Ministers representing countries participating in NATO's integrated defence programme⁹ attach particular importance to further exploration with other interested parties of the possibility of mutual and balanced force reductions and have therefore issued a declaration on this subject. [44]

The two main items proposed by the NATO ministers are closely similar to the two items proposed in the Warsaw Pact Prague communiqué of Oc-

⁹ That is, excluding France.

tober 1969 (page 65) with the addition of the word "cultural" in the second item.

The declaration on mutual force reductions, made at the same time at the NATO meeting in May 1970, includes the following passage:

Ministers invite interested states to hold exploratory talks on mutual and balanced force reductions in Europe, with special reference to the Central Region. They agree that in such talks the Allies would put forward the following considerations:

(a) Mutual force reductions should be compatible with the vital security interests of the Alliance and should not operate to the military disadvantage of either side having regard for the differences arising from geographical and other considerations.

(b) Reductions should be on a basis of reciprocity, and phased and balanced as to their scope and timing.

(c) Reductions should include stationed and indigenous forces and their weapons systems in the area concerned.

(d) There must be adequate verification and controls to ensure the observance of agreements on mutual and balanced force reductions. [44]

The Warsaw Pact powers responded in a memorandum, following a conference of the Foreign Ministers of Warsaw Treaty member-states on 21 and 22 June 1970. They suggested including in the agenda the question of creating, at the all-European conference, a body on questions of security and co-operation in Europe. The memorandum said:

The governments which adopted the present memorandum believe that a study of the question of reducing foreign armed forces on the territory of European states would serve the interests of a detente and security in Europe. In order to create in the shortest possible period of time the most favourable conditions for the discussion of appropriate questions at the all-European conference and in the interests of the productivity of studying the question concerning the reduction of foreign armed forces, this question could be discussed in the body which it is proposed to set up at the all-European conference or in some other manner acceptable to interested states. [45]

The memorandum also said that questions of the environment (pollution, etc.) could be discussed under the second item of the agenda, which could also be expanded to include the development of cultural ties. Thus they now suggest the following questions for consideration by an all-European conference:

On ensuring European security and the renunciation of the use of force or the threat to use it in relations between states in Europe; on the expansion of trade, economic, scientific-technical and cultural ties on an equitable basis, directed at the development of political co-operation between European states; on the creation at the all-European conference of a body on questions of security and co-operation in Europe. [45]

There is, then, a certain area of agreement between the NATO and Warsaw Pact proposals. However, whereas the NATO memorandum refers to the necessity for reduction to include both stationed and indigenous forces, the Warsaw Pact memorandum refers only to the reduction of foreign armed forces. Whether this difference is big enough to prevent any talks beginning remains to be seen.

The forces in Europe

Introduction

Most presentations of the military situation in Europe are in Western literature, and they are mainly background material to the question: what would happen if there were a Warsaw Pact attack? How long would the conventional forces be able to defend themselves? The question here is rather different: what possible reductions, withdrawals, disengagements or methods of control might be acceptable to both sides—so that neither side felt significantly less secure than it does now? The difference in the question leads to a difference in the material presented.

First, what is the area which might be covered? It seems likely that any negotiations would concentrate, at least to start with, on troops and weapons in the Central Region—which is here taken to be West Germany and Benelux on the Western side and Poland, Czechoslovakia and East Germany on the Eastern side. The NATO powers, in their May 1970 declaration, suggested that any talks should have “special reference to the Central Region”. The Warsaw Pact powers, in their June memorandum, referred to “a study of the question of reducing foreign armed forces on the territory of European states”—and most of these forces are in fact in the Central Region countries.

This does not mean, of course, that negotiators would only look at the figures of forces in the Central Region: they would consider them against the background of the total force levels of NATO and Warsaw Pact countries both in Europe and in the rest of the world. In particular, they would take into account forces and weapons in France on the one hand, and in the European part of the USSR on the other. In the figures which follow, it is indicated which group of countries is included.

To what extent is it possible to envisage agreements, or negotiations, about limiting, or reducing, the total number of weapons and troops engaged in the whole European confrontation—that is, troops in the Northern and Southern Regions, in France and in the Soviet Union itself? There is a difficulty here. It is hard to envisage any negotiations about proposals which might limit the right of the Soviet Union to move troops where it wished within its own territory, and which did not at the same time limit the right of the

United States in the same way. It does not therefore seem useful to consider any approach which would involve setting some kind of limit to the number of troops which were deployed in the Western part of the Soviet Union only. There seems to be no obvious stopping-place between negotiations about the Central Region only, and negotiations about the total world-wide forces deployed by the NATO and Warsaw Pact powers. Since these countries account for the vast bulk of world military expenditure, disarmament negotiations on such a scale would be a major step forward; but it is perhaps unlikely that either side is ready to contemplate so big a step as yet.

This section therefore is mainly concerned with background material to a discussion of the Central Region: this includes, of course, material on troops and weapons outside the region as well.

Another general problem is that there is no single figure for the number of troops in a country or region: the number is a function of time—not only because of the possibility of reinforcements from outside, but also because of the possibility of mobilization of reserves within the country. Comparisons will vary, therefore, according to whether they are peacetime figures, or figures after a short alert period—say three to four days, or after a month.

Naval forces are not included. It is most unlikely that they would in fact be included in any discussions of forces in Central Europe—and it would be rather difficult sensibly to allocate portions of the fleets on either side to the Central Region specifically.

The basic material on the conventional balance in Europe is presented in the form of two tables, one (table 2.6) giving troops and weapons on either side, and one (table 2.7) giving a comparison of men, firepower and mobility in a US and Soviet division. Extensive comments are then offered on the items and figures. The purpose of the tables is not to provide a single assessment, but rather to provide some figures as a basis for the discussion of the many different assessments that have been made, and to illustrate the different views which are likely to be taken if discussions do begin. The assessment can differ a good deal according to whether one takes divisions or manpower, according to the importance accorded to various weapons, and so on.

The balance of nuclear weapons in Europe is not discussed. The quantities on both sides are great (page 46–7). Some preponderance on one side or the other—even if it could be established—would not be particularly meaningful. With nuclear weapons, even a decisive superiority of numbers does not ensure victory, as it has with other weapons, but merely mutual destruction—and there are no degrees of importance in the matter of suicide. Further, for nuclear weapons to be used in Europe, they do not have to be in

Table 2.6. NATO and Warsaw Pact forces in Europe (excluding naval forces)

Category	NATO				Warsaw Pact			
	Nation	Northern & Central Region	Southern Region	Total	Nation	Northern & Central Region ^a	Southern Region ^a	Total
1. Divisions ^b available 1/2 week after order for mobilization ^c	USA	5		5	USSR in other Pact countries	28	4	32
	Other NATO	25	33	58	Other Warsaw Pact	34	27	61
	France	5		5	USSR in European USSR	11	3	14
	Total	35	33	68	Total	73	34	107
2. Divisions ^b available 1 month after order for mobilization	USA	7		7	USSR in other Pact countries	28	4	32
	Other NATO	30	34	64	Other Warsaw Pact	34	27	61
	France	5		5	USSR in European USSR	56	10	66
	Total	42	34	76	Total	118	41	159
3. Manpower (in thousands) combat and direct-support troops available in peacetime	USA	} 600	525	200	USSR	600	100	700
	Other NATO			925	Other Warsaw Pact	325	275	600
	France	100		100	Total	925	375	1 300
	Total	700	525	1 225				
4. Tanks (medium/heavy battle tanks) available 1/2 week after order for mobilization	USA	1 200		1 200	USSR in other Pact countries	6 950	1 000	7 950
	Other NATO	4 500	1 800	6 300	Other Warsaw Pact	7 500	6 000	13 500
	France	1 500		1 500	USSR in European USSR	2 650	700	3 350
	Total	7 200	1 800	9 000	Total	17 100	7 700	24 800
5. Tanks (medium/heavy battle tanks) available 1 month after order for mobilization	USA	1 850		1 850	USSR in other Pact countries	6 950	1 000	7 950
	Other NATO	5 500	2 000	7 500	Other Warsaw Pact	7 500	6 000	13 500
	France	1 500		1 500	USSR in European USSR	12 900	2 250	15 150
	Total	8 850	2 000	10 850	Total	27 350	9 250	36 600

6. Tactical aircraft in operational

service in peacetime								
light bombers	50	—	50	USSR	220	60	280	
				Other Warsaw Pact	40	—	40	
fighter/ground attack	1 150	550	1 700	USSR	820	105	925	
				Other Warsaw Pact	465	110	575	
interceptors	450	300	750	USSR	885	295	1 180	
				Other Warsaw Pact	1 115	565	1 680	
reconnaissance	400	125	525	USSR	220	40	260	
				Other Warsaw Pact	30	10	40	
Total	2 050	975	3 025	Total	3 795	1 185	4 980	

Source: The main source was the Institute for Strategic Studies publication *The Military Balance 1969–1970*, but some changes were made in the figures.

^a Hungary is assigned to the Southern Region.

^b Division equivalents.

^c The shortest possible warning time is assumed to be half a week with methods of intelligence. (An attacking side would of course have longer than this.) The divisions concerned would not be ready in the mobilization area and would not necessarily be at 100 per cent manpower strength.

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Europe. Whether one side has more nuclear warheads than the other in Europe, therefore, is not material to any assessment.

Divisions to be included

The figures in table 2.6 show, for the Northern and Central Regions taken together, and half a week after mobilization, 73 Warsaw Pact divisions, as against 35 NATO divisions. The two regions are taken together because there is no good way of allocating the Soviet divisions in the USSR between the Central and Northern Region. A number of possible variants on these figures can be presented:

	<i>Numbers of divisions</i>	
	NATO	Warsaw Pact
Northern and Central Regions (including USSR and France)		
“M” day ^a	29	65
Add those mobilized in 1/2 week	6	8
Total after 1/2 week	35	73
<i>of which</i>		
Central Region only (excluding USSR and France) ^b	27	62
<i>of which</i>		
“Foreign” ^c	10	28
<i>Percentage of divisions in Central Region which are foreign:</i>	37	45

^a Mobilization day.

^b That is, troops in Benelux and West Germany on the Western side, and troops in East Germany, Poland and Czechoslovakia on the Eastern side.

^c US, British and French troops stationed in West Germany and Soviet troops stationed in East Germany, Poland and Czechoslovakia.

Not all authorities give exactly the same figures; most, however, present estimates which are fairly close to these figures.

The comparison of divisions available after one month shows a rather greater Warsaw Pact predominance than the comparison of divisions after half a week. The problem of reinforcements is two-fold: the problem of mobilization and the problem of transportation. Any discussions of troops in the Central Region, and the withdrawal of standing forces, would have to include consideration of the possibilities of mobilization and reinforcement. The figures given here are for undisturbed mobilization. A new set of considerations would come into play if the question were about the possibilities of reinforcement after a conflict had begun.

The general view presented, in most sources, is that the Warsaw Pact could reinforce the Central Region more quickly and more massively than NATO.

There has been constant complaint on the NATO side, especially from US spokesmen, about European NATO's narrow mobilization base. McNamara, for example, comments: "The greatest deficiency in the European NATO forces, however, is the lack of an adequate mobilization base." [3] Clark Clifford repeated this view a year later: "Moreover, much greater attention should be given by our NATO partners to their mobilization capabilities." [2] Estimates about reinforcements on the NATO side vary, partly probably because of differing definitions. The Institute for Strategic Studies, in the section on forces in the NATO European area, says: "A further 14 division forces could be brought forward if time allowed." [46] Another source suggests, for Central Europe, "6 post-mobilization-day divisions either ear-marked for assignment or likely to be assigned shortly after mobilization". [47] In table 2.6, six divisions have been put in as mobilizable within half a week: seven divisions have been put in as possible further reinforcements for the Northern and Central Regions within one month, with one additional division for the Southern Region.

There is no great problem of transport for the reinforcing divisions already in Europe or Britain, at least to Central Europe. There are obviously more questions about reinforcements from the United States—questions both about the number of troops available and about the time it would take them to get to Europe. First, for the past three years the extent of United States involvement in Viet-Nam has set a fairly close limit to the number of troops likely to be available for reinforcing Europe. Secondly, there are very different estimates of the time that would be needed. McNamara is on record as saying: "The United States can more than double its combat-ready divisions in Central Europe within several weeks of mobilization" [48], which would imply an additional five divisions. On the other hand, the *Economist* has commented: "The Americans would take 30 days to get their two 'rotating brigades' back from the United States. How much longer would it take them to fly over the two divisions whose equipment is held in store in Germany?" [49] The two divisions ear-marked for reinforcing the US Seventh Army, whose equipment is in store in West Germany, have been put in the table as possible United States reinforcements to Europe within a month.

It is difficult to say whether more divisions could be brought over within a month, if they were available. The United States is building up its airlift and sealift forces; successive secretaries of defence have complained about their inadequacy. Airlift capabilities should have improved a good deal by

1972: by then some eighty of the C5A—"Galaxy"—transport planes should be in service.¹⁰

On the Warsaw Pact side, the general view in most Western sources is that the Soviet Union could mobilize a very substantial number of divisions within a month—of the order of 40. (These are the divisions classed as being in the category "combat-ready degree 2". Combat-ready degree 1 divisions are those immediately available. Combat-ready degree 3 are cadre divisions, which would probably take longer than a month to mobilize.) Estimates of mobilization rates, of course, have a much higher margin of error than estimates of forces in being.

There are, however, quite big differences in the estimates of the time it would actually take to mobilize these 40 combat-ready degree 2 divisions. Some authorities suggest it could be done "in a few days", [50] or "at short notice". [51] Others consider that it would need "several weeks of mobilization". [52] However, it is possible that it would be the problem of transport rather than the problem of mobilization which would limit the Soviet Union's ability to reinforce the Central Region. It is true that the Soviet Union has the advantage of being able to reinforce the Central Region by land. However, a number of authors suggest that the roads and railways through Poland would not allow a reinforcement rate of more than 30 to 40 divisions a month [53]—though again there are those who suggest the possibility of a higher figure. [54] The authorities suggesting a peacetime capability of only 30 to 40 a month base their views on the assessment of road and rail facilities made some time ago; these facilities have probably improved since then, and the table shows 45 divisions as possible reinforcements of the Northern and Central Regions.

Manpower

The figures for divisions, however, need a good deal of qualification. There are a number of units not organized into divisions—independent brigades, territorial forces, and so on.¹¹ Then, divisions differ considerably among themselves. Their combat value depends on many factors; some of those which can be quantified are described below.

One of the most important differences is in the number of men per division. As table 2.7 shows, a US armoured division has nearly twice as many men as a Soviet tank division. There are differences not only between blocs

¹⁰ The CSA can carry 56 700 kg for 8 000 miles, or twice that payload over shorter ranges. It can carry 700 troops. So far, (July 1970) some 12 to 14 of these planes have been delivered: there are some structural problems with cracks in the metal of the wings.

¹¹ It is for this reason that most authors count the forces in terms of divisions equivalents—as is done in table 2.6.

but also within NATO as well; and the comparisons should if possible include not just the division forces but also the non-divisional combat and combat-support troops. One such comparison is given by former Assistant Secretary of Defense Alain C. Enthoven: "The average NATO division force in the Center Region has about 23 600 men (actual peacetime strength), compared to about 13 500 for the average Pact division. The average US division force has about 40 000 men." [55]

A comparison in numbers of men shows a very different ratio between NATO and Warsaw Pact forces from a comparison in numbers of divisions. Here again, there is not just one single agreed estimate: two others are given below, to compare with the one set out in the main table. They are all mobilization-day estimates:

	<i>Manpower (in thousands)</i>	
	NATO	Warsaw Pact
1. Institute for Strategic Studies:		
combat and direct support troops available in peacetime Northern and Central Regions ^a	700	925
Southern Region	525	375
Total	1 225	1 300
2. McNamara: troops deployed in all regions of Continental Europe^b		
	900	960
3. Enthoven: troops deployed in the Central Region only^c		
Manpower in divisions	389	368
Manpower in division forces	677	619

Sources: Institute for Strategic Studies. *Military Balance 1969–1970.*

McNamara: Reference [3].

Enthoven: Reference [55].

^a France has been added to the ISS figures.

^b The definition of the area covered is not clear in the source.

^c France is included; troops in European USSR are excluded. Enthoven also has lower figures than other sources for the number of Soviet and Warsaw Pact divisions in the Central Region.

The low manpower strength of the Warsaw Pact divisions compared with the NATO divisions is mainly accounted for by the relatively small number of support units. This means that the combat staying power of a Warsaw Pact division is probably on average lower than that of a NATO division and the Warsaw Pact division would have to be relieved sooner. (The point is discussed further in the assessment, page 81.)

There do not appear to be any published estimates which convert the figures for reinforcements into numbers of men. There are, however, figures for the total world-wide strength of the two alliances: in some situations these could be relevant. In total, NATO has more men under arms than the Warsaw Pact. Total NATO forces in all theatres, excluding navies and air

Table 2.7. US and Soviet divisions: men, firepower, mobility^a

Weapons	US armoured division	USSR tank division	US mechanized division	USSR motorized rifle division
<i>Men</i>	16 000	9 000	16 000	10 500
<i>Firepower</i>				
Tanks, reconnaissance	40	20	38	20
Tanks, battle	324	310 ^b	162	186 ^b
Anti-tank weapons ^c	49	20	67	75
Field artillery pieces and mortars	129	80	129	120
Rocket launchers	9	20	9	20
Tactical-missile launchers	4	3	4	3
Anti-aircraft weapons	100	60	100	60
<i>Mobility</i>				
Armoured personnel carriers	750	300 ^d	800	400-500 ^d
Bridge, 50-60 tons	160 m	120 m	160 m	120 m
Helicopters	97	3	97	3
Fixed-wing aircraft	4	—	4	—

Sources: The main sources were Friedrich Wiener. *Die Armeen der NATO-Staaten*. 2nd edition. Vienna, 1968, and *Die Armeen der Warschauer-Pakt-Staaten*. 4th edition. Vienna, 1969.

^a Some numbers are approximate.

^b 31 per tank division.

^c Light one-man weapons are not counted.

^d 12-13-man carriers are being changed to 8-man carriers.

forces, are of the order of 3.5 million, excluding France, and 3.9 million including France. Total Warsaw Pact forces are put at 2.8 million.

Tanks

Manpower is one important factor in assessments of division strength; another is firepower. The main weapon for direct fire in the ground forces is the tank.

There is no dispute in the West about the fact that the Warsaw Pact powers are superior in the number of tanks. There is some variation in the estimates of the degree of superiority. The figure for the number of Warsaw Pact tanks in table 2.6 is somewhat higher than that given by the Institute for Strategic Studies. Table 2.6's figures are derived from using the estimate of complements in table 2.7, showing the firepower for Warsaw Pact divisions, and multiplying them by the number of divisions. There is no published evidence to suggest that Soviet or other Warsaw Pact divisions have less than their full complement of tanks.

The ratio of NATO to Warsaw Pact tanks in the Central and Northern Regions implied by the figures is 42:100 three to four days after mobilization. Enthoven—whose estimate of Warsaw Pact divisions is lower than the one on which these figures are based—gives a NATO: Warsaw Pact tank ratio of 55:100.

The significance of this superiority is debated. Enthoven is doubtful about the decisiveness of the Warsaw Pact's superiority in tanks. He says:

It is not clear that this numerical superiority in Pact tanks is a decisive advantage. It reflects Soviet tradition, which stresses tanks heavily. NATO armies have deliberately chosen to place less emphasis on tanks than do the Soviets. We could increase the emphasis on tanks if we thought the total effectiveness of our forces would be increased thereby. In any case, NATO tanks are better, especially the M-60, the Leopard and the Chieftain, which are more accurate at long range than the principal Warsaw Pact tanks, the T-54 and T-55. Also, since NATO would be on the defense along most of the front, its 50 per cent advantage in infantry anti-tank weapons would be important.

Studies show that the NATO tanks and anti-tank weapons have a high kill potential against the Pact tank force. Although we cannot draw the conclusion that we would necessarily defeat the enemy tank force, we clearly are not in a hopeless situation, especially when one considers the additional large tank kill potential of our tactical aircraft. [55]

Enthoven's view has been criticized on a number of counts. First, it might not be so easy to "change the mix of weapons". The number of tanks in a US armoured division is closely similar to the number of tanks in a USSR tank division—the Warsaw Pact superiority does not lie in the number of tanks per division, but in the number of divisions. Secondly, on the quality of tanks, the Soviet Union is now introducing a new tank, the T-62, into its units. Thirdly, on anti-tank weapons, Enthoven himself comments: "Most of our anti-tank weapons would be spread more or less evenly across the front, while the enemy can concentrate his armor in a few places." [55]

The more generally held military view on the NATO side is probably that expressed by the former British Defence Minister, Healey, who said:

... [T]he Warsaw Pact has advantages in two particular respects so great as to render doubtful any prospect NATO might have of putting up a successful conventional defense for more than a few days. These advantages are numbers of tanks and surprise. Strength of armor is likely to be decisive in any operations in Central Europe, especially in the open country of North Germany. The Warsaw Pact countries outnumber NATO in tanks by more than two to one in peacetime and by more than two-and-a-half to one after mobilization. [56]

Other weapons

There is a similar debate about the comparison of the two blocs in other land weapon systems as well. The main proponent of NATO superiority—here as elsewhere—is Enthoven, who says:

In nearly every other area of land forces capability (that is, other than tanks) the NATO forces hold the advantage in immediately available forces. . . . NATO has about 30 per cent more APCs [armoured personnel carriers] than the Pact. The number of artillery and mortar tubes is about equal on both sides. However,

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because of more effective ammunition, the greater accuracy of certain weapons, and greater ammunition-expenditure rates because of greater logistic capability, NATO's firepower is superior to that of the Pact. Since NATO forces have considerably more men engaged in logistics tasks in and behind the division, and more transport vehicles per combat vehicle, NATO's ability to supply ammunition and fuel and to keep tanks operating should be greater. The Soviets apparently plan on lower artillery ammunition rates than NATO does. [55]

These points are also criticized. For instance, it is pointed out that the Warsaw Pact has begun to introduce 8-men armoured personnel carriers in place of its existing stock of 12–13-men carriers. Enthoven's comparison of the number of artillery and mortar tubes seems surprising, in the light of the estimates shown in table 2.7 of the firepower in US and Soviet divisions. The US Secretary of Defense Laird has called attention to the increase in the conventional firepower of Soviet ground forces since mid-1968 (which is Enthoven's date): "Recent changes have resulted in a substantial increase in the number of artillery tubes available to the Soviet ground forces." [57]

On engineers, Enthoven claims that NATO has "a substantially greater engineer capability, as measured by the number of men in engineer units". [55] It is counter-argued that "all arms of the Soviet Army in Eastern Europe . . . get far more intensive river-crossing training than do NATO forces. Soviet transport vehicles require less engineer forces for mobility tasks and support." [55]

Aircraft

The Warsaw Pact also has superiority in the number of aircraft immediately available—in the Central Region—though regional figures are not very meaningful for aircraft. The mix of planes is different on the two sides. The Warsaw Pact has a much higher proportion of interceptors: NATO a much higher proportion of ground-attack fighters (table 2.6).

Reinforcements could alter the picture. Enthoven gives the world-wide NATO and Warsaw Pact forces of tactical aircraft as 11 500 and 9 200 respectively. (The planes on United States aircraft carriers are not included in these figures.) This raises the question whether the two sides have the airfields and base facilities to accommodate them. There is some divergence of views in published sources about numbers of airfields. General Sir John Hackett is on record as saying: "It is notable that in the Soviet Zone of Germany, Czechoslovakia and Poland there are over 220 airfields suitable for high performance aircraft with 140 lesser ones. NATO's designated airfields number no more than one-third of this." [47] On the other hand Wiener, writing in 1968, said that NATO in Europe had more than 220

airfields in 1965. [58] On both sides, the reinforcement possibilities are limited by the necessity of keeping the aircraft dispersed.

There is considerable argument about the quality of the tactical air forces on either side. In his defence statement in 1968, McNamara set out the figures on the basis of which he claimed superiority for NATO. The figures he gives are in fact for all regions; but the conclusion is specifically about Central Europe:

In the case of air forces, our relative capability is far greater than a simple comparison of numbers would indicate. By almost every measure—range, payload, ordnance effectiveness, loiter time, crew training—NATO (especially US) air forces are better than the Pact's for non-nuclear war, as shown in the table below.

Selected characteristics of air forces—all regions

Primary Mission Capability	<i>NATO</i>	<i>Warsaw Pact</i>
Interceptors (high speed/low payload)	9 %	34 %
Multipurpose (high speed/high payload)	31	8
Attack (low speed/high payload)	24	20
Reconnaissance	7	2
Low Performance (low speed/low payload)	29	36
Total	100 %	100 %
Payload Index	100	35
Index of Typical Loiter Time	100	20-40
Index of Crew Training	100	55

As a result of these advantages, which continue to move in our favor every day, we estimate that the NATO M-Day air forces deployed in Central Europe would have significantly more offensive capability than the Pact forces. [3]

These claimed advantages are set out in more detail by Enthoven, who says:

A key question is how effective the Soviet interceptors would be in stopping NATO fighter bombers. We do not know precisely, but one thing is clear: with its high percentage of multi-purpose aircraft, NATO has more flexibility than the Pact countries. NATO can use its aircraft partly for offensive attacks and partly for protection against Pact interceptors, as the situation requires. Considering the limitations of the Pact forces' ability to patrol the front lines, many NATO aircraft should be able to penetrate Pact defenses and attack Pact troops. . . . All these factors change the conclusions derived from simple counting of aircraft. The NATO air forces have much greater tactical airpower than the Pact air forces. [55]

These conclusions have been criticized on various grounds. One is that the NATO strike and attack aircraft in the Central Region which are currently limited to a nuclear role have not been deducted. Secondly, the loiter

time comparison is questioned: "The loiter time comparison appears to have little relevance because Pact forces can be expected to take advantage of their numerical superiority offensively rather than defensively." [55] Thirdly, it is argued that a great number of the Warsaw Pact interceptors have a dual role—that they are also suited for performance as fighter-bombers and the pilots probably get training in this as well. [59]

Other qualitative factors

Some quantities can be given for the comparisons of divisions, such as men, firepower and mobility, and for comparisons of air forces—though these qualifications do not necessarily lead to agreed assessments. There are, in addition, large numbers of other factors less susceptible of quantification which go into the assessment of the balance between NATO and the Warsaw Pact.

The calculation of the East–West military balance in Europe is extremely complex, with many unknowns and some unknowables, particularly in the dynamics of combat operations. The analysis is plagued by incommensurables, the "unquantifiable", and manifold uncertainties. How does one analyze the interaction of the air battle with the ground engagement? How valuable are indices of comparative firepower—given entirely different tactics and organization between Western and Eastern armies? What about the intangibles of leadership, morale—and luck? The attacker—we always assume it is "they", and they doubtless assume it is "we"—has the considerable advantage of surprise; but conventional military wisdom calls for a numerical superiority of three to one, that is, a much greater ratio of force-to-space, for a successful attack. Most importantly, the nuclear weapons available to both sides add the major uncertainty; even if not used, the possibility that a defender might initiate the use of nuclear weapons inhibits an attacker from massing his forces. And so on. [60]

Other qualitative factors which are unpredictable and difficult to measure are geographical advantages, intelligence, training levels and even weather conditions. One particular point which has been raised in the West in recent years is the reliability of some Warsaw Pact forces in certain conflict situations. For instance, McNamara has said: "Moreover, we are no longer convinced that the East European forces, which constitute more than half of the Warsaw Pact's combat-ready strength in Central Europe, would be fully effective in an unprovoked attack on NATO." [48]

Another consideration is the awkwardness of the routes of logistical support for NATO forces, now that France has withdrawn from the integrated defence system of NATO. Before the withdrawal of France, the major lines of supply were from the rear. Now, lacking the strategic depth that France previously provided, supplies must come through North German ports, Belgium or the Netherlands: in some cases the lines of communication are

nearer to the border than the bases of the troops being supplied. The lines of communications through France would probably be restored if war broke out: but it is not possible for planners to be certain of this.

Assessment

The purpose here is not to present one more evaluation of the total picture, but to look at the main arguments about the balance and to present the important conflicting assessments—since all this material is relevant to discussions of disengagement or force reduction.

A large number of authors preface their assessments by commenting on the difficulties. The quantitative data assembled here are only part of the picture, of course: table 2.7 shows figures for the firepower of US divisions—other divisions on the NATO side have different mixes of weapons. In addition there are all the relatively imponderable qualitative factors. None the less assessments have to be made: and most of the authors who stress the difficulties do in fact end up by making some kind of judgement.¹²

One major question is, of course, whether or not it is acceptable to begin with a basic comparison of NATO and Warsaw Pact divisions. There are those who find it “not unfair . . . to regard them as roughly equal in combat effectiveness” [49] or say that “in firepower and overall combat effectiveness the opposing divisions are roughly equal”. [61] They point to the closely similar firepower of a US armoured division and a Soviet tank division.

However, others consider it more sensible to begin any basic comparison with the numbers of troops rather than the numbers of divisions. Both McNamara and Enthoven take this view. McNamara commented: “While manpower comparisons alone are not conclusive measures of military strength, I believe they are reasonable first approximations of relative ground force capabilities.” [3] Enthoven comments: “A soldier, unlike a division, is a relatively equivalent unit on both sides, if he is similarly trained and equipped.” [55] The point has already been made (page 75) that the main effect of the different divisional manpower strengths is in the division’s staying-power.

Another general consideration is the size of the military budgets of the two alliances. It is true that they can only be used for making “order of magnitude” comparisons. However, it is difficult to avoid the conclusion that, in total, NATO powers are devoting more resources to military ex-

¹² The problem of coming to a judgement in a situation where there are “imponderables” is by now a familiar problem both in systems analysis and cost-benefit analysis. The view is becoming more widely held that, since any judgement implies that the person judging must have assigned some values to the various “imponderables”, it is better if these values are made explicit, however rough and ready they may be.

penditure than Warsaw Pact powers—this is, after taking into account differences in military pay, etc. Even the Western authorities who make the most extensive upward adjustments to the Soviet military expenditure figure usually leave the adjusted Soviet figure slightly below that of the United States. And there is little doubt that other Warsaw Pact powers are devoting fewer resources to military uses than other NATO powers. Using estimated defence purchasing-power exchange-rates, other Warsaw Pact military expenditure in 1969 was little more than one-third of that of other NATO. It is most unlikely that any plausible upward adjustment for exclusions could remove a difference as big as this. This is, of course, a comparison of world-wide military expenditure, and not just of expenditure in Central Europe: but it has its relevance.

However, the predominant consensus view among the authorities in the West is that the Warsaw Pact powers have a conventional superiority in Europe: the discussion tends to be in terms of how long NATO troops could successfully put up resistance, with conventional weapons, to a Warsaw Pact attack. The figure commonly given is a few days. General Hackett has said: "Staff colleges are permitted to teach (and Rhine Army to plan and exercise) on the assumption that a conventional phase might last for as long as a week or 10 days." [47] He then went on to raise the question whether the time might not be shorter. Brigadier Hunt agrees with the former British Defence Minister:

Mr Denis Healey has said that it is doubtful whether NATO could put up a successful conventional defence for more than a few days. Few commanders would disagree with him. He also said that NATO could not forgo reliance on nuclear escalation in the event of large-scale attack, without an increase in European military budgets at present beyond practical possibility. It is difficult to disagree with this proposition as well. . . . There is no depth in its defence. West Germany is a narrow strip of territory and to fight for long might mean falling back to the Rhine. [62]

Healey has also commented:

Attempts have recently been made to argue that this bleak picture is over-pessimistic and fails to take into account qualitative factors. . . . No one would deny the need to take qualitative factors into account, but we are still a long way from deciding which factors are relevant and what value should be attached to them. [56]

The dissenting opinions—that NATO and Warsaw Pact forces are not far from parity—are mainly, but not entirely, American. The McNamara view was that NATO conventional forces would be capable of dealing with the most likely kind of conflict—one arising from miscalculation:

The most likely kind of conflict in NATO Europe is one arising from miscalculation during a period of tension, rather than a deliberately pre-planned Soviet attack. In this kind of crisis, the Soviets would not necessarily have the initiative in mobilizing and deploying troops. Even though the Pact forces could mobilize somewhat faster than NATO, they would not achieve a decisive advantage. Furthermore, NATO has an air advantage. It would thus appear that the balance of forces would, over time, be sufficient to cope with the situation and hopefully lead to a de-escalation of the crisis. Nevertheless, we are urging our allies to improve their reserves and thus our confidence of being able to match a Pact build-up. [3]

The Enthoven view, summing-up, is: "In sum, NATO's conventional forces are not grossly inferior to those of the Pact." [55]

Finally, Alastair Buchan has commented:

Even if one can assume a Soviet superiority in ground forces of over three to one for an attack on Western Europe (about 75 divisions as against some 22 NATO divisions) it is by no means certain that a superiority of this magnitude would be sufficient to overcome well established forces fighting over terrain with which they were familiar, even without using tactical nuclear weapons. In the Second World War commanders like Montgomery and Rommel preferred a superiority of four to one to be certain of success. [52]

NATO and nuclear weapons

The NATO official view that it is inferior in conventional weapons is an important factor in any discussions of force reduction or other forms of disarmament; for one thing, it determines NATO's attitude to the use of nuclear weapons.

NATO's official strategic concept since 1967 has been described as one of "flexible response". This was described in the communiqué of the meeting of ministers which adopted it as follows:

The revised strategic concept ... which adapts NATO's strategy to current political, military and technological developments, is based upon a flexible and balanced range of appropriate responses, conventional and nuclear, to all levels of aggression or threats of aggression. [63]

This is further described by the Netherlands Minister of Defence as follows:

The flexible response strategy implies no hard and fast choice of one or more unalterable methods of response but the keeping open of as many options as possible. The enemy must be left in no doubt that, if he commits aggression, resistance can and will be offered, but for the rest he must remain completely in the dark about the nature and extent of that resistance. [64]

The conditions under which NATO might resort to nuclear weapons, and the form in which it might do so, have been clarified to some extent in

recent months. Over the two years since December 1967, NATO's Nuclear Planning Group has been working on the matter, and in January of this year the NATO Council approved two policy documents containing general guidelines for nuclear consultation policy and for the possible tactical use of nuclear weapons in defence of the treaty area. These documents have not been published: but their general tenor has been indicated by Healey, the former British Defence Minister:

We have been trying to develop a strategy—and we have finally succeeded in the last year or so—which makes it possible for NATO to deal with any small-scale incursion or accidental conflict over the Iron Curtain without using nuclear weapons at all, but which, in the case of a deliberate major conventional attack—which, as I say, is very unlikely but still not impossible—would be able to hold the attack for long enough for the NATO Governments to agree on using nuclear weapons. . . . The real point of the initial use of nuclear weapons is to persuade the other side that if they have miscalculated and assumed that nuclear weapons won't be used, they are wrong. In order to persuade them of that, you have got to use them not just in a demonstrative sense. . . . It's really more of a sample use. You've got to show them that you are prepared to use them seriously and affect the course of the battle. . . . On the other hand you've got to use them in such a way that the enemy has an opportunity to think again. . . . The new guide-lines are really designed to try to trace a number of possible uses of nuclear weapons . . . which would perform this double function of demonstrating our readiness to escalate if the enemy doesn't stop, but also to demonstrate our ability to stop escalating if the enemy decides after all to call the whole thing off. The guide-lines so far concern the initial use of tactical nuclear weapons against a large-scale invasion. . . . The next question we have to consider is: supposing our initial use of nuclear weapons doesn't deter the Russians from continuing, what is the follow-on use which makes sense? [65]

The credibility of this strategic concept has been disputed. Lord Mountbatten of Burma has said: "During my six years on the NATO Military Committee I never missed an opportunity of saying, loud and clear, that the actual use of tactical nuclear weapons could only end in escalation to total global nuclear destruction and that, for that reason, no one in their senses would contemplate their use." [66] Sir John Hackett has commented: "In North Western Europe nuclear weapons are virtually unusable, and whatever is said officially this is almost certainly recognized on both sides." [67]

There are also a number of US authors who cast doubts—for example, F. S. Wyle, a former Deputy Assistant Secretary of Defense for Policy Planning:

Nuclear weapons are no substitute for conventional forces. There is no inherent advantage to either side, whether attacking or defending, in the use of nuclear weaponry if the other side has nuclear weapons as well. In the tactical or battlefield area, the logic of nuclear weaponry has become very much the same as

in the strategic or long-range area. . . . To suggest therefore that a US force reduction in peacetime can be offset with increased peacetime political reliance on nuclear weapons (a "lowered nuclear threshold") is not realistic. Nuclear weapons do not balance ground forces—only ground forces do that. [68]

However, NATO's official view, in any discussion that might begin on forces and weapons in Europe, would presumably still be that it needs to be prepared in certain circumstances to use nuclear weapons first.

Different views are expressed in the West about the Warsaw Pact attitude toward Pact use of nuclear weapons. Denis Healey commented: "I don't think it would, in fact, make sense for NATO to aim at an all-out conventional defence against an all-out Warsaw Pact conventional attack, because all Soviet exercises and training assume the use of nuclear weapons from the word 'go', so that an all-out conventional attack is very unlikely. If ever we did face an all-out attack, the other side would use nuclear weapons to begin with: there's a great deal of evidence for that, both in the exercises they do and in their strategic journals." [65] On the other hand, some authors have in fact found evidence that a Soviet strategic doctrine for conventional war in Europe is being developed: "An indication . . . is found in the Warsaw Pact manoeuvres that took place the last week in October 1965. The war game began with a surprise attack by the West deep into Thuringia, a part of East Germany, employing conventional tank forces, artillery and air support. By the third day, the Warsaw Pact forces had repelled the attack and launched a counter-offensive—all with conventional weapons. At this point the Western 'enemy' began to use nuclear weapons, that were responded to by 'mighty atomic counter attacks'. The scenario used for these manoeuvres would indicate that, on the military side, the Soviet military plans envision employing a conventional defence, at least initially." [60]

A statement by Marshal Grechko, Minister of Defence of the USSR, would seem to indicate this also. He said, in November 1969:

Much attention is being paid to the rational combination of nuclear-missile weapons and the perfection of conventional, classical weapons, to the ability of detachments and units to carry out military operations both with and without the use of nuclear weapons. Such an approach to the problem guarantees a high level of the military versatility of our troops and their constant readiness for operating in different situations. [5]

Implications for discussion on disarmament

There would obviously not be much prospect of any reduction of forces in Europe if there were a high state of tension between the two blocs. This has not been so for a long time now: and it is probably true on both

The main arms race

sides that the belief that the other side intends to attack is waning. This diminishing belief in the other side's aggressive intentions is important for any successful negotiations.

The very large quantity of resources devoted to military uses in Europe (the tables in the previous section show totals of 2¹/₂ million men, 35 000 tanks and 8 000 planes in peacetime) can be explained by the fact that over a long period in the past a number of Western leaders genuinely feared that the Soviet Union intended to launch an attack on Western Europe; and Soviet leaders genuinely feared that the Western powers intended to launch an attack to reunify Germany. These fears have been dying for some time: but the forces remain.

One of the difficulties that bedeviled the previous discussions of disarmament and force reductions in the late fifties and early sixties has now been removed. (An account of the negotiations in this period is given in the reference section, page 388.) Then, the Western powers were constantly linking the discussion of force reductions with the problem of German reunification; they did not recognize the border between East and West Germany as the dividing line for the consideration of force reductions on either side. This source of disagreement has gone. It is very possible, therefore, that the Western powers might find that some of the proposals put forward by the Soviet Union in the fifties are now acceptable to them.

The problem of parity

With the European conventional confrontation, as with the confrontation with nuclear weapons, negotiations would be very difficult if they depended on a precise agreement on parity between the two sides. There are wide divergencies in the assessment made by different authorities on the Western side: the divergencies between the assessments made by authorities on opposite sides would probably be at least as great. It is an interesting exercise to attempt to look at NATO strength through Warsaw Pact eyes, and make out a "worst case" analysis from the Warsaw Pact point of view. The emphasis would undoubtedly be different: quite possibly the comparisons of expenditure—showing a much larger total for NATO than for Warsaw Pact powers—would be emphasized. A Warsaw Pact comparison might bring in items which are not normally brought into the Western comparison at all—such as the comparison of fleets in the Mediterranean.

Fortunately an agreement on "parity" is not a *sine qua non* for successful negotiations on disarmament. Any agreement need only be concerned to preserve the defensive capability of the parties concerned. It does not need to preserve their offensive capability. It is generally accepted that fewer forces are needed for the defence than the offence—though the ratio given

varies. Three to one is the commonly accepted figure (page 80). Liddell Hart, explicitly discussing Central Europe, suggested a ratio for secure defence on the NATO side of 2: 3.

Although on the Eastern Front the Germans often defeated set-piece offensives on sectors where the Russians had concentrated a 7 to 1 superiority of forces, the Russians usually succeeded in finding penetrable stretches somewhere on the front when their *overall* superiority had risen to about 3 to 1.

With the NATO forces it would be unwise to reckon that they could hold their own with as low a ratio as that on which the Germans managed to do so—in view of the NATO mixture of nationalities, different training systems, and other handicaps. But if their forces had a ratio of 2 to 3 that should be a safe insurance against a sudden attack, provided that they attain adequate mobility and flexibility. [69]

Past proposals

There have been a very large number of proposals for various kinds of disarmament or arms regulation in Europe. A full account of them is given on pages 388 to 424, under three headings: proposals for disengagement and force reductions in Europe; proposals for nuclear-free zones and the freezing of nuclear weapons; and proposals for inspection against surprise attack. Under all three headings there are proposals which could usefully be re-examined.

There are a number of past proposals—mainly Soviet proposals—either suggesting ceilings on the number of foreign troops in the Central Region, or proposing percentage reductions in the total number of troops or the total number of foreign troops (page 388 to 401), which might now be re-examined by both sides. Since these proposals covered a much larger area in Eastern bloc countries than in Western bloc countries, they allowed to some extent for greater possibilities of reinforcement on the Eastern side.

The NATO powers have proposed reductions in the numbers of troops, both “stationed” and indigenous. Presumably the European powers are anxious that the gains from military expenditure reductions should be evenly spread. However, West Germany makes a substantial contribution to the cost of the British and US troops on its territory, and is likely to be under pressure to increase it: West Germany therefore would also stand to gain economically if foreign troops were withdrawn. The Warsaw Pact proposal for the agenda is limited to the reduction in the numbers of foreign troops. The difference between the two approaches should not be insurmountable. It is probably realistic on both sides to consider troop reductions rather than complete withdrawals, at this stage.

The “Open Skies” proposals are probably of no relevance today, because of the advances made with satellite reconnaissance. The proposals for

ground observation posts are, however, still relevant, and it is certainly worth re-examining the details of the Soviet proposal of 12 December 1958 (page 420), and the results of the "First Look" exercise in inspection and observation in the UK.¹³ There are, in addition, other measures of a similar nature: the notification of manoeuvres, the exchange of observers on manoeuvres, and the agreement not to conduct manoeuvres within a certain distance of the borders on either side.

It ought to be possible to negotiate some agreement at least to reduce the number of nuclear weapons in Central Europe. The Western powers may be unwilling—given their present attitude to the use of nuclear weapons (page 83)—to agree to a nuclear-free zone or to any "no-first-use" clause, since (credibly or not) they envisage first use under certain conditions. But there seems no reason why this necessitates having the nuclear weapons actually in Western Europe itself. Healey has commented: ". . . I also believe that the credibility of the threat to retaliate with nuclear weapons against an overwhelming aggressive invasion is increased with the presence of nuclear weapons on the spot." [56] This is debatable—and indeed at the same time Healey pointed out: "In order to use nuclear weapons in Central Europe, you don't actually have to have nuclear weapons in Central Europe." [56] Certainly on the Western side, the number of nuclear warheads (for which the last publicly provided figure is 7 000) seems extremely high. Perhaps the rationale of having such a large number is that it improves their credibility as a deterrent: with such a large number about, it is hard to believe that one would not be used if serious hostilities broke out. This is not a very stable foundation for long-term European security arrangements. The nuclear weapons in Europe should at least be included on the agenda of any discussions about the level of forces and armaments in Europe.

Whereas there are known to be this very large number of tactical nuclear weapons actually located in West Germany, it is uncertain whether there are many, or any, actually located in East Germany, Poland or Czechoslovakia. This means that any reduction in the number of tactical nuclear weapons on the NATO side would to some extent be a unilateral act. The NATO powers would presumably try to get something in exchange, therefore, and might ask for a reduction in the numbers of heavy tanks on the Warsaw Pact side. It may be that this kind of thinking is behind some of the recent rather oblique references to "asymmetric reductions" which have been made on the NATO side.¹⁴

¹³ *SIPRI Yearbook 1968/69*, pages 170–71.

¹⁴ "It may well be that the balance of security can best be preserved by force reductions or limitations which in themselves do not appear balanced or symmetrical." Ivor Richards, "A European Defense Policy", *Survival*, March 1970.

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Chapter 3. The militarization of the deep ocean: the sea-bed treaty

Introduction

This chapter attempts a juxtaposition of material on armaments and on disarmament. Normally, the two questions are not discussed together: one set of publications is devoted to questions of military technology, and a quite different set to questions of disarmament. It seemed right, in a yearbook of this kind, to attempt to bring the two together: to take an area in which a disarmament move is being made—in this case the sea-bed—and to look at the provisions of the draft treaty prohibiting the emplacement of mass destruction weapons on the sea-bed and in its subsoil, now before the General Assembly, against the background of the military developments in the same field.

There is a further reason for considering the military technology of the deep ocean and the ocean floor.¹ The waters under 2 000 feet comprise an immense volume of space which has hitherto been relatively little exploited for military purposes. It is one of the frontiers of military technology. The research and development effort devoted to making its exploitation possible has been increasing very fast in recent years.

There are three reasons for not limiting the treatment to the military uses of the sea-bed only—which is what the present disarmament negotiations are about. First, many of the developments on the sea-bed are part and parcel of the broader issue of submarine warfare. Second, it is important in looking at partial disarmament measures to examine whether they will really fulfill their purposes or whether they may be circumvented by military developments: so it is important to see how many of the operations which could be conducted from the sea-bed could also be conducted as well, or better, from the deep ocean. Finally, the technology is in many respects the same for a military use of the sea-bed or of the deep ocean in general.²

¹ The “deep ocean” is in this context defined as the sea-bed and its subsoil outside territorial waters—including the continental shelf area—and the water masses above the sea-bed below the maximum operating depth of present submarines (probably about 2 000 feet).

² The military technology behind the Polaris submarines was discussed in the *SIPRI Yearbook 1968/69*, pp. 96–111.

The aim is not to depict the power balance in the deep ocean between the two super powers or between any other nations.³ Rather, it is to show to what extent the deep ocean has been militarized already, and what are the likely further trends of development. The deep ocean programme of the United States is in this context used as the main example for two reasons. First, the United States is the nation most advanced in the military uses of the deep ocean, and there is an abundance of material available about its activities. Second, it is postulated that whatever the United States can do, the other super power, the Soviet Union, may also be able to do now, or in due course; for some of the developments this applies to a lesser extent to other advanced countries as well.

The chapter is divided into three parts. Part I discusses present and future military uses of the deep ocean and the ocean floor. It begins with a general discussion of the factors that are causing the military move under water. This is followed by a short background section on the characteristics of the deep ocean environment and a comprehensive section on anti-submarine warfare weapons and tactics. The remaining sections deal with the new developments: the new technology being developed for underwater operations; the development of advanced undersea mobile systems, nuclear and non-nuclear; existing and proposed future military uses of the ocean floor. Part II is an account of the sea-bed disarmament debate and an analysis of the text of the draft treaty as tabled in the Geneva Disarmament Conference in September 1970. Part III, finally, summarizes the conclusions that emerge from a comparative study of the military developments in the deep ocean and the provisions of the draft sea-bed treaty. Square-bracketed references, thus [1] refer to the list of sources on page 179.

Part I. The militarization of the deep ocean

A. The move underwater

The world seems to be on the verge of a large-scale military development of the deep ocean including the ocean floor. Underwater military systems have, it is true, been in existence for decades. But the conventional, that is, diesel-powered, submarines of World Wars I and II were never independent of the ocean surface. They needed to surface in order to take in oxygen for their batteries as well as for communication purposes.

The nuclear submarines of the last decade have, on the other hand, been

³ Some aspects of the power balance in the ocean are discussed in the chapter on the strategic background to SALT, p. 38, and in the survey of world fighting vessels in the reference section, p. 307.

independent of the surface. They do not need oxygen for their propulsion mechanism and they can receive communications by trailing antennae submerged several tens of feet below the surface. Their hulls have so far, however, not been able to withstand the pressures below a depth of 2 000–3 000 feet; their normal operating depth is considerably less than 1 000 feet.

New marine technology is now reducing these and other limitations on operations in the deep ocean. This involves extending the capability of man to work as a diver down to 1 000 feet, which includes the whole continental-shelf area; building deep submergence vehicles that soon can go down to 20 000 feet; using new long-endurance power sources under the sea; development of manned underwater stations and their installation at depths of 6 000 feet; deployment of submarine-detection systems on the ocean floor, etc. But whereas technology is, undoubtedly, the short-term factor that determines the speed and extent of underwater military development, it is not the prime mover. That force must be sought elsewhere, in the strategic competition between the super powers, the United States and the Soviet Union. They are the only ones who, rightly or wrongly, feel that they have the world-wide interests to motivate such operations far from their own territories, and the resources—economic and technological—to bear the high costs of further developments. This does not, however, exclude the fact that a country like France is also very advanced in undersea operations.

The prime motive of the super powers for moving into the deep ocean is probably to secure as nearly as possible 100 per cent invulnerability for their strategic deterrence forces. The reasoning is that only thereby will they be able to keep their “second strike” or “assured destruction” capability secure under all sorts of more or less likely circumstances.

*The case made for underwater
nuclear-missile systems*

The case for underwater nuclear-missile systems has often been stated in the negative, as a case against the present dominant deterrent, land-based missiles. This case can be summarized thus. Land-based missiles (Minuteman, SS-9, etc.) can be detected by satellite reconnaissance and other means. At the same time the accuracy of attacking missiles is advancing fast and is coming down to a fraction of a mile measured in CEP. In addition, MIRV systems are being developed with the consequence that there will be a disproportion between the number of attacking warheads and the number of landbased missiles in silos. As a result the latter become increasingly vulnerable. The increases in the efficacy of attack appear in general to be out-running the developments in defence. The hardening of missile silos and the

introduction of ABM cannot be counted upon to improve defence in the same proportion.

These are the arguments presented. How far they are justified is another matter. They imply that there is a significant risk that at some point one of the two super powers might attempt a first strike against the land-based missiles of the other. It can be argued that this is a rather fanciful assumption, and indeed that this process of seeing remote and extremely unlikely threats as real and immediate is one of the strong forces behind the technological arms race. (For a further discussion of this matter see chapter 2, page 38.)

The basing of nuclear-missile systems on surface ships may make them less vulnerable than land-based systems.⁴ Despite their advantage in mobility, surface ships too suffer some disadvantages from a military point of view. They are visible in the electromagnetic spectrum, for instance from aircraft and satellites and by radar; they are vulnerable to attack from ship-to-ship missiles, from submarines and from aircraft; they are exposed to environmental restrictions in the form of wind and rough seas; their speed of transit in water is limited. While some of these limitations may be overcome in the future by the development of new types of surface systems, such as small, very fast surface-effect vehicles (similar to the hovercraft) and very large floating stable platforms,⁵ the risk of detection will always remain high for surface systems. The opposite is true for an underwater mobile system and herein lies its decisive advantage as a nearly invulnerable deterrent force.

The specific advantages of undersea weapons systems have been stated several times:

The absorption of water with respect to light, high-energy particles, electromagnetic radiation, heat and other known forms of energy is such that, except for acoustic radiation, none of the mechanisms postulated has a detection range potential which is significant when compared with the vast areas available in the ocean. The ultimate test in this regard is the ability of the submersible to blend with and be masked by the environment. At near zero speed this ought to be quite attainable. The hotel load for life support and weapons readiness is modest, and if, for example, power is supplied by fuel cell, the machinery associated with it should be extremely quiet. Drifting in the current, at great depth or at low speeds, the hydrodynamic wake would be insignificant. A further aid would be

⁴ The US Navy has for several years studied concepts for such ships. One current concept is SABMIS, Seabased Anti-Ballistic Missile Intercept System, that provides for the basing of Poseidon missiles, or longer-range missiles, together with ABM radars, on board surface ships of cruiser size or larger. Another is BMS, Ballistic Missile Ship, and SLMS, Ship Launched Missile System—surface ships equipped with offensive ICBMs.

⁵ In the United States funding has already started for the building of prototypes of such surface-effect vehicles and large stable platforms. [1]

the capability to move very close to the bottom, rendering the submersible difficult to detect by long-range, active sonar. Ultimately, the undersea weapons systems could develop into something akin to a manned, on-the-bottom, slowly mobile mine. [2]

The ability to hide is thus what makes the modern submarine an ideal strategic deterrent from a military viewpoint. This is already practically true of the Polaris/Poseidon weapons system, which uses only about 10 per cent of the ocean volume. The military undersea systems now in the planning stage will be even less targetable by their ability to use virtually the whole ocean volume. Mobility is a key element in the ability to hide, as is, in certain situations, slow speed: below 5 knots the noise of a submarine will be almost indistinguishable from the background noise.

Compared to mobile underwater systems, fixed installations on the ocean floor might be more easily detected—though with more difficulty than the detection of land-based systems. An example of the difficulty involved is that it took the US Navy five months to find the sunken submarine *Scorpion* although it knew the submarine's approximate location; the submarine was, however, at a depth of 8 000 feet when found.

The invulnerability of a fully deployed undersea deterrent system does not mean that no single vessel can be destroyed by an enemy. It means that the entire system as such is non-targetable at a given time and that, therefore, enough vessels will always survive to strike back.

Other advantages often claimed for the undersea deterrent system include: its invulnerability permits longer reaction time in a crisis situation; it will to some extent move the threat of a nuclear exchange from land to sea; because of the risk of accidents, it is preferable to have nuclear weapons in the sea rather than on land. It has even been argued that a mobile sea-based ballistic-missile system might lead to unilateral removal of land-based ICBMs by making these missiles obsolete. [3, 4] Inter-service rivalry would, though, seem to mitigate against such a step.

One specific reason for the United States interest in the undersea deterrent is probably that the USA starts with two advantages—one geographical and one technological. The USA has easy access to the sea; the USSR has not. The US Chief of Naval Operations has recently reiterated that the United States should “capitalize on the geographic asymmetries between Russia and the United States”. [5] The United States has also developed long-range, sea-based missile systems that can target the Soviet Union from all directions and not just over the Arctic.

Technologically, the United States probably has a lead of several years over the Soviet Union in advanced undersea-warfare operations. A figure of two years is sometimes mentioned. That this figure may sometimes be more

is indicated by the fact that the first Soviet "Polaris-type" submarines have become operational only recently, eight to ten years after the deployment of the first US Polaris. (See further Chapter 2, page 42.) The United States certainly leads the Soviet Union in the military use of the continental-shelf areas.

The disadvantages of undersea military systems

Even from the point of view of a military planner an undersea deterrent force has some disadvantages. First, it is very costly to build and certainly more expensive to operate than a land-based missile force. [6] The relative military advantages of undersea deterrent forces over land-based forces may, however, still speak in favour of the former when a cost-benefit analysis is made: that is why such systems are being developed at all. Second, undersea systems, whether offensive or defensive, demand very advanced technology that is now only partially developed.

Taking a broader view, one may observe the following disadvantages. Until now the deep ocean and the ocean floor have been practically unmilitarized. The only exceptions seem to be US bottom detection systems outside US coasts and, probably, near passages where Soviet submarines enter the two major ocean basins, and, maybe, in the open Pacific. With the introduction of advanced undersea deterrent forces, operating in the whole ocean volume down to the ocean floor, the demand will come for supplementary military installations for detecting enemy forces and, perhaps, for servicing one's own forces. Indeed, this development has already begun, as will be shown later. Because of the "action-reaction" phenomenon, more and more resources will be spent on undersea warfare in the, perhaps vain, hope of finding countermeasures to Polaris and more advanced deterrent forces. Adding to this is the anticipatory belief, common among military planners, that the adversary will always be able to do what one's own side can do. This may lead to a constant search for countermeasures to the new weapons one is developing oneself—a narcissistic arms race.⁶ And, although the development of a new submarine deterrent force, the ULMS, may appear as "stabilizing" to the US Navy, it is doubtful whether it will appear in the same light to the Soviet or Chinese Governments, considering the US lead in undersea warfare. (The ULMS is described on page 131.)

B. The ocean environment

In order to explain why and how the deep ocean is used for military purposes it is necessary first to describe the basic facts that influence operations underwater.

⁶ Cf. the discussion in the *SIPRI Yearbook 1968/69*, pp. 94–95.

The world ocean

The oceans of the world form one continuous watermass, covering some 140 million square miles or 71 per cent of the earth's surface. Its depth ranges from 600 feet or less above continental shelves to nearly 36 000 feet in the Marianas Trench in the Pacific; the mean depth is 12 451 feet. By restricting himself so far to operations in the upper 2 000 feet, man has in fact used less than 10 per cent of the volume of the world ocean. On the other hand, if he could develop the capacity to operate at depths of 20 000 feet he would reach 98 per cent of the ocean floor.

The ocean floor can be said to consist of two main areas: the extension of the continents under water and the deep-ocean floor. The former area consists of the continental shelves, which are the only parts of the ocean floor that have been subjected to significant military and commercial exploitation, and their continuation in the continental slopes (down to a mean depth of 2 000 feet). Together with the outlying continental rise, where thick, sedimentary layers are concentrated, the shelf and the slope form the continental margin. This area has the same geological structure as the landmasses above sea level, and is estimated to contain the bulk of the exploitable economic resources of the ocean floor. These sub-marine extensions vary in breadth from coastline to coastline: along the east coast of the United States, the west coast of Europe and in South East Asia they are very wide; along the west coast of South America they are very narrow. It has been calculated that the underwater extensions of the continents to a depth of 600 feet are equivalent to approximately one-fourth the area of the continental landmasses.

The deep ocean floor area, on the other hand, has a different geological structure, and its economic value is much more uncertain. The area beyond the continental margins includes wide plains (abyssal plains), very long and very high sub-marine mountain ranges, isolated sea mountains and deep ocean trenches.

Sea water has some special characteristics, of which several are very important for undersea operations:

Density. Sea water differs from air in density by a factor of about 800. The high density of the sea causes greater drag-opposing motion compared to that in the air.

Pressure. The pressure at sea level (one atmosphere) is 14.7 pounds per square inch; pressure increases rapidly with depth at an almost constant factor of one atmosphere per every additional 33 feet of depth. This means that an object at 2 000 feet is exposed to pressure 60 times greater than at sea level and at 20 000 feet to pressure 600 times greater.

Temperature. In most regions of the world the temperature in the top 500–1 000 feet of the ocean is affected by seasonal weather conditions which often cause a well-mixed and nearly isothermal surface layer. Below that is the “thermocline” layer, which is not affected by seasonal factors but where the temperature changes rapidly with a comparatively small change in depth. The temperature of the deep watermasses, below 3 000–4 000 feet, stays constantly at about -3°C . Temperature is the most important variable affecting the propagation of sound in the ocean.

Salinity. The salinity of the oceans varies somewhat around a mean figure of 3.5 per cent. It is a main factor determining the electric properties of sea water.

The opaque environment

From a military point of view—both in relation to anti-submarine warfare and for command and control of an undersea deterrent force—perhaps the most important characteristics of sea water are its reactions to the penetration of electromagnetic energy, which includes light and radio waves, and sound. Because of the physical properties of sea water, electromagnetic waves as a rule do not penetrate far in the ocean, compared with their penetration in air, whereas sound waves penetrate better in sea water than in air.

Electromagnetic waves have a short penetration in the ocean because water has a low electrical resistance and therefore absorbs energy from the electromagnetic waves. The penetration of sunlight into the sea is effectively reduced to zero at about 300 feet for red and 1 000 feet for blue rays. Thus, the prospects for long-distance sub-surface penetration by electromagnetic radiation are not promising. [7] For practical purposes, visibility near the ocean bottom is often reduced to tens of feet or less because of turbidity and the scattering of light beams.

There has been some talk of using laser beams for penetrating beneath the sea. Fast, blue-green lasers have some penetrating capacity in water; it has been shown that visibility in turbid water can be increased by this means to 300–400 feet. [8] On purely technical grounds, this would seem to be a maximum. It seems doubtful, however, that lasers could be of much use for detecting submarines from aircraft or satellites. This is due not only to their range limitation under water, but also to the fact that laser beams are too narrow to be efficient for surveillance purposes. However, lasers have been used experimentally for measuring wave height from aircraft. [9]

High, medium and low frequency radio waves cannot penetrate below the water surface. Very low frequencies (VLF), generated as long waves by very strong transmitters, may, however, penetrate down to 60–100 feet, [10]

which is important for communications with submerged submarines. Recently, the Americans have developed the use of extremely low frequencies (ELF) which penetrate much deeper. However, the use of VLF and ELF frequencies is limited to very simple Morse code transmissions. (This advanced technology is described further on page 118.)

Whereas electromagnetic energy generally has a poor penetrating capacity in sea water, sound waves may, under favourable circumstances, travel very far. At about 5 000 feet per second, or about 3 600 miles per hour, sound travels about five times faster in water than in air. Since the attenuation is not prohibitively great, sound has become the only practical means of detection beyond some tens of feet. Sound waves may also be used for communication purposes, but much less information can be transmitted in this way than by electromagnetic energy.

As a rule, sound does not travel a direct path in sea water. The propagation of sound is governed by several factors, but the chief one is the sound's velocity, which rises as temperature and pressure increase. Since temperature and pressure movements tend to vary inversely as the depth of water increases—as a rule the temperature drops and the pressure rises—this leads to a rather peculiar pattern of sound propagation in the sea. In the mixed surface layer, extending down to a few hundred feet, sound velocity generally increases with depth, so sound waves tend to bend back towards the surface. In the next layer, the "thermocline", velocity falls with depth and sound waves are refracted downwards. Consequently, there is an area between these two layers—a sound shadow zone—which is not reached directly by sound since the sound is refracted either upwards or downwards. This area can only be reached by bottom-bouncing sound signals, which require a knowledge of bottom properties.

Where the thermocline ends and the deeper waters, which have a constant temperature, begin, there is a band where sound is refracted downwards if it moves up and upwards if it moves down. This is the so-called deep sound channel, which is at 3 000–4 000 feet in the Atlantic and Pacific. Here the sound waves will travel along an axis for considerable distances: ranges up to 12 000 miles have been achieved. The deep sound channel has been used for localizing sunken aircraft and disabled submarines and, recently, for experiments in detecting enemy submarines.

Sound will further refract from marine life in the sea, which may cause scattering phenomena; this applies, for instance, to the masses of phytoplankton in the surface layers.

Despite the dependence of sound on oceanographic variables such as temperature, salinity, bottom characteristics and marine life, it remains the only form of energy that can penetrate the watermass of the ocean over any

distance. It has, therefore, become the main means of detection in anti-submarine warfare.

Advanced techniques are now being developed to convert sound pulses to pictures. It was reported in 1969 that a television-like image of targets under water at distances up to 100 yards had been obtained by this method, which is called sonography or acoustical imaging. [11]

There are various other short-range means of finding objects in the ocean, such as magnetic anomaly detection. These will be discussed in the context of anti-submarine warfare.

The calm environment

There are no ordinary waves, no strong currents, no storms in the deep ocean. In contrast to land the deep ocean has thermal stability: this is of considerable help for the design of all structures, civil and military. Compared to the surface, it is a calm environment; the few violent movements that occur are caused by seismic activity or, in a few areas, by so-called deep ocean waves. However, there are bottom currents which, although slow, may affect bottom installations either by producing a wake of turbid water—which may be detectable by acoustic means—or by affecting foundation stability. [12]

Despite its calmness the deep ocean is a very hostile environment for man because of the heavy pressure, the darkness, the coldness and the effects of corrosion and marine fouling.

The deep ocean is not completely silent. Background noise, caused by marine life, bottom currents, seismic activity and noise penetrating from surface movements, is always present. This is an important factor affecting the detection of submarines in the deep ocean.

Oceanography

The oceans are still to a large extent unexplored. While the broad features of the ocean floor have been traced, detailed knowledge of bottom profiles and sedimentary properties, essential for commercial and military exploitation, is lacking for substantial areas. Surface and underwater movements are largely unpredictable. Furthermore, because of the fluid state of the ocean there will always be a need for continuous measurement of sea states, temperatures at different depths, salinity, current direction and speed, ambient noise, water visibility, plankton layers and so on. This applies specifically for ASW operations.

The nations of the world are rapidly increasing their spending on oceanography. In the United States, for example, federal spending on oceanographic research and technology has gone up from about \$25 million in

1956 to about \$530 million in 1970. In 1969 it was reported that the US Department of Defense had approved a long-term programme for spending \$3.8 billion on ocean engineering and deep submergence during the period 1970 to 1982 [111]. In total terms other countries lag far behind the United States in expenditure on marine science and technology. A comparison based on 1967/68 figures produces the following result: the USA \$480 million; Canada \$38.6 million; UK \$31.2 million; France \$19.2 million; Japan \$8.4 million; West Germany \$7.4 million. [44] No reliable figures have been found for the Soviet Union. On the initiative of the US Government, an International Decade of Ocean Exploration is being launched in the 1970s.

While increased oceanographic knowledge has many civil uses, there is no doubt that defence interests have been the major force behind the great surge in spending for oceanographic research during recent years. This is definitely so for the United States, the nation that spends most on oceanographic research. For several years now, 50–60 per cent of US Government expenditure on marine science and technology has gone to the Navy. Of this about half goes to oceanographic operations and the rest to deep ocean technology. The close interrelation between military and civilian oceanography is indicated by the fact that 90 per cent of the Navy's basic oceanographic data is said to be unclassified and made available for general use. [13] At the same time, a great deal of oceanographic research conducted by civilian agencies is very useful to the military as well.

Two quotations illustrate the military interest in oceanographic research. A 1966 report by the President's Science Advisory Committee said:

The most urgent aspect of Federal involvement in ocean science and technology for the next 5 to 10 years relates to national security in the narrow, strictly military sense. The U.S. Navy . . . will have increasing need for specialized oceanographic data for specific devices being developed or improved and will continue to require better understanding of characteristics of the ocean environment in which it operates. [6]

The Oceanographer of the US Navy, Admiral Waters, said in 1969:

Why has oceanography become so important to the Navy? . . . It is simply that oceanography provides necessary scientific and engineering support to every waterborne weapon and surveillance system in every area of warfare. It plays a role in such basic Navy missions as the protection of shipping; the surveillance of foreign naval forces that pose a potential threat; strategic deterrence through the Polaris submarine fleet; the ability to mount and support amphibious assault operations; mine warfare and mine countermeasures, and sea-based air strikes and certain ground actions. It has become an essential element in the maintenance of American sea power. [14]

The Admiral added further that half the Navy's oceanographic budget goes to programmes supporting anti-submarine activities. Most of these programmes are in the field of acoustic detection (cf. page 108), but two programmes are worth mentioning here as examples of military oceanography. One is the GOFAR project, Global Ocean Floor Analysis and Research. GOFAR is designed to further the Navy's understanding of the geological processes occurring on the ocean floor. It will result in charts of floor contour and composition, magnetics and gravitational anomalies, and acoustics. This information is said to be needed for search, rescue and salvage operations, the reliable use of bottom-bounce sonar, and the installation of bottom structures. [15]

The Arctic is another focus of military oceanography in the United States. The President's Marine Science Council proposed in 1969 that the USA should aim at achieving, amongst other things, a leading US position in the Arctic that will satisfy its political, scientific, economic, and other interests; an improved capability to inhabit and operate in the Arctic; and the capability to perform operations necessary to the successful conduct of national defence. [16] This, obviously, involves more than oceanographic operations. But these are important for developing effective under-ice operating capabilities for the nuclear submarine force. [13] Furthermore, a large surface-effect vehicle is now being developed for use in the Arctic. [1]

A civilian oceanographic programme for which there is great military interest is the establishment of a network of surface buoys for data gathering. The buoys have submerged sensors and usually telemeter data to aircraft or land. The largest such programme that has been considered is the "Monster" buoy system, involving moored buoys, 40 feet in diameter, which can measure and record 100 channels of scientific data. Recently the "Monster" buoy programme has been partially shelved for lack of funds; but the concept is pursued within the National Data Buoy Systems, now being developed under the US Coast Guard. The systems' primary mission would be to measure and assemble marine environmental data on a continuous, automatic, year-round basis. The research environment includes the deep ocean areas, the continental shelves of North America and the interior waters of the United States. The buoys will serve many civil purposes—for instance, general oceanography and weather prediction—but they will also have important military functions in relation to anti-submarine warfare, barrier operations, amphibious operations and reconnaissance. The National Data Buoy Systems are scheduled to become operational in 1976/77. [17] \$6.5 million was funded for the programme in fiscal year 1970 and \$13.5 million in fiscal year 1971. [1]

The United States is not alone in making increased efforts in ocean-

graphy. The Soviet Union has also reached a high level of development in oceanography, as have, to a lesser extent, Japan and France. Some observers, pointing to the number of oceanographic vessels or oceanographic specialists, maintain that the Soviet Union is, in fact, leading the United States in oceanography. Admiral Waters said in 1969:

Comparing efforts and achievements in oceanography, the United States and the Soviet Union are about equal. All other nations lag behind, though many of them have very respectable programs. . . . Comparisons between nations are tricky since each emphasizes the phase of oceanography that best serves its own needs. Russia and Japan are both ahead of the United States in the use of oceanographic techniques to support their fisheries industry and of course they both catch many more fish than we do. Russia has a larger number of research ships than the U.S. fleet, but our ships, at least our newest ones, are better equipped. U.S. oceanographic shore facilities, inadequate as they are, are much superior to Russia's. I believe that we are ahead in naval applications of oceanography and that we will stay ahead. But of course the two countries exchange no information about naval applications of oceanography, so that we can only guess that we lead the Soviets in this area. Certainly, the United States has no cause for complacency, for even though the U.S.S.R. was a late starter in oceanography, she has made great strides. [14]

Commercial exploitation of the deep ocean

The economic resources of the ocean are enormous according to most estimates. Sixteen per cent of the entire oil and gas output of the non-socialist states now comes from underwater wells on the continental shelves. This percentage is expected to increase to about 35 per cent within a decade or so when exploitation of the whole continental-margin area has become possible. This assumes however that a number of environmental problems, such as pollution, and the risk of bottom collapse following formation of an empty oil or gas pocket in the subsoil, can be solved.

Minerals are abundant in the sea—both as dissolved elements in sea water and in solid forms on and in the ocean floor. So far, it has not been economical to exploit these mineral resources to any significant extent; but with the advance of technology such a time may arrive, unless other considerations indicate that a threat to the environmental balance may follow.

The following prediction about the commercial use of the ocean in the future was made by a US naval scientist:

Such developments must include extraction of oil and gas, extraction of hard minerals, fish farming, aqua culture and regulated fish hunting, biologic and mineral extraction, fresh water, utilization of the sea for disposal and treatment of wastes, utilization of the sea as a thermal sink, utilization of the sea as a radiation protection cover for reactor power sources, atmospheric prediction and

weather control, large scale transport including off-shore terminals, off-shore processing plants, fixed or semimobile artificial islands, airports, recreation and commercial facilities, etc. [18]

As pointed out earlier, there seems now to be general agreement among experts that most of the ocean's resources are concentrated in the continental-margin areas, in particular the continental shelves, rather than in the very deep waters and the abyssal plains. This situation is certain to influence the establishment of any international regime for the exploitation of the resources of the ocean floor, a matter with which the United Nations has been preoccupied for two years. Most nations now seem to agree that there is an area of the ocean floor outside national jurisdiction which must not be expropriated by any one nation but should be reserved for the benefit of mankind. It seems, though, that it will be a long time before this concept is realized. Pending the setting-up of an international regime, the use of the ocean's resources is to some extent governed by the 1958 Geneva Conventions on the Continental Shelf and on the High Seas. The Geneva Conventions leave, however, considerable uncertainty about the right of exploitation on the ocean floor outside an undetermined limit of the continental shelf. The following statement—by a lawyer in the British Parliament—seems to give a fair description of the existing situation, in the absence of a legal regime for the ocean floor:

As regards resources, I think one can say that the law is that anybody can take what he finds—findings are keepings—but that nobody can acquire an exclusive right over any area of the sea-bed. This is important, since it means that nobody can rely on security of tenure sufficient to justify the huge capital expenditure involved in extracting these resources. [19]

Under all circumstances the extension of the commercial uses of the ocean is likely to influence the military uses of the ocean. A number of points may be summed up here, some of which will reappear in later sections:

1. Much the same technology is required for civil and military operations under water. This is likely to speed up the military development.
2. The development of civilian bottom installations in the future, as predicted above, may lead some nations to give military protection to such installations (cf. page 142).
3. The commercial activity in the ocean is already now such that the noise created by these operations—for instance off-shore oil prospecting and drilling—"interferes" with submarine detection by acoustical means.
4. Continued commercial exploitation of the deep ocean, including the development of submarine tankers and other civil submarines, are likely to be put

forward as reasons for keeping acoustic surveillance systems on the ocean floor in order to follow what goes on in the ocean: to track submarine disasters, etc. This may have important implications for future disarmament negotiations over the sea-bed (cf. page 153).

5. If, as seems likely, an international regime for the exploitation of the ocean floor is set up, there are certain to be some problems of reconciling the allocation of leases with a presumed freedom for nations to place military installations, excluding mass-destruction systems, anywhere on the ocean floor. Conflicts are bound to arise if one nation wants a lease in an area where another nation may have placed a secret military installation.

C. Anti-submarine warfare⁷

The development of ballistic-missile submarines has led, not unnaturally, to a big increase in the attention given to anti-submarine warfare. To take one example, the United States is estimated to spend around \$2 billion a year for anti-submarine warfare and perhaps an equal amount for undersea warfare. These figures have been rising rapidly since 1960. [20] About 20 per cent, nearly \$0.5 billion, of the Navy's research and development budget now goes to the ASW sector. [21] Some of the developments in ASW involve the deep ocean or ocean floor, and others do not. This section presents a picture of the whole field—an account simply of those operations which concern the deep ocean or sea-bed would necessarily be rather disjointed.

The ASW problem

The problem in anti-submarine warfare is immense. It is generally stated in the following terms:

Detection: The ASW side must first of all find out that there is a submarine in the water. This can be a most difficult task since the enemy submarines will do their utmost to conceal themselves in the ocean. The new nuclear submarines, with their capacity to remain submerged for very long periods, can hide anywhere in the upper 10 per cent of the ocean volume. Even modern conventional submarines using snorkels are difficult to find.

Classification: When a suspected submarine has been detected, it must be properly classified. Many "false targets" in the ocean react to ASW detection methods: schools of fish, whales, certain water layers, etc. Friendly submarines must be sorted from enemy submarines and the latter classified according to type. The last point is important since it determines the kind of countermeasures used.

⁷ For details of the submarine fleets of the great powers see the reference section, p. 307.

Localization: The accurate position of the detected submarine must be established. The submarine must then be tracked continuously until the means of attack has been delivered. This is not easy since the submarine may use the time lag between detection and attack for evasive movements.

Attacking: The submarine must be attacked by a weapon that can reach it while it is diving into deeper water.

Destruction: The weapon must actually hit the submarine or make such an indirect impact on it that it either is destroyed immediately or is forced to surface where it can be fairly easily eliminated.

In order to eliminate just one submarine all these operations must be successfully concluded.

The ASW strategy most likely to be used in a war, at least by the United States, is an offensive forward strategy. This means, in particular, to attack enemy submarines as near their home bases as possible, before they reach their stations in the open ocean and while they may be passing through straits or other geographical barriers.

This strategy has been explained several times, for instance by Admiral Caldwell, Director of the US Navy's ASW programme:

The overall objective of our ASW strategy and our ASW effort is to provide the United States with the capability to use the sea as our national interest demands in the face of a massive submarine threat. U.S. antisubmarine warfare forces can be engaged throughout the spectrum of conflict from cold war through limited war to general war. The key element of U.S. antisubmarine strategy in a limited or a major war is the conduct of offensive operations that will destroy enemy submarines before they reach their operating areas. This offensive strategy is to be implemented by attack submarines and by ASW aircraft, both land and carrier based operating in response to intelligence of enemy submarine movements.

With the Soviets now capable of operating submarines in all waters of the world, we are forced to maintain a variety of weapon systems to counter the submarine wherever it operates. [22]

ASW means of detection

Essentially three means of detection are available: electromagnetic, acoustic and magnetic. These are discussed in turn.

ELECTROMAGNETIC DETECTION

Electromagnetic detection includes the optical field, radar, infrared and laser. Optical identification and radar are, of course, used by surface ships,

aircraft and helicopters whenever a submarine surfaces. The radar systems are also efficient against snorkels and floating antennae. Infrared detection may be employed by aircraft, helicopters or satellites to trace the heat emitted by submarines, which to some extent shows up in surface water movements; but this is also a near-surface method. All these methods are handicapped by the fact that the penetration of electromagnetic energy in water is low (page 99).

ACOUSTIC DETECTION

Acoustic detection is the primary method of finding submarines below the surface, again for reasons explained earlier. The most important term in acoustic detection is sonar which stands for "Sound, Navigation and Ranging". There are two broad categories of sonar techniques, passive and active sonar. Passive sonar devices simply listen to sounds created by the submarine's propulsion machinery or by its movement through the water. They can detect a submarine over fairly long distances (see below); they cannot, however, determine the distance to it with any accuracy.

Active sonar systems send out high energy sound waves which strike underwater objects and return echoes to listening instruments. Active sonar possesses three advantages over passive sonar: it does not depend on the target to generate noise; the distance as well as the direction of the target can be measured; and a comparison of the acoustic frequencies of the echo and the transmitted pulse will produce a so-called Doppler signal which indicates whether targets are moving toward or away from the sonar. Important disadvantages of active sonar are: the transmissions reveal the presence of the sonar transmitter over an area far greater than its own zone of detection; it receives echoes from a wide variety of objects difficult to distinguish from submarines. [7] Two additional problems are that for geometrical reasons the signal received on reflection from the target varies as the fourth power of the range, i. e., if the range is doubled the echo received will diminish by 15/16ths; and that using stronger transmitting signals may cause "cavitation", that is, an air-vapour pocket in front of the transmitter. The attenuation of sound in water may be partially overcome by using low frequency sound waves; however, these are more difficult to generate and are less suitable for target discrimination, being too long. The problems of sound generation under water seem, however, to be on the verge of being overcome with the construction of high energy transducers that can generate megawatts of acoustic power rather than a few tens of kilowatts. According to a recent expert statement it is now possible to "ring an entire ocean basin like a bell, putting enough acoustic energy in the water to cause it to reverberate from shore to shore". [105]

The propagation of sound is also governed by environmental factors (page 100). Sound signals seldom travel in a direct path and the practical ranges that can be achieved are limited. Sophisticated passive sonars now in use can receive sounds almost 100 miles away. The ranges in the active mode are usually much shorter, generally 10–15 miles. [23] However, ranges in excess of 30 miles have been achieved by the newest US active sonars using the bottom-bouncing technique. The United States is also utilizing one very large VLF transmitter, the Artemis project (see page 150), which is reported to achieve ranges of several hundred miles by using the deep sound channel.

Sonars can be used in many different ways, some of which are described here.

Hullmounted on surface ships, usually destroyers. Modern destroyers often have combined passive/active sonars. The newest types, for instance the American AN/SQS-23 and AN/SQS-26, are very large and high-powered. The output of the sonars controls the firing of the ship's anti-submarine weapons.

Hullmounted on submarines. One example is the BQQ-2 on US nuclear attack submarines. It has both a passive acquisition subsystem and an active/passive tracking subsystem. Since concealment in the water is the biggest advantage of submarines, they use the passive mode as much as possible, and put on the active sonar only immediately before attacking.

Variable depth sonar (VDS). This sonar is dragged through the water by cable from a surface ship. American VDS-sonars can be lowered to 500 feet and the French and Canadians are reported to be developing sonars that go down to 1 000 feet. [11] The main advantage of VDS-sonar to surface ships is that it can be used to sense targets under the thermocline (see page 100). There is, however, a tremendous drag problem if greater depths than that are attempted.

Helicopter-dipped sonar. Helicopters may be sent out from surface ships and, while hovering, lower a cable with a sonar at its end to listen for submarines.

Sonar buoys. Essentially there are two sorts: those dropped from aircraft in order to obtain a "fix" on a suspected submarine and those established as long-term listening posts. Both kinds of buoys listen for sounds under water and report by radio to aircraft, satellites or surface ships. Sonobuoys may

be, and probably are, used for establishing surface barrier detection systems for submarines.

Sonobuoys dropped from aircraft have been a standard submarine detection source since late in World War II. The most common US type is the "Jezebel" AQA-5 passive buoy used together with the "Julie" explosive echo ranging charge. The principal drawback with existing passive types has been the necessity to drop a whole string of them, together with explosive charges that pump sound into the water at preselected depths, in order to detect and localize a submarine. The system requires a great deal of electronics analysis in the aircraft. The biggest breakthrough in sonobuoy technology is said to be the AQA-7, DIFAR, which uses directional sensing: fewer buoys need to be dropped and less data processed on board the aircraft. [24] Sonobuoys are expendable; they eventually turn themselves off and sink. Prices are now said to be less than \$100 a piece. [25] The latest US sonobuoy programme is CASS, Command Activated Sonobuoy System, now being developed. (Permanent surface buoys are discussed on page 103.)

A function similar to that of the sonobuoy is performed by an oblong platform with tanks in the lower end, which, when filled with sea water, give it a stable upright position in the water. Several such platforms are in operation now: the manned, 355 foot long FLIP, the unmanned long SPAR and the smaller STOPS and TOTEM, of which there are many. With sensors attached to their lower ends they may listen for submarines and telemeter data to aircraft or land. The larger platforms also have a special role in connection with the Artemis long-range acoustic detection system.

There are also midwater moored sonobuoys that can either be interrogated by friendly submarines or signal to neighbouring surface buoys which relay the information. Sonar pickets are presently visualized by the US Navy as free-swimming sonar platforms operating at depths of 4 000–6 000 feet at speeds of 15–25 knots. [26]

Bottom sonars. Fixed bottom sonars have been deployed by the Americans on the US continental shelf since the 1950s. The systems, code-named Caesar and Colossus, will be described in the section on bottom installations (page 148). Basically they consist of series of passive sonars, that is hydrophones, connected by cable to land. A new system, Sea Spider, is now being developed for use on the ocean floor in the Pacific; it will have an independent long-endurance power source. Bottom sonars are also used at present for barrier control purposes. [10] Since they can be installed at fixed positions, bottom sonars are much more efficient than other forms of sonars for accurately measuring the distance to a target submarine. Because of the need to use very base lines for submarine detection, bottom sonars are as

a rule installed in widely separated pairs—at greater distance from each other than is possible with ship-borne sonars.

Despite their limitations due to the difficulty of predicting sound propagation in water, sonar systems are likely to remain the chief means of detecting submarines. As submarines become quieter—their chief countermeasure—more advanced and expensive technology will go into the sonars.

MAGNETIC ANOMALY DETECTION

A Magnetic Anomaly Detector (MAD) is a sensitive magnetometer which senses local variations in the earth's magnetic field. On land natural anomalies are common, but at sea local anomalies are rare because bodies of ore are too remote from the surface for detection. However, when a metallic body, such as a submarine, nears the surface, the magnetic field disturbance can be measured. The favourable features of this sensor system are that it is unaffected by the surface and is invulnerable to jamming. MAD's severe range limitation of less than 3 000 feet is its great drawback. This limitation allows the system to be used only for final confirmation of contact and localization for destruction, not for searching large expanses of ocean. [27]

MAD devices are mostly used on ASW aircraft and helicopters. Another use of magnetic anomaly detection is in a cable system on the sea-bed in shallow water. The cables will register all magnetic objects that pass over them and alert ASW forces.

A Soviet article on ASW assumes, however, that the application of plastics, aluminum, titanium and other non-magnetic materials (glass) in submarine construction can substantially lower the effectiveness of magnetic detection means. [23]

DEPENDENCE ON THE MEDIUM

The dependence of all sensors on the characteristics of the medium is evidenced by the United States ASWEPS (Anti-Submarine Warfare Environmental Prediction System) programme:

This is the system, deployed on surface ships, whereby the Navy attempts to predict oceanographic (primarily thermal) conditions in the ocean up to six hours in advance—an important factor in getting the most usefulness out of acoustic search gear. A largely automatic system has been developed for measuring key parameters down to depths of 2 500 feet, computer processing them, and displaying them in a useful manner—all in less than 13 minutes and while underway. Other spin-offs are found in the form of better correlation detection, quieter and faster hulls, etc. [28]

ASWEPS has been in operation since 1959. Both surface ships and buoys are used for gathering ASWEPS data. Collected data are broadcast daily to

provide ASW commanders with the environmental information they need for immediate tactical decisions and for planning ahead.

ASW weapons systems

Anti-submarine warfare is a complex task usually requiring the co-operation of several systems—unmanned surveillance systems, aircraft, surface ships and submarines—against a single submarine. The ASW forces of the US Navy, for instance, operate in task forces generally consisting of an ASW carrier with specialized aircraft, destroyers and attack submarines (hunter-killer groups).

ASW CARRIERS

ASW carriers are as a rule smaller than attack carriers. Only the Western navies have ASW carriers; the Soviet Union has none besides two new helicopter carriers. According to the defence posture statement by Secretary Laird in February 1970 the US Navy should now have four ASW carriers (CVS) in operation with four air groups. In recent years there has been some doubt about the cost-effectiveness of the ASW carriers. The Nixon administration has, however, now decided to keep them but improve their ASW capabilities. This will be accomplished by the development of a new carrier-based ASW aircraft, the S-3A (formerly VSX). [29] This aircraft is a scaled-down model of the land-based P-3C described below. It will have the same computerized detection system (A-NEW).

DESTROYERS AND HELICOPTERS

Destroyers are often described as the “work horses” of the ASW group. The newest destroyers have powerful sonars that control the firing of anti-submarine torpedoes and missiles (see below). Some destroyers have also been equipped with helicopters for submarine hunting. The Americans for some years experimented with unmanned drone helicopters, DASH, that were sent out from destroyers: the helicopters were unmanned because they were meant to deliver nuclear depth charges and therefore should be expendable. The DASH programme has now been terminated, and the US Navy has become more interested in manned light helicopters, LAMPS (for Light Airborne Multiple Package System). The LAMPS will probably be used mostly for dropping sonobuoys but they will also carry torpedoes.

Relatively speaking, the importance of destroyers as a means of detection in ASW seems to have diminished in recent years in favour of aircraft and anti-submarine submarines. But operating together with other sensor systems the destroyer retains part of its importance as a weapons platform against enemy submarines.

LAND-BASED ASW AIRCRAFT

Land-based ASW aircraft are considered a fairly efficient means of looking for submarines on, or not too deep below, the surface. With their long endurance—more than ten-hour patrol times—they can scan vast expanses of the ocean. One of the most advanced types is the US P-3C Orion now coming into operation. It carries a very sophisticated ASW electronics package, A-NEW, costing \$5.3 million each as against \$1.7 million for each airframe.

The centre of A-NEW is a very versatile computer that can accept information from manually dictated or sensor-input sources such as two different kinds of sonobuoys, magnetic anomaly detection systems, low light television and electronic intelligence. A-NEW can keep track of as many as thirty sonobuoys, targets or other items of interest, evaluate the data from dropped sonobuoys necessary to obtain a “fix” on a submarine and control the firing of the aircraft’s anti-submarine weapons. [30]

In addition to the P-3C, of which about 100 have been authorized so far, the US Navy operates the P-3A which, although lacking the A-NEW package, has the same air-droppable sonobuoys (DIFAR and CASS) and the same weapons (MK 46 air-launched active acoustic homing anti-submarine torpedo) as the newer P-3C. [29] In a few years the carrier-borne ASW-aircraft, S-3A, will also be operational.

The advantages of ASW aircraft can be summed up thus. With their sensors they can detect the presence of submarines on or near the surface and direct surface ships, anti-submarine submarines or other aircraft to the place for attack. Equipped with sonobuoys, depth charges and torpedoes, they may attack and destroy the submarine. If possible they will operate with a screen of destroyers around the suspected position of the enemy submarine in order to prevent it from escaping. The aircraft is itself invulnerable to attack from the submarine. The aircraft’s main disadvantages are that its sensors cannot penetrate deep below the surface where the submarine may be hiding, and that, because of its speed, it has difficulty maintaining the position of the submarine.

To some extent satellites and other space vehicles may also be used in ASW. Satellites are known to have been used for infrared detection of submarines (page 99). The Manned Orbiting Laboratory (MOL), long advocated by the US Department of Defense, included specifications for an ASW function. The project, which was funded at \$600 million in fiscal year 1969, has now been terminated by the Nixon administration. However, its functions are likely to reappear in other US space programmes, manned or unmanned.

ANTI-SUBMARINE SUBMARINES

The anti-submarine submarine has many advantages as an ASW hunter. It uses the same medium as the target and can therefore do whatever it can do—for instance, remain undetected for long periods, listen quietly over long distances, dive deeper, attack with the same weapons. This applies particularly to the new nuclear attack submarines developed as a countermeasure to the nuclear-powered ballistic-missile submarines. Anti-submarine submarines are, however, expensive and, consequently, few in number; they have the same communication and navigation problems as other submarines.

In the forward ASW tactics deployed by the US Navy, the anti-submarine submarines are usually assigned patrol sections along barrier lines, such as the lines between Greenland-Iceland-Faroe Islands-Scotland or between the Aleutian Islands and the northern Japanese islands in the northern Pacific. A nuclear-powered attack submarine of the “Permit” class can there “patrol a 60 nautical miles front with reasonable assurance of catching everything that comes through. It need only execute a narrow figure-8, or a continuous up-and-down spiral of narrow radius, around the centreline of the patrol sector to hear and be able to destroy everything that moves at a speed above 10 knots. Keeping its speed at 5–7 knots, it would be itself unheard.” [10]

After intensive debate and considerable pressure from Congress and the Atomic Energy Commission, the United States is now embarking on a new generation of nuclear-powered attack submarines that will have greatly increased speed and quietness. Initially, these two characteristics are being developed separately. Work on two “high speed” (40 knot?) submarines, “SSN-688” class, started in 1969 and at least another seven are funded for fiscal years 1971 and 1972. [29] They are very expensive, and will cost about \$150 million each.

According to many naval experts quietness is the most desirable characteristic in a submarine. In the United States work is now progressing on an experimental, very quiet, nuclear-powered submarine, the so-called Turbine Electro-Drive Submarine (TEDS). Its cost may be as high as \$200 million. [31] The turboelectric power plant will eliminate several noise-makers in the submarine. The turbogenerator will probably be driven by a natural circulation water-cooled reactor instead of the pressurized-water reactor which is standard in other nuclear-powered submarines. [25]

Construction of a third “new design” nuclear-powered submarine, incorporating both high speed and quietness, was announced by Secretary of Defense Clifford in January 1969. According to a later statement by Secretary of the Navy Chafee, this “new design” submarine for the mid-1970s should have even greater performance than the TEDS-submarine. [32]

The new fast-quiet submarines will probably also go deeper than present attack submarines, and are expected to be a prime weapon against the new Soviet Polaris-type submarines. At the same time they will be better able to avoid Soviet anti-submarine warfare efforts.

ASW means of attack

The main categories of ASW means of attack are torpedoes, missiles, depth charges and mines.

TORPEDOES

Torpedoes are the classical weapon of the submarine. Several advanced types are in existence or being developed:

Homing torpedoes that use acoustic ranging to locate their target and in that way seek to overcome their main restriction—limited speed. Modern highspeed torpedoes may reach a maximum speed of about 60 knots but that is not enough against submarine targets which may move at 30–35 knots. [23]

Wire-guided torpedoes that are continuously fed new guidance orders from the submarine that fired them.

Torpedoes with nuclear warheads that do not have to hit the target in order to destroy it.

Torpedoes launched from surface ships or dropped from aircraft.

The most advanced US torpedoes are:

ASTOR, a submarine-launched, wire-guided torpedo that weighs 1 ton, achieves long range and has a nuclear warhead.

Mark 46, a light-weight, high-speed, active acoustic homing anti-submarine torpedo that may be launched from surface ships and aircraft.

Mark 37, a conventional anti-submarine torpedo fired by submarines. It is now considered obsolete because of limited speed, range, acquisition and depth capabilities in comparison to modern, fast deep-diving target submarines. [29]

Mark 48, the successor to Mark 37, under development. Its very sophistication has caused repeated development difficulties. The cost of the total procurement programme has gone up six times, from an original estimate of \$687 million to \$3.64 billion at present. [5] It has a conventional warhead, is wire-guided and can go very deep. It will be the main weapon against the new Soviet deep-diving ballistic-missile submarines. In addition to its role as an ASW weapon, it is being developed as a weapon against surface ships. Procurement has started this fiscal year. [29]

ANTI-SUBMARINE ROCKETS

One way of overcoming the limited range and speed of conventional torpedoes is to fire them by rockets in a ballistic trajectory through the air. The US Navy has developed two types:

ASROC is fired from surface ships; the rocket usually carries a torpedo which is released by parachute before the end of the ballistic trajectory. Once in the water, the torpedo homes in on the target. The rocket may also carry a depth charge, nuclear or conventional, which descends without parachute to predetermined depths and detonates. [28] Its range is reported to be about 6 miles. [33]

SUBROC, a nuclear depth charge launched by a submarine underwater in a ballistic trajectory against a target submarine, has been introduced on the US "Permit"/"Sturgeon" class nuclear attack submarines. [22] The Polaris/Poseidon submarines are also reported to be equipped with them. The range of SUBROC is estimated to be 26–30 miles. [28, 33]

AIR-DROPPED DEPTH CHARGES

Several air-dropped depth charges are in existence, as mentioned earlier. One type used by the US Navy, called LULU, has a nuclear warhead. (For the effects of nuclear explosions in the ocean, see below.)

MINES

Mines have a long history in anti-submarine warfare; they were used extensively during World War II. International law, it is true, now severely restricts the laying of minefields in time of peace; but the capability has been developed to lay thousands of mines in a few days in the event of an outbreak of hostilities. [34] Modern mine warfare leaves little to the discrimination of the target vessel. The mines have been tailored to submarines as the target of interest. Scientists have measured many attributes of a submarine and have developed sensing devices and data-processing equipment for mines which all but allow them to "think". Existing mines include:

Moored conventional mines that depend on physical contact for their activation.

Cable-controlled bottom mines.

Pressure mines—a ground mine for use in shallow waters (not more than 180 feet). Lying on the bottom, the mine detonates when an underwater structure passes over it, causing a pressure differential to be registered in the mine. Pressure mines are very difficult to sweep and therefore constitute a particularly potent anti-submarine weapon.

Magnetic mines. Activated by the magnetic field created by a submarine, they may be either moored or ground mines. Their range is limited to a few hundred feet.

Acoustic mines. They react to the noise created by a submarine, may be either moored or lying on the bottom and presumably have a longer range than pressure or magnetic mines.

Torpedo mines. The US Navy is developing one deep ocean mine, CAPTOR, that is really an encapsulated torpedo: upon activation it can seek out the target and destroy it. CAPTOR has a large radius. [32]

During recent years there has been talk of nuclear mines. It has been said, for instance, that they could be used to create very large flood waves that would destroy enemy coastal areas. [35] On the other hand, it is pointed out that no nation would like to deploy unmanned and unguarded nuclear weapons that could be interfered with or "stolen". [36] Proof of the low military interest in nuclear mines is perhaps the proposal that bottom anchored ones be outlawed in the draft sea-bed treaty (see page 160).

EFFECTS OF NUCLEAR EXPLOSIONS UNDER WATER

Several of the ASW weapons mentioned above are, or may be, equipped with nuclear charges. Generally speaking, the effect of any explosive on any target increases with the depth at which the explosive effects reach the target. That is, the fact that pressure increases with depth compounds the impact of the explosive on, say, the pressure hull of a submarine. The high explosive effects of nuclear charges make them therefore very potent against submarine targets.

Theoretically, a submarine at its collapse depth—which for modern US nuclear-powered submarines is likely to be around 3 500 feet—can be destroyed by the shock wave from a very distant underwater explosion. If the nuclear weapon burst occurs near the surface of the water, the effects on the submarine are, however, reduced.

Ranges at which nuclear weapons are effective against submarine targets at different depths have been calculated. For example, a submarine with a maximum depth capability of 2 000 feet will be destroyed by a nuclear weapon of 10 KT that explodes within about 1.2 miles when the submarine is at 500 feet. Similarly, if the submarine is known to be at about 500 feet within an area of 50 square miles, twelve 10-KT weapons will be needed to cover the area and destroy the submarine. Using larger nuclear weapons increases the effects. From a military point of view the main advantage of nuclear weapons in undersea warfare is that they do not require the position of the underwater target to be known exactly.

The communications problem

A problem common to all undersea operations, including anti-submarine warfare, is how to communicate underwater. Three sorts of communication

are normally needed: land control centre to submarine, surface ship to submarine, and submarine to submarine. (The general environmental problems of communications under water were discussed on page 99.)

The very low frequency (VLF) radio waves used for command and control of the Polaris can penetrate 60–100 feet underwater. The submarines need not stay at that level to receive the signals, since they carry a trailing wire antenna which has a naturally positive buoyancy. The wire is several hundred feet in length—long enough for the submarine to dive fairly deep and still have a chance of hearing transmissions from shore. [10]

The United States has six fixed VLF stations at different places in the world that send messages to the Polaris submarines. The two largest, of 1-megawatt peak pulse each, are in Maine, USA and Northwest Cape, Australia. These are backed up by a large number of low frequency (LF) stations (probably used for close-to-surface communication with the submarines). Because the fixed radio stations are vulnerable to nuclear attack, the TACAMO airborne VLF system has been recently introduced. In addition, a Ship Mobile VLF system is now being considered [32], as well as a satellite VLF system. [21]

The main drawbacks of the present communications system are: it limits the operational depth of the submarines for periods of time to a few hundred feet; it is vulnerable to jamming; it is only one-way communication. To communicate with land the Polaris probably has to protrude an aerial above surface.

Experiments have been made with sonobuoys for air-to-subsurface communications and vice versa, but so far, apparently, with unsatisfactory results. [10]

Use of extremely low frequency waves, ELF, has recently made it possible to extend considerably the penetration of radio waves into water, thereby increasing the operational depths of ballistic-missile submarines. This is the aim of Project Sanguine, started by the US Navy in 1968 with the construction of a facility in Wisconsin. Very large stations and antennae, as well as favourable underlying geologic strata, are required for emitting ELF waves. The cost of the project has been estimated at \$1 1/2 billion. ELF waves not only penetrate very deep (the exact depth is classified), they are also considered to be invulnerable to jamming in contrast with the present VLF system. Messages are transmitted in Morse code in very short time periods. Project Sanguine ran into some initial difficulties because the very strong transmitter used in the facility caused local disturbances. It will probably not be fully operational until 1976/77. [21, 37]

For communication between surface ships and submarines and between two submarines underwater “telephones” are used. A US Navy system, AN/

UQC-1, dubbed Gertrude, has an effective range of a few thousand yards for voice communication. A more advanced system, AN/BQA-2, has somewhat greater range—perhaps 20 000 yards—but at the expense of directness and speed. [10] In connection with the development of the deep-submergence vehicles DSRV and DSSV, described in a following section, design characteristics have been specified for an underwater telephone system that would provide a communication capability at all depths down to 20 000 feet, with the support vessels up to 3 miles away from the point on the surface directly above the submarine.

Submarine navigation

Related to the communications problem is the problem of navigation in the deep ocean.⁸ Generally speaking a US submarine can use three or four different systems for establishing its position: its own inertial-guidance systems, SINS, of which the Polaris has three; fixes received by radio from Omega land-based VLF stations while submerged below the surface; fixes received by radio from Transit satellite HF stations while antennae are surfaced; and, in the near future if not now, interrogation of sonar navigation beacons placed on the sea-bed in suitable places. For the ballistic-missile submarines exact navigation is particularly important, as it has a direct bearing on missile accuracy.

Another aspect of navigation involves moving near the ocean floor—which is an ideal hiding place. But this has its own difficulties:

From a tactical point of view, the very deepest depths of the ocean would be the ideal place to operate, since enemy sonar would have difficulty distinguishing a sub from other artifacts on the bottom. But this raises another serious problem—the possibility of collision with one of the many sea mountains that project up from the bottom. One could easily navigate this terrain using the same sort of electronics, modified for sonar, that ground-hugging fighter-bombers use. But the danger here is that the submarine would be giving his position away continuously. It will be a long time, in my judgement, before submarines will be able to clip along at, say, 20 knots near the bottom using a passive navigation system like inertial guidance. We just don't know enough as yet about the geography of the ocean floor to be able to navigate blind the way a pilot does when making a landing in a mountainous region. [38]

Conclusions

This discussion of ASW may have created the impression that the submarine is losing ground to the ASW side. This impression would certainly be wrong. Most advantages are still on the side of the modern nuclear-powered sub-

⁸ The navigation systems supporting Polaris submarines were described in the *SIPRI Yearbook 1968/69*, p. 105.

marine, which is undergoing continuous improvements. It has enormous possibilities for hiding just by moving submerged in the vast ocean, undetectable by sonar in certain thermal layers. Since it is also becoming quieter and faster and soon will go deeper, it will have every chance of escape. It can also use active countermeasures: put out false targets to distract the ASW forces; employ mine countermeasures such as towing large noise-making devices or magnetic generating equipment; or, in a war, hide behind a nuclear explosion.⁹

There are essentially three possible tactics in anti-submarine warfare: attempting to destroy every submarine by trailing it from its home port (sometimes called attrition); open-area surveillance and targeting; and barrier control. The feasibility of the first method has yet to be demonstrated: according to US Navy sources Soviet attack submarines have never been able to trail a Polaris submarine, although they have tried. [39] If trailing should occur the counter-tactic used is often to intervene with a third submarine between the trailer and the target submarine.

Open-area surveillance—from ASW aircraft, satellites and surface ships equipped with ASW radar—and targeting are used but probably still with limited results. The picture may change, however, if ever large parts of the ocean floor are covered with a network of bottom detection systems and the ocean surface with a network of buoys that communicate with aircraft.

For detecting ballistic-missile submarines in a nuclear war, trajectory analysis has been considered. This involves locating a missile-firing submarine by analysing the trajectories of its first one or two missiles, and then destroying it. In principle this method is feasible but its utility depends primarily on how fast the submarine can launch its missiles. The Polaris/Poseidon submarines fire their missiles very fast, and are not considered to be vulnerable to trajectory analysis, according to a statement by the US Chief of Naval Operations. [40] Admiral Caldwell, Director of the US Navy's ASW programme, has said "that a Soviet ballistic missile firing submarine has a better than 50 per cent chance of getting its missiles off before being detected and destroyed". [41]

Probably the most effective ASW tactic at present is to operate a forward barrier-control system. The US Navy uses this tactic. Provided the barrier is a co-ordinated system of bottom detection devices, other sensors, attack submarines and ASW aircraft, it should have some chance of stopping enemy submarines in a war situation. The use of this tactic cannot, however, prevent submarines from passing the barrier and disappearing in the ocean in peacetime with the purpose of establishing a continuous open-ocean

⁹ The sound and heat effects created by a nuclear explosion will confuse any acoustic detection system.

patrol. The tactic can only be effective against a country surrounded by geographical barriers to the ocean, such as the Soviet Union, not against a country that has no geographical barriers outside its coasts, such as the United States.

There have been some proposals in the United States for declaring larger areas of the ocean floor out of bounds to foreign submarines by establishing so-called Submarine Detection and Identification Zones, (SUBDIZ). [42] Navy officials have spoken against this proposal: if the United States established SUBDIZ zones off US coasts—zones as broad as the missile ranges of Soviet ballistic-missile submarines—other countries would do likewise. This, they feel, would be much more harmful than beneficial to US interests because it would limit the operational freedom of the US Navy.

Expert opinion seems to be fairly convinced that developments in anti-submarine warfare lag far behind increases in the evasive capacity of nuclear submarines. This is shown by the discussions about the “vulnerability” of the Polaris submarine that went on in the United States in 1969/70.

The debate began with a statement by Secretary of Defense Laird in Senate hearings on 21 March 1969:

I do not believe that we will be in a position where the Polaris would be sufficient in that time period, after 1972, to be relied upon as the deterrent force of the United States.

I believe we have to have a more varied deterrent than that one system, and I believe this because of certain sophisticated new research and programs that are being carried forward, because of the developments not only that we have had, as far as submarines are concerned, but the developments that the Soviets have had in the area of submarines.

So, in directing my attention as to whether the Polaris fleet, if all our bombers and all of our Minuteman were destroyed, would be a sufficient and credible deterrent in the period 1972 and beyond, I tried to give the impression . . . that I did not think the Polaris fleet of 41 submarines, by itself, would be a sufficient and credible deterrent during that particular time period to prevent a nuclear war. [43]

The statement, made while Laird defended the Safeguard ABM system, caused considerable concern. Deputy Secretary of Defense Packard then made a more guarded statement on the matter in Congressional hearings on 15 April 1969:

The Soviets appear to have allocated considerable resources to expanding and improving their submarines and ASW capability in the past few years. We must assume that the Soviets will continue this effort and, indeed, might further expand it. Given their well-known concern with Polaris, we must further assume the possibility that a substantial portion of their effort could be directed toward countering Polaris.

In specific, however, we have no evidence of any present or prospective

Soviet “breakthrough” in ASW technology that would sharply increase the threat to Polaris. Based on the data we now have, we expect the Polaris to remain highly survivable at least until the late 1970’s, but we can’t be sure. This date is not set by any specific projection of a known threat, but rather by the general uncertainties associated with projections of this nature so far in the future.

Nonetheless, given these uncertainties in predicting the future in this field and the current level of the Soviet effort, it would be imprudent to ignore the possibility of the emergence of a “greater than expected” Soviet ASW threat in the 1970’s. [32]

Then, on 12 May 1969, Admiral Levering Smith, Director of the Navy’s Strategic Systems Project and head of the Polaris force, flatly denied knowledge of any new factors making the Polaris fleet vulnerable:

1. I am quite positive that Russian submarines cannot and are not following any of our Polaris submarines under water. I am also quite positive that the new generation of Russian submarines that are getting close to operational status, that are now being tested, will also not be able to follow our Polaris submarines.
2. The Russians have no specific new antisubmarine warfare methods the Navy knows of that would make the Polaris fleet vulnerable to attack, despite many reports of a superior Russian sonar system or satellite detection capability.
3. We have tried to use satellites to detect submarines under the water. The laws of physics will have to be changed to make it practical. The chances of a satellite going over the right spot aren’t very good. It’s possible, but not practical, to use satellites for submarine detection. [45]

By the time of his defence statement for fiscal year 1971, made in February 1970, Secretary Laird had changed his assessment on the vulnerability of the Polaris:

According to our best current estimates, we believe that our Polaris and Poseidon submarines at sea can be considered virtually invulnerable today. With a highly concentrated effort, the Soviet Navy today might be able to localize and destroy at sea one or two Polaris submarines. But the massive and expensive undertaking that would be required to extend such a capability using any currently known ASW techniques would take time and would certainly be evident.

However, a combination of technological developments and the decision by the Soviets to undertake a world-wide ASW effort might result in some increased degree of Polaris/Poseidon vulnerability beyond the mid-1970s. I would hope that Polaris would remain invulnerable at least through the 1970s. But, as a defense planner, I would never guarantee the invulnerability of *any* strategic system beyond the reasonably foreseeable future, say 5–7 years. [29]

D. The new technology

The military conquest of the deep ocean and ocean floor requires new technologies. These are described in this section as a background to the discussion of existing and future deep submergence vehicles and bottom in-

stallations in the next two sections. First, however, the broad categories of military uses now being contemplated must be set out.¹⁰

1. *Deep submergence vehicles* (page 129) that can reach various depths down to 20 000 feet. These may be either combat submarines or smaller rescue, search or work vehicles. They will require very strong pressure hulls. The smaller vehicles will require new non-nuclear power systems.

2. *Bottom or sub-bottom stations* (page 143) to be used, for instance, as command and control centres for submerged weapons systems or manned bottom surveillance stations. The bottom stations can be either fixed or transportable. They can, further, be divided into two different categories. The first category consists of stations which will rest at shallow depths, down to about 1 000 feet, and will permit the use of free-swimming "saturated" divers (page 127) operating from compression chambers (Sealabs). This will make possible operations at all continental-shelf depths and on top of shallow sea mountains. The second category consists of one-atmosphere installations which will permit normal living and work conditions inside the installation at any depth but exclude the possibility of divers moving outside the pressure hull. It should soon be possible to build such manned bottom stations at depths considerably below the continental shelf, for instance, on many sea mountains. All manned stations will need power sources which are independent of surface or land support via cable. They will further require lock-out facilities that permit the "mating" of submersibles to transport men to and from the installations. If the stations are going to be constructed underwater, advanced building techniques must be developed. Finally, the installations will probably in many cases be equipped with unmanned work vehicles for operating on the ocean floor.

3. *Unmanned bottom detection and surveillance systems* (page 148). The detection systems are mainly acoustic "listening posts" for submarines. These have been in existence for many years but further improvement is being sought—for instance in developing independent power sources and more advanced instrumentation.

US Navy Deep Ocean Technology (DOT) programme

In 1968 the United States launched a major twelve-year programme for developing the technological capabilities for deep ocean operations. The programme is revised annually and funding is still low. An official publication described the DOT programme in 1968:

The Navy ocean engineering program includes studies, hardware development, and prototype installations for military underwater tasks. The primary effort is

¹⁰ Underwater weapons such as torpedoes and mines are excluded here.

The militarization of the deep ocean

the Deep Ocean Technology Project to develop technical options and to assist the Navy to assess more precisely the technical feasibility and requirements for future undersea warfare systems. The areas being studied in relation to their potential deep ocean use include: manned and unmanned submersible vehicles; fixed and mobile bottom structures; engineering properties of the sea floor; metals and non-metallic materials; submersible motors, electrical components and propulsion devices; equipment, instruments and tools; life support systems; long-endurance power sources.

Two major, long-range projects were selected by the Navy as initial goals—an advanced deep ocean submersible and an experimental, one-atmosphere, bottom habitat. (Both projects are designed as ‘test beds’—not for operational use, to test a wide variety of components and equipments.) [46]

In 1969 a naval scientist listed the DOT focal projects then being planned:

1. An interim transportable mobile undersea station (6 000 feet).
2. A continental-shelf manned bottom installation (850–1 000 feet).
3. A surface-stabilized support platform (6 000 feet).
4. An interim work submersible (8 000 feet).
5. A transportable (mobile) undersea station (12 000–20 000 feet).
6. A manned bottom (in and on the sea floor) installation complex. [47]

For these projects technological advances are being made with pressure hulls, power systems, underwater construction techniques and diving operations. Each of these is considered in turn.

Pressure hulls

A main limitation on the depth capability of existing submarines is the strength of their pressure hulls. The hulls of the *Polaris* submarines, for instance, are made of high grade steel which can withstand a pressure of 80 000 pounds per square inch (HY-80 steel).¹¹ This means that they can operate safely at 1 500–2 000 feet but will probably collapse at about 3 500 feet or lower, due to increased oceanic pressure. The pressure hull should not only be strong but also light so as to achieve a neutral buoyancy for the submarine.

The advanced hull materials being developed in the United States include: new high grade steels (HY-140 steel or higher), which will make operations possible to about 10 000 feet; titanium and aluminum, which are much less dense than steel but present difficult fabrication-technique problems; and glass materials. Glass is considered a most promising construction material for deep submergence vehicles. The strength of glass and glass-reinforced plastics increases with pressure, that is with lower depth. Glass is also very light. Theoretically, it has unlimited capability down to any depth. The

¹¹ HY = High Yield strength steel.

problem is that glass is brittle, but attempts are being made to overcome this and other manufacturing problems.

A light pressure hull is as a rule insufficient for achieving neutral buoyancy at very low depths, so supplemental buoyancy material will be required. New buoyancy materials now being developed include syntactic foams consisting of very light hollow glass microspheres in a resin matrix.

Power systems

Power systems are required that are independent of the surface and can operate unattended for months and years. One such power source is the nuclear reactor. It has, however, taken considerable time to develop small reactors for use in small deep submergence vehicles. Last year the US Navy launched a small nuclear deep submergence research and engineering vehicle, the NR-1, which uses a pressurized-water reactor (page 135). Nuclear reactors capable of maintaining large manned bottom stations still remain to be established on the ocean floor, but are presumably receiving priority development.

Otherwise, most efforts are going into the development of general purpose, extended-endurance energy sources in the low power range, 1–100 kW. The main choices are fuel cells, dynamic conversion systems and radio-isotope power sources. [26]

Fuel cells, according to a US Navy ocean-engineering report, are particularly attractive for deep submergence vehicle power supplies with endurance requirements in the range of 20 to approximately 200 hours. [48] Isotope-fuelled systems are claimed to be the most practical candidates presently foreseen for deep ocean applications requiring up to about 15 kW and mission durations longer than six months; among the applications mentioned are deep ocean acoustic devices such as navigation aids and submarine surveillance systems. [26] The US Atomic Energy Commission has, in fact, already developed several such isotope power sources, called SNAPs (first developed for use in space), which have been used in the sea, including the ocean floor, for several years. [49] One, SNAP-7E, now rests on the sea floor in 15 000 feet of water near Bermuda. Another, SNAP-7D, has been operating unattended since January 1964 on a deep ocean moored buoy in the Gulf of Mexico. [49] Moreover, such isotope power sources are now being sold commercially.

A very important future application of non-nuclear power sources, such as fuel cells and dynamic conversion systems, may be the development of a new generation of non-nuclear-powered ballistic-missile submarines. In the future, such power systems might well permit continuous undersea operations for fifteen to twenty days. Since they would be less complicated and

much cheaper than nuclear reactors, they might open up the technical possibility for advanced medium-sized nations to develop their own ballistic-missile submarine deterrent forces.

Advanced construction techniques

Off-shore construction techniques have advanced considerably during recent years based on the experience of several hundred oil rigs.

Deep water drilling is today not an insuperable problem. In fact, some experts claim that drilling operations in 1 000 feet of water are less difficult than drilling at 300 feet where currents and other shallow-water factors influence the operations. Experimental drilling has been carried out at a depth of 12 000 feet in the Gulf of Mexico under the JOIDES Deep Sea Drilling Program. According to the most recent reports the problem of re-entry into a hole drilled in the ocean floor should now have been solved for the first time—a significant achievement that will advance undersea construction techniques. Another US programme, Project Mohole, involved drilling in deep water through the ocean floor down to the earth's mantle. The project was terminated last year because of lack of funds rather than technological obstacles.

Although the first generation of manned bottom stations is of the transportable type, for instance the US Sealab installations, development work is being actively pursued on fixed manned stations as well. For stations at relatively shallow depths, concrete constructions may be suitable; experiments have shown that spherical concrete hulls may be suitable for underwater applications to depths of about 3 500 feet. [48] Testing concrete constructions is part of the US Navy DOT programme. Concrete is already in use for submerged oil-storage tanks.

The US Navy has recently started the Sea-Floor Construction Experiment (SEACON), a project to build an undersea habitat at a depth of 600 feet to research both methods and tools for sea-floor construction. [106]

For fixed installations at depths greater than 3 500 feet, so-called in-bottom habitats seem most promising. This involves the construction of large manned stations in the sub-soil of the continental shelf or the deep ocean floor, or in a sea mountain. The technique will not differ much from that of undersea mining, which is well developed. One undersea mine, at which over 4 000 men work, is situated 1 500 feet below sea level off Newfoundland. [12]

Special work vehicles are required for undersea construction work. Several such vehicles have already been developed, or are under development, in the USA, USSR, UK and France. Most of the deep submergence vehicles have outside manipulator arms attached to the pressure hull which can lift

objects or work with tools under water. There are also surface-operated, unmanned work vehicles in use, some of which can reach depths below 10 000 feet.

Advanced diving operations

Until some years ago the use of divers for work undersea was severely limited by existing diving techniques. Conventional diving methods using helium-oxygen breath mixture do not permit men to dive deeper than about 560 feet; at such depths abnormally long decompression periods are required, which are proportional to the time spent at a given depth. At 560 feet the decompression time is two hours for one minute at the bottom: for practical purposes this means that divers cannot operate at that depth. [50]

This unfavourable ratio of bottom time to decompression time has been overcome with a technique known as "saturation diving". In saturation diving the diver is provided with a fixed capsule on the sea floor or a personnel transfer capsule which transports him to the deck decompression chamber of a ship. The capsule is pressurized to the outside water pressure and provided with a suitable breathing-gas mixture. After about twenty-four hours of exposure under pressure, all tissues of the diver's body have a gas saturation equivalent to the surrounding atmosphere, and the diver is considered to be "saturated". Then his requirements for decompression are based on the sea depths he will have to work in rather than the duration of the dive. A diver saturated to 300 feet requires the same decompression time (approximately two and a half days) whether his work at the bottom lasts one day or one month. After hours of work at depth, he returns to the underwater habitat or ship decompression chamber. Since there is no appreciable difference between the pressure of the habitat and that of the outside water, there is no need for decompression of a man entering the undersea chamber. The decompression is accomplished in a single step when he returns to the surface. [48]

The United States has undertaken saturation diving operations down to 600 feet in connection with Sealab experiments. Operations down to 1 000 feet should be possible within the near future. The French, who also are very advanced in saturation diving, are said to be ready for depths of about 800 feet. [51]

With the present state of the art of diving technology, man can operate as a free swimmer at all continental-shelf depths. According to the latest US Marine Science Council annual report, present defence requirements for diving-system capabilities involve submarine rescue, salvage and object recovery, continental-shelf construction programmes, amphibious and mine warfare and harbour defence. [1] In future, saturation diving techniques

may well turn out to be indispensable for the construction and maintenance of any undersea stations. [50]

The theoretical limit of saturation diving using gaseous breathing mixtures such as helium-oxygen and, in future, hydrogen-oxygen is about 3 000 feet. But concepts are being developed to extend this limit much further by the use of fluid breathing. This would require surgical operations on the diver but could, in theory, make dives possible to depths below 10 000 feet.

Other developments

It has been possible to give here only a few examples of important technological developments relevant to the military uses of the deep ocean and the ocean floor. Again based on United States experience one could further mention development of:

1. Advanced propulsion machinery for deep ocean submersibles. This includes free-flooded machinery placed outside the pressure hulls, thereby extending depth capability, and tandem propulsion which will make it possible for some submersibles to hover like helicopters;
2. Capacity to carry weapons external to the pressure hulls of submarines. Studies are now being undertaken to test the feasibility of this concept, the realization of which would significantly extend the range of undersea military operations; [12]
3. New anchorage technique on the deep ocean floor by using tripod-like Padlock anchors that are explosively driven into the bottom. A number of such anchors can be used together for construction purposes;
4. Various kinds of underwater tools—operated either by divers or by manipulator arms on work vehicles;
5. New materials for deep ocean use which are tested on so-called submersible test units (STU). The programme includes the exposure of a variety of metallic and non-metallic materials in depths of 2 500 feet and 6 000 feet for extended periods of time to determine the corrosive and biological degradation of construction materials exposed to an ocean environment.

Conclusions

The main conclusion emerging is that most of the technological problems connected with military operations on the whole continental shelf appear now to be solved. Advances are being made, especially by the United States, to extend the operations first to 2 000 feet, which includes the continental slopes, then to 6 000 feet, which includes many submerged ocean ridges and sea mountains, and finally to 20 000 feet, which includes 98 per cent of the

ocean. Several of the technological developments required for these advances seem likely to be realized by private firms even if public support temporarily should be lacking.

Many engineering tasks for really deep or very long-endurance operations remain, however, to be solved. As the US Navy has found out, equipment for deep ocean use has often failed under realistic testing. [52] But the pace of the advance of undersea technology is such that it seems probable that the following two objectives set by the Stratton Commission¹² will be fulfilled:

The Commission recommends that the United States establish as a goal the achievement of the capability to occupy the bed and subsoil of the U.S. territorial sea. The Commission also recommends that the United States learn to conduct surface and undersea operations to utilize fully the continental shelf and slope to a depth of 2 000 feet.

The Commission recommends that the United States establish as a goal the achievement of the capability to explore the ocean depths to 20 000 feet within a decade and to utilize ocean depths to 20 000 feet by the year 2 000. [53]

E. Advanced undersea mobile systems

Background

Mobile systems are favoured over fixed installations under water for several reasons:

From the point of view of security, mobile systems are less vulnerable. When moving at low speed they blend with the environment and may, under favourable circumstances, remain undetectable by acoustic means.

They are, by definition, more versatile and useful for many different tasks, including tasks normally associated with fixed installations. Because of their versatility, mobile systems are often stated to be more cost-effective than fixed installations.

More technological and operational experience has been gained in designing mobile deep ocean systems, which in many respects represent a follow-up on present submarines, than in designing fixed installations.

Advanced undersea mobile systems are presently being developed for three main functions:

Strategic needs. This is the quest for the invulnerable second-strike deterrent. The Polaris/Poseidon system now fills this role for the USA. The next development is the Undersea Long-Range Missile System (ULMS) (page 131).

¹² The Commission on Marine Science, Engineering and Resources (chairman Dr Julius Stratton) was appointed by President Johnson in January 1967. The Commission submitted its report, *Our Nation and the Sea*, in January 1969.

Rescue, object recovery and other secondary military tasks. If the deep ocean and ocean floor are to be used to full military advantage, many secondary missions must be performed including rescue from disabled submarines and other deep submergence vehicles, recovery of objects on the ocean floor, construction work on the sea floor, and transport to and from manned undersea installations. In the United States the preparation for these activities started with formation of the Deep Submergence Systems Review Group (DSSRG) in 1963. It was set up as a result of problems experienced in locating and salvaging remains of the submarine *Thresher*, which was lost in that year in 8 400 feet of water with 129 men on board. Two more accidents have highlighted the importance of a deep submergence capability to the US Navy. The first was the loss in 1966 of a hydrogen bomb on the ocean floor outside Palomares, Spain; it was later recovered by two deep submergence vehicles. The second was the loss in 1968 of the nuclear submarine *Scorpion*. Submarine disasters are not unusual: about two submarines (US and others) are lost each year in various parts of the world.

On the recommendation of the Deep Submergence Systems Review Group, the US Navy in 1964 established the Deep Submergence Systems Project (DSSP) in order to improve its capabilities in deep sea rescue, salvage, search and diving. The increased capabilities resulting from the DSSP will have many important military applications. The DSSP consists of five separate programmes:

1. Submarine location, escape, and rescue systems: (a) location of co-operative and unco-operative targets; (b) escape from 850 feet of water; (c) rescue down to collapse depth (probably a maximum of 3 500 feet).
2. Large salvage systems: (a) salvage from the depths of the continental shelf (down to 850 feet); (b) feasibility of salvage from deeper waters.
3. Deep ocean search, investigation and small object recovery: (a) search and light work in waters as deep as 20 000 feet; (b) small object recovery from 20 000 feet of water.
4. Man-in-the-sea: (a) diving to 850 feet and remaining submerged for extended time periods in order to perform useful work; (b) study and research on diving to physiological limits of man's ability.
5. A nuclear-powered research and engineering submersible (NR-1).

While all these activities continue, it has recently been reported that the DSSP will cease as an independent project office and its functions will be integrated into other Navy commands. [106]

Oceanographic and commercial needs. Many deep submergence vehicles have been developed for oceanographic research in the deep ocean. Obviously this has both a civilian and a military side.

The first oceanographic deep ocean vehicles were bathyscaphs. One of these was the *Trieste* which went down to nearly 36 000 feet in 1960. Many others have been developed since. During the 1960s a need has arisen for commercial deep submergence vehicles, in connection with off-shore drilling for oil and gas. Further exploitation of ocean resources is likely to increase the use of such vehicles for exploration, exploitation, construction and repair purposes.

New US advanced strategic undersea systems

The idea of an advanced Undersea Long-Range Missile System (ULMS) was born in the early 1960s as a result of the work of the Advanced Sea-Based Deterrent study group. The group's main recommendation, made in 1964, was the basing of medium-to-long-range ballistic missiles in the ocean in specifically designed submersible vessels capable of operating at depths from approximately 1 000 feet to 11 000 feet. [54] Continued evaluation of the project took place during the 1960s. In 1967 the Institute for Defense Analysis, at the request of the Secretary of Defense, reported on a large number of systems for basing an advanced ICBM in the future, the so-called STRAT-X study. Four systems were selected in the final analysis; two of these were sea-based systems, a submarine (ULMS) and a surface ship system (Ballistic Missile Ship, BMS). [40]

The ULMS programme is best described in two Navy statements at Congressional hearings in 1969 and 1970. The 1969 statement reads:

The ULMS Program visualizes design and construction of a prototype sub-efficient Ballistic Missile Submarine with a longer-range ballistic missile. This improved sea-based system would permit home-porting and operations from bases primarily in the US. The missile would be long range, to cover targets as soon as submarines leave US bases, thus eliminating travel time to and from launch stations.

The ULMS Program visualizes design and construction of a prototype submarine with long range missile to shorten the decision-to-force-deployment lead time. . . . A prototype will provide an essential test unit for demonstrating system improvements. This unit will utilize much Poseidon technology. . . . A decision to procure the ULMS force can be made later as the need develops.

The need for an ULMS force will result from:

a. The eventual need to replace present strategic offensive systems with a more effective and survivable system. The longer range missile will achieve about a ten-fold increase in the sea area from which the ULMS submarines can reach targets, thus providing added survivability insurance against any possible Soviet anti-submarine break-through.

- b. The longer range missile will enable the ULMS submarines to cover targets from around the entire Soviet defense perimeter, and force a potential aggressor to invest heavily in weapons other than ICBMs aimed at the US.
- c. New maintenance concepts will permit ULMS submarines to spend more time at sea, less time under overhaul, thus reducing cost and increasing efficiency. The development and deployment of the ULMS system will tend to stabilize the arms race and facilitate arms limitation agreements since (1) the system will be highly survivable, even in the face of unforeseen threats, thus reducing the overall numbers of missiles required to ensure that an effective number survives a first-strike, and (2) when deployed in numbers will add immeasurably to credibility of US deterrent by making it impossible to gain decisive military advantage through nuclear attack on US. [22]

The 1970 statement reads:

Some of the characteristics which we hope to incorporate in this new ULMS nuclear-powered submarine are as follows:

- (a) Quietness.—The ship will be constructed to take advantage of the many improvements that we are now able to make in reducing ship's noise.
- (b) Reduced maintenance.—Modular construction concepts will be used in order to reduce maintenance time and cost.
- (c) Improved sonar.—An improved sonar suit will be provided for ULMS which will insure her superiority in this regard over the Soviets.
- (d) Self-defense.—A defensive weapons system will be provided which will enable ULMS to fire our latest weapons. . . .

We are asking for \$44 million R.D.T. & E. money this year. We estimate a total of about \$2 billion will be required, spread over the next 8 years, until the initial operational date of about. . . . This estimate is based on a normal development program and the development of a missile with a range of about . . . nautical miles. . . . It is important to recognize that these estimates are at best rough order of magnitude, for as I noted, we are very much involved in design studies to define the characteristics of the system. [5]

For fiscal year 1969/70 the Department of Defense asked for \$20 million for development of the ULM System. During the appropriations hearings in 1969, the anti-ABM year, the Senate first voted to strike this out altogether but eventually a compromise on \$10 million was reached. This year the Department of Defense is asking for \$44 million for fiscal year 1970/71. The US Department of Defense is now reported ready to approve major fiscal year 1972 funding requests for the ULMS. [112]

The following additional information appeared at the defence posture hearings this year. The missiles will presumably have a MIRV capability. The number of missiles per submarine is likely to be larger than the 16 in the Polaris. (Another source gives 24 missiles per vessel.) This will make the ULMS submarines larger and significantly heavier than the present Polaris/Poseidon boats, which are of the order of 7 000 tons. These characteristics

will, it is stated, permit a smaller ULMS submarine force than the 41-unit Polaris/Poseidon force. Basing the ULMS submarines at US continental ports is said to reduce political and balance-of-payments problems. Over all, it is predicted that the ULM System will lead to significant cost reductions per alert missile compared to Polaris/Poseidon. [37]

According to a British naval expert the ULMS missiles are expected to have a range of 6 000 nautical miles, or alternatively, a shorter range with flatter trajectories (which are more difficult to counter with anti-ballistic missiles). [55] The missiles may in fact be up-rated Poseidon missiles provided with "Augmented Thrust Propulsion".¹³

Development work is now directed mostly towards designing the submarine, rather than the ULMS missiles, which are regarded as an easier task. The submarine is likely to incorporate design features of the experimental deep diving submarine *Dolphin* and the nuclear research submarine NR-1 (page 134). Judging from the press reports in 1964 regarding the recommendations of the ASBD study group and the *Dolphin's* stated depth capability of 10 000 feet, it is possible that attempts will be made to design the ULMS to an equivalent depth or an even greater one.

The ULMS submarines are likely to use the Sanguine communication system. This should allow them to stay much deeper than the present Polaris/Poseidon submarines. At the same time work is continuing to develop the capability to fire missiles from very deep under the water.

Although ULMS now seems to have been selected as the future US advanced undersea strategic deterrent, other concepts for an undersea deterrent were also considered during the evaluation process in the 1960s; but one should probably not ascribe too much importance to them. One such concept was a "shallow missile underwater barge system". [6] It involved placing ICBMs on slow-moving underwater barges stationed on the US continental shelves and in US coastal waters, including possibly the Great Lakes. There it would presumably be possible to guard them against Soviet ASW efforts. The concept seems now to have been abandoned as have all projects for bottom missile installations (discussed on page 142). The ULMS is seen as offering greater security, by using the whole ocean volume, and better cost-effectiveness, by using Polaris technology.

Other submersibles

The many different kinds of submersibles with both civil and military missions may be classified according to whether they are tethered or untethered, maneuverable or not maneuverable, manned or unmanned.

¹³ In the 1967 McNamara defence budget \$3 million was included for Augmented Thrust Propulsion for the advanced sea-based deterrent. [56]

The bathyscaph is a tethered—that is, surface-controlled—manned vehicle which is not maneuverable. Bathyscaphs have been used for reaching the lowest depths of the ocean.

Tethered unmanned maneuverable vehicles, for instance the US Navy CURV (Cable-operated Underwater Recovery Vehicle), have proved very versatile for undersea operations, such as object recovery (see page 140). Another US tethered unmanned vehicle, RUM, designed as a bottom-crawling vehicle capable of operating at depths to about 20 000 feet has, however, not proved successful; this was due to difficulties that seem to be inherent in bottom-crawling vehicles. [57] A British firm is, though, now reported to have designed a manned bottom-crawling vehicle for continental-shelf operations. [51]

Typical free-swimming manned submersibles now in operation have pressure hulls of ring-stiffened cylinders or spheres made of high strength steel. Maximum speeds usually vary from 2 to 5 knots, mission endurance from 4 to 30 hours and range from several to about 100 miles. Of the 82 proposed or existing vehicles in 1969, 24 were planned for operations to at least 6 000 feet and only 12 for operations to 20 000 feet. [12]

The main missions for which non-military submersibles are employed include oceanographic research, object recovery, work on off-shore oil rigs and other tasks connected with the commercial exploitation of ocean and sea-bed resources. Because of the advanced technology required for these submersibles, most have been developed and built by US space and aircraft companies, for instance Westinghouse, Lockheed, General Dynamics, Reynolds Aluminum, North American Rockwell and General Motors. Several privately-owned submersibles have been leased by the US Navy, usually for military oceanographic research.

Nations besides the United States which are building submersibles include the Soviet Union, France and Japan. Tables 3.1 and 3.2 list some US and non-US submersibles and describe their most important characteristics.

Advanced US military submersibles

There are several kinds of military submersibles for different purposes, including test, rescue and service, and search vehicles.

TEST VEHICLES FOR LARGER SUBMARINES

The two most important test vehicles are the deep-diving submersible *Dolphin* and the nuclear research and engineering submersible NR-1.

The *Dolphin* is reported to be a test vehicle for the future generation of deep-diving attack submarines. Its depth capacity, long classified, was re-

cently stated in an official publication to be 10 000 feet; [1] this is probably about three or four times deeper than existing nuclear submarines can go. The *Dolphin* was launched in 1968, having been under construction since 1962. It has a near-cylindrical pressure hull. The energy source is silver-zinc batteries which makes for very silent running; the endurance capability of the batteries under water is not known, but it should be at least several days, perhaps longer. The advanced submarines that follow the *Dolphin* design will most likely have nuclear propulsion.

The *Dolphin* is large for being a deep-diving submersible; it weighs 900 tons and can take a crew of 22. Besides being a prototype submarine it is built to test deep ocean weapons and tactics for developing weapons to be fired to and from much greater depths than is possible with systems now operational; [58] to test advanced electronics for future use; and to conduct acoustic research in the deep ocean.

NR-1 has been built in co-operation with the Atomic Energy Commission. It is the first deep submersible to have nuclear propulsion, giving it much longer endurance than any other submersible, 30–60 days under water. The power is provided by a small nuclear reactor which is the first of its kind. NR-1 weighs 400 tons and takes a 7-man crew; it is equipped with external wheels for riding on the ocean floor, when not travelling in the waters above the floor, and also with mechanical arms for picking up objects and performing useful work. Its depth capability has not been revealed but is thought to be several thousand feet. [58]

NR-1 was delivered to the Navy in October 1969 and is now undergoing extensive sea trials. The main purpose of the vehicle is to demonstrate the feasibility of nuclear propulsion at deep depths; in addition the NR-1 will conduct extended search, recovery, survey and surveillance missions to its test depth. [1]

RESCUE AND SERVICE VEHICLES

Part of the US Deep Submergence Systems Project includes building a series of deep submergence rescue vehicles. The two first DSRVs were completed in 1970 and are now undergoing sea tests.

The DSRV was designed primarily for rescuing crews of disabled submarines; the need for such a facility was urgently felt after the *Thresher* catastrophe in 1963. The crew of a submarine can, however, be rescued only as long as the submarine is above the maximum depth its pressure hull can stand: for most modern nuclear submarines this limit probably does not exceed 3 500 feet. If the submarine sinks below this level, the crew will be lost in any case. According to a statement made in 1969 in the US Senate there has been since 1928 only one submarine accident during peacetime

3.1. Some US undersea vehicles

Name	Owner/Operator	Year built	Length (feet)	Energy source	Speed (knots)
Aluminaut	Reynolds Aluminum	1965	51	Silver-zinc batteries	2-3.8
Alvin	US Navy/Woods Hole Institution	1965	23	Lead-acid batteries	2
Ben Franklin (PX-15)	Grumman Aircraft Corp.	1968	48	Lead-acid batteries	2.5-5
CURV III (Cable-controlled Underwater Recovery Vehicle)	US Navy	1969	13	Tethered	..
CURV (IV)	US Navy	Under development	..	Tethered	..
Deep Quest	Lockheed	1967	40	Lead-acid batteries	2-4.5
Deep Star 2 000	Westinghouse	1970	20	..	3
Deep Star 4 000	Westinghouse	1965	18	Lead-acid batteries	1-3
Deep Star 20 000	Westinghouse	Under construction	36	Silver-zinc batteries	1.5-5
Deep View	US Navy	Under construction	15.6	..	..
Dolphin (AGSS-555)	US Navy	1968	152	Silver-zinc batteries	..
DOWB	General Motors	1968	17	Electrical cells	2-5
DSRV I & II	US Navy	1970	49.3	Silver-zinc batteries	3-5
DSSV	Lockheed/US Navy	Under construction	50	(Fuel cells)	5
NR-1	US Navy	1969	137	Nuclear reactor	..
RUM (Remote Underwater Manipulator)	US Navy/Scripps Institution of Oceanography	1960	..	Tethered	..
Sea Cliff (Autec 1)	US Navy	1970	25	Lead-acid batteries	2.5
Sea Drone I	Oceanic Industries	Under construction	13	Lead-acid batteries	6
Trieste II	US Navy	1965	78.5	External lead-acid batteries	2
Turtle (Autec II)	US Navy	1970	25	Lead-acid batteries	2.5

Sources: Marine Science Affairs, 1967. Annual Report of the President to Congress. Washington, February 1967. pages 130-31.

Marine Science Affairs, 1970. Annual Report of the President to Congress. Washington, April 1970. pages 279-280.

Design depth (feet)	Personnel (crew + observers)	Endurance (man-hours)	Range (nautical miles)	Remarks
15 000	3 + 4	336-504	96	Aluminaut is made of forged aluminum rings and has two manipulator arms lifting 4 000 lbs. Vehicle has been used for oceanography, mineral and oil survey and in 1966 Palomares bomb search. As far as is known, Aluminaut has not yet reached its maximum design depth.
6 000	1 + 2	24-30	16	Not operational. Participated in Palomares search.
2 000	3 + 3	4 320-6 048	..	Payload capacity 85 000 lbs. In 1969 Ben Franklin performed a 31-day undersea drift test in the Gulf Stream.
7 000	..	Unlimited	..	Developed from an earlier version that reached 2 500 ft. Operated from a surface ship, CURV recovered the Palomares bomb with the help of its manipulators. See text, page 134.
20 000	..	..	..	Part of the US Deep Ocean Technology programme.
8 000	2 + 2	192	48	Multi-mission research test vehicle.
2 000	1 + 2	36-144	16	Will operate at continental-shelf depths; equipped to perform heavy work and provide large payload capability.
4 000	1 + 2	12-48	18	
20 000	1 + 2	64	20	Expected to become operational in 1971.
1 500	3	2-8	..	The submersible consists of a glass hemisphere mated to a HY-100 steel hull cylinder. Reported to be ready for tests in autumn 1970.
10 000	22	..	..	Experimental military submarine. See text, page 134.
6 500	2 + 1	195	40	
5 000	3 + 24	48	..	Submarine rescue vehicle with mating facilities. See text, page 135.
20 000	2 + 2	120	..	Deep ocean search vehicle. See text, page 140.
..	7	30-60 days	..	Multi-purpose deep ocean research vehicle. See text, page 135.
20 000	Unmanned	..	..	Unmanned ocean-floor crawler. See text, page 134.
6 500	1 + 2	24-30	16	In use on Autec test range. See text, page 152.
20 000	Unmanned	..]	6	An untethered drone that will be controlled acoustically from a surface ship and used for oceanographic research.
20 000	1 + 1	12-24	10	Bathyscaph rebuilt from Trieste 1, constructed by Auguste Piccard.
6 500	1 + 2	24-30	16	In use on Autec test range. See text, page 152.

Submersible fleet needs more use. *Undersea Technology* April 1969. pages 36-40.

RUM explores sea 4 miles down. *Missiles and Rockets* 6 (23), 6 June 1960. page 35.

Niblock, Robert W. Unmanned, untethered submersible designed for work to 20 000 feet. *Undersea Technology* May 1970. pages 42-76.

3.2. Some non-US undersea vehicles

Country	Name	Year built	Operating depth (feet)	Personnel (crew + observers)	Endurance (hours)	Range (nautical miles)	Remarks
USSR	Atlant I	1963	330 (660)	1	..	Tethered	A "bathyplane" used in fisheries research. [1, 2]
	Bentos 300	Under construction	1 000	..	14 days	..	Designated an underwater laboratory although it has an independent propulsion system. [2]
	KRAB	..	..	..	..	..	A tethered, unmanned vehicle reported to be similar to the US CURV. [2]
	Sever I	1959	2 000	1	6	Tethered	[1]
	Sever II	1965	6 500	..	2	..	A free-swimming underwater research vehicle. During design stage possibly called GA-2000. [2, 3, 4]
	Severyanka	1958	550	60 (6 scientists)	2	16 500	A converted submarine used for fisheries research. [1, 3, 5]
France	Archimède	1961	28 500	3	12	12	A bathyscaph used by the French Navy. [3, 5]
	Argyronète	Under construction	2 000	10 + 4	..	..	A multi-purpose free-swimming submersible which also can be used as a base for saturation diving experiments at continental-shelf depths. Reported to become operational in 1972. [2, 6]
	SP-300 Souscoupe	1964	1 000	2	4	4	Constructed by Cousteau/Westinghouse.[3] An earlier version, SP-350, dates from 1959.
	SP-3000 Souscoupe	1970	10 000	3	48	..	This is the latest of Cousteau's free-swimming submersibles. [7]
Japan	Kuroshio II	1960	650	4-6	..	Tethered	Operated by Hokkaido University. [3]
	Yomiuri	1964	1 000	6	6	24	Operated by Mitsubishi/Yomiuri Shimbun Newspaper for fisheries, oceanography and sea floor investigation. [3]
	(20 000)	Under construction	20 000	..	..	..	Deep submergence search vehicle for 20 000 feet built in a joint venture by the Japanese Government and the Mitsubishi Corp.; reported at a sea-bed conference, organized by the Center for the Study of Democratic Institutions, Santa Barbara, California, January 1970.
United Kingdom	Pisces	1969	3 500	2	4	..	Designed in Canada by International Hydrodynamics, Vancouver, but built by Vickers Oceanics, UK.
	Sea-bed Vehicle (SBV)	Under construction	600	..	..	Tethered	A crawling vehicle developed by a British firm for ocean floor exploration. [2]
	SURV (Standard Underwater Research Vehicle)	1967	1 000	2	36	..	Built by Lintoft Engineering Ltd. [8]
Switzerland	Auguste Piccard	1964	2 500	40	8	48	Operated by the Swiss National Exposition Corp. in the Geneva Lake. [3]

operations from which there was even a possibility of rescue. [59] This clearly implies that the DSRV must have other important functions.

The DSRV is a small submersible with a strong pressure hull of HY-140 steel and a stated depth capability of 5 000 feet. The DSRV's most essential function is its ability to "mate" with a disabled submarine and rescue up to 24 crew members at a time. In order to do this it has been provided with advanced propulsion machinery, underwater sensors, and navigation and control systems that permit it to "hover" over a sunken submarine like a helicopter before "mating". The energy source is silver-zinc batteries; the speed is 3 to 5 knots. The DSRV has a maximum underwater endurance of 48 man-hours; therefore its crew of three men should be able to stay submerged for 16 hours.

The DSRVs will be based in continental US ports, be air-transportable and also be able to ride on top of a nuclear "mother submarine" to go near the place of a disaster. During rescue operations the DSRV will be controlled from a specially designed surface ship. A specially designed nuclear-powered support submarine for the DSSV, the Argonaut system, is being planned.

The total cost of six DSRVs, initially estimated at \$119 million, has now gone up to \$480 million. The first DSRV cost about \$43 million. [59]

According to an announcement by then Secretary of the Navy Ignatius in 1968, the United States is willing to share the benefits of the DSRV rescue system with foreign navies. This means that the interested nations would have to modify their submarines so that, when disabled, they could be mated with the DSRV. [12]

Since the DSRV will only rarely be engaged in rescue missions, its secondary missions may be more important. They will include: sonar research, bottom coring, aiding man-in-the-sea experiments, ocean mapping, scientific and oceanographic research and retrieving objects of commercial, scientific and military value from the ocean. [60] In addition, the DSRV's ability to mate with a nuclear submarine should permit a significant extension of continuous submerged submarine operations. [61]

Sources:

1. Boylan, Lee. Soviet Bloc Submersible Development. *Foreign Science Bulletin* 5 (1): 1-55, January 1969. Washington: Library of Congress.
2. Strömbäck, Stig. Uses of the Sea and the Seabed for Military Purposes. (Unpublished manuscript.) Stockholm, December 1969.
3. Marine Science Affairs, 1967. Annual Report of the President to Congress, Washington, February 1967, page 132.
4. Kassel, M. Bernhard. Soviet Deep-water Vehicles. *US Naval Institute Proceedings* 91 (12): 152-54, December 1965.
5. United States and Foreign Undersea Research Vehicles. *Aerospace Technology* 31 July 1967, pages 111-118.
6. Argyronète Project Under Construction *Science Journal* 6 (2): 15, February 1970.
7. *Le Monde* 8 May 1970.
8. Undersea Technology. Handbook/Directory 1969. Virginia: Compass Publications, pp. E 32-35.

More important still may be that the DSRVs should be capable of inspecting and repairing various bottom installations, and perhaps of refuelling undersea supply depots and power stations. It should not be more difficult for the DSRV to mate with a manned undersea installation than with a disabled submarine.

DEEP-SUBMERGENCE SEARCH VEHICLE

Another important part of the Deep Submergence Systems Project is the Deep Submergence Search Vehicle (DSSV) which will have a diving depth of 20 000 feet, more than two times as deep as any existing free-swimming submersibles can go. The DSSV's stated functions are underwater search and small object recovery. At present, underwater search is extremely slow—about 0.1 square mile per hour. [12]

According to present plans, the DSSV will have a pressure hull of high strength steel or titanium, a fuel-cell power source and advanced side-looking sonars. Like the DSRV, it will be configured to ride on top of a modified submarine.

Funding for the DSSV has been rather slow and the target date for completion of the vehicle is now 1975. Like the DSRV, it is being built by Lockheed. Westinghouse, which lost out to Lockheed in the contract competition, is building its own 20 000 feet submersible, the *Deep Star 20 000*, which might be completed before the DSSV.

The primary military significance of the DSSV is probably that it will serve to test materials and technology for use on future military submersibles. It may also serve as a survey and repair vehicle for bottom surveillance systems, and as a transport vehicle to future manned underwater stations.

OTHER MILITARY SUBMERSIBLES

The US Navy has in operation several other submersibles, of which a few can reach 6 000–7 000 feet. They are mostly used for deep ocean research and recovery. The two most recently commissioned are the *Sea Cliff* and the *Turtle*, which can reach a depth of 6 500 feet with a 2- or 3-man crew.

Design studies are proceeding on two new deep submergence vehicles, the Deep Ocean Survey Vehicle (DOSV) and the Deep Ocean Test Bed Vehicle. Their design depths have not been revealed, but are likely to surpass that of the *Sea Cliff* and the *Turtle*.

The third version of the Navy's unmanned tethered vehicle, CURV, has been tested for operations at a depth of 7 500 feet while being controlled from a surface mother ship. CURV helped in recovering the lost hydrogen bomb off the Spanish coast in 1966. The concept has proved so successful that a new model will be built that can reach 20 000 feet. [14]

Finally there is the unmanned "Probe", a self-propelled torpedo-like instrument package with a pre-set internal guidance system and a 14 000-foot depth capability. The Probe, which is 122 inches long, is launched from and tracked acoustically by a surface ship. It has been used for oceanographic and acoustic research—gathering data on sound velocity, thermal properties and other physical properties on magnetic tape. [12]

Conclusions

There seems no doubt that the submersibles now operational or under construction contain characteristics that will be adapted for tomorrow's submarines. Depths of over 8 000 feet have been achieved with free-swimming submersibles, and vehicles for 20 000-foot depths should be operational within a few years.

From a military point of view one important function of these submersibles is thus to serve as test vehicles for future combat vehicles. At the same time, they may perform useful work connected with the installation and servicing of bottom installations, extend the operational range of existing submarines, and conduct military oceanographic research.

When the future generation of deep submergence combat vehicles, for which ULMS provides the conceptual framework and *Dolphin* may be the prototype, has been developed, one can foresee not only that these vehicles will operate anywhere in the deep ocean, secure from present ASW efforts, but also that plans will be developed for supporting infrastructure installations submerged at continental-shelf depths. In such cases base facilities would be located underwater and smaller submersibles serve as transport vehicles between the submarines and land or surface ships.

F. Bottom installations

A continuous thread through this narrative has been that whenever there is a choice the military will favour mobile undersea installations over fixed ones. There are, however, a number of reasons why some sorts of ocean floor installations are likely to increase in the future.

There are specific military requirements for bottom surveillance systems for ASW; requirements for underwater command and control centres, service and repair stations for deep submergence vehicles and submerged port facilities on continental shelves may well be developed for the future.

The commercial exploitation of the deep ocean and the ocean floor is likely to continue at an increased rate, bringing with it civilian bottom installations for the extraction and storage of oil, gas and hard minerals.

Underwater oil-storage tanks are already a reality. Some nations may feel they need to protect their underwater civil installations, such as oil drilling sites and underwater oil-storage tanks. Indeed, a semi-official US publication has quoted this as a reason for the development and construction of military submarines. [12] It is not inconceivable that a kind of underwater police force will be formed to guard such installations.

Whether a competition among nations for political or economic conquest of the bottom regions is a motive for military installations there is disputable. As pointed out earlier (page 105) most nations now seem to agree that there is an area of the ocean floor which is outside national sovereignty and which cannot be claimed by any nation but is reserved for the use of all mankind. On the other hand, when this area is delimited, some nations may want to obtain full national sovereignty over their continental-shelf areas; and they may try to prove their sovereignty by placing military installations there.

Bottom installations for mass-destruction weapons

Bottom installations for mass-destruction weapons, fixed as well as crawling, are outlawed in the draft sea-bed treaty (page 154). The prohibition covers both mass-destruction weapons as such—nuclear, chemical, biological and radiological weapons—and structures “specifically” designed for storing, testing and using such weapons. Although the word “specifically” is ambiguous in this context, the prohibition signifies in effect that bottom missile installations (the other cases are just theoretical) are of no particular interest to the military. There is evidence for this in a statement made in Senate hearings on 24 July 1969 by Dr Robert W. Morse, a former Assistant Secretary of the Navy who was responsible for much of the US deep submergence programme:

Senator Pell: Do you have any concern about moving in terms of prohibiting mobile weapons systems from operating on the seabed?

Dr. Morse: No; I do not really—otherwise I think we may end up banning things that do not have any military use and certainly we can get widespread agreement on that. One has to remember that the great advantage of deploying a weapons system at sea is mobility, and that if one bans only fixed nuclear weapons systems at sea he may well be banning something that doesn't have any value anyway. Consider the Polaris, if the Polaris fleet were anchored at fixed points it certainly would not represent the threat that it does today. [62]

It is true that bottom missile systems were at one time in the early sixties considered by the US Navy's Advanced Sea-Based Deterrent study group. One concept involved the deployment of missiles stored in un-manned silos drilled in the ocean floor; another, mentioned in the 1966 ocean study by the President's Science Advisory Committee, was “a missile crawler ocean

floor system". [6] These projects, although probably technically feasible, have now been abandoned for several military and technical reasons.

Fixed bottom installations are inherently vulnerable to detection and attack by an adversary; if protected they would only attract further attention. They are likely to be as expensive, if not more expensive, than ballistic-missile submarines without enjoying the advantage of the latter in mobility and invulnerability.

Crawlers are not very practical since they come up against all sorts of obstacles on the ocean floor and stir up sediments reducing visibility. When detected on the ocean floor they would probably be easy prey to an adversary: they would not be able to escape as a submarine does and would lack the hardening of a missile silo in the subsoil. On the other hand, the ability to rest and hide temporarily on the ocean floor, which will not be forbidden in the sea-bed treaty, is already a characteristic of the Polaris force and will no doubt be specified for the ULMS force as well.

A strategic planner could probably still conceive of one argument for storing nuclear missiles on the sea-bed, and that is for replenishment of ballistic-missile submarines in a nuclear war. It is difficult to believe, however, that once the submarines on station have fired their missiles more would be needed.

Manned deep ocean installations

Several kinds of manned deep ocean installations are feasible; some of these are being actively developed by the United States for military purposes:

Transportable underwater habitats that have the same internal pressure as the outside water. These rest on the continental shelf and are used by saturation divers (Sealabs).

Transportable one-atmosphere stations located on continental shelves, seamounts or deep ocean floor (Manned Underwater Stations, MUS).

In-bottom one-atmosphere installations on continental shelves or seamounts (Rocksites).

SEALABS

The Sealabs, which are part of the US man-in-the-sea programme (page 130), are already well advanced. In 1964, 1965 and 1969 Sealab experiments were conducted off the US coast, near Bermuda and California, at depths from 193 to 600 feet. In these experiments saturated divers spent up to four weeks in the underwater habitats, performing work at the test sites. A fourth Sealab experiment is planned to involve operations at 850 feet. Using saturation-diving techniques and habitats at ambient pressure, it should be possible to go down to 1 000 feet and possibly eventually 2 000 feet. The use of

3.3. Experiments with underwater laboratories

Country ^a	Designation	Year	Place	Depth (feet)	Crew	Duration (days)	Remarks
USA	Man in Sea I	Sept. 1962	Mediterranean	200	1	1-4	The first saturation diving experiment, organized by E. A. Link.
	Man in Sea II	June 1964	Bahamas	449	2	2	Link's second experiment.
	Sealab I	July 1964	Bermuda	193	4	11	The first Sealab experiment in saturation diving run by the US Navy employing a balanced pressure double chamber. The Sealabs were preceded by the "Genesis" experiments in simulated facilities.
	Sealab II	Aug. 1965	California	205	10	10 (1-28 days)	The preliminary specifications for Sealab II were developed by the Naval Mine Defense Laboratory, which also built Sealab I. MDL is very active in ASW and USW. (<i>US Naval Institute Proceedings</i> , June 1966, page 102. <i>Undersea Technology</i> , July 1967, page 29.)
	Tektite I	Feb. 1969	Virgin Islands	43	4	59	Organized by General Electric Corp., NASA, and the Department of the Interior to investigate the behaviour of men living together in confined space for extended period.
	Sealab III	Feb. 1969	California	624	12	discontinued	The project was discontinued after an accident. Further Sealabs are planned to 850 feet. See text, page 143.
	NEMO	1969	..	600	2	1-2	A glass, one-atmosphere observatory moored in deep ocean. See text, page 147. (<i>Marine Science Affairs</i> , 1970).
	Habitat II	1969	Hawaii	500	1	7	
	Tektite II	April 1970	Virgin Islands	50-100	5	14-30	The experiment will last seven months, and a great number of aquanauts will participate. (<i>International Herald Tribune</i> , 5 March 1970).
	Aegir	June 1970	Hawaii	520	6	5	Experiment run by Makai Range, Inc. (<i>Undersea Technology</i> , July 1970, page 35).
USSR	Kichesh	Summer 1965	Crimea	50	4	..	The pressure hull was made from a railway tank.
	Ikhtiandr I	Aug. 1966	Crimea	54	1-2	7	Single chamber laboratory. An earlier experiment may have taken place.
	Sadko I	1966	Caucasus	140	2	6 hours	A one-month experiment at 83 feet is also reported.
	Oktopus	July 1967	Crimea	33	3	several weeks?	

	Ikhtiandr 2	Aug. 1967	Crimea	..	5	..	
	Sadko 2	Summer 1967	Caucasus	85 (200)	2	6	Double sphere design. <i>Soviet Weekly</i> , 27 July 1968, reports a dive to 170 feet. Further information in [1].
	Chernomor	June 1968	Crimea	47 (100)	3	14	The first real Soviet "Sealab" experiment. <i>Soviet Weekly</i> , of 17 August 1968, reports a five-day dive to 500 feet. Further information in [2].
	Sadko 3	Summer 1968	Caucasus				Reported in <i>Undersea Technology</i> , April 1968, page 46. There is some doubt whether the experiment really took place.
	Sprut	1968	Crimea	33	2-3	14	"Underwater balloon"; practically no metal was used in the manufacture.
	Ikhtiandr 3	Sept. 1968	Crimea	40	several	8	A "vitreous" structure.
France	Précontinent I	Sept. 1962	Mediterranean	33	2	7	Organized by Jacques-Yves Cousteau.
	Précontinent II	June 1963	Red Sea	36 (90)	5	7 (29-31)	The first manned experiment to last one month under water.
	Précontinent III	Oct. 1965	Mediterranean	128	6	21	
Germany, Fed. Republic of	BAHI	Sept. 1968	Baltic Sea	33	2	11	
	UWL-Helgoland	July 1969	North Sea	75	4	10	

^a Other countries which are reported to have carried out experiments with manned underwater structures include: Australia, Bulgaria, Cuba, Czechoslovakia, German Democratic Republic, Italy, Netherlands, Poland, Romania, and the United Kingdom. Many of these experiments were sporting events, not all successful. They are not believed to be comparable to those listed above.

Sources:

Haux, Gerhard. The World-Wide Use of Underwater Laboratories (UWL). *Diving Technics Information* July 1969. Issued by Drägerwerk, Lübeck. (This source applies unless otherwise stated.)

1. Mayer, *et al.* The Sadko-2 Underwater Laboratory. *Sudostroyeniye* (Leningrad), May 1968. pages 11-14. (JPRS 46427, 13 September 1968.)
2. Podrazhanskiy, *et al.* The Parted Sea Reveals the Crystal Arch. *Tekhnika Molodezhi* (Moscow), November 1968. pages 5-6. (JPRS 4701, 12 December 1968.)

free-swimming divers below the latter depth would require liquid breathing techniques, still very much in the future.

France, the Soviet Union and a few other countries have also conducted Sealab-type experiments. Table 3.3 contains a list of experiments with underwater laboratories conducted by the United States and other countries.

Thus far all Sealab experiments have been dependent for power on surface support through umbilical cables. Self-contained power sources, however, are likely to be developed soon. This will greatly increase the military significance of future Sealab-type installations:

The ultimate aim of the Navy's Man-in-the-Sea program is to give man the capability of free-ranging, completely autonomous existence on the ocean floor to depths of 800 feet and for periods as long as 90 days. This means that the Navy's objective in the Sealab projects is the use of the continental shelf—the area that is of primary interest to commercial and economic groups One reason for the Navy's vital interest in deepwater operations is in connection with the installation of anti-submarine surveillance equipment. It appears far better to use men for inspection, repair, and maintenance than to use unmanned vehicles which, even when fitted with manipulators and TV equipment, cannot cope with unforeseen conditions. [63]

ONE-ATMOSPHERE TRANSPORTABLE INSTALLATIONS

For operations at depths below 1 000 feet, one-atmosphere installations in pressure hulls have to be used. Development of such installations is the aim of the US Navy Deep Technology (DOT) programme (page 123).

The most advanced DOT project is the Manned Underwater Station (MUS), which provides for development of an undersea station at 6 000-foot depths. Initially baptized "Seascope", it was described in an official Navy publication in 1967:

The focal project established for the Deep Ocean Technology Program is Seascope, an experimental manned sea floor base. The technologies required to establish this project will support the Navy missions in strategic deterrence, anti-submarine warfare, anti-shipping warfare, underwater reconnaissance, search, location, rescue and recovery. [48]

The concept for MUS has been further developed by the Naval Civil Engineering Laboratory. Current plans provide for a transportable station consisting of two main cylinders, one for habitation and one for a nuclear power source, with small access and observation spheres above and below. The first stations will probably accommodate small crews of 15 to 25 men [12] for 30-day periods. [26] Parallel design and analysis studies for the MUS have been completed by three private corporations: Westinghouse Electric, Southwest Research Institute and General Dynamics. Access would be through mating with a deep submergence vehicle (DSRVs, DSSVs). A

1968 panel report on power technology for the US Navy predicted that the Manned Underwater Station would “hopefully” reach the ocean floor at 6 000 feet in the early 1970s. [26]

The military missions foreseen for the MUS include its “utilization as a covert underwater listening post for an underwater equivalent to the DEW line”. [26] The combination of a MUS with a mated deep submergence vehicle would be a particularly potent one.

Another advanced concept for a deep ocean manned station is the Naval Endreobenthic Manned Observatory (NEMO). This involves mooring a spherical pressure hull of acrylic plastic in 1 000 feet of water. The observatory would be used mainly for military oceanographic research. Mission duration would be rather short, about ten days. [26] The first NEMO has recently become operational and tested to a depth of 500 feet. It is expected to have a role in the Navy’s Sea-Floor Construction Experiment (page 126). [106] NEMO is an example of an installation which can be described as either a station or a vehicle.

Other concepts for manned underwater stations have been put forward by private US corporations. One is Project Bottom Fix, proposed by the General Electric Company in co-operation with Corning Glass Works. The objective is to occupy the mid-Atlantic ridge or a Pacific seamount at depths to 12 000 feet for long-term oceanographic research, undersea surveillance, or commercial mining and drilling operations. [26] Another concept is the Atlantis project, prepared jointly by the Chrysler Corporation and the University of Miami. This project provides for construction of an underwater laboratory initially at 1 000 feet, planned for 1973; later operations would take place at 6 000 feet. By the spring of 1969 industrial participants had contributed about \$1.5 million in engineering services toward the Atlantis programme. The whole programme is estimated to cost \$110 million. [64] The Navy has not been prepared to support Atlantis. [62] Finally, one source reports that North American Rockwell has a contract with the Navy to develop data permitting construction of underwater habitats for up to 1 000 men at depths of 6 000 feet. [65]

ROCKSITES

A third group of manned deep ocean stations, being actively considered by the US Navy, is in-bottom installations. These would involve drilling large tunnels and chambers below the sea floor (page 126). The project is described in the 1969 report of the Stratton Commission:

An imaginative proposal, Project Rocksite, is being considered by the US Navy. This project calls for drilling tunnels into the seabed, combining the existing capability of forming tunnels and shafts beneath the sea floor, with a new

technology for mating submersibles to a seafloor shaft entrance, thus providing a completely independent sub-seafloor installation. [53]

Rocksite installations have been considered suitable for shallow continental-shelf waters, where tunnels and shafts can give access to the land surface; or on the top or sides of shallow seamounts. [48] Their main military advantage over habitat stations is, of course, that they would be much harder to detect and destroy.

The feasibility of manned deep ocean installations was examined in some detail by the Panel on Industry and Technology of the Stratton Commission, which reported in 1969. The panel, which drew on the best expertise in the United States, proposed twelve national projects in sea technology, of which four were manned bottom stations with military functions. These proposed four stations are described in table 3.4. The panel's recommendations included:

An isolated station emplaced on a seamount should receive high priority. Within 20 years laboratories should be established in waters as deep as the Mid-Atlantic ridge, and before the end of the century an ocean bottom station at 20 000 feet should be built. [12]

Bottom surveillance systems

The USA has deployed bottom surveillance systems for detecting enemy submarines for many years. According to a reputable technical journal, bottom fixed sonars have monitored the coastal area of the United States "for at least 18 years" (counting from 1969). [11] Another source states they date back to the early 1950s. [24]

Both passive and active acoustic detection systems are in use. The passive systems consist of bottom arrays of hydrophones that listen for the sounds of submarines; the active systems rely on very powerful transmitters that send out sound signals which bounce off enemy submarines and are picked up by special listening devices. As pointed out earlier (page 110), the chief advantage of bottom acoustic detection systems over ship-borne or moored sonar systems is that they may be installed in fixed positions with a long base line.

The best known passive detection system is the Caesar programme, which is deployed on the US continental shelf in the Atlantic at a depth of 100 fathoms (600 feet). [66] The Caesar programme and some of the later systems are described in a 1967 publication:

Concept studies for the highly classified CAESAR program were begun by Western Electric Company in 1956. The original installation on the East Coast of the United States consisted of a series of hydrophones connected by undersea

3.4. Ocean floor stations proposed by Stratton Commission

Projects	Description	Operational systems	Expected military benefits
1. Fixed continental-shelf laboratory	200-2 000-foot depth range, 1 atmosphere, saturation-diving facilities, 15-150 men, logistics supports from shore, surface umbilicals or mating submersibles. Much beneficial technology will be gained for the future development of manned undersea military stations.	Undersea command and control system.	Improved undersea capability, stronger industrial and manpower base, concealment and hardness.
2. Portable continental-shelf laboratories	2 000-foot depths, 1 atmosphere, 5-75 men, saturation-diving facilities. Military use could include training, logistics, and technology development as well as a quick reaction monitoring in areas requiring intense surveillance.	Undersea command and control system.	Improved undersea capability, stronger industrial and manpower base, concealment and hardness.
3. Seamount station	Permanently fixed on a submerged seamount at a depth less than 2 000 feet. Crew of 10-50 men, supported by nuclear reactor.	Ocean weather station, ocean surveillance station, command and control station, undersea broad ocean support site.	Generally improved undersea capability, extended sea power, improved broad ocean surveillance, broadened ocean support independent of surface.
4. Deep ocean stations	Establishment on continental slope and mid-ocean ridge (both 8 000 feet) and abyssal depths (20 000 feet), crews of 10-50 men supported by nuclear power and deep-diving submersibles.	Ocean surveillance station, deep undersea broad ocean support site, command and control station.	Deep broad ocean undersea support, improved understanding of tactical advantage of three-dimensional naval operations.

cables anchored to the continental shelf; acoustic data thus obtained were assessed for approximate location of submarines or other mobile underwater objects. During the Cuban episode of 1962, the system sufficiently proved its value to be expanded and upgraded, with a Pacific Coast CAESAR projected in 1965. There has also been discussion of similar surveillance projects to monitor strategic sea-lanes and foreign coast lines and harbors.

In 1964, CAESAR was refined by addition of the COLOSSUS system, which consists of 5 to 15 upward-looking sonar heads per mile, connected to submerged cables. The sonars act as a direction finding network, using the same cables on a time-shared basis, with land-based computers to isolate submarine signatures from local noise. Related to the CAESAR program are BARRIER and BRONCO concepts. The former is an adaptation of CAESAR to natural land barriers in foreign waters; the latter is concerned with locating and tracking potentially hostile enemy submarines.

Development and installation of the Pacific Coast and BARRIER-type CAESAR systems have encountered marine engineering difficulties through absence of a Continental Shelf. To obviate this problem, the Navy is looking at highly portable proximity locators which could ultimately replace static CAESAR sites. These new units would not only relay submarine positions but, also, provide three-dimensional capability for indicating depths. Utilization of lightweight, air-droppable, self-mooring equipment in the role is an alternate possibility, with patrol aircraft acting as interrogation centers. In FY67, \$17.9 million was budgeted by the Navy for procurement under the CAESAR program. . . . Under investigation are sophisticated, long-range, passive U/W systems. . . .

CAESAR, part of the overall Navy Sound Surveillance System (SOSUS) program, was funded at \$48.0 million in FY68 for procurement to continue and expand the underwater detection system. Expansion includes provision of "technical support" to a friendly nation to install CAESAR sound systems off its shore, with procurement and control of the facility left with the US Navy. [67]

Recently a passive detection system in the Pacific, called "Sea Spider", has been mentioned; unlike Caesar it has a self-contained power source:

It has been reported this month [September 1969] that the Navy is in the process of strengthening offshore submarine detection systems by installing an experimental deep underwater sound surveillance system called "Sea Spider" on the floor of the Pacific Ocean off Hawaii. "Sea Spider", a ten-foot hydrophone, designed for long range tracking of underwater traffic, will be anchored to the sea floor by three strands of heavy cable. Unlike the secret "Project Caesar" sound detection system already installed in the Atlantic which is powered by shore based generators, the Sea Spider gear will be powered by self-contained nuclear batteries. The initial installation will cost about \$1.4 million and, if successful, the system would become the primary continental fence protecting against missile submarines in the same way that our radar fences warn of approaching enemy aircraft or ballistic missiles. The sound signals from a submarine when analyzed by a computer would not only disclose a submarine's location, but also its type—nuclear or conventional, attack or missile launcher—as revealed by its own peculiar acoustic "signature". The Navy has also begun arrangements for sea floor surveys to expand "Project Caesar" coverage in the Atlantic at a cost of about \$2 million in fiscal 1970. [68]

This is probably connected with an earlier disclosed project Sea Spider, that consisted of an underwater moored buoy system. In 1967 an official Navy publication stated that a submerged float had been moored 115 feet below surface by three wires fixed at the bottom in 2 600 feet of water. Design of a system for installation in 17 000 feet of water was said to be under way. [69] In February 1970 development difficulties were, however, reported for the Sea Spider project. [107]

In 1966 the existence of a joint US-Canadian sophisticated detection system, Nutmeg, was reported. It was said to be similar to Caesar. [113]

Both "Caesar" and "Sea Spider" are passive detection systems. The active

part of the Sound Surveillance System (SOSUS) is called "Artemis". It is concerned with long-range submarine detection using very strong VLF transmitters and pick-up stations on the ocean floor and the surface.

The transmitter used is installed in a former Navy tanker, the *Mission Capistrano*. The *Mission Capistrano* circulates in the Atlantic sending out very strong low frequency sound signals that are picked up by various receiving stations. These have included: a network on top of Argus Island, a seamount off the coast of Bermuda; [70] the long floating "flipping" platforms FLIP and SPAR, [28] (cf. page 110); the passive bottom detection systems mentioned earlier; and probably US surface ships and submarines, as well as surface buoys. In all cases the receiving stations would have to identify the sound signature of the enemy objects from the reflected signals. The problem of signature identification is much more difficult in an active system than in a passive one but "there are some things that can be done". [71, 105] The practical ranges and surveillance areas covered in the Artemis system have not been disclosed but are thought to be up to several hundred miles. In the near future the very strong and very bulky VLF transmitters that have to be used for the active detection system may be installed on the continental shelf. This is said to offer many distinct technical advantages compared to ship-borne transmitters, including the possibility of achieving higher outputs of power and, consequently, greater ranges of detection. [34] (Cf. also page 108.)

The exact location of the fixed bottom detection stations is not known. Besides the networks off US coasts the most likely places are possible barrier areas, for instance between Greenland and Scotland and between Japan and Alaska. A NATO project was launched in 1969 to establish a Fixed Acoustic Range (FAR) in the Azores to be used for "necessary acoustic measurements". [22] This probably is related to a disclosure in 1968 that the submersible *Alvin* made geological and photographic surveys of three seamounts west of Santa Maria Island, Azores, for future implantation of experimental underwater acoustic equipment. [72] Finally, as mentioned above, the United States has decided to provide technical support to a "friendly nation" to install Caesar sound systems off its shores.

One must assume that other nations with major naval interests, particularly the Soviet Union, may have installed bottom detection systems in areas which they consider sensitive to their national interests.

Only a few figures, all relating to the United States, are available for expenditure on bottom detection systems. A published estimate reports that the USA had spent \$155 million on research, development, test and evaluation of underwater surveillance systems up to and including fiscal year 1965, and \$177 million on procurement of the same systems up to and including

fiscal year 1968. [67] In an article in *Foreign Affairs* in October 1968 the Maltese Ambassador to the United Nations, Dr Pardo, said that “an informed guess is that the United States Navy is currently spending about \$400 million for submarine tracking and detection devices installed on the ocean floor”. [73]

Other military ocean floor installations

The ocean floor is also being used for other military purposes, among which are the emplacement of isotope-fuelled navigation devices, undersea test ranges, bottom engineering test units, seismic detection of underground explosions, and disposal of military waste products.

NAVIGATION AIDS

Underwater navigation is still very difficult despite the development in inertial-guidance systems (page 119). The problem is likely to become more acute for the deep-diving submarines now being developed. One solution is to deploy underwater acoustic positioning instruments that provide accurate positions to the submarines. According to a 1967 ACDA report, such instruments are now for sale in the commercial market in the United States. The devices, which probably are moored to the sea floor, are described as operating reliably at all depths, having a battery life of one year or one million pulses, and being designed for permanent or temporary installation. [74] The same source also said that sea-floor acoustic beacons are being developed. The Industry and Technology Panel of the Stratton Commission recommended in 1969 that the US Government should provide underwater navigation aids for civilian purposes as well: both surface- and bottom-mounted units were mentioned. [12]

UNDERWATER TEST RANGES

The United States has several military underwater test ranges. The largest is probably the Atlantic Undersea Test and Evaluation Center, Autec, installed off Andros Island in the Bahamas under an agreement between the USA and the UK that took five years to negotiate. Autec was scheduled for completion this year. It provides test facilities down to 6 000 feet and according to a Navy report was established to carry out the following functions:

Perform operational evaluations of advanced undersea weapons systems and components; measure submerged submarine tactical characteristics; measure submarine noise and target strength; calibrate large, low frequency source transducers and test sonobuoys; evaluate attack effectiveness of submarines, surface ships and aircraft in competitive type exercises. [48]

The two new US submersibles, *Sea Cliff* and *Turtle*, with a 6 500-foot depth capability, are deployed on this test range.

Another important test range is being developed at Makerpuu Point, Hawaii. This is the Makai Undersea Test Range which will include capabilities to 18 000 feet within 80 miles of shore. The range is being developed for the man-in-sea programme, and for deep vehicle and ocean instrumentation test and evaluation. [12]

The Ocean Engineering Test Range is operated by the Naval Undersea Warfare Center at San Clemente Island, California. It features graduated plateaus to 4 000-foot depths and has been used for full-scale Polaris underwater launch tests and for Poseidon missile tests. [12]

BOTTOM TEST UNITS

Another military use of the ocean floor involves recoverable, submersible test units. One such unit is the Deep Ocean Test Instrumentation Placement and Observation System (DOTIPOS) a bottom structure that is lowered from a surface ship to a working depth of 6 000 feet. DOTIPOS carries television and still cameras, lights, power source, electronic equipment and other equipment for carrying out various experiments. [57] The previously mentioned Submersible Test Units (STUs) (page 128) are designed for testing materials to 6 000 feet in the open ocean. [12]

CONCLUSIONS

The ocean floor has already been used for a long time for military purposes. This has been mainly for the deployment of anti-submarine detection systems. In the near future manned underwater stations for ocean-wide surveillance, command and control purposes, etc., will become operational down to at least 6 000 feet. Initially they will probably be deployed on continental shelves and continental slopes and later on selected seamounts in the Atlantic and the Pacific. Fixed missile installations on the sea floor are ruled out of consideration, not because they are being outlawed in the draft sea-bed treaty but because they are not militarily attractive compared to free-swimming, missile-launching vehicles.

Bottom detection systems are considered to be much more efficient than other anti-submarine detection systems. This is due to the fact that they can be installed in fixed positions over long distances. Nations are therefore not likely to forego the use of such systems as long as they consider themselves exposed to the threat of ballistic-missile and attack submarines. The extension of the commercial exploitation of the ocean in the future is also likely to be used as an argument for keeping bottom surveillance systems (page 105). The same arguments apply to bottom navigation devices.

Bottom mines were discussed on page 116. They are not, as far as is known, deployed outside territorial waters in peacetime. At the outbreak of hostili-

ties they can be laid in large numbers in a very short time, particularly in barrier lines where enemy submarines have to pass. Conventional bottom weapons other than mines are conceivable, for instance shore-bombardment weapons and some types of barrier weapons; however, their military value remains doubtful. Submarines and surface vessels are so much more versatile for all military operations that they will remain the main military platforms.

The primary functions of the military manned underwater stations now under development will probably be: research about the deep ocean and ocean floor environment for ASW purposes; use as manned ASW surveillance stations; and, later, use as relay stations for extending the operations of submarines and other military submersibles. Since manned bottom stations are more vulnerable than submarine vessels—not least because their installation will not fail to be observed—they will probably not be used for forward offensive operations. A degree of cover is, however, likely to be provided through the simultaneous development of manned stations for scientific and commercial purposes: it may in future be hard to tell a military station from a civil one.

Because of the immense area of the ocean floor, existing and future military installations on the sea-bed are likely to cover only a miniscule part of the ocean floor. Even so, their presence would certainly create some problems for any future international agency allocating titles for commercial exploitation of the sea floor (page 106).

Part II. *The sea-bed disarmament debate*

Introduction

Arms-control measures concerning the sea-bed have only recently begun to receive much attention.

In 1967, the United Nations decided to engage in a thorough examination of the possibility of reserving exclusively for peaceful purposes the sea-bed, the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind. A special committee was set up to deal with the problem in its entirety. [75] Disarmament of the sea-bed was subordinated to the broader issue of the exploitation of the environment.

In 1968, the USSR proposed that agreement be reached for the cessation of patrols by missile-carrying submarines with nuclear missiles on board, in areas where the borders of parties to the agreement are within range of

such missiles. It also suggested that the Eighteen-Nation Committee on Disarmament (ENDC) should consider the prohibition of the use for military purposes of the sea-bed beyond the limits of the territorial waters. [76] The USA proposed to take up the question of arms limitation on the sea-bed with a view to preventing the use of this environment for the emplacement of weapons of mass destruction. [77]

Negotiations at the ENDC began in the spring of 1969 with the presentation by the Soviet Union of a draft treaty which provided for total demilitarization of the sea-bed and ocean floor. [78] The United States, in opposing the Soviet comprehensive approach, submitted its own draft calling only for denuclearization of the sea-bed environment.¹⁴ [79]

Interest in disarmament measures diminished considerably, especially among the non-aligned countries, when it became evident that no comprehensive ban on the military use of the sea-bed would be achieved in the foreseeable future. There was even a feeling that the discussion of the subject diverted attention from more important and urgent problems.

On 7 October 1969, following major concessions by the Soviet Union, the two big powers, co-chairmen of the Conference of the Committee on Disarmament (CCD),¹⁵ tabled a joint draft treaty under which the parties would undertake "not to emplant or emplace on the sea-bed and the ocean floor and in the subsoil thereof beyond the maximum contiguous zone provided for in the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone any objects with 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". [80]

The majority of nations found the text of the joint draft treaty inadequate. Criticism concerned mainly the scope of the prohibition; the area of the sea-bed to which the prohibition should apply; the methods for verifying compliance with the obligations assumed; and the procedure for amending the treaty. It was strongly urged that the formulations used should ensure that the interests of all coastal states were safeguarded. Requests were also put forward for entrusting the United Nations with the task of securing the observance of the treaty and for periodic reviews of the operation of the treaty. Several delegations to the CCD prepared working papers with specific proposals for changes.

¹⁴ The two drafts and the views of the ENDC members on them were reported in the *SIPRI Yearbook 1968/69*, pp. 180-184.

¹⁵ In the summer of 1969, the membership of the Eighteen-Nation Committee on Disarmament was enlarged and it was decided that the new name of the conference would be "The Conference of the Committee on Disarmament" (CCD).

On 30 October 1969, a revised joint draft was submitted by the USA and USSR; it included a few amendments on which the co-chairmen agreed. [81] The new draft clarified the status of the zone lying between the outer limit of territorial seas narrower than twelve miles and the outer limit of the maximum contiguous zone; it provided for the right of recourse of the parties to the UN Security Council in the event of serious doubts concerning the fulfilment of the treaty obligations; it included a provision for a review conference; it established an equal voice of all parties in deciding which amendments should be introduced in the future.

The text was discussed at the twenty-fourth UN General Assembly session. It still proved unsatisfactory to most delegations which claimed that their fundamental concerns had not been met. A series of new proposals were made. The General Assembly called upon the CCD to take those into account and to continue its work on the subject. [82]

On 23 April 1970, a third version of the joint US-Soviet draft treaty was issued by the co-chairmen of the CCD. [83] It incorporated suggestions made by different delegations, particularly by Argentina, Brazil, Canada and Mexico. The verification provisions were elaborated in greater detail than in the previous texts; the concept of a "sea-bed zone" was used in place of the earlier references to the "maximum contiguous zone"; the so-called disclaimer clause dealing with the relationship of the obligations assumed under the treaty and other international obligations of the states parties to the treaty was expanded and appeared as a separate article; a provision was included to the effect that the treaty would not affect international agreements concerning the establishment of nuclear-free zones.

In the opinion of a number of countries the draft still required improvement. Demands were put forward concerning a binding commitment to continue negotiations on further measures prohibiting the military use of the sea-bed; recognition of the principle of international responsibility for verification procedures; and full respect for the sovereign rights of coastal states. The legal structure of the document was found to be unnecessarily complicated, the drafting imprecise and the language confused to the point of allowing conflicting interpretations.

The above demands were partially met in the fourth consecutive version of the draft treaty submitted by the Soviet Union and the United States on 1 September 1970. [108] The resulting text (see reference section 3A.1, page 425) was judged acceptable by the Disarmament Committee, and hope was widely expressed that the draft treaty would be commended by the UN General Assembly and opened for signature at an early date.

It is remarkable that the members of the CCD did not question whether any nation would ever wish to "emplant or emplace" nuclear, chemical or

biological weapons on the sea-bed, beyond its immediate national control—that is, whether there was any content to the treaty at all.

The following section gives a detailed account and analysis of the proposals submitted for consideration, the positions taken on the main issues and the evolution of those positions in the course of negotiations both in the Disarmament Committee and the UN General Assembly.

Scope of the prohibition

United Nations resolutions of 18 December 1967 [75] and 21 December 1968 [84] set forth as an objective the reservation of the sea-bed and ocean floor and the subsoil thereof exclusively for peaceful purposes. They thus formed a framework for possible disarmament measures. A controversy arose over the meaning of the term “exclusively for peaceful purposes”.

The non-aligned countries contended that the United Nations had invariably understood the use of a given environment for exclusively peaceful purposes to mean the prohibition of all military activities whatever their purpose, and that there should be no departure from such practice in the case of the sea-bed and the ocean floor. Some of them reasoned that since the sea-bed must be used for the benefit of all states (as stated in the above resolutions), any military use of it represented an unjustified territorial usurpation hampering peaceful exploitation of the environment.

The Soviet Union also equated “peaceful purposes” with “non-military purposes”. Its approach was similar to that applied to Antarctica under the treaty of 1 December 1959 (which entered into force on 23 June 1961), and the moon and other celestial bodies under the treaty of 27 January 1967 (which entered into force on 10 October 1967).

The Antarctic Treaty stipulates that the continent shall be used for peaceful purposes only and that there shall be prohibited, *inter alia*, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military maneuvers, as well as the testing of any type of weapons. [85] The treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies, states that the moon and other celestial bodies shall be used by all states parties to the treaty exclusively for peaceful purposes; the statement is followed by the prohibition of establishing there military bases, installations and fortifications, testing any type of weapons and conducting military maneuvers. [86]

The first Soviet draft treaty aimed at demilitarizing completely the sea-bed and the ocean floor as well as the subsoil thereof. It prohibited the placement of objects with nuclear weapons or any other types of weapons

of mass destruction and also the setting up of military bases, structures, installations, fortifications and other objects of a military nature. [78]

The Soviet Union advanced the view that, should only some categories of weapons be prohibited, a race in non-prohibited arms might develop on the sea-bed. Moreover, an unconditional ban on military activities would facilitate the problem of verification because states would not fear that control would reveal military secrets. Demilitarization would not imply prohibition of means of communication, beacons and such other installations which have no direct military purpose. The exact meaning of "no direct military purpose" was not explained.

The United States interpreted the phrase "peaceful purposes" as not barring military activities generally; specific limitations of certain military activities would require detailed arms-control agreements, and military activities not precluded by such agreements would continue to be conducted in accordance with the principle of freedom of the seas. It saw the analogy with the clause of the treaty on outer space, under which the parties undertook not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, although the treaty does not provide for the use of outer space exclusively for peaceful purposes.

The USA proposed that states undertake not to emplant or emplace fixed nuclear weapons or other weapons of mass destruction or associated fixed launching platforms on, within or beneath the sea-bed and ocean floor. [79] The prohibition would apply whether or not a missile or a warhead containing a nuclear weapon or other weapon of mass destruction was actually in place on a fixed launching platform. The difference between "emplant" and "emplace" in the context of the treaty was not explained.

Advocating denuclearization, the United States asserted that only weapons of mass destruction could have enough significance militarily to warrant the expense of their stationing on the sea-bed. It expressed the belief that realistic possibilities did not and would not soon exist for such conventional military uses of the sea-bed as would be threatening to the territories of states. Some non-nuclear but clearly military uses of the sea-bed (e.g., devices for the detection and surveillance of submarines) were strictly defensive, essential to the security of states and therefore indispensable. Complete demilitarization would, moreover, raise insuperable verification problems by imposing a task of deciding whether each object or installation emplaced on the sea-bed was of a military nature. In any event, the United States, being a major naval power, was not prepared to accept a ban on all military activities on the sea-bed.

The above arguments were found unconvincing and even contradictory,

for if the emplacement of conventional weapons on the sea-bed really had little military significance, there should be no objection to including such weapons in the prohibition, possibly with some exceptions for surveillance instruments. The majority of the Disarmament Committee members favoured the widest possible ban. They thought that prohibitions limited to weapons of mass destruction would give to the emplacement of conventional weapons a legal sanction they might not otherwise enjoy and could lead to conflicts respecting the right to protect the emplacement in question. Proliferation of conventional arms on the sea-bed might also render later agreement with the view to their limitation a difficult if not altogether impossible task. In this connection reference was made to the unfulfilled pledge by the nuclear powers, contained in the partial test-ban treaty, to achieve the discontinuance of all test explosions of nuclear weapons. On the other hand, a blanket prohibition, such as the one proposed by the USSR, was found deficient in that it did not fully protect the security and other interests of small and medium coastal states.

Compromise suggestions ranged from a general ban, subject to exception for devices and activities not of a directly military nature or of a purely passive defensive character (e.g., sonar devices for tracking submarines), to a ban comprising weapons of mass destruction as well as conventional weapons to be agreed upon in a list, to a prohibition of weapons of mass destruction in a first stage to be followed by a ban on conventional weapons at a later stage.

A specific proposal was made by Canada to prohibit the placement beyond a twelve-mile zone of all weapons of mass destruction; all components of weapons of mass destruction; storage containers, launching platforms or vehicles for deployment or delivery of weapons of mass destruction; all other weapons, military activities, undersea bases or fortifications from which military action could be undertaken against the territory, territorial sea or air space of another state, including but not limited to: shore bombardment weapons or systems; devices capable of disrupting communications, air and maritime navigation and other peaceful pursuits; devices to counter, disrupt, neutralize or render ineffective any defensive instruments of another state—that is, detection, surveillance, defensive fire control and so on; installations from which manned incursions could be mounted against another state; chemical or other means of destroying or denying the sea-bed resources of another state. [87]

In spite of the overwhelming support for a prevention of both nuclear and conventional arms race on the sea-bed, the Soviet Union, in an unexpected move, decided to accept the US approach. The explanation offered by the USSR for this change of mind was that the prohibition of emplacement of

the most dangerous weapons ensured the most speedy and, in existing conditions, the widest possible demilitarization of the sea-bed.¹⁶

The draft treaty submitted jointly by the United States and the Soviet Union provided for an undertaking by states parties to the treaty, not to emplant or emplace on the sea-bed and the ocean floor and in the subsoil thereof any objects with 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. The parties would also undertake not to assist, encourage or induce any state to commit actions prohibited by the treaty and not to participate in any other way in such actions.

As an obvious concession to those who favoured a wider approach, one paragraph of the preamble to the draft treaty expressed conviction that the treaty constituted a step towards the exclusion of the sea-bed, the ocean floor and the subsoil thereof from the arms race, as well as determination to continue negotiations concerning further measures leading to this end. [80]

Compared to the US draft treaty, the joint draft described the object of the prohibition in some more detail, but the language was vague and the CCD members asked for more precision. According to explanations given by the sponsors, the treaty would prohibit, *inter alia*, nuclear mines anchored to or emplaced on the sea-bed. It would not apply to facilities for research or for commercial exploitation not specifically designed for storing, testing or using weapons of mass destruction; but facilities specifically designed for using such weapons would not be exempted from the prohibitions of the treaty on the ground that they could also use conventional weapons. The prohibitions were not intended to affect the conduct of peaceful nuclear explosions or applications of nuclear reactors, scientific research or other non-weapons applications of nuclear energy, consistent with the treaty obligations.

No clarification was provided as to the status of facilities which were not specifically designed for storing, testing or using weapons of mass destruction, but which were subsequently adapted to serving some of these purposes.

The main modification consisted in dropping the word "fixed" which had

¹⁶ The January 1970 issue of the authoritative Soviet journal *International Affairs* carried an article "Keeping the Seabed out of the Arms Race". This article, which described the negotiations over the sea-bed treaty, omitted any account of the Soviet Union's change of position. The Soviet idea to prohibit all military uses of the seabed outside national jurisdiction was revived in August 1970, when the UN Committee on the Peaceful Uses of the Seabed was elaborating a declaration of principles governing the activities of states with respect to the sea-bed.

been used in the US text to describe nuclear weapons and launching platforms, but the actual scope of the banned activities remained unclear. It was explained, but not written into the draft, that while submersible vehicles able to navigate in the water above the sea-bed would be viewed as any other ships and would not be violating the treaty when anchored to, or resting on, the bottom, bottom-crawling vehicles which could navigate only when in contact with the sea-bed and which were specifically designed to use nuclear weapons would be banned.

Since the prohibition would embrace not only fixed (as had been provided for in the US draft), but also certain mobile facilities, the retention in the new text of the terms "emplant or emplace" did not seem to be entirely compatible with the widened scope of the prohibition.

The reaction at the CCD to the narrowly restricted draft treaty was unenthusiastic. Preference for a comprehensive ban was reiterated. Mexico felt that since the main nuclear powers were probably the only powers capable of initiating a nuclear-arms race on the sea-bed, and since they had reached the conclusion that it would be contrary to their security and excessively costly to do so, their unilateral statements containing the same obligations as those included in the draft treaty would suffice until such time as a comprehensive ban should come into force. [88] Uganda suggested a UN resolution prohibiting any military activity on the sea-bed and the ocean floor. [89] Nevertheless, there was no strong opposition to having a denuclearization agreement first and hope was expressed that negotiations with a view to enlarging the range of weapons to be prohibited would be quickly resumed. Assurances were asked as to further steps in this direction and requests were made that the generally worded declaration of intent to continue negotiations, as contained in the preamble (see above), should be embodied as a firm obligation in a separate article of the treaty.

Sweden proposed that in such a new article, to be added to the text, the parties should undertake to continue negotiations in good faith on further measures relating to a more comprehensive prohibition of the use for military purposes of the sea-bed and the ocean floor and the subsoil thereof. [90] The wording was similar to that included, on the insistence of the non-nuclear-weapon states, in the Non-Proliferation Treaty under which the parties undertook to pursue negotiations on measures relating to cessation of the nuclear arms race and to nuclear disarmament.

The Swedish proposal met with approval by the non-aligned countries as well as the Soviet Union's allies and the majority of the allies of the United States. To reinforce the commitment for a wider arms prohibition, it was also suggested that an explicit reference be made to those UN resolutions which called for the reservation of the sea-bed exclusively for peaceful pur-

poses. As a matter of fact, the draft treaty established no connection between prevention of the arms race on the sea-bed and the preservation for peaceful purposes of a zone situated beyond national jurisdictions.

A number of countries thought that, limited as it was to denuclearization, the draft treaty did not go far enough in outlawing all the relevant nuclear facilities on the sea-bed. In the view of Ceylon, for instance, even a temporary use of the sea-bed and ocean floor by submarines with nuclear capability or with the capacity for mass destruction, for purposes even incidental to their operation, should be banned. [91] Another suggestion, made by the United Arab Republic, was to cover by the prohibition all nuclear explosive devices and to defer the conduct of peaceful explosions in the sea-bed environment until such time as it was possible to provide a criterion whereby such explosions could be clearly differentiated from nuclear weapon tests. [92] Mongolia pointed out that since the sea-bed treaty would permit the emplacement within a twelve-mile coastal zone of installations specifically designed for testing nuclear weapons, it would seem to be at variance with the Test Ban Treaty of 1963, which prohibits nuclear-weapon test explosions underwater, including territorial waters or high seas. [93] The Soviet Union and the United States then made it clear that the sea-bed treaty would not affect obligations assumed under other arms-control treaties.

The term "weapons of mass destruction" was regarded as lacking in precision. Requests were made to define more rigorously the ambit of the military prohibitions and to specify that chemical and biological arms were included in the ban.¹⁷

Except for minor changes, the definition of the scope of the prohibition remained unaltered in the revised US-Soviet drafts of 30 October 1969 [81] and 23 April 1970. [83]

The United States held that the correct approach lay in adopting a measure which was realistic in the light of the present state of technology and verification capabilities and in reviewing this measure later as those capabilities may change. In its view, the commitment to this principle was reflected in the preamble, as well as in the provision for a review conference. However, as a result of strong pressure exercised by the non-aligned states which in a special working paper set out their proposed amendments [109], the co-chairmen of the CCD included in the draft treaty of 1 September 1970 a separate article reading: "The Parties to this Treaty undertake to continue

¹⁷ There has never been any doubt that nuclear weapons as well as chemical and biological weapons are weapons of mass destruction. The Outer Space Treaty of 1967 employed the terms "nuclear weapons or any other kinds of weapons of mass destruction" without defining the latter.

negotiations in good faith concerning further measures in the field of disarmament for the prevention of an arms race on the sea-bed, the ocean floor, and the subsoil thereof". [108] The relevant part of the preamble dealing with future negotiations has been deleted.

Geographical extent of the area covered by the prohibition

There was a general understanding that sea-bed disarmament measures were to include the area reserved exclusively for peaceful purposes. The latter was defined in UN resolutions of 1967 and 1968 [75, 84] as well as of 1969 [94] as the area underlying the high seas beyond the limits of present national jurisdiction. The vague language of the definition reflects the lack of agreement as to where these limits lie. Positions differ on several points including the outer limit of the territorial sea and the outer limit of the continental shelf. Hence the conflicting opinions as to the geographical area to be covered by an arms-control treaty.¹⁸

The view prevailed that a precise boundary, devised specifically for arms-control purposes and expressed in terms of distance from the coast, should be agreed upon.

Under the Soviet draft treaty the prohibition was to cover the area beyond a twelve-mile maritime zone of the coastal states. The outer limit of that zone was to be measured from the same baselines as were used in defining the limits of the territorial waters. [78]

The United States draft provided for a prohibition beyond a three-mile band adjacent to the coast. [79] The USA was willing to accept that the outer limit of the band should be measured from baselines drawn in a manner specified in the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone.

While there was consensus that the treaty should cover as large an area of the sea-bed and ocean floor as possible, the views differed as to the specific width of the zone exempt from the prohibition. A good number of countries considered a twelve-mile limit as the most appropriate. The main argument

¹⁸ In 1969, the twenty-fourth UN General Assembly requested the Secretary-General to ascertain the views of member states on the desirability of convening at an early date a conference on the law of the sea to review the régimes of the high seas, the continental shelf, the territorial sea and contiguous zone, fishing and conservation of the living resources of the high seas, particularly in order to arrive at a clear, precise and internationally accepted definition of the area of the sea-bed and ocean floor which lies beyond national jurisdiction, in the light of the international régime to be established for that area. [94]

advanced against a three-mile zone was that it would create difficulties in the verification of the fulfillment of the obligations by those parties which claimed territorial waters of a greater width. Such countries, and they constitute a majority, in the exercise of their sovereignty on the territorial sea (extending to the air space over the territorial sea as well as to its bed and subsoil) could restrict the movement for the purpose of control of foreign ships and foreign planes beyond the three-mile band. A list indicating the breadth of territorial seas claimed by selected countries is in the reference section 3A.2, page 429.

Some delegations saw the need for an even larger zone free from arms restrictions. They said they could accept a twelve-mile limit only if the prohibition concerned the placement of nuclear and other weapons of mass destruction. Italy stated that if the scope of the ban were extended to conventional-weapon installations, it would insist, because of the demands of national security, that the prohibition should apply beyond a curve corresponding to a depth of two hundred metres. This bathymetric approach (which was one of the criteria applied in determining the continental shelf under the Geneva Convention of 1958) met with objections as it involved unequal treatment of states and left outside the prohibition extensive areas in which the emplacement of weapons was most likely and technically least complicated. Canada advanced the idea of a 200-mile security zone extending from the outer limits of the twelve-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 treaty. It said that, in its opinion, it would be difficult to reconcile the coastal state's rights under the convention on the continental shelf with freedom of military activity by foreign states on its continental shelf; Canada could not accept such activity. Nigeria felt that a fifty-mile security zone would suffice. Some other nations stated that while they were not interested in placing defensive equipment on their own continental shelves, they wanted other states to be banned from doing that.

Japan proposed that the treaty should cover the entire area of the sea-bed and ocean floor, both under the high seas and the territorial waters. [95] Most countries, however, suggested retention of a part of the sea-bed for defence requirements until measures of general disarmament of the high seas were agreed upon.

It was stressed repeatedly that the delimitation of the area to be covered by the treaty, whatever the scope of the prohibition, should serve the purpose of the treaty only, without affecting the position of any state with respect to the law of the sea questions.

The first joint US-Soviet draft treaty [80] defined the area of prohibition

as lying beyond the maximum contiguous zone provided for in the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone. Article 24 in Part II of that Convention states that the contiguous zone, i.e., the zone contiguous to the territorial sea, may not extend beyond twelve miles from the baseline from which the breadth of the territorial sea is measured. For the purpose of the sea-bed treaty, the measurement of the outer limit of the contiguous zone was to be effected in accordance with the provisions of Section II (Part I) of the 1958 Convention (see reference section 3A.3, page 432) and in accordance with international law. The latter stipulation was added to cover situations where the Section II rules were expressly inapplicable under the terms of the Convention.

The draft thus implicitly adopted the Soviet position on the geographical extent of the area to be covered by the treaty. (On the question of measurement there had been no argument between the USA and the USSR.)

The text contained a disclaimer clause which was based on a corresponding provision of the US draft treaty. It stated that nothing in the treaty shall be interpreted as supporting or prejudicing the position of any party with respect to rights or claims which such party may assert, or with respect to recognition or non-recognition of rights or claims asserted by any other state, related to waters off its coasts, or to the sea-bed and the ocean floor.

The critics of the draft treaty pointed out that the text did not clearly stipulate that only a coastal state had the right to emplant or emplace nuclear weapons and other weapons of mass destruction on the sea-bed within its own maximum contiguous zone. A gap was therefore created for those coastal states which did not claim territorial waters co-incident with a contiguous zone of twelve miles. Other states would, for example, be entitled to install nuclear weapons in the area between three and twelve miles off the coasts of those countries which adhered to the three-mile territorial sea limit. The United Kingdom then suggested amending the wording of the article in question so as to stipulate that a party would not place the prohibited weapons beyond its maximum contiguous zone.

The above demands were partially met in the revised joint US-Soviet draft treaty of 30 October 1969. [81] Later, following the proposal by Argentina, [96] the co-chairmen of the Disarmament Conference formulated the corresponding provision in such a way as to make the undertakings by states parties to the treaty applicable also to the twelve-mile sea-bed zone, except that within such a zone they shall not apply either to the coastal state or to the sea-bed beneath its territorial waters. [83]

The non-acceptance of the proposal to prohibit the placement of weapons of mass destruction by any party beyond its own maximum contiguous zone, and the insertion in the draft treaty of the exception concerning territorial

waters, gave rise to further doubts about the value of the treaty. According to the language of the draft, nuclear states would have the possibility to install weapons of mass destruction on the sea-bed beneath the territorial waters within the twelve-mile sea-bed zone of other states, obviously with the consent and authorization of the states concerned ("allied option"). This would not be permitted in the band between the outer limit of the territorial sea and the twelve-mile limit of the sea-bed zone in cases where the breadth of the territorial waters is narrower than twelve miles.

Mexico thought that the language of the relevant provision might be so interpreted as to invalidate the obligations in the zone to which the treaty applied. It proposed to delete the phrase "or to the sea-bed beneath its territorial waters" and to state, in keeping with the terms used in the previous draft, of 30 October 1969, that the treaty obligations should "also apply within the twelve-mile zone, except that within that zone they shall not apply to the coastal state". The proposal was not accepted. The co-chairmen of the CCD stressed that the exemption with respect to the sea-bed beneath the territorial sea within the sea-bed zone did not in itself constitute granting of permission for the emplacement of weapons of mass destruction within such territorial sea, and the treaty therefore left unaffected the sovereign authority and control of the coastal state within such territorial sea. [110] Mexico considered this explanation not satisfactory.

The remarks made by some countries that any accident that occurred with nuclear installations or weapons in territorial waters was likely to affect the area considered to be the common heritage of mankind, and the call for a voluntary abstention from placing such weapons on the sea-bed under the territorial seas until such time as that area, too, was covered by the treaty, went unheeded.

The strongest objections, however, were related to the very reference in the sea-bed treaty to the 1958 Geneva Convention. It was contended that the reference was misleading and gave rise to arguments of a legal and practical nature.

The contiguous zone is a surface criterion applying to superjacent waters and not to the sea-bed or ocean floor or the subsoil thereof. There seems to be no relationship between its characteristics and a treaty prohibiting the emplacement of weapons on the sea-bed. The linking of the limits of the zone exempted from a sea-bed treaty prohibitions with the limits of the maximum contiguous zone, as provided in the 1958 Geneva Convention, also posed the question of what would happen to the sea-bed treaty if and when the Geneva Convention expired, were differently interpreted, or were to be amended specifically with regard to those points that were taken as reference points for the relevant articles of the treaty.

Only a minority of nations have ratified the Geneva Convention on the Territorial Sea and the Contiguous Zone (see reference section 3A.4, page 435). Some of the non-parties to the convention qualified its provisions as highly controversial, narrow and antiquated, and thought it inappropriate to invite states non-parties to the convention to accept the ideas of the latter in order to define new obligations.

The Latin American countries, claiming territorial waters as broad, in some cases, as 200 nautical miles, considered the US-Soviet proposal to be an attempt to reduce the limits of the territorial sea of other states. It was suspected that the reference to the 1958 Geneva Convention would make it possible to invoke its provisions against third states who were not parties to the convention and were not willing to agree to any restriction on their jurisdiction.

While accepting the twelve-mile limit for the purpose of the sea-bed treaty, as well as the criteria for measuring the limit, as specified in the 1958 Convention, the majority of states insisted on a straightforward formulation acceptable to all and devoid of any implication of tacit submission to the provisions of that convention. A proposal was made by Argentina at the twenty-fourth session of the UN General Assembly, to eliminate the reference to "maximum contiguous zone" in the definition of the geographical region covered by the treaty, and to introduce instead the concept of a "sea-bed zone". In seeking to set the outside limit of the sea-bed zone, the Argentinian text mentioned the provisions of the 1958 Geneva Convention in order to describe the configuration of the sea-bed and to provide a form of measurement that would allow the establishment of the zone of application of treaty commitments. To reinforce the incidental nature of the reference to the Geneva Convention and to ensure that the differing positions of states parties on the questions relating to the law of the sea would not be affected by such reference, the disclaimer clause appearing in the first two US-Soviet drafts was to be expanded and transformed into a separate article of the treaty. [96]

The approach, however, was inconsistent. If the aim was to separate the régime of the sea-bed treaty from the general régime of the law of the sea, there was no necessity to make even indirect references to the 1958 Geneva Convention. A simple and self-sufficient formula could be used, stating the extent of the zone and how it should be measured.

The Argentinian proposal was accepted by the United States and the Soviet Union and incorporated, with a few editorial changes, in the revised text submitted by them on 23 April 1970. [83]

In the new version the parties were to undertake not to emplant or emplace the prohibited weapons on the sea-bed and the ocean floor and in the

subsoil thereof beyond the outer limit of a sea-bed zone, defined as coterminous with the twelve-mile outer limit of the zone referred to in the Geneva Convention on the Territorial Sea and the Contiguous Zone, and measured in accordance with the provisions of that convention and in accordance with international law.

The draft disregarded the claims for a security zone extending from the outer limit of the twelve-mile coastal band, where coastal states would enjoy exclusive defensive rights. As a result, the emplacement by any state of conventional weapons off the shore of another state in the proximity of or even right beyond the outer limit of the twelve-mile sea-bed zone would not be prohibited. Mexico drew attention to the serious consequences for the security of coastal states deriving from that situation. It asked to introduce a rule prohibiting the use for military purposes of the continental shelf of any state. That would prohibit, *inter alia*, the establishment of military bases, structures, installations, fortifications and other devices of important military value in this sub-marine zone; the prohibition would not bar means of communication, shipping and surveillance.

The disclaimer article stated that nothing in the treaty shall be interpreted as supporting or prejudicing the position of any state party with respect to existing international conventions, including the 1958 Convention on the Territorial Sea and the Contiguous Zone, or with respect to rights or claims which such party may assert, or with respect to recognition or non-recognition of rights or claims asserted by any other state, related to waters off its coast, including *inter alia* territorial seas and contiguous zones, or to the sea-bed and the ocean floor, including continental shelves.

Such a sweeping disclaimer, if taken literally, may contradict the very sense of the treaty. To have any meaning, a disarmament or a non-armament measure must restrict, at least in some degree, the freedom of action as well as certain rights or claims the states may have asserted hitherto.

Verification of prohibition

The problem most extensively discussed was how to verify compliance with the prohibitions. This was considered to be the principal multilateral aspect of the treaty because the obligations not to emplace nuclear weapons were in fact confined to the two big powers; the large majority of other countries would be prevented from doing something which in any event they could not do.

In the first drafts the question was dealt with rather cursorily. The Soviet Union proposed that all installations and structures on the sea-bed and the ocean floor and the subsoil thereof should be open on the basis of reciprocity

to representatives of other states parties to the treaty for verification of the fulfilment of the obligations. [78] The United States proposed that the parties should be free to observe activities of other states on the sea-bed and ocean floor, without interfering with the activities or otherwise infringing rights recognized under international law, including the freedom of the high seas. [79]

Both texts proved unacceptable. Requests formulated and suggestions put forward concerned: assistance to be provided to technologically less developed countries in carrying out verification activities; internationalization of control procedures; nature of verification; rights of coastal states.

It was pointed out that while verification must protect the interests of all, a mere proclamation of the right to verify would be meaningless for the majority of states, with less-developed undersea technology. Such countries would be unable to exercise the right of verification even if they suspected that they were threatened by weapons or military installations in adjacent areas of the sea-bed, unless they were guaranteed assistance in carrying out the necessary operations by the technologically more advanced states. On the other hand, some countries felt that in seeking direct aid from one or another nuclear power they would compromise their policy of non-alignment.

The authors of the drafts of the treaty refused to commit themselves formally to assisting any complaining state in the verification. The United States said that, given the present state of technology, heavy expenses as well as hazards were involved in performing major underwater searches, the equipment and personnel for these specialized activities being in very short supply. Besides, varying political relations among a large number of countries that might become parties to the treaty made it impossible for the United States to accept a firm obligation in this respect. A special paragraph dealing with this subject was nevertheless inserted in the joint US-Soviet drafts. The text of 23 April 1970 [83] stipulated that verification may be undertaken by any state party using its own means, or with the full or partial assistance of any other state party. No procedures for obtaining such assistance have been specified.

The reluctance to resort to the optional aid of the technologically advanced states, and to rely for security on such uncertain factors as the good will, availability of equipment, or the changing circumstances of the world situation, brought about demands from many states for the internationalization of control. Some urged the setting up of a special body responsible for the observance of the sea-bed treaty prohibitions. Others envisaged the use of existing international organizations for channeling verification requests, or informing the UN Secretary-General—with a view to notifying all signatories—of any noticed activity which might be contrary to the observance

of the treaty, as well as of the results of verification, if and when undertaken. Canada suggested recourse to appropriate international procedures or good offices, including those of the UN Secretary-General, in identifying the state responsible for activities giving rise to concern relating to compliance with the treaty, as well as in arranging assistance in carrying out verification procedures. [97] The suggestion was understood to mean that if and when an international machinery to regulate the exploitation of the sea-bed was set up, it might be possible for states, so desiring, to make use of that machinery for their verification needs in relation to the sea-bed treaty. Still others understood internationalization only as a possibility of calling upon the UN Security Council to settle disputes over verification.

The USA and the USSR considered the establishment of special international arrangements for carrying out control or the turning of verification functions over to the UN, as needless and, in any event, premature and wasteful of resources. They were unwilling to link the concept of international machinery for the peaceful uses of the sea-bed with verification aspects of the sea-bed treaty. The proposal for inclusion in the article on verification of a provision concerning the good offices of the UN Secretary-General was categorically rejected by the Soviet Union. Referring to the past experience, notably to the events in the Congo, it said that such a provision could serve as a cover for attempts by some Western countries to use international institutions to the detriment of the interests of other states or groups of states. The USSR and the USA believed that reliance should be placed on consultation and co-operation. They agreed^o that if consultation and co-operation had not removed the doubts and there remained a serious question concerning fulfilment of the obligations assumed under the treaty, a state party may, in accordance with the provisions of the UN Charter, refer the matter to the Security Council, which may take action in accordance with the Charter. [83]

The sponsors of the draft treaty assured that nothing prevented any party from applying directly to the Security Council without resorting to consultation. This right exists anyway under the UN Charter independently of the sea-bed treaty. Moreover, every member of the United Nations has the right to seek the advice and assistance of the Secretary-General.

The non-aligned countries appealed for the incorporation into the text of at least some reference reflecting the idea of international verification as a possible future development. The insistence on the internationalization of verification procedures was probably not directly related to the requirements of the sea-bed treaty. No one expected that there would really be much need for verification. What mattered was the establishment of a principle to be followed in future disarmament measures of greater importance.

Eventually, in the draft treaty of 1 September 1970, [108] it was stated that verification may be undertaken also "through appropriate international procedures within the framework of the United Nations and in accordance with its Charter".

As regards the nature of verification, the right of each state to observe was taken for granted and it was felt that the right to verify would be deprived of substance if it were limited to observation. A number of countries insisted on access without restriction, so that the dubious installations may not only be "looked at" but also "looked into", but they failed to explain how this could be achieved. They also asked that the parties should be obliged to disclose their activities; a clause on non-interference with the sea-bed activities would leave the complaining state in a position of weakness vis-à-vis the suspected state, the latter being able to procrastinate in the removal of doubt by invoking the clause.

The Soviet Union was in favour of access to sea-bed facilities, similar to that provided under the Treaty on Antarctica. The USA maintained that a right to go into a facility emplaced on the sea-bed or to open up equipment for the purpose of verifying whether nuclear weapons had not been installed there, would be difficult to exercise and unnecessary. Under the freedom of the high seas, parties could approach the area of a facility or an object, so long as there was no interference with the activities of the states concerned. Besides, emplacements for nuclear weapons on the scale required to be of significant military value would be difficult to build without the knowledge of other countries. The placement of such installations would require a great deal of sophisticated material, unusual engineering activities and a highly visible support effort, also on the surface of the sea. In addition, the deploying country would obviously try to develop security systems to protect the military secrets of such installations. All this would attract attention of other maritime countries. The United States held that the configuration and operation of facilities specifically designed for nuclear weapons and other weapons of mass destruction would be conspicuous and identifiable.

Following compromise proposals made by Brazil [98] and Canada [97], as well as some other countries, the United States and the Soviet Union agreed on, and wrote into the draft of 1 September 1970, the following procedure: Each party shall have the right to verify through observation the activities of other parties on the sea-bed, the ocean floor and in the subsoil thereof beyond the sea-bed zone, provided that observation does not interfere with such activities. If after such observation reasonable doubts remain concerning the fulfilment of the obligations assumed under the treaty, the party having such doubts and the party responsible for the activities giving rise to the doubts shall consult with a view to removing them. If the doubts

persist, the party having such doubts shall notify other parties, and the parties concerned shall co-operate on such further procedures for verification as may be agreed, including appropriate inspection of objects, structures, installations or other facilities that reasonably may be expected to be of a kind prohibited by the treaty. If the state responsible for the activities giving rise to the reasonable doubts is not identifiable by observation of the object, structure, installation or other facility, the party having such doubts shall notify and make appropriate inquiries of parties in the region of the activities and of any other party. If it is ascertained through these inquiries that a particular party is responsible for the activities, that party shall consult and co-operate with other parties as provided above. If the identity of the state responsible for the activities cannot be ascertained through these inquiries, then further verification procedures, including inspection, may be undertaken by the inquiring party. [108]

It is not clear how the right to verify through observation the activities of other states on the sea-bed can be reconciled with the right of coastal states, under the Convention on the Continental Shelf, to establish safety zones which may extend to a distance of 500 metres around installations for the exploitation of the natural resources on the sea-bed, and which must be respected by ships of all nationalities.

The extent of inspection envisaged in the draft treaty has not been spelled out; in particular, it is unclear whether it implies access to the object of verification. The formula also poses a problem of how to proceed if the identity of the state responsible for the activities giving rise to doubts became known only after the verification procedures had been initiated, and if the state in question proved to be a non-party to the treaty.

In the course of the sea-bed debate, some countries maintained that since under the Geneva Convention on the Continental Shelf the coastal state has the exclusive right to explore and exploit the resources of the continental shelf, it has also the rights and prerogatives with respect to whatever activities are carried out there, and that these rights and prerogatives could not be jeopardized through an international agreement for a collateral measure of disarmament. They argued that verification on the continental shelf should be subject to special provisions. (For the list of the parties to the Convention on the Continental Shelf, see reference section 3A.5, page 436.) The countries most concerned were those which claimed extensive continental shelves. Their concern stemmed from the alleged possibility that a hostile state might, in the guise of conducting activities authorized by the treaty, do other things, such as controlling conventional armaments, or indulging in industrial espionage of facilities installed for peaceful exploration, or exploiting the resources of the sea-bed belonging to another state.

To protect the interests of medium and small nations, Brazil [98] and Canada [99] urged that a system be devised under which the coastal state would be duly notified and entitled to direct participation in verification operations taking place in areas outside the twelve-mile zone but under its national jurisdiction. Also whenever observation included research and exploration in the areas of legitimate economic and security interests to the coastal state, the right of the coastal state to be advised of and to participate in such activities should be respected. The 1958 Geneva Convention which established the right of the coastal state to participate or to be represented in the scientific research concerning the continental shelf and undertaken there, was quoted in support of the above demand.

Sweden asked that the exemption of the coastal state from the prohibitions under the treaty within the twelve-mile zone should be matched by an exclusive right for the coastal state in relation to verification within that zone, irrespective of whether its territorial sea extended to twelve nautical miles or less. This was needed to avoid any conflict regarding the responsibility for fulfilment of the treaty obligations within the "gap" between the territorial waters and the twelve-mile limit. [100] The USSR assured that the above right was implied in the draft.

The United States and the Soviet Union agreed that the treaty should not interfere with the existing rights and obligations under international law, but were unwilling to develop new procedures for safeguarding the interests of coastal states. To the United States, notification and participation or association of the coastal states seemed to be an unnecessary and undesirable restriction on the right of a party to observe and verify the activities of others. The proposed procedure for involving a coastal state would require a corresponding power to enforce the obligation. But it would not be immediately apparent whether a ship, sailing on the high seas, was engaged in activities completely unrelated to the treaty, or whether it was carrying out some form of verification. The coastal state, therefore, might feel authorized to attempt to exercise some form of control over the activities of any ship or submarine in the vicinity of its continental shelf. Any such effort would be regarded as an infringement of the freedom of the high seas which, under the 1958 Geneva Convention on the High Seas, are open to all nations. It would also be inconsistent with the 1958 Geneva Convention on the Continental Shelf, which stipulates that the rights of the coastal state over the continental shelf do not affect the legal status of the superjacent waters as high seas, or that of air space above those waters. It seemed improbable that any country could in some way approach the continental shelf of another state and, under the guise of sea-bed arms-control verification, exploit resources of the shelf without the knowledge of the coastal state. The United States

maintained that exploitation of resources of the sea-bed could not be done clandestinely. However, if it were felt that verification activities were somehow being used as a cover to circumvent the coastal state's exclusive right of exploration and exploitation on the continental shelf, those activities could be brought into question by the coastal state, but special procedures providing for co-participation were needless and undesirable.

Nevertheless, some attempt was made to meet more fully the demand for safeguarding the interests of coastal states. In the 1 September 1970 version of the joint US-Soviet draft treaty it is stated that verification activities pursuant to the treaty shall not interfere with activities of other parties and shall be conducted with due regard for rights recognized under international law including the freedom of the high seas and the rights of coastal states with respect to the exploration and exploitation of their continental shelves.

It is also stipulated in the draft treaty that parties in the region of the activities giving rise to doubts concerning the fulfilment of the obligations under the treaty, including any coastal state, and any other party so requesting, shall be entitled to participate in consultation with a view to removing the doubts and in co-operation on further procedures for verification. After completion of the further procedures for verification, an appropriate report shall be circulated to other parties by the party that initiated such procedures. Also, whenever the identity of the state responsible for such activities cannot be ascertained through inquiries, the inquiring party shall invite the participation of the parties in the region, including any coastal state, and of any other party desiring to co-operate, in undertaking verification procedures, including inspection. [108]

Relationship with nuclear-free zones

Under the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco), the parties are obliged to maintain a régime of total absence of nuclear weapons from their territories. The term "territory" includes, for the purposes of the treaty, the territorial sea, air space and any other space over which the state exercises sovereignty in accordance with its own legislation. The draft of the sea-bed treaty implies the right of any coastal state to emplace nuclear weapons on the sea-bed within a belt of sea twelve miles in breadth, adjacent to its coast.

To avoid incompatibility, it was requested by Mexico, the depositary state of the Treaty of Tlatelolco, to insert in the sea-bed treaty a clause ensuring that the status of the denuclearized zone in Latin America would not be prejudiced. The draft of 23 April 1970 included a special article to

the effect that the provisions of the sea-bed treaty shall in no way affect the obligations assumed by the parties under international instruments establishing zones free from nuclear weapons. [83] However, in view of the fact that the draft sea-bed treaty also implies the possibility for the nuclear powers to establish submarine nuclear installations within a twelve-mile sea-bed zone of another state, with the consent of the latter, Mexico insisted on adding a paragraph to the above-mentioned article.

Under the proposed provision the parties to the treaty would undertake not to contribute in any way to the commission, within the twelve-mile zone, of any acts involving violation of the obligations embodied in international instruments establishing nuclear-free zones. [101] The provision has not been included in the draft of 1 September 1970. The co-chairmen of the CCD considered that the obligation already contained in the draft treaty, not to induce other states to carry out activities prohibited by the treaty, was fully applicable within any nuclear-free zone. [110]

Review conference

Many participants in the talks supported the idea put forward in the US draft that a provision be made in the treaty for a review conference to take place after an appropriate lapse of time. It was suggested by the CCD members that the conference should consider further prohibitions of the military uses of the sea-bed, additional procedures for verification and such other measures which might be required in the light of the possible establishment of a régime for the exploration and peaceful exploitation of the sea-bed. The last drafts submitted by the USA and the USSR contained a provision for holding a conference of parties to the treaty five years after its entry into force, in order to review the operation of the treaty with a view to assuring that the purposes of the preamble and the provisions of the treaty are being realized; the review shall take into account any relevant technological developments.

Provision for amendments

The first joint draft required the approval of the states parties possessing nuclear weapons for any amendments which might be introduced to the treaty. This was considered tantamount to establishing a right of veto for the nuclear powers and was opposed as unnecessary, inappropriate and discriminating between the signatories.

The United States and the Soviet Union agreed that the amendments shall

enter into force for each state party accepting the amendments upon their acceptance by a majority of the states parties to the treaty and thereafter for each remaining state party on the date of acceptance by it.

Entry into force

According to the Soviet draft, the treaty would enter into force after the deposit of instruments of ratification by five governments, including the depositary governments. The first joint draft provided that the treaty should enter into force after the deposit of instruments of ratification by twenty-two governments, including the governments designated as depositary governments of the treaty. This followed the precedent of the 1958 Geneva Law of the Sea Conventions. Some countries thought that in view of the nature of the treaty and the scope of its application it would be advisable to increase substantially the number of ratifications necessary before the treaty can enter into force. The proposals to this effect having not been accepted the relevant article of the draft remained unchanged.

Part III. *The significance of the draft sea-bed treaty*

Nuclear installations on the sea-bed, although once considered in the United States, are now not attractive to the military. Since the primary interest of the military is to have an invulnerable deterrent, mobile systems are favoured over fixed systems (page 142). All evidence suggests that the United States decided to develop mobile post-Polaris deterrent systems rather than fixed nuclear installations long before the denuclearization of the sea-bed was considered on the international disarmament agenda.

The United States draft treaty for a denuclearization of the sea-bed was therefore not very significant when it was tabled at the Geneva Disarmament Conference on 22 May 1969. It was put forward in fulfilment of the obligation under the Non-Proliferation Treaty to work for nuclear disarmament.¹⁹

The US draft—and the final outcome—in many ways conformed to the demands of the US Navy. These were made perfectly clear as early as the

¹⁹ Mr David H. Popper, Deputy Assistant Secretary for International Organization Affairs, Department of State, said in a speech about US policy in the deep ocean environment on 12 August 1968, after the first US suggestion to the UN General Assembly that this matter should be considered: "By exploring the possibilities of an effective international agreement along these lines, the United States, together with other parties to the Nonproliferation Treaty when it becomes effective, would be acting pursuant to article 6 of that treaty, which binds the parties to pursue negotiations in good faith on effective measures relating to nuclear disarmament." [102]

autumn of 1967, immediately after Ambassador Pardo's (Malta) speech in the United Nations had initiated the sea-bed debate. At a law conference in October 1967, Assistant Secretary of the Navy, Robert Frosch, said:

The case of the submarine armed with nuclear missiles is a serious consideration from the standpoint of protection of national interests. Certain policies which might favour our military and our defense systems in this respect are: The rules should not deny freedom of the seas for the deployment of strategic forces by all nations. The rules should not deny freedom of the seas for deployment of strategic detection and warning devices. Future development of international agreements should allow use of the ocean surface, the air and space above it, and the ocean bottom for warning devices. [103]

Dr Frosch also noted in Congressional hearings in December 1967—apropos Ambassador Pardo's statement in the United Nations that the military development of the sea-bed had not started—that “the Navy has used the sea bottom for many purposes for many years, and it is incorrect to assume that we are not using the sea bottom”. [104] The US interpretation of the term “peaceful purposes” should also be looked at in this light (page 158).

Earlier Soviet disarmament schemes for the sea-bed had been more ambitious than the US ones. The Soviet retreat from its previous position was correspondingly great. The first Soviet proposal for disarmament of the sea-bed, which was included in the USSR Memorandum of 1 July 1968, went furthest in proposing that patrolling by submarines carrying nuclear missiles should be prohibited in areas from which the missiles can reach the frontiers of the parties. Their second, detailed proposal of 18 March 1969 omitted this clause but prohibited any use for military purposes of the sea-bed and the ocean floor and the subsoil thereof. A third position was taken when the Soviet Union, on 7 October 1969, publicly embraced the US proposal for a denuclearization measure only.

There are probably several reasons for the change in the Soviet position on the demilitarization of the sea-bed. First, the Soviet Union had the same political reasons as the United States for demonstrating to world opinion that progress was being made towards nuclear disarmament, and denuclearization of the sea-bed was the type of agreement that could be reached quickly. Secondly, since the Soviet Union trails the United States in making military use of the sea-bed, it might see some advantage even in a very limited agreement compared to none at all.

The sea-bed treaty binds, in effect, only the super powers. A prohibition on placing nuclear weapons on the bed of the sea cannot be a restraint on the military policies of countries which have formally renounced acquisition of such weapons under the Non-Proliferation Treaty, or for those others,

including France, the United Kingdom, and China which, while having nuclear weapons, may not have the means to conduct the banned activities on a significant scale for a long time to come. One issue that directly engages the non-nuclear states is, however, the question of non-nuclear military installations on their continental shelves, and this question is not covered by the treaty.

It is doubtful whether any country will feel more secure as result of the treaty. The effect of a possible nuclear attack from an installation emplanted on the sea-bed is the same as from any other nuclear launching device.

The military significance of the draft sea-bed treaty appears at the time of writing (September 1970) to be low. It amounts to the banning of something which does not exist and which, even without the sea-bed treaty, was not likely to develop. In its present form the draft treaty is not likely to limit the military uses of the ocean floor, even less of the deep ocean. It does not in any way restrict the operations of deep-diving ballistic-missile submarines, nor does it prohibit manned military underwater stations and ASW detection systems. With all its limitations as to scope and geographical extent it is much less important as a preventive, non-armament measure than the Antarctic Treaty, the Treaty on Outer Space, or the Treaty of Tlatelolco. Since it permits the placement on the sea-bed of facilities servicing free-swimming nuclear-weapon systems, the treaty will be no obstacle to the development of a nuclear arms race in the whole of the sea environment.

It has been said in favour of the treaty that it has three advantages: it forestalls the military option, however insignificant, of placing mass destruction weapons on the sea-bed; it may lead to further disarmament measures on the sea-bed in accordance with the promise in article V of the last draft; it is a "confidence-building measure" which might reduce suspicions between the power blocs and improve the international atmosphere. Of these arguments the second deserves most attention: what further measures might be envisaged and what value would they have?

Present military uses of the sea-bed consist mainly of submarine detection systems with manned military underwater stations soon coming into operation. It is hard to believe that the great powers will be prepared to give up these uses until more progress is made with general disarmament.

Provided efforts continue to demilitarize the sea-bed, the next move might be towards the banning of conventional weapons, for instance along the lines suggested by Canada (page 159). This presumes that a way can be found to solve the difficult control problems which caused lengthy discussions over the present draft treaty. However, with the exception of mines, no such weapons seem to have been developed so far, nor is there much military interest in them. This might make it easier to reach an agreement; but it also

means that such a treaty would, again, be a measure of little significance.

The main trouble with all disarmament proposals for the sea-bed, however, is that they take for granted that the sea-bed is an area which can be dealt with separately from the rest of the deep ocean. This is not so. What matters militarily is the spread into the deep ocean waters of ballistic-missile submarines and their supporting equipment, as well as the counter-weapons they have called into being. Developments on the sea-bed are simply part of this trend.

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Chapter 4. The CBW debate and other disarmament measures

Part 1. *The CBW debate*

Square-bracketed references, thus [1] refer to the list of sources on page 215.

Introduction

Since 1966, the prohibition of chemical and biological warfare has occupied an important place on the agenda of disarmament talks. This is due to the fact that much information has become available to the public about CB weapons, about accidents of contamination which occurred in storing, testing and transporting these weapons, as well as about the actual use of chemicals in international conflicts.

In the latter part of 1969 and in 1970 the debate was more animated and also more specific than at any time since World War II.¹

A report on chemical and bacteriological (biological) weapons and the effects of their possible use, prepared by a group of experts at the request of the UN General Assembly and published on 1 July 1969 [1] contributed to the debate. It described the basic characteristics of CB weapons; their probable effects on military and civilian personnel; environmental factors affecting the use of CB weapons; possible long-term effects on human health and ecology; economic and security implications of the development, acquisition and possible use of CB weapons and systems of their delivery.

The over-all assessment was that certain chemical and biological agents are potentially unconfined in their effects, both in space and time. Their large-scale use could conceivably have deleterious and irreversible effects on the balance of nature. The danger would apply as much to the country that initiated the use of these weapons as to the one which had been attacked. No system of defence, whatever its cost, could be completely secure. CB weapons are not a cheap substitute for other kinds of weapons. Their elimination would not detract from any nation's security.

¹ The *SIPRI Yearbook 1968/69* included a section on developments in chemical and biological weapons (page 112), as well as an account of the discussion on CBW prohibition at the spring 1969 session of the Eighteen-Nation Disarmament Committee (page 186).

A group of World Health Organization consultants, in a specialized report [2] submitted later, differed somewhat from the UN experts with respect to the emphasis and the assessment of possible effects of CBW on public health. They arrived, however, at essentially the same technical conclusions.

The UN report was welcomed as a useful basis for consideration of CBW problems. The majority of nations approved the UN Secretary-General's recommendations which accompanied the report: to renew the appeal to all states to accede to the Geneva Protocol of 1925; to make a clear affirmation that the prohibition contained in the Geneva Protocol applies to the use in war of all chemical, bacteriological and biological agents (including tear gas and other harassing agents) which now exist or which may be developed in the future; to call upon all countries to reach agreement to halt the development, production and stockpiling of all chemical and bacteriological (biological) agents for purposes of war and to achieve their effective elimination from the arsenal of weapons.

Throughout the discussion in the Disarmament Committee and the UN General Assembly a distinction was drawn between measures to prohibit the use and measures designed to abolish CB weapons. The present account follows this distinction. It is divided into three parts. The first, dealing with the question of the prohibition of use of CB weapons, reviews the efforts to ensure adherence to the 1925 Geneva Protocol and the controversy over the scope of the prohibition covered by the Protocol. The second analyses the positions taken with regard to the prohibition of production and possession of those weapons; it discusses the issue whether chemical and biological warfare should be treated jointly or separately; it examines the draft conventions submitted to international bodies, and it touches upon the problem of verification. The third part sums up the situation on the eve of the twenty-fifth UN General Assembly session.

Prohibition of use of CB weapons

Adherence to the Geneva Protocol

For some time there has been pressure from many quarters to bring about universal adherence to the 1925 Geneva Protocol prohibiting the use in war of asphyxiating, poisonous or other gases, and of bacteriological methods of warfare. The United Nations passed resolutions, the last of which, adopted without opposition on 16 December 1969, invited all states which had not yet done so to accede to or ratify the Geneva Protocol in the course of 1970 in commemoration of the forty-fifth anniversary of its signing and the twenty-fifth anniversary of the United Nations. [3]

Similar calls were made by some of the non-governmental organizations, in particular by the International Committee of the Red Cross, a special NGO Committee on Disarmament, and the International Association of Microbiological Societies.

From the outset, the country principally aimed at was the USA, the only big power not yet party to the Geneva Protocol. (China, France, UK and USSR have been parties since the late twenties.) Furthermore, the United States was known to have a very large programme for CBW research, production and stockpiling, both domestically and abroad, and to have made extensive use of some types of chemicals in the hostilities in Indochina.

The United States has taken the position that it respects the principles and objectives of the Geneva Protocol, but for years it resisted formal international commitments in this field. The pressure of world opinion and especially of American internal opinion brought about a change in the policy.

On 25 November 1969, the US President issued a statement containing the following decisions:

With regard to the chemical weapons—reaffirmation of the renunciation of the first use of lethal chemical weapons; extension of the renunciation to the first use of incapacitating chemicals;² submission of the 1925 Geneva Protocol to the Senate for its advice and consent to ratification.

The statement made no reference to harassing chemicals, such as tear gas, or to anti-plant agents; later it was made plain that these were not included.

With regard to the biological weapons—renunciation of the use of lethal biological agents and weapons, and all other methods of biological warfare; confinement of biological research to defensive measures such as immunization and safety measures; disposal of existing stocks of bacteriological weapons. [4]

It was not clear whether the renunciation embraced toxins, an important category of possible warfare agents,³ but on 14 February 1970 another announcement was made about the US decision to renounce offensive prepar-

² The WHO report divides biological and chemical agents into three types. A lethal agent is one intended to cause death when man is exposed to concentrations well within the capability of delivery for military purposes. An incapacitating agent is one intended to cause temporary disease or to induce temporary mental or physical disability, the duration of which greatly exceeds the period of exposure. A harassing agent (or short-term incapacitant) is one capable of causing a rapid disablement that lasts for little longer than the period of exposure. The report adds: The above classifications are not toxicological categories, for the effects of a chemical warfare agent depend as much on the way it is used as on its toxicological properties. If too much of an agent intended for harassment is used, it may kill or severely injure. Likewise, if a low concentration of a lethal agent is disseminated, its effects may be only incapacitating or harassing.

³ Toxins are poisonous substances produced by living organisms including plants, animals and bacteria. In contrast to the organisms that produce them, toxins are not capable of reproduction.

ations for and the use of toxins as a method of warfare; to confine the military programmes for toxins, whether produced by bacteriological or any other biological method or by chemical synthesis, to research for defensive purposes only; to destroy all existing toxin weapons and all existing stocks of toxins which are not required for a research programme for defensive purposes. [5]

The United States appeared to hope that other states would also unilaterally renounce B weapons. It urged, nevertheless, that such decisions be converted into an international obligation through a convention.

The United Kingdom declared that it had never had any biological weapons, did not have any now, and had no intention of acquiring any. A similar statement was made by Canada which added that it did not possess any chemical weapons either and did not intend to develop, produce, acquire, stockpile or use such weapons at any time in the future unless these weapons should be used against the military forces or the civil population of Canada or its allies.

Sweden called attention to the fact that it neither possessed, nor intended to manufacture, any biological or chemical means of warfare. The Netherlands recalled that as long ago as 1930, when it ratified the Geneva Protocol, it was among the first countries to renounce unconditionally the use of B weapons.

Mexico suggested, as an intermediate step pending a comprehensive ban on CB weapons, that states make declarations along the same lines as that made by the United States, and renounce unilaterally the use in war of biological weapons, their manufacture and stockpiling; the renunciation would acquire a contractual character when over-all agreement was achieved. Several delegations to the CCD emphasized that unilateral decisions can be no substitute for internationally binding agreements.

In renouncing production and stockpiling and any use of biological weapons, including toxins, as well as first use of lethal and incapacitating chemicals against any country, whether or not bound by similar commitments, the United States went further than the ban under the Geneva Protocol.

However, the non-inclusion of harassing and anti-plant agents in the renunciation concerning chemical warfare, the use of which in Indochina set in motion the present international drive for the ratification of the Geneva Protocol, raised a serious problem in view of the US declaration that it would ratify the Protocol.

The majority of states consider the ban under the Geneva Protocol as all-inclusive (see discussion in the next section); no party has entered reservations limiting the types of weapons to which it applies. If now the United

States were to adhere to the Geneva Protocol with a formal reservation attached to the Protocol, limiting the scope of its undertakings, it is likely that such a step would be challenged by other nations. This, in turn, in view of the international weight of the United States might upset the construction of the Protocol and worsen the situation which was meant to be improved.

The line of thought in a number of countries is rather towards the withdrawal of earlier reservations to the Geneva Protocol. This is especially true about the reservation exempting parties from prohibition of use of CB weapons against non-parties. If this position is generally accepted and the reservation withdrawn, the text of the Protocol itself might require clarification since, as it stands now, the parties "agree to be bound as between themselves".

There is less support for the dropping of another reservation which states that the obligations would cease to be binding in regard to all enemy states whose armed forces or whose allies failed to respect the Protocol. The issue is bound to be thoroughly considered in conjunction with any convention prohibiting the production and stockpiling of CB weapons. The Soviet Union said that the reservations had played an important role in preventing a widespread use of CB methods of warfare and had served as the basis for the warning issued by the Allied Powers to the German Government concerning the possible use of chemical weapons by the latter during the Second World War; and that the adoption of a convention aimed at eliminating completely CB weapons from military arsenals, with the participation of a wide range of states, would make pointless the question of reservations to the Geneva Protocol. The Soviet Union failed, however, to indicate whether it would then contemplate formal withdrawal of its reservations.

Indeed, the retention of the right to use CB weapons, even in extraordinary situations, would seem incompatible with a ban on the very possession of those weapons. But some countries, concerned by the difficulty of ensuring fool-proof verification, may prefer to retain the right of retaliation, using agents produced and converted into weapons after they had suffered an attack with similar arms. For the same reasons they may insist on retaining a defensive capability, while in fact the absence of defensive equipment and associated training from the military forces of states would greatly contribute to confidence in the absence of CB warfare capability.

Japan, which deposited the instrument of ratification of the Geneva Protocol on 21 May 1970, has not attached any reservation to it. Japan proposed that each state should undertake never, under any circumstances, to engage in CB warfare. The US administration proposes to ratify the Protocol with a reservation permitting the use of chemical weapons and agents if an enemy or its allies were to employ them first.

The procedure of ratification of the Geneva Protocol by the United States was considerably delayed. The reason for the delay had apparently been lack of agreement within the US administration as to whether the Protocol should be approved with or without exceptions, and, in the latter case, whether this should be done now or after the termination of the war in Viet-Nam. Eventually, on 19 August 1970, the US President asked the Senate to approve the Protocol with an "understanding" that the use in war of riot-control agents and chemical herbicides was not prohibited, and that smoke, flame and napalm were also not covered by the Protocol. [29]

Since the 1969 UN call for universal adherence to the Geneva Protocol, the number of parties to the Protocol has not increased significantly; but new ratifications included some important countries. For the list of parties to the Protocol and a note on the number of parties, see reference section 3B.1, page 438.

Tear gas and herbicides

As mentioned above, the controversy over the scope of the prohibition constitutes the main stumbling block to the general acceptance of the Geneva Protocol, the point at issue being whether the use of tear gas and anti-plant chemicals is banned under international law.

The United States and Australia maintain that tear gas and anti-plant chemicals are not covered by the prohibition.

The UK Secretary of State for Foreign and Commonwealth Affairs announced on 2 February 1970 that while tear gases and shells producing poisonous fumes are prohibited under the Geneva Protocol, CS and other such gases not significantly harmful to man in other than wholly exceptional circumstances, are not.⁴ It was later explained in the British Parliament that the use of the substance in question in very high concentrations in enclosed spaces over long periods would be an exceptional circumstance. The UK Government thus threw confusion upon an interpretation of the Protocol, which a predecessor government had enunciated in 1930, and which subsequent governments had upheld ever since.⁵

Those who oppose a ban on the use of tear gas and herbicides in war argue that the former is employed by many countries for domestic riot-

⁴ CS is a chemical irritant first discovered in 1928 (C and S being the initials of the two discoverers), nowadays widely used as a tear gas by police forces, and as a harassing agent by military forces in Viet-Nam.

⁵ In 1930, the British Government submitted a memorandum in the League of Nations which, referring to the English version of the Geneva Protocol of 1925, said: "Basing itself on this English text, the British Government have taken the view that the use of 'other' gases, including lachrymatory gases, was prohibited." The Draft Disarmament Convention submitted by the United Kingdom in 1933 to the Disarmament Conference contained a provision stating that "The prohibition of the use of chemical weapons shall

control purposes, and the latter involve the same chemicals and have the same effect as the materials commonly used in many countries to control vegetation. They also maintain that in some cases the use of tear gas, herbicides and defoliants in warfare may be more humane than the use of conventional weapons.

The majority of UN members, however, take the position that the existing rule of international law prohibiting chemical warfare covers all chemical weapons and support the UN Secretary-General's recommendation to this effect (see above).

The main arguments of those who favour a comprehensive ban are as follows:

1. No sharp demarcation line can be drawn between harassing and other anti-personnel chemical agents.
2. The military applications of tear gas are very different from civil applications. In the former, tear gas is used as an adjunct to firepower; in the latter, it is used to disperse crowds without injury. In war there is also a risk of escalation: tear gas might provoke the use of even more harmful agents.⁶
3. Military employment of anti-plant chemicals may lead to their intake by humans in dosages far higher than those experienced when the same chemicals are used for agricultural and other purposes; there is a substantial risk that people exposed to them might suffer acute or chronic injury. In some situations disruption of the ecological equilibrium may occur, with possible long-term damage to the environment.
4. The negotiating history of the Geneva Protocol (as well as that of the preceding international treaties which prohibited gas warfare) supports the view that the states which concluded it meant it to be comprehensive. If at the time of signing the Protocol any nation had wished to restrict the prohibition to lethal gases, it would have asked to employ an appropriate term in the text, but no such wish was expressed. The states parties to the Protocol did not oppose the official British and French interpretation, made public in 1930, that tear gas fell within the prohibition. Subsequent conclusions

apply to the use, by any method whatsoever, for the purpose of injuring an adversary, of any natural or synthetic substance harmful to the human or animal organism, whether solid, liquid or gaseous, such as toxic, asphyxiating, lachrymatory, irritant or vesicant substances."

⁶ On the four past occasions when highly lethal chemical warfare agents were used extensively—World War I, the Italian invasion of Ethiopia, the Japanese invasion of China and the Yemeni Civil War—the use of tear gas always preceded resort to more lethal gases.

reached and resolutions adopted by international bodies confirmed that tear gas was in the category of banned weapons,⁷ but no one has challenged the right to use tear gas in time of peace for police operations.

5. Chemicals capable of damaging plants but not directly harmful to people or animals were unknown when the Geneva Protocol was being worked out, but from international documents adopted later,⁸ it may reasonably be assumed that if such chemicals had then existed they would have been explicitly prohibited, for the aim of the discussions on CBW had been to prevent the use of weapons directed specifically against living organisms.

6. If some kinds of chemical warfare were condoned, the legal constraints represented by the Geneva Protocol would be considerably weakened and the Protocol itself undermined. The rule "no gases" appears to be legally well-founded, practical and politically advisable.

Considerations of this kind led to the adoption by the United Nations of a resolution which stated that the 1925 Geneva Protocol embodied the generally recognized rules of international law prohibiting the use in international armed conflicts of all biological and chemical methods of warfare, regardless of any technical developments. It declared as contrary to those rules the use in international 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;

any biological agents of warfare—living organisms, whatever their nature, or infective material derived from them—which are intended to cause disease or death in man, animals or plants, and which depend for their effects on their ability to multiply in the person, animal or plant attacked. [6]

⁷ The Special Committee of the Disarmament Conference, in its report of May 1932, expressed the opinion that lachrymatory gases should not be considered separately from the point of view of their use in warfare. A resolution submitted by the Committee specifically mentioned lachrymatory substances as those subject to absolute prohibition. The report issued in December 1932 by the Special Committee on chemical, bacterial and incendiary weapons stated that lachrymatory substances could not be treated separately as far as the prohibition of the use of poisonous substances in wartime was concerned.

⁸ The report of the Special Committee of the Disarmament Conference of May 1932 explained that if no special reference was made in it to plants, it was because it was felt that in practice it would not be possible to employ, for the purpose of damaging plants, substances which were not also harmful to human beings or animals, or which were not likely to make the plants harmful to them. A resolution adopted by that Committee with regard to bacteriological weapons declared absolute prohibition of use of pathogenic microbes, viruses or infected substances by bringing them into contact with human beings, animals or plants. In 1954, a protocol signed by the members of the Western European Union defined chemical weapons as any equipment or apparatus expressly designed to use, for military purposes, the asphyxiating, toxic, irritant, paralytic, growth-regulating, anti-lubricating or catalysing properties of any chemical substance.

The resolution was adopted with only three dissenting votes (USA, Australia and Portugal). The majority of the thirty-six states that abstained took no position on the substance of the issue. Their reservations were mostly of a legal nature, both constitutional and procedural, in particular with regard to the competence of the General Assembly to interpret existing international instruments through resolutions. Some abstaining countries were not parties to the Geneva Protocol and did not feel called upon to interpret the provisions of an agreement to which they had not acceded. (The full text of the resolution and the voting record are on page 444.)

The UN resolution of December 1969 has not, as yet, influenced the policies of the opponents of a prohibition of tear gas in war. The UK official statement claiming the legality of CS came in February 1970. In March 1970 Canada did not include tear gas and other crowd and riot-control agents in its commitment not to develop, produce, acquire, stockpile or use chemical weapons; it explained that "their use or the prohibition of their use in war presents practical problems in relation to the use of the same agents by police and armed forces for law enforcement purposes which require detailed study and resolution".

A somewhat different situation developed with regard to anti-plant agents due, in the first instance, to warnings by US scientists that chemical defoliants posed dangers of birth defects to the population living in the areas being sprayed. In April 1970 restrictions were imposed in the United States on the domestic uses of some such chemicals as health hazards. The use of one of them (agent Orange) in Indochina was suspended by the Department of Defense, but operations using other agents (White and Blue) continued.

According to official US figures, since the start of the chemical defoliation and anti-crop programme more than fifty thousand tons of anti-plant chemicals have been sprayed over some twenty thousand square kilometres in Viet-Nam. On 26 August 1970, the US Senate rejected an amendment to the military procurement bill, providing that no funds authorized under the bill would be used to procure, maintain or use herbicides. The opponents of the amendment argued that herbicides were used for the protection and safety of US troops and that this immediate benefit outweighed any adverse economic effects and possible long-term ecological consequences. [30]

Except from Australia, which has troops in Viet-Nam, there has been no explicit support for the US justification of military use of anti-plant agents. The Netherlands officially declared its willingness to co-operate in seeking agreement to abolish the use of herbicides and defoliants in war, its decision being based on the consideration that large-scale use of such chemical agents might have unpredictable long-term effects on man's environment.

Prohibition of production and possession of CB weapons

Separate or joint treatment of chemical and biological weapons

The CCD and the United Nations extensively discussed whether chemical and biological weapons should be treated jointly or separately.

The following main arguments were advanced in favour of a separate treatment according priority to biological weapons:

1. The two categories of weapons differ as regards the potential toxicity, speed of action, duration of effect, specificity, controllability and residual effects; the biological weapon is the only self-propagating weapon in existence and is the most odious of all weapons.
2. Weight for weight, biological agents are of potentially much greater contaminating power, much more difficult to control in action and more unpredictable in effect than chemical agents; while chemical weapons affect smaller areas and can be used with a certain amount of precision, biological weapons are totally indiscriminate and are likely to affect vast areas and civilian populations far removed from the scene of their use.⁹ Biological weapons may therefore be thought of principally as strategic weapons, chemical weapons primarily as tactical ones.
3. While chemical weapons have been used in warfare and a number of countries have a chemical warfare capability or are conducting research in this field, biological weapons have never been used and few nations appear to have engaged in substantial efforts to develop them.
4. A ban on biological weapons poses a less difficult problem of verification than that on chemical weapons.

The proponents of a joint treatment of chemical and biological weapons argued that:

1. Both categories of weapons are classified as weapons of mass destruction, whether destined for strategic or tactical use.

⁹ In this connection reference was made to the United Nations report which contained comparative estimates of disabling effects of hypothetical attacks on totally unprotected populations using a nuclear, chemical or bacteriological (biological) weapon that could be carried by a single strategic bomber. According to those estimates the area affected would be: in the case of a nuclear weapon (1 megaton)—up to 300 square kilometres; in the case of a chemical weapon (15 tons of nerve agent)—up to 60 square kilometres; in the case of a biological weapon (10 tons)—up to 100 000 square kilometres.

2. Both have been dealt with together in a number of international agreements and documents; a separate treatment would lead to the weakening of the 1925 Geneva Protocol.
3. All biological processes depend on chemical or physico-chemical reactions and what may be regarded today as a biological agent could, as knowledge advances, be treated as a chemical agent.
4. The fact that a certain quantity of a chemical agent will produce a lethal effect in an area smaller than that affected by the same quantity of a biological agent appears insignificant in view of the enormous stockpiles of agents which have already been accumulated.
5. A combination of B and C weapons can be used with a view to obtaining greater effectiveness or to making their detection more difficult.
6. The means of delivery of chemical and biological agents are similar and in the armed forces of many countries the same services deal with CB means of warfare and protection.
7. If biological weapons, which have never been used, and which are considered to be of little military effectiveness, were to be dealt with now and chemical weapons, which have already been used, and with disastrous effects, were left for a later examination, the chemical arms race may intensify and may even seem legitimized. If anything, chemical warfare should get priority.

An attempt was made by Sweden to analyse the question from a substantive point of view so as to determine how far it was feasible to treat chemical and biological weapons together, or to what extent it was necessary to give them separate treatment.

It appeared from the analysis that development of warfare agents and of devices for their dissemination, including preparation of instructions and manuals, as well as training, could be prohibited unconditionally and the prohibition might be dealt with in one comprehensive treaty; only with regard to the verification aspect might such differences exist that would call for separate treatment. It would seem to be possible to prohibit simultaneously the testing of chemical and biological warfare agents; for the purpose of verification some leads might be derived from surveillance of the site of and the security arrangements for testing areas, while in order to provide more conclusive evidence different techniques for various chemical and biological means of warfare might have to be foreseen.

As far as production was concerned, the Swedish view was that biological agents lent themselves to unconditional prohibition, with some exceptions for quantities needed for laboratory work and for developing protective

substances. Unconditional prohibition was also possible for a series of chemical agents such as nerve gases and toxins. However, to establish boundary lines between the production of chemical agents having a legitimate use in peaceful activities and production for direct warfare purposes, one would have to resort to conditional prohibition or prohibition with partial restraints. Technically the problem might be dealt with either in one comprehensive treaty with specified exemptions or in a separate treaty or protocol. Such agents as were generally excluded from civilian use could be automatically included in a treaty of unconditional international prohibition. While for all agents under unconditional prohibition the most effective means of verification should be sought, for those other cases of chemical agents it might suffice to prescribe a procedure of obligatory reporting to some international agency on their production, stockpiling and civilian use. Transfers between countries of all BW agents and of an increasing number of C agents would have to be prohibited unconditionally. Certain rules as to reporting to some international agency or agencies would be warranted; this must relate to all agents which might be used as means of warfare. Destruction or decontamination of CB weapons may be prescribed under a general prohibitory rule, but the technically separate types of treatment required would call for different modalities if the destruction was to be verified. [7]

Morocco believed that a legal instrument prohibiting the development, production and stockpiling of chemical and biological weapons (with a provision for their destruction) could include definitive verification procedures relating only to biological weapons; the total elimination of such weapons could be effective upon the entry into force of that instrument. In view of the technical difficulties connected with the verification regarding chemical weapons, the instrument should provide for the manner in which subsequent examination would be held to arrive, within a prescribed period of time, at a supplementary document laying down verification procedures for C weapons; the latter document would put into effect the total and definitive implementation of the provisions prohibiting such weapons. [31]

On 25 August 1970, the group of twelve non-aligned members of the Disarmament Committee stated in a joint memorandum that it was essential that both chemical and biological weapons should continue to be dealt with together in taking steps towards the prohibition of their development, production and stockpiling and their effective elimination from the arsenals of all states. It expressed the conviction that an effective solution of the problem should be sought on this basis. [32] Argentina, a member of the group, explained that "to deal together" did not necessarily imply the idea of a joint solution in a single instrument. [45]

The "joint versus separate treatment" dispute may appear academic. It

may seem immaterial whether there are one, two or several international instruments covering the prohibition of production and possession of CB weapons as long as there is confidence that eventually the whole range of the weapons in question will be banned. But such confidence is lacking. There is a strong feeling that a convention limited to biological weapons—and it is with such a convention that the advocates of a separate treatment want to start—may not be followed by a similar agreement on chemical weapons. The Nuclear Test-Ban Treaty of 1963 set a significant precedent. In spite of the formal pledge by the big powers to achieve the discontinuance of all test explosions, the treaty continues to be partial and the prospects for banning underground nuclear tests still remain uncertain.

The US representative to the CCD, in explaining his government's position on the military usefulness and the military roles of each of the two categories of weaponry, indicated the motives underlying the US decision on the renunciation of biological means of warfare. He said that it was the considered judgement of the US Government that biological weapons have no value as a deterrent against use by others because retaliation in kind would not be an acceptable or rational response to a biological attack. They have no value as a means of redressing military balance either, because few, if any, military situations can be imagined in which a state would try to redress a military imbalance by retaliating with weapons whose effects would not show up for days. For these reasons, even the known retention of biological weapons by one state should not affect another state's decision to give them up; inspection is not necessary.

Chemical weapons, on the other hand, have in the US view obvious usefulness in certain military situations, primarily as battlefield weapons. They are more predictable than biological weapons and, unlike the latter, they can produce immediate effects, which is an important quality for use in combat. Hence the belief that a chemical warfare capability is important for national security. Unlike the case with biological weapons, the inability of an attacked nation to retaliate with chemicals could give a military advantage to any government which might resort to using chemical weapons. In particular, the one-sided possession of nerve agents could offer unacceptable advantages to the power possessing them. Anyone who suggests retaliating with nuclear weapons in the event of a chemical attack is abrogating, in the US opinion, his responsibility to find meaningful arms-control solutions to the problems of chemical weapons. [8]

The United States has not ruled out the possibility of eliminating chemical capabilities; it made it dependent upon appropriate verification. In a special working paper on the subject it drew attention to the magnitude and complexity, if not insolubility, of the problem. [9]

Many nations fear that to separate the treatment of biological weapons from that of chemical weapons would be to put off chemical disarmament indefinitely.

The divergent approaches were reflected in draft conventions submitted to the CCD and the UN General Assembly.

Draft convention on BW

On 10 July 1969, the United Kingdom tabled in the CCD a draft convention providing for undertakings: never, in any circumstances, by making use for hostile purposes of microbial or other biological agents causing death or disease by infection or infestation in man, other animals, or crops, to engage in biological methods of warfare (Article I); not to produce or otherwise acquire, or assist in or permit the production or acquisition of microbial or other biological agents of types and in quantities that have no independent peaceful justification for prophylactic or other purposes, as well as of ancillary equipment or vectors the purpose of which is to facilitate the use of such agents for hostile purposes; not to conduct, assist or permit research aimed at production of the kind prohibited above; to destroy, or divert to peaceful purposes, within three months after the convention comes into force for a given party, any stocks of such agents or ancillary equipment or vectors as have been produced or otherwise acquired for hostile purposes (Article II).

Any party believing that biological methods of warfare have been used against it would be entitled to lodge a complaint with the UN Secretary-General, submitting all evidence at its disposal, and request that the complaint be investigated and that a report on the result of the investigation be submitted to the Security Council; any party believing that another party has acted in breach of other undertakings under the convention would be entitled to lodge a complaint with the Security Council and request that the complaint be investigated (Article III).

Each party would affirm its intention to provide or support appropriate assistance to any other party, if the Security Council concludes that biological methods of warfare have been used against that party (Article IV).

The preamble reaffirmed the validity of the 1925 Geneva Protocol and Article VI stated that nothing contained in the convention shall be construed as in any way limiting or derogating from obligations assumed under the Protocol.

Special provision was made for negotiations on effective measures to strengthen the existing constraints on the use of chemical methods of warfare (Article V).

The United Kingdom stressed that the convention would not prohibit the

development of a passive defensive capability against biological warfare. It did not make it clear, however, whether it was permitted under such justification to develop new biological warfare agents.

The UK delegation submitted, as a document complementary to the draft convention, a draft Security Council resolution by which the UN Secretary-General would be requested to take measures enabling him to investigate without delay complaints lodged with him, as well as complaints with the Security Council, if so requested by the Council; and the Security Council would declare its readiness to give urgent consideration to complaints lodged with it, and to any report that the Secretary-General may submit on the result of his investigation of a complaint, and to consider urgently what action should be taken or recommended in accordance with the UN Charter, if it concluded that the complaint was well-founded. [10]

On 26 August 1969, taking account of some of the critical remarks made by different delegations, the United Kingdom revised the text of its draft by introducing the following amendments:

The undertaking by a party not to engage in biological methods of warfare (Article I) was now qualified by the clause: "insofar as it may not already be committed in that respect under Treaties or other instruments in force prohibiting the use of chemical and biological methods of warfare." The purpose of the amendment was to make it clear that existing commitments under the Geneva Protocol and other agreements were not affected by the draft convention; some countries in becoming parties to the convention would undertake additional commitments under Article I, others would not. The ban was extended to cover microbial or other biological agents causing damage in addition to those causing death or disease (Article I).

To emphasize the right to develop defence measures, which would include in particular vaccines for protection against possible biological attack, the exception to the prohibition of production or acquisition was modified to read: "independent justification for prophylactic or other peaceful purposes" (Article II).

The complaints lodged with the Security Council would have to be supported by all evidence at the disposal of the complaining party, as in the case of complaints lodged with the UN Secretary-General (Article III).

To avoid the impression that negotiations on chemical weapons would aim at a convention more limited in scope than the draft convention on biological weapons, the words "the use of" were dropped in Article V, to read "effective measures to strengthen the existing constraints on chemical methods of warfare".

A change was also made in the related draft Security Council resolution by adding a preambular paragraph which reaffirmed the right of individual

and collective self-defence recognized in Article 51 of the UN Charter. [11]

The Netherlands suggested that the undertaking not to produce should apply to biological agents "that are not exclusively required for prophylactic or protective purposes" and to leave out from the corresponding part of Article II of the draft the word "independent" which could lead to confusion, and also the term "peaceful" which may be interpreted by some as permitting "passive defence". The United Kingdom agreed to delete the word "independent", but felt that the substitution of "protective purposes" for "other peaceful purposes" would place too restrictive an interpretation on the legitimate peaceful uses which would be exempt from the prohibitions.

The United States, whose policy on toxins is now identical to its policy on biological programmes, proposed to include toxins in the UK draft convention because the production of bacteriological toxins in any significant quantity would require facilities similar to those needed for the production of biological agents. Though toxins of the type useful for military purposes could conceivably be produced by chemical synthesis in the future, the end products would be the same in the effects of their use and those effects would be indistinguishable from toxins produced by bacteriological or other biological processes. The United States also suggested the deletion in Article I of the phrase "by infection or infestation" in order to put the emphasis of the prohibition on the agents themselves rather than on the manner in which a disease is introduced.

Article I, as proposed by the USA, would provide for an undertaking never, in any circumstances, by making use for hostile purposes of microbial or other biological agents or toxins causing death, damage or disease to man, other animals or crops, to engage in biological methods of warfare.

Article II would also undergo a modification, so as to include toxins in the convention's prohibitions and requirements concerning production, acquisition, research and destruction. [12]

The UK considered that the formulation of its draft already covered the prohibition of production and acquisition of toxins but agreed to making a specific mention to that effect and accepted the US amendments. [33] (For the text of the revised UK draft convention of 18 August 1970, see reference section 3B.3, page 446.)

The United Kingdom's draft was criticized chiefly for not dealing with chemical weapons. The amendment concerning toxins was found insufficient by the critics, and a mere assurance, that negotiations on measures to strengthen the existing constraints on chemical methods of warfare would be pursued, was considered inadequate.

Some considered the complete prohibition of use of biological weapons, that is even in self-defence or retaliation, as a step forward when compared

to the Geneva Protocol; others thought that its inclusion in a convention dealing with production was unnecessary and, because it was confined to B weapons, even a risky undertaking.

The need was stressed for some system of inspection to ensure abidance by the commitment not to produce B weapons, irrespective of the complaints procedure. (The problem of verification is dealt with in more detail in a later section.)

Draft convention on CBW

On 19 September 1969, Bulgaria, Byelorussia, Czechoslovakia, Hungary, Mongolia, Poland, Romania, Ukraine and the USSR submitted to the twenty-fourth UN General Assembly a draft convention prohibiting both chemical and biological weapons.

The undertakings provided for were: not to develop, produce, stockpile or otherwise acquire CB weapons (Article 1); to destroy within a specified period or to divert to peaceful uses all previously accumulated CB weapons (Article 2); not to assist, encourage or induce any particular state, group of states or international organizations to develop, produce or otherwise acquire and stockpile CB weapons (Article 3). Each party shall be internationally responsible for compliance with the provisions of the convention by legal and physical persons exercising their activities in its territory, and also by its legal and physical persons outside its territory (Article 4); it would take the necessary legislative and administrative measures to prohibit the development, production and stockpiling of CB weapons and to destroy such weapons (Article 5). The parties would consult one another and cooperate in solving any problems which may arise in the application of the provisions of the convention. The convention would enter into force after the deposit of a specified number of instruments of ratification, including those of the permanent members of the UN Security Council. [13]

In response to criticism concerning the inadequacy of the verification system, Hungary, Mongolia and Poland suggested, on 14 April 1970, the inclusion of a new article by which each party would be entitled to lodge a complaint with the UN Security Council. Such a complaint should include all possible evidence confirming its validity as well as a request for its consideration. The Security Council shall inform the parties of the result of the investigation. A draft was also proposed of a special Security Council resolution declaring the readiness of the Council to consider any such complaints and to take all the necessary measures for their investigation. [14] (The text of this convention and amendments are on page 449.)

The fact that the draft convention dealt with both chemical and biological weapons was widely welcomed. The draft was found deficient with regard

to verification and control. The inclusion of a complaints procedure, patterned after the corresponding clause of the UK draft, muted the criticism to some extent, but failed to remove it altogether. The United States said that it would have no way of knowing, if the draft convention of the Socialist countries were to be adopted, whether the chemical weapons possessed by the Soviet Union had been destroyed pursuant to the convention or whether the Soviet Union was continuing to produce chemical munitions or was retaining a capability to produce such munitions. The method of consultation between the parties, as proposed in the draft, was considered lacking in precision. Some delegations pointed out that a state cannot be held responsible for acts committed by unauthorized individuals outside its territorial limits and that Article 4 of the draft was therefore unenforceable. Moreover, the requirement that the convention should be ratified by all the permanent members of the UN Security Council could delay indefinitely the entry into force of the CBW prohibition.

Important objections were also raised with regard to the very object of the prohibition. The draft is limited to banning weapons as end-products. This could mean that the development, production and stockpiling of agents or their intermediates would be permitted as long as they were not "weaponized", that is, put into munitions, and that the components of weapons would not be abolished. Under such circumstances, the parties would preserve the capability for quick, if not immediate, retaliation and also the right to do so, since the draft makes no provision for banning the use of chemical and biological weapons, and the Geneva Protocol does not provide for absolute prohibition of use either.

The United States stated that the draft convention of the Socialist countries could not be a basis for negotiation. [34]

The problem of verification

In the view of the United Kingdom, verification in the sense in which the term is normally used in disarmament negotiations is not possible in the field of biological warfare. A provision therefore was made in the UK draft convention for a complaints procedure to deter would-be violators. Quick and automatic investigation—contended the UK—should be possible where a party alleged that biological methods of warfare had been used against it because, in that case, the complainant would provide all the facilities for carrying out an investigation. In other cases, facilities for conducting an inquiry would have to be provided by the accused party. The investigating body would establish the types and quantities that were in production and report the justification for that production offered by the state concerned. It would then be for the UN Security Council and for individual

parties to decide whether the justification was adequate and to act accordingly.

It was suggested that a roster of experts to be made available for investigation should be provided for and kept by the UN Secretary-General.

With regard to an agreement covering chemical weapons, the United Kingdom saw the main difficulty in reducing the risk of entering into such an agreement to an acceptable level: verification measures involving intrusiveness were unacceptable to a number of states, while the likelihood of detecting violations through external means, such as observation satellites and remote sensors, was low. [35]

The United States attached paramount importance to controlling a ban on C weapons. It pointed out that the capacity for producing chemical warfare agents grew out of, and was linked to, the commercial industry. It quoted data showing that the raw materials for various CW agents, and even some agents themselves, were produced in vast amounts in a great many locations throughout the world. [9] It also maintained that the production of chemical nerve agents involved chemical processing in which the production facilities and equipment utilized were similar to the equipment and processes used by a major segment of the world chemical industry. The problem of identification of nerve agent production facilities could not therefore be solved by off-site observation. [17] As to economic data monitoring, the United States considered that under optimum conditions such monitoring could be of ancillary use, but alone would not provide an answer to the verification problem. [36] The conclusion arrived at was that progress in eliminating C weapons depended upon developing reliable international verification arrangements, involving inspection techniques, so as to have confidence that whatever bans are placed on such weapons were being observed. The United States admitted that it was unable to define the measures needed for reliable verification; the problem required further study.

The position of the Soviet Union and other Socialist states on the question of ascertaining whether or not CB weapons are being produced was that any system of verification would be impractical in view of the specific features of chemical and bacteriological substances: the process of manufacturing such substances for peaceful purposes was essentially no different from that of their production for military purposes. They asserted that control of an international character would be tantamount to the intrusion of foreign personnel in chemical and biological enterprises: "There would have to be a controller in every pharmacy, drug store, garage or any place where chemical and bacteriological (biological) weapons might be produced." Their conclusion was that such a procedure was impossible and that it would be

more appropriate to leave control to the national governments which would see to it that no firm, juridical or physical person, would produce chemical and biological weapons; any problems which may arise in the application of the provisions of the convention could be solved by the parties through consultation and co-operation.

The chief emphasis was placed by the Socialist countries on legislative and administrative measures as safeguards at the national level. Such measures proposed by them, as well as by others, included:

Placing under civilian administration or control all institutions now engaged in research, development and production in the field of C and B weapons; enactment of law or laws on the prohibition of research for weapons purposes, development, production and stockpiling, as well as on the elimination of existing stocks and the abolition of testing fields and installations serving the production of CB weapons; establishment of a special government agency, on the pattern prescribed in the Single Convention on Narcotic Drugs, for the purpose of ensuring compliance with the CBW convention; introduction of a national system of compulsory registration of CB agents which could be converted into weapons; control of the import and export of such agents; control of the manufacture, import and export of equipment and apparatus that could be used for the production of CB weapons; deletion from army manuals of all instructions related to the use of CB weapons, except for sections dealing with protection; inclusion in the textbooks dealing with chemistry and biology of an indication that the use of CB agents for any warlike purposes constitutes a violation of international law and is liable to prosecution. Mexico felt that individuals could be active participants in the denunciation of treaty violations and thus become agents of disarmament and champions of the interests of the international community.

It was suggested that a clause be added to the convention which would provide for holding a review conference on a regular basis. The conference could, in the light of new developments in science and technology, recommend to the parties other appropriate measures to be applied in order to secure further the implementation of the convention.

The Socialist states envisaged the possibility of on-site inspection, if and when the UN Security Council decided to conduct such inspection under the complaints procedure.

The complaints procedure provided for in both draft conventions was generally considered an important part of the verification system. The formula was expected to function as a restraint, though in the view of a number of delegations it needed greater precision from the procedural point of view as well as with regard to results that would ensue if the Security Council

were to be convinced of the accuracy of an alleged breach of the obligations. Some countries favoured a graduated approach beginning with complaints lodged with the UN Secretary-General or a specially set up international organ preferably upon consultation between the states concerned. A system of "verification by challenge", outlined by Sweden, would permit a party under suspicion of having violated its engagements to free itself from that suspicion through the supply of relevant information, not excluding invitation to inspection. The resort to the Security Council could then be an ultimate step.

Attitudes to the adequacy of administrative undertakings plus a complaints procedure were varied and rather tentative, but most nations, apart from the Socialist group, considered them to be insufficient for CW disarmament. It was asked how a suspicion that a violation had been committed was to be established to justify a complaint. The requirement for international control arrangements was repeatedly emphasized. Some proposals to this effect were:

1. International exchange of information on pertinent peaceful, scientific, technical and other activities.
2. Compulsory reporting on chemical and biological agents, applying to both qualitative and quantitative factors, an international organ having the duty of receiving, storing, analysing and distributing the information contained in the reports. (Tentative lists of agents subject to prohibition and reporting were prepared by Sweden and Japan.)
3. Appropriately regulated access to institutions which prior to the ban were engaged in research, development, production and testing of CB weapons, as well as to institutions which by their nature could be engaged in such activities (lists of such facilities to be declared by governments).
4. Control from the air by satellites and other devices for remote detection.
5. Tracing in each state the flow of materials which may be used for the production of the most dangerous agents, by checking the amount of their output, import and export, or the amount of their consumption for different purposes.

In the view of the non-aligned countries represented in the Disarmament Committee, verification should be based on a combination of appropriate national and international measures, which would complement and supplement each other, thereby providing an acceptable system which would ensure effective implementation of the prohibition. [32]

A number of countries favour the convening of a group of experts to study the problem of control in its entirety, especially over chemical weapons. Italy submitted specific suggestions as to how such a group should function. [15] The Soviet Union, however, thought that consideration of the

CBW prohibition should not be channeled into a discussion of technical details, since the problem was essentially political. [37]

Conclusion

While B weapons appear likely to be unreliable and of little effectiveness, C weapons appear less so, and there is hesitation about getting rid of them. This hesitation finds expression in insistence on standards of verification that may be impossible of fulfillment politically, if not technically. It follows that the prospects for an early conclusion of a convention prohibiting the production and stockpiling of both chemical and biological weapons are not good. There may even be a risk that pursuit of the technicalities of verification will become a convenient way of avoiding the political decision concerning the ban. The United States formally declared that to insist on a single agreement would be to resign oneself to no concrete advance for a considerable period of time.

An alternative would be the signing of a treaty banning only biological weapons with the understanding or a pledge that talks on extending the ban to chemical weapons would continue. If the Soviet Union agrees to this course, the existing UK draft convention may provide a basis for agreement, since apart from its partial approach it does not seem to contain many provisions objectionable to the Socialist states.

However, the value of such a measure would not be much greater than that of uniform unilateral renunciations if they were now forthcoming from all the major powers.

Still another possibility is a treaty which would ban biological weapons and, at the same time, provide for a cut-off of production and non-transfer between countries of at least the most lethal chemical agents, suitable only for use in war. The danger of chemical warfare would not, of course, be eliminated through such a measure, considering the quantities of chemical weapons already accumulated, but a halt would be called to proliferation of those weapons, both vertical and horizontal, and experience gained in the implementation of the treaty might facilitate further progress towards complete elimination of CB weapons.

Part 2. Other disarmament measures

Chemical and biological warfare and the sea-bed treaty were the two main items on the disarmament agenda in 1969. This chapter reports very briefly on four other items: the state of play with the non-proliferation treaty, the cessation of nuclear tests, military aspects of radiological and laser technology, and the disarmament decade.

Non-Proliferation Treaty¹⁰

On 5 March 1970, when the United States and the Soviet Union deposited their instruments of ratification (the United Kingdom had ratified earlier), the Treaty on the Non-Proliferation of Nuclear Weapons entered into force.

However, the full success of the NPT is not yet assured. Some states with advanced nuclear technology, such as Israel, South Africa, India, Pakistan, Brazil and Argentina, have not signed the treaty. Other highly industrialized states, such as the Federal Republic of Germany, Italy, Switzerland, Japan and Australia, have signed it, but not ratified. Their declared reason for not ratifying the treaty is that the modalities of verification of the fulfillment of the obligations have yet to be worked out with the International Atomic Energy Agency. The main problem involved is how detailed the control should be.

There is a time-table established in the NPT for the conclusion of verification agreements with the IAEA. Negotiation of such agreements shall commence within 180 days from the original entry into force of the treaty. For states depositing their instruments of ratification or accession after the 180-day period, negotiation of such agreements shall commence not later than the date of the deposit. The agreements shall enter into force not later than eighteen months after the date of initiation of negotiations. Thus, at the latest two years after the coming into force of the treaty, i. e., on 5 March 1972, the first agreements must be ready for application.

As of mid-June 1970, only four states had indicated their readiness to enter into negotiations with IAEA: Bulgaria, Czechoslovakia, Hungary and Poland. In July 1970, an IAEA committee drew up a model agreement on safeguards.

Two of the present nuclear-weapon powers have not adhered to the treaty—France and China. France has declared, however, that it would not act against the aims of the NPT. China, which is opposed to the treaty, has not made a similar pledge, but it does not seem likely that it would proliferate nuclear weapons.

According to article V of the NPT, potential benefits from peaceful applications of nuclear explosions should be made available to non-nuclear-weapon states. Technical aspects of the problem have been dealt with within the framework of the IAEA, as well as bilaterally in talks between the Soviet Union and the United States.

Sweden and Mexico felt that work should be soon initiated on the overall agreement or agreements concerning peaceful explosions. Sweden sug-

¹⁰ This was extensively discussed in the *SIPRI Yearbook 1968/69*, pages 159-171.

gested that the following considerations be taken into account: the disarmament interests must be protected, so as not to prejudice the need for a comprehensive ban on nuclear-weapon tests; the benefits of peaceful explosions should be made available to non-nuclear-weapon states on a non-discriminatory basis; the decision-taking as to the propriety and priority of a particular project involving a nuclear explosion for a peaceful purpose should be international, not bilateral or unilateral, responsibility; the interests of less-developed countries must be protected through a system of obligatory licensing of each project; any obstacles to efficient application of peaceful nuclear explosions, such as cratering projects as well as some other underground explosions, which might lead to violations of the prescription in the partial test-ban treaty against over-border leakages of radioactivity, may have to be removed by amendments; provision should be made so that when a comprehensive test ban has been achieved national projects also within the nuclear-weapon states will be added to those which have to be licensed by international decisions.

In the opinion of Sweden, the IAEA must be equipped to observe and control the execution of a project in order to make sure that it is conducted in accordance with existing international rules; the Agency should also be able to help finance such projects as are envisaged to take place in less-developed countries. The political task of finally deciding if a certain project is sound and therefore eligible for international licensing must be allotted to a separate international body outside the formal framework of the IAEA but inside the framework of the United Nations.

Cessation of nuclear tests

Following up the discussions initiated during the spring 1969 ENDC session, several more working papers and proposals concerning an underground nuclear weapon test ban were submitted to the summer 1969 CCD¹¹ session.

The CCD considered the suggestion¹² to establish through international co-operation a voluntary exchange of seismological data in order to create a better scientific basis for evaluation of seismological events. Sweden submitted a working paper describing the Hagfors Seismological Observatory in Sweden, as a contribution towards a better understanding of the control problems connected with a treaty banning underground nuclear weapon tests. The United Kingdom submitted a working paper [18] on research into techniques for distinguishing between earthquakes and underground explo-

¹¹ Renamed CCD at the summer 1969 session.

¹² The original suggestion was made by Canada at the spring 1969 ENDC session. See the *SIPRI Yearbook 1968/69*, page 178.

sions. It stated the United Kingdom's conclusion that seismological verification of a test ban over large areas is limited to yields of about 10 kt and over, and even this capability assumes that modern equipment replaces that of the standard stations; to lower the identification threshold it may be necessary to consider new systems.

The question of an exchange of seismological data was discussed at an informal meeting on a comprehensive test ban, held on 13 August 1969 at the request of the Canadian delegation. The Canadian delegate said that his country's working paper [19] proceeded on the assumption that the problems of verifying a comprehensive test ban would decrease provided an exchange of original seismological data could be assured. The US delegate expressed support for the Canadian proposal. [20]

On 17 November 1969, there was submitted to the United Nations General Assembly a draft resolution [21] concerning seismic exchanges. The Soviet Union said that it was ready to engage in an exchange of seismological data, but not data on seismic stations. The Soviet delegate also stated that his government considers that participation in an international exchange of seismological data should not impose upon participating countries any obligation to submit to international inspection on their territory and that evaluation of the information resulting from the exchange should not be carried out by an international body but by each state for itself. [22]

On 16 December 1969, the General Assembly adopted a resolution asking the Secretary-General to transmit to governments a request for certain information about seismic stations—in particular a list of all seismic stations from which the government concerned would be prepared to supply records on the basis of guaranteed availability and to provide data about each station, in particular the co-ordinates and the instrumentation. Pursuant to the resolution, the Secretary-General circulated a note soliciting responses to a questionnaire which specified the necessary details that governments were invited to submit.

By July 1970, fifty-four returns were available: thirty-three countries reporting information for seismograph stations on their territory, fifteen countries reporting no operational seismograph stations on their territory, and six countries indicating that in their view the purposes of the resolution were unnecessary, or preferring to maintain a voluntary form of seismological data exchange and including no data on seismograph stations in their returns. [38]

Canada submitted a preliminary assessment of world-wide seismological capabilities in detecting and identifying underground nuclear explosions, based on the information submitted in response to the UN questionnaire. It described the verification capabilities, in terms of seismological body

wave magnitudes, of those parts of the present seismographic resources which are explicitly available for a global data exchange. [39]

The UK in a working paper on verification tried to determine, in terms of explosion yields and body wave magnitudes, the verification capabilities of a hypothetical global system of twenty-six array stations. [40]

Sweden compared the identification capabilities of the two systems in terms of the yield of underground nuclear explosions in hard rock, by interpreting the body wave magnitude limits given in the two above-mentioned papers. [41]

The United States presented a report on Project Rulison, an experiment carried out on 10 September 1969 under the US Atomic Energy Commission's Plowshare programme to develop peaceful uses of nuclear energy. The purpose of this report was to present a résumé of seismic data, including travel times and the amplitudes of the principal phases and the associated body—and surface—wave magnitudes. [42] The United States also said that the Norwegian Seismic Array (NORSAR) in southern Norway, constructed with US assistance, was approaching full operational status; also the Alaskan Long Period Seismic Array (ALPA) north of Fairbanks, was nearing completion. By the end of 1970, data from ALPA and NORSAR would be transmitted in real time, i.e., as the event was happening, to the Seismic Array Analysis Center in Washington for recording and processing, as was already the case with data for the Large Aperture Seismic Array (LASA) in Montana. The data would be stored on magnetic tapes and made available to all at nominal cost.

It was generally recognized that though the resources for test-ban monitoring had much improved during the last year and new improvements were in sight, further progress towards a comprehensive test-ban treaty depended to a considerable extent on the kind of agreement which might emerge from the Strategic Arms Limitation Talks between the Soviet Union and the United States.

The United Kingdom recalled its proposal for a quota of nuclear tests on a descending scale, and said that it would be of value in a situation in which agreement on a comprehensive ban had been reached in principle but the super powers were not yet ready to accept the immediate suspension of all tests.

Military aspects of radiological and laser technology

Upon the initiative of Malta, the twenty-fourth UN General Assembly invited the CCD to consider effective methods of control against the use of

radiological methods of warfare independently of nuclear explosions, and recommended that, in the context of nuclear-arms-control negotiations, the need for effective methods of control of nuclear weapons that maximize radioactive effects be examined. [23] The General Assembly also recommended consideration of the implications of the possible military applications of laser technology. [24]

On 14 July 1970, the Netherlands, in special working papers submitted to the CCD, expressed the following views with regard to radiological warfare and laser technology.

Judging by the available information, possibilities for radiological warfare existed theoretically, but did not seem to be of much or even of any practical significance. Therefore, there was no practical usefulness in discussing arms-control measures related to radiological warfare. [25]

Laser technology could be used for communications systems and optical computers, both of which could have military uses. They could also be used instead of radar for measuring distances, for surveillance and reconnaissance purposes, as well as for navigation systems and detection of submarines. Laser beams could be used to designate targets to be attacked by bombs, missiles or artillery. Future applications were conceivable for defence against missiles, including ballistic missiles, low-flying planes, tanks and for night-fighting. They might also be used as mass-destruction weapons in outer space and to replace fissionable material to set off thermonuclear weapons. The conclusion was that while the conceivable military applications of laser technology for weapons purposes did not seem to substantiate the need for arms-control consideration at this time, it seemed appropriate to follow attentively further developments in this field with a view to possible future arms-control discussion. [26]

A good number of CCD members seemed to share the above opinion.

Disarmament decade

On 16 December 1969, as a result of the initiatives of the Romanian delegation to the CCD and of the UN Secretary-General, the UN General Assembly declared the decade of the 1970s as a Disarmament Decade and requested the CCD to work out a comprehensive programme dealing with all aspects of the problem of the cessation of the arms race and general and complete disarmament under effective international control. [27] The resolution was adopted with no dissenting vote, with thirteen abstentions including those of France and the Soviet Union. The latter objected to establishing a timetable for disarmament measures and expressed apprehension lest a proclama-

tion of the decade foster an illusion that such complex problems could be programmed.

The question of a comprehensive disarmament programme received considerable attention at the summer 1970 session of the CCD.

The United States believed that at present negotiable measures in the CCD were: an agreement banning B weapons, the prohibition of weapons of mass destruction on the sea-bed, a comprehensive test-ban treaty, and the cessation of production of fissionable material for weapons purposes.

The United States recalled the principles it had put forward in 1966 for regional conventional arms limitation agreements: the arrangement should contain an undertaking by the affected countries not to acquire from any source, whether indigenous production or importation, those types of military equipment which they agree to regulate; the initiative should come from within the region concerned; the arrangement should include all states in the region whose participation is deemed important by the other participants; potential suppliers should undertake to respect the regional arrangement by not supplying the prescribed types of equipment to the affected countries; the arrangement should contribute to the security of the states concerned and to the maintenance of a stable military balance; adequate provision should be made for satisfying all interested parties that the arrangement is being respected.

The following guidelines were proposed in this connection: One or more countries in a region might unilaterally undertake not to acquire certain types of expensive, technologically advanced combat equipment; the cumulative effect of unilateral decisions by a number of countries might lead to the *de facto* exclusion from the region of major items of military equipment and the resulting stabilization of the arms situation in the region could then serve as the basis for formal agreement along the above-enumerated principles. States outside the region, capable of supplying the equipment in question might similarly undertake, after consultation with the countries having taken the initiative, not to turn over the specified types of equipment to the countries involved; this would create an additional guarantee against the acquisition of the specified types of equipment by countries in the region, which could be incorporated in an appropriate agreement. Countries might unilaterally undertake to make available to others in the region information regarding national policies as to production, purchase or supply of arms; the information could be disseminated through existing regional organizations. [43]

Canada accorded priority to a sea-bed treaty, the elimination of CB weapons and the question of international seismic data exchange in the context of a test-ban treaty. It also thought that the time was ripe for consideration

of a freeze of military budgets as an initial measure leading to a balanced reduction of armaments and armed forces.

The Netherlands suggested that the programme to be elaborated should comprise: measures to increase confidence, measures to prevent armament, measures to limit armament, measures of disarmament, general and complete disarmament. It stressed that a balance between nuclear and conventional measures should be taken into account and attention should be given to the increasing arsenals and the trade in conventional armaments. Regional, bilateral and multilateral actions would provide wide options in the context of the disarmament decade.

Sweden proposed that the Disarmament Conference gradually extend its consideration of weapons of mass destruction to all such means of warfare which through large-scale use may cause unnecessary sufferings for civilian populations. It also thought that the time had come for arms-limitation measures, particularly "freezes". In the nuclear field this meant, apart from a comprehensive test-ban treaty and a cut-off of fissionable material production, a moratorium on testing and deployment of sophisticated delivery systems. The partial sea-bed draft treaty should lead to the demilitarization of the sea-bed; the 1925 Geneva Protocol should be strengthened by prohibiting production, testing and stockpiling of CB weapons; and the Treaty of Tlatelolco should be followed by the establishment of nuclear-free zones in other regions. A constant balance sheet should be kept which would compare changes in armaments on the one hand and disarmament on the other. *Pari passu* with disarmament, a strengthening must take place of the United Nations machinery for establishing friendly relations, for settling disputes, for keeping watch on conflicts, for equipping task forces to observe and supervise standstill and other similar agreements, and for peace-keeping activities in general. [16]

Yugoslavia singled out the following confidence-building measures to be contained in the programme: a convention banning the use of nuclear weapons; stopping the escalation of military presence on foreign territories and gradual military disengagement on a regional basis; refraining from manifestation of force, such as the holding of maneuvers near other countries; reduction of military budgets. In the list of measures for preventing and restricting armaments, which had also been proposed by others, Yugoslavia included a treaty banning the production of nuclear weapons.

Japan suggested, among other things, the freezing of the military balance in specific areas or regions of conflict and controlling the export of conventional arms to those areas or regions.

Italy proposed to initiate studies relating to the question of the reduction of armed forces and conventional armaments, and in particular to examine

the following points in depth: relationship between nuclear disarmament and the beginning of reductions in conventional means of warfare; determination of the geographical areas within which the first reductions in conventional means of warfare would take place; elaboration of technical criteria necessary for the implementation of reductions; relationship between armament reductions and controls. It asked for a commitment to open negotiations on a first round of reductions of armed forces and armaments.

Romania suggested prohibition of military maneuvers on the territories of other states; liquidation of foreign military bases; withdrawal of foreign troops and suppression of military blocs. It recalled its proposal for the establishment of a nuclear-free zone in the Balkans.

Poland said that the planned conference on European security may establish a permanent body to negotiate measures of regional disarmament. After the entry into force of the Non-Proliferation Treaty on the territory of European non-nuclear states, Poland would propose measures of regional nuclear disarmament in Europe.

Brazil, supported by some non-aligned countries, insisted that a link be established between savings resulting from disarmament measures and promotion of economic expansion of developing countries.

The Soviet Union reiterated its plea for general and complete disarmament, but also stressed the importance of partial disarmament measures.

It was generally recognized that one of the prerequisites for progress towards significant measures of disarmament, especially in the nuclear field, was the participation of all militarily important states, in the first place the People's Republic of China and France.

The UN Secretary-General saw the need for greater publicity concerning both armaments and disarmament and said that the United Nations could assemble and provide information along the lines of the Armaments Yearbook published by the League of Nations, which contained information on the level of armaments and armed forces, on military expenditures and on trade in arms. He also proposed that a comprehensive study be undertaken of the economic and social consequences of the armaments race and of massive military budgets. [28]

On 27 August 1970, Mexico, Sweden and Yugoslavia submitted to the CCD a draft comprehensive programme of disarmament. The document contained principles and proposals as to elements and phases of the programme and procedures for its implementation, and stated that the aim of this comprehensive programme was to achieve tangible progress in order that the goal of general and complete disarmament under effective international control may become a reality in a world in which international peace and security prevailed, and economic and social progress were attained. [44]

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Part II. Special Article

The Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco)

This section was written by Dr Alfonso García Robles, Mexican Under-Secretary of State for Foreign Affairs. Dr Robles was Chairman of the Preparatory Commission for the Denuclearization of Latin America.

On 14 February 1967 an international instrument establishing the first nuclear-weapon-free zone covering territories densely inhabited by man was opened for signature. This instrument is the Treaty for the Prohibition of Nuclear Weapons in Latin America, known also as the “Treaty of Tlatelolco”, the Aztec name of the historic quarter in Mexico City where the treaty had been approved two days earlier. The treaty was the result of some four years of pioneer work by the Latin American states. Its importance can be appraised easily: it defines a zone entirely free of nuclear weapons which, once the treaty has entered into force for all the countries in the area, will cover more than 20 million square kilometers and, at the present level of population density, will be inhabited by some 260 million human beings. Today this zone already covers a territory of nearly 6 million square kilometers with an approximate population of 100 million inhabitants.

This section gives a summary of the background and main aspects of the treaty and its two additional protocols.

Brief negotiating history

On 29 April 1963, five Latin American presidents drafted a joint declaration¹ in which, in the name of their peoples and governments, they announced that the latter were “prepared to sign a multilateral Latin American agreement whereby they would undertake not to manufacture, receive, store or test nuclear weapons or nuclear launching devices”.

Seven months later, on 27 November 1963, the United Nations General Assembly approved resolution 1911 (XVIII), entitled “Denuclearization of Latin America”, invoking in forthright terms the support and encouragement of the world community for the initiative embodied in the declaration,

¹ UN document A/5415/Rev.1.

noting that initiative “with satisfaction” and expressing the hope that the states of Latin America would initiate studies “concerning the measures that should be agreed upon with a view to achieving the aims of said declaration”. The Assembly furthermore requested the UN Secretary-General to extend “to the States of Latin America, at their request, such technical facilities as they may require in order to achieve the aims set forth” in the declaration.

After the closure of the eighteenth session of the General Assembly, the Mexican Ministry of Foreign Affairs initiated active consultations with the foreign ministries of the other Latin American republics on the measures likely to be most effective for carrying out the recommendations of resolution 1911 (XVIII).

The outcome of these consultations was the Preliminary Meeting on the Denuclearization of Latin America (REUPRAL). At this meeting, which took place in Mexico from 23 to 27 November 1964, two basic resolutions were adopted: the first defined the term “denuclearization”, specifying that it should mean solely “the absence of nuclear weapons” and not the prohibition of the peaceful use of the atom which, on the contrary, should be encouraged, especially for the benefit of the developing countries; the second established the Preparatory Commission for the Denuclearization of Latin America (COPREDAL) and instructed the commission to prepare a draft treaty on the subject.²

Four months later, the preparatory commission held its first session. It was attended by observers from the Netherlands and Yugoslavia, the first time observers from another continent were present. During this session, the commission adopted its rules of procedure, based on those of the UN General Assembly, and set up a co-ordinating committee and three working groups, designated by the first three letters of the alphabet, each with clearly defined and urgent tasks to carry out.³

The three working groups laboured hard in the interval between the first and second sessions, and when the latter was opened on 23 August 1965, the commission had before it their respective reports. One of these, that of working group B, included a preliminary draft of articles on verification, inspection and control, prepared with the aid of a very full digest of all the available material on the subject supplied by the Secretary-General of the United Nations, and with the technical advice of the Chief of the UN Disarmament Affairs Division.

At its second session, the commission considered this preliminary draft and transmitted it to the governments. It also approved a general declaration

² UN document A/5824.

³ UN document A/5912.

of principles (later to become, with slight modifications, the preamble to the treaty) and established a negotiating committee whose main task was to obtain from the nuclear powers a commitment to respect the legal statute of the military denuclearization of Latin America, as it would be embodied in said international treaty.⁴

The interval between the second and third sessions of the preparatory commission was the longest between any two meetings of the commission. But the seven and one-half months that passed before the commission sat again were far from wasted. For a considerable part of that time either the negotiating committee or the co-ordinating committee was hard at work. The former submitted to the commission a full report on the results of the negotiations it had held with the representatives of the nuclear states while the twentieth session of the UN General Assembly was in progress. The efforts of the latter produced a succinct working document in the form of a preliminary draft treaty which gave the commission its first text presenting a general picture of the problems which it would face in preparing the denuclearization treaty.

This working document was elaborated on the basis of three documents: the preliminary draft of the articles on verification, inspection and control, prepared the year before by working group B; a preliminary draft treaty submitted by the Government of Mexico; and some observations communicated by the Government of Chile. Together with a draft treaty submitted jointly by the delegations of Brazil and Colombia shortly after the session began, the working document served as background material for the unanimous adoption of the "Proposals for the Preparation of the Treaty on the Denuclearization of Latin America". It was rightly said at the time that these "proposals" would have, as an immediate antecedent to the treaty, a title even more outstanding than that of the Dumbarton Oaks Proposals in relation to the San Francisco Charter.⁵

The number of observers attending the fourth session was greater than the twenty-one members of the Commission. (The session was attended by observers from Austria, Belgium, Canada, Republic of China, Denmark, Finland, France, Federal Republic of Germany, Ghana, India, Israel, Italy, Japan, Norway, the Netherlands, Poland, Romania, Sweden, Yugoslavia, the United Arab Republic, United Kingdom and United States.) The session was divided into two parts. The first considered only the motion submitted by various delegations for the postponement of the discussions. At the only meeting of this part, which took place on 30 August 1966, the commission received the second report of the negotiating committee, giving an account of

⁴ UN document A/5985.

⁵ UN document A/6328.

the result of the informal inquiries that the committee had been requested to make with a view to entering into contact with the Government of the People's Republic of China. The second part of the session, from 31 January to 14 February 1967, culminated in the adoption and opening for signature of the Treaty for the Prohibition of Nuclear Weapons in Latin America.

As soon as the treaty entered into force for eleven States, the depositary government (Mexico) convened, in accordance with paragraph 3 of article 28, a preliminary meeting of those states in order for the Agency for the Prohibition of Nuclear Weapons in Latin America (known by its Spanish acronym OPANAL) to be set up and commence its work. A preliminary meeting (REOPANAL)⁶ took place in late June 1969 and carried out successfully all the preparatory work necessary for the first session of the General Conference of OPANAL. The latter was inaugurated on 2 September 1969 in the presence of the Secretary-General of the United Nations and the Director General of the International Atomic Energy Agency (IAEA). After seven working days, the General Conference gave its approval to a series of basic juridical and administrative documents which provide the foundations for the new Latin American Agency.⁷

Structure of the treaty

The Treaty of Tlatelolco consists of thirty-one articles, one transitional article and two additional protocols.⁸ A study of the treaty's provisions, particularly if made in light of the proceedings of the preparatory commission, permits a full appreciation of the vast and complicated task the commission had to perform in preparing the treaty and the numerous difficult problems it was able to solve.

The purposes of the treaty and the principles upon which it is based are set forth in brief form in the preamble. Article 1 defines the obligations of the parties to the treaty. The following four articles (2-5) provide definitions of several terms used in the treaty, such as "contracting parties", "territory", "zone of application" and "nuclear weapons". Articles 7 through 11 establish the organizational and procedural structure of the Latin American Agency created by the treaty and specify the functions and powers of its principal organs: General Conference, Council, and Secretariat. The following five articles (12-16) and paragraphs 2 and 3 of article 18 are devoted to the functioning of the control system. Article 17 deals in general

⁶ UN document A/7639.

⁷ UN document A/7681.

⁸ The text is given in full in Annex 1, p. 237.

with the peaceful uses of nuclear energy and paragraphs 1 and 4 of article 18 with nuclear explosions for peaceful purposes. Finally, in addition to the usual final clauses on matters such as privileges and immunities, signature, ratification and deposit, reservations (which are not admitted), entry into force (for which an elaborate procedure, to be examined later, is established), amendments, etc., article 20 spells out the measures to be taken in the event of violation of the treaty. They consist mainly of a report thereon to be made simultaneously by the General Conference to the United Nations Security Council and General Assembly through the UN Secretary-General and to the Council of the Organization of American States, as well as “for such purposes as are relevant in accordance with its statute” to the IAEA.

Some basic provisions of the treaty

Purposes and principles

The preamble defines eloquently the treaty’s purposes and guiding principles. In it the signatory states, “faithfully interpreting” the desires of their peoples, express the firm conviction:

That the military denuclearization of Latin America—being understood to mean the undertaking entered into internationally in this Treaty to keep their territories forever free from nuclear weapons—will constitute a measure which will spare their peoples from the squandering of their limited resources on nuclear armaments and will protect them against possible nuclear attacks on their territories, and will also constitute a significant contribution towards preventing the proliferation of nuclear weapons and a powerful factor for general and complete disarmament.

Obligations of the parties

As regards the obligations of the parties to the treaty, the Latin American states have drawn up a definition which is undoubtedly one of the most comprehensive ever produced on a world or regional level. It certainly seems to have left no loopholes.

Under article 1 of the treaty, the contracting parties undertake to “use exclusively for peaceful purposes the nuclear material and facilities which are under their jurisdiction and to prohibit and prevent in their respective territories” both “the testing, use, manufacture, production or acquisition by any means whatsoever of any nuclear weapons” and “the receipt, storage, installation, deployment and any form of possession of any nuclear weapons”, by the parties themselves, directly or indirectly, on behalf of anyone else, by anyone on their behalf or in any other way.

The parties also undertake “to refrain from engaging in, encouraging or

authorizing, directly or indirectly, or in any way participating in the testing, use, manufacture, production, possession or control of any nuclear weapon”.

Organization

In order to ensure compliance with the above obligations, the treaty's articles 7 through 11 call for establishment of an international and independent organization to be known as the Agency for the Prohibition of Nuclear Weapons in Latin America. Its headquarters are in Mexico City. The Agency's supreme organ is its General Conference which will hold regular sessions every two years and which may also hold special sessions whenever the treaty so provides or when, in the opinion of the Council, circumstances require it. The Council is composed of five members of the Agency elected by the General Conference. There is also a secretariat headed by a general secretary who, like the rest of its staff, should be an international civil servant.

Verification and control

The provisions on verification and control are contained in articles 12 to 16 and article 18, paragraphs 2 and 3. As the UN Secretary-General emphasized in his message to the preparatory commission when the treaty was approved, on 12 February 1967, this marks the first time that an international treaty dealing with disarmament measures includes an effective control system with permanent organs of supervision. The system calls for the full application of the IAEA safeguards; but its scope is much greater. On the one hand, it is to be used not only to verify “that devices, services and facilities intended for peaceful uses of nuclear energy are not used in the testing or manufacture of nuclear weapons”, but also to prevent any of the activities prohibited in article 1 of the treaty from being carried out in the territory of the contracting parties with nuclear materials or weapons introduced from abroad, and to make sure that any explosions for peaceful purposes that might be carried out are compatible with Article 18 of the treaty. On the other hand, the treaty assigns important functions of control to the three main organs of the Agency for the Prohibition of Nuclear Weapons in Latin America. Moreover, it also provides for the submission by the parties of periodic and special reports, for special inspections under certain circumstances, and for the transmission of the reports on those inspections to the UN Security Council and General Assembly.

The thoroughness of the above procedures led UN Secretary-General U Thant to state, when addressing the opening meeting of the General Conference of OPANAL on 2 September 1969: “There is embodied in your

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Treaty a number of aspects of the system known as 'verification-by-challenge', which is one of the more hopeful new concepts introduced into the complicated question of verification and control."

Definition of "nuclear weapon"

The definition of the term "nuclear weapon", which the preparatory commission finally approved after considering and rejecting several drafts, was included in article 5 of the Treaty of Tlatelolco. It has the merit of being objective, precise and in accordance with the most recent technological advances. For the purposes of the treaty, "a nuclear weapon is any device which is capable of releasing nuclear energy in an uncontrolled manner and which has a group of characteristics that are appropriate for use for warlike purposes". In addition, the treaty provides that "an instrument that may be used for the transport or propulsion of the device is not included in this definition if it is separable from the device and not an indivisible part thereof".

Entry into force

The question of the entry into force of the treaty was probably that which gave rise to the most prolonged discussion in the preparatory commission and for whose solution the greatest obstacles had to be overcome. When the matter was taken up for the first time in the commission in April 1966, two distinct trends emerged. One was that the treaty should enter into force, in accordance with the generally applicable rule in such cases, between those states which had ratified it, on the date on which the respective instruments of ratification were deposited. With respect to the Latin American Agency that the treaty set up, its entry into operation should be provided for as soon as eleven instruments of ratification had been deposited, since that number would constitute a majority of the twenty-one members of the preparatory commission. The states supporting the second position, on the contrary, held that the treaty, even though it had been signed and ratified by all the states members of the preparatory commission, should enter into force only when four prerequisites had been fulfilled. Essentially these are the prerequisites appearing in paragraph 1 of article 28 of the treaty, which may be summed up as follows: signature and ratification of the treaty and of additional protocols I and II by all the states to which the three instruments in question are open for signature, and the conclusion of agreements with the IAEA on the application of its system of safeguards by all the signatory states to the treaty and to additional protocol I.

Since it was impossible to find a solution to the problem raised by these

two divergent positions at the third session, the preparatory commission incorporated into the proposals which it approved on 3 May 1966 two parallel texts, setting forth, respectively, the provisions that should appear in the treaty if the first thesis were accepted and those that should appear if the second thesis were preferred.

To settle the problem, the co-ordinating committee in its report of 28 December 1966 suggested the adoption of a conciliatory formula that might receive the support of all states members of the commission without detracting in any way from the substance of the respective positions set forth in the two alternative texts included in the proposals.

This was the formula which, with certain modifications, was finally adopted and incorporated in article 28 of the treaty. According to it, the treaty would enter into force for all signatory states only when the four requirements set forth in paragraph 1 of the article had been met. Nonetheless, paragraph 2 states:

All signatory States shall have the imprescriptible right to waive, wholly or in part, the requirements laid down in the preceding paragraph. They may do so by means of a declaration which shall be annexed to their respective instrument of ratification and which may be formulated at the time of deposit of the instrument or subsequently. For those States which exercise this right, this Treaty shall enter into force upon deposit of the declaration, or as soon as those requirements have been met which have not been expressly waived.

Paragraph 3 of article 28 provides further that:

As soon as this Treaty has entered into force in accordance with the provisions of paragraph 2 for eleven States, the Depositary Government shall convene a preliminary meeting of those States in order that the Agency may be set up and commence its work.

An eclectic system has thus been adopted which, while respecting the views of all signatory states, makes it impossible for any state to attempt to veto the entry into force of the treaty *vis-a-vis* those states which wish to submit voluntarily to the status of denuclearization as defined and enunciated in the treaty.

In view of the novel system just described, special provisions were also approved for the eventual denunciation of the treaty by the states which have become contracting parties to it by virtue of having waived the requirements set forth in paragraph 1 of article 28. For these states, the denunciation, in conformity with the transitional article of the treaty, will take effect "on the date of delivery of the respective notification", and not three months later as contemplated in article 30(2).

Use of nuclear energy (including explosions for peaceful purposes)

From the beginning of their joint discussions at the Preliminary Meeting on the Denuclearization of Latin America in November 1964, one of the fundamental concerns of the participating states—as is shown by the fact that the first resolution adopted at that meeting applied to this question—was to spell out that, for the purposes they had in mind, “denuclearization” should be understood to mean the absence of nuclear weapons but not, of course, the rejection of the peaceful uses of the atom. On the contrary, in that very same resolution they emphasized the appropriateness of encouraging international co-operation in the peaceful uses of nuclear energy, particularly for the benefit of the developing countries.

Subsequently, the second and third sessions of the preparatory commission adopted similar texts which, with slight modifications, were to become one of the paragraphs in the preamble to the treaty, drafted in the following terms:

... The foregoing reasons, together with the traditional peace-loving outlook of Latin America, give rise to an inescapable necessity that nuclear energy should be used in that region exclusively for peaceful purposes, and that the Latin American countries should use their right to the greatest and most equitable possible access to this new source of energy in order to expedite the economic and social development of their peoples.

The treaty itself establishes the right, with no limitations other than those that may flow from the obligations assumed under the treaty, to use nuclear energy for peaceful purposes, and specifically provides, in article 17, that:

Nothing in the provisions of this Treaty shall prejudice the rights of the Contracting Parties, in conformity with this Treaty, to use nuclear energy for peaceful purposes, in particular for their economic development and social progress.

It was precisely for the purpose of avoiding any misunderstanding concerning the scope of the treaty and to indicate clearly that what was intended was not civil denuclearization but only military denuclearization, that the preparatory commission decided, at its last session, to change the original name of the treaty from “Treaty for the Denuclearization of Latin America” to “Treaty for the Prohibition of Nuclear Weapons in Latin America”.

The desire to encourage and promote to the utmost the peaceful utilization of nuclear energy could not, however, have led the co-authors of the treaty to forget the primary object of the treaty which is set forth in clear, precise and unambiguous terms in article 1 of the instrument, by which the contracting parties undertake, *inter alia*:

... to refrain from engaging in, encouraging or authorizing, directly or indirectly, or in any way participating in the testing, use, manufacture, production, possession or control of any nuclear weapon.

Thus, when drafting the provisions which would later be included in article 18 dealing with nuclear explosions for peaceful purposes—which, although they still are at an experimental stage, could have future importance—special care was exercised to avoid any attempts to test or manufacture nuclear weapons under the pretext of carrying out such explosions for peaceful purposes, attempts which would completely negate the fundamental purpose involved, the very *raison d'être* of the treaty. The effort was therefore made to set up a system that would permit the carrying out of such explosions to the greatest degree compatible with the absolute, categorical and unconditional prohibition of nuclear weapons.

To this end, the first paragraph of article 18 contains the provision that the contracting parties may carry out explosions of nuclear devices for peaceful purposes, but only if they can show that such explosions are feasible without violation of “the provisions of this article and the other articles of the treaty, particularly articles 1 and 5”. In the last analysis, this means that the explosions in question may be carried out *directly* by the parties to the treaty only if they do not require the use of a nuclear weapon as defined in article 5 of the treaty.

Furthermore, article 18 goes on to state, in paragraphs 2 and 3, the obligations relating to advance information, observation, verification and control applying to any eventual nuclear explosion for peaceful purposes.

Lastly, paragraph 4 of article 18 specifies that “the contracting parties may accept the collaboration of third parties”—obviously meaning nuclear-weapon states—for the purpose set forth in the first paragraph of the article, i.e., explosions for peaceful purposes, on the condition that they comply with the measures detailed in paragraphs 2 and 3.

An objective analysis of the provisions of article 18, which must be read in light of those of articles 1 and 5, would not seem to lend itself to conflicting interpretations. Nevertheless, as is frequently the case with legal texts—such as articles 5 and 18 of the treaty—which are the result of an effort intended to conciliate divergent opinions, different interpretations with regard to the meaning and scope of those articles, especially the former, have been officially put forward, as is explained below.

Meeting of the signatories

Another aspect of the treaty which includes an unusual formula relates to the status of the signatory states.

The states signatories to the treaty, by the mere fact that they are signa-

teries, acquire certain rights under articles 6 and 29 by virtue of which they can request the convening of a meeting of all the states which are signatories of the treaty "to consider in common questions which may affect the very essence" of the instrument, including possible amendments to it. In the latter case, namely, if it is a question of considering possible amendments to the treaty, an immediate meeting of the signatories is mandatory, even though no state may have requested it. The meeting of the signatories, however, would be only consultative in nature, since the adoption of decisions would be left to the General Conference in which only the contracting parties would participate, and by this term it is meant, under article 2, those states for whom the treaty is in force.

The additional protocols

The treaty contains two additional protocols.⁹ The text of their preambles is identical: it recalls UN resolution 1911(XVIII) and states the conviction that the treaty "represents an important step towards ensuring the non-proliferation of nuclear weapons"; points out that the latter "is not an end in itself but, rather, a means of achieving general and complete disarmament at a later stage"; and expresses the desire to contribute "towards ending the armaments race". A few observations follow on the operative parts of the protocols.

Additional protocol I

Under article 1 of this protocol, those 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 would, upon becoming parties to the protocol, agree "to undertake to apply the statute of denuclearization in respect of warlike purposes as defined in articles 1, 3, 5 and 13 of the Treaty" to such territories.

One aspect which should be borne in mind in connection with this protocol is the following: it does not give those states the right to participate in the General Conference or in the Council of the Latin American Agency. But neither does it impose on them any of the obligations relating to the system of control established in article 14 providing for semi-annual reports, in article 15 providing for special reports, and in article 16 providing for special inspections. In addition, the prohibition of reservations included in the treaty's article 27 is not included in the protocol. Thus in the protocol the necessary balance has been preserved between rights and obligations: although the rights are less extensive, the obligations are also fewer. This

⁹ See the text in Annex 1, p. 252.

protocol is open for signature to France, the Netherlands, the United Kingdom and the United States.

Additional protocol II

This protocol is open for signature to states possessing nuclear weapons, that is to say, France, the People's Republic of China, the Soviet Union, the United Kingdom and the United States. According to the stipulations contained in its articles 1 through 3, the obligations assumed by the nuclear powers which become parties to the protocol are the following:

that of respecting, "in all its express aims and provisions", the "statute of denuclearization of Latin America in respect of warlike purposes, as defined, delimited and set forth" in the provisions of the Treaty of Tlatelolco;

that of not contributing "in any way to the performance of acts involving a violation of the obligations of article 1 of the Treaty in the territories to which the Treaty applies", and

that of not using or threatening to use "nuclear weapons against the Contracting Parties of the Treaty".

The above undertakings, made binding on the nuclear powers by signature and ratification of additional protocol II of the treaty, are in strict accordance with both the letter and the spirit of the exhortations of the United Nations General Assembly, repeated in many resolutions. Especially worth recalling are the provisions of UN resolution 1911(XVIII), in which the Assembly expressed its trust that the nuclear powers would "lend their full co-operation" for the effective realization of the military denuclearization of Latin America; of resolution 2153(XXI) in which it called upon "all nuclear-weapon Powers to refrain from the use, or the threat of use, of nuclear weapons against States which may conclude treaties", such as the Treaty of Tlatelolco in order to "ensure the total absence of nuclear weapons in their respective territories", and of resolution 2286 (XXII) by which the Assembly invited the nuclear powers "to sign and ratify Additional Protocol II of the Treaty [of Tlatelolco] as soon as possible".

Another resolution which also deserves to be quoted in connection with this matter is resolution B adopted in September 1968, by the Conference of Non-Nuclear-Weapon States. In this resolution, the conference, after recalling the three above-mentioned resolutions of the General Assembly, as well as resolution 2028(XX) which "established the principle of an acceptable balance of mutual responsibilities and obligations of the nuclear-weapon and non-nuclear-weapon States", stated its conviction that "for the maximum effectiveness of any treaty establishing a nuclear-weapon-free zone, the co-operation of the nuclear-weapon States is necessary and that such co-

operation should take the form of commitments likewise undertaken in a formal international instrument which is legally binding, such as a Treaty, convention or protocol”.

The operative part of the resolution ended by expressing the regret of the conference because of “the fact that not all nuclear-weapon States have yet signed Additional Protocol II of the Treaty of Tlatelolco” and by urging “the nuclear-weapon Powers to comply fully with paragraph 4 of resolution 2286(XXII)”.

Subsequent to the above resolution, on 20 December 1968, the UN General Assembly adopted resolution 2456B(XXIII) in which it reiterated “the recommendation contained in resolution B of the Conference of Non-Nuclear-Weapon States, concerning the establishment of nuclear-weapon-free zones, and especially the urgent appeal for full compliance by the nuclear-weapon Powers with paragraph 4 of General Assembly resolution 2286 (XXII) of 5 December 1967, in which the Assembly invited Powers possessing nuclear weapons to sign and ratify as soon as possible Additional Protocol II of the Treaty for the Prohibition of Nuclear Weapons in Latin America”.

Finally, the General Conference of the Agency for the Prohibition of Nuclear Weapons in Latin America (OPANAL), in its resolution 1(I),¹⁰ adopted on 5 September 1969, stated in a comprehensive manner all of the most important reasons why it should be deplored that additional protocol II of the treaty had not yet been signed and ratified by all nuclear-weapon states and why it is urgent that these states “comply fully with the appeals made to them by the General Assembly of the United Nations and the Conference of Non-Nuclear-Weapon States”. The resolution ended by calling upon the states members of OPANAL to propose jointly the inclusion in the agenda of the twenty-fifth session of the United Nations of the following item: “Status of the implementation of resolution 2456B(XXIII) concerning the signature and ratification of Additional Protocol II of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco)”.

Conflicting interpretations

A few of the states which have signed either the treaty or the protocols have made interpretative declarations regarding the meaning and scope of some of the provisions of the instruments, either at the moment of signature or of ratification. Nevertheless, in most of these relatively few cases the interpretation given does not lend itself to any controversy. This is the case, for

¹⁰ See the text in Annex 2, p. 254.

instance, with the understanding which the British Government included in its statement of 20 December 1967, when it signed additional protocols I and II:

The reference in Article 3 of the Treaty to "its own legislation" relates only to such legislation as is compatible with the rules of international law and as involves an exercise of sovereignty consistent with those rules, and accordingly that signature or ratification of either Additional Protocol by the Government of the United Kingdom could not be regarded as implying recognition of any legislation which did not, in their view, comply with the relevant rules of international law . . .

It is obvious that no one would contest this statement which, in light of the preparatory work of the treaty, corresponds to what its authors had in mind all the time.

The same is true of the affirmation incorporated in the statement accompanying the signature of the United States Government to the effect that:

The United States takes note of the Preparatory Commission's interpretation of the Treaty, as set forth in the Final Act, that, governed by the principles and rules of international law, each of the Contracting Parties retains exclusive power and legal competence, unaffected by the terms of the Treaty, to grant or deny non-Contracting Parties transit and transport privileges.

In fact, this statement reflects faithfully the declaration included by the preparatory commission in the final act of its fourth session which reads as follows:¹¹

The Commission deemed it unnecessary to include the term "transport" in article 1, concerning "Obligations", for the following reasons:

1. If the carrier is one of the Contracting Parties, transport is covered by the prohibitions expressly laid down in the remaining provisions of article 1 and there is no need to mention it expressly, since the article prohibits "any form of possession of any nuclear weapons, directly or indirectly, by the Parties themselves, by anyone on their behalf or in any other way".
2. If the carrier is a State not a Party to the Treaty, transport is identical with "transit" which, in the absence of any provision in the Treaty, must be understood to be governed by the principles and rules of international law; according to these principles and rules it is for the territorial State, in the free exercise of its sovereignty, to grant or deny permission for such transit in each individual case, upon application by the State interested in effecting the transit, unless some other arrangement has been reached in a Treaty between such States.

Moreover, when the US Government pointed out in its statement that "As regards the undertaking in Article 3 of Protocol II not to use or threaten

¹¹ COPREDAL/76, page 8. Also reproduced as UN document A/6663.

to use nuclear weapons against the Contracting Parties, the United States would have to consider that an armed attack by a Contracting Party, in which it was assisted by a nuclear-weapon State, would be incompatible with the Contracting Party's corresponding obligations under Article 1 of the Treaty . . .", it was no doubt stating a truism which no one would be inclined to question.

There are, however, two points on which conflicting interpretations regarding the treaty have arisen. The first concerns the question of nuclear explosions for peaceful purposes dealt with in article 18. In this connection the positions adopted by the United Kingdom and the United States could be summarized using the terms employed in the interpretative statement of the UK, already mentioned, as follows:

Article 18 of the Treaty, when read in conjunction with Articles 1 and 15 thereof, would not permit the Contracting Parties to the Treaty 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 . . .

The position of Mexico—and, insofar as it has been made known, of all other signatories of the treaty, with the exception of the three which will be discussed below—is essentially the same and can be summarized as follows:

Paragraph 1 of article 18, as the text reads, is clearly subordinated to articles 1 and 5 of the treaty. This means that for one of the contracting parties to carry out directly a peaceful nuclear explosion, it will have to prove previously that a nuclear weapon will not be required for that explosion; that is to say, in accordance with the objective definition contained in article 5 of the treaty, that it will not require "any device which is capable of releasing nuclear energy in an uncontrolled manner and which has a group of characteristics that are appropriate for use for warlike purposes".

Since the consensus of the experts on this matter is that it is at present impossible, it must obviously be concluded that the states parties to the treaty will not be able to manufacture or acquire nuclear explosive devices, even though they may be intended for peaceful purposes, unless and until technological progress has developed, for such explosions, devices which cannot be used as nuclear weapons.

Mexico also places an identical interpretation on the pertinent provisions of the Treaty on Non-Proliferation of Nuclear Weapons. It understands the term "nuclear explosive devices" as used in the treaty, especially in its article 2, which forbids their manufacture and acquisition by non-nuclear-weapon states, as synonymous with "nuclear explosive devices appropriate for use

for warlike purposes". That is why, when signing the treaty on 26 July 1968, the Mexican Government made an interpretative statement to the effect that it understands that, if technological progress makes it possible to differentiate between nuclear weapons and nuclear explosive devices for peaceful purposes, it will be necessary to amend the relevant provisions of the treaty in accordance with the procedure established therein.

As indicated above, three of the treaty's signatories—Argentina, Brazil and Nicaragua, of which only Nicaragua is a party to it—have put on record (the first two when signing the instrument and Nicaragua when ratifying it) points of view which differ from the interpretations just described. The attitudes of Argentina and Brazil are practically identical and may be illustrated with the statement made by the Government of Brazil upon signing the treaty on 14 February 1967.

It is the understanding of the Brazilian Government that said Article 18 permits the States signatories to carry out, by themselves or in association with third parties, nuclear explosions for peaceful purposes, including those which presuppose devices similar to those used for military armaments.

As regards Nicaragua, the relevant part of its declaration is drafted as follows:

... Nicaragua, on signing this Treaty, does so reserving its sovereign right to employ, according to its own judgement, nuclear energy for peaceful purposes, such as for the removal of great quantities of earth for the construction of interoceanic or any other kind of canals, irrigation works, electric plants, etc.

A second provision of the treaty which has also been a subject of conflicting interpretation is article 25 containing a definition of the countries eligible to sign the treaty. The controversy arose when Guyana expressed the desire to sign the treaty, a desire that has been opposed by Venezuela which maintains that paragraph 2 of article 25 applies to such a request, in view of the pending claim between the two states. In order to find a solution to this conflicting interpretation of the treaty which has arisen between Guyana and Venezuela, the General Conference of OPANAL, at its first session, adopted on 8 September 1969 its resolution 17(I) creating a three-member Committee of Good Offices and entrusting it with the task of making "every effort to find a solution satisfactory to both parties which will further the purposes and principles of the Treaty".¹²

Progress achieved so far

On 14 February 1967, the same day that the treaty was opened for signature, fourteen of the twenty-one members of the preparatory commission

¹² UN document A/7681, page 12. The committee consists of Jamaica, Mexico and Peru.

which had drafted it became its signatories. Their number increased gradually and on 26 October 1967 all those members, plus Barbados (which had not yet achieved independence at the time the treaty was approved), had become signatories to the treaty.¹³ Of the sovereign states at present in existence in the region, only Guyana¹⁴ and Cuba¹⁵ have not yet signed the treaty.

As to ratifications, sixteen states have to date deposited their respective instruments together with the declaration waiving all the requirements laid down in paragraph 1 of article 28, so that the treaty is already in force for all of them. The signatory states which are not yet parties to the treaty are the following six: Argentina, Brazil, Chile, Colombia, Panama and Trinidad and Tobago.

As regards the additional protocols, protocol I bears the signatures of the Netherlands and the United Kingdom, and protocol II those of the United Kingdom and the United States. Both protocols have so far been ratified by the United Kingdom.

Bearing in mind, on the one hand, the reiterated requests made by the UN General Assembly to the nuclear-weapon powers that they sign and ratify additional protocol II at the earliest possible date,¹⁶ and, on the other hand, the positive position so repeatedly stated in the United Nations debates by representatives of France, the United States and the Soviet Union, towards nuclear-weapon-free zones which—as is the case with the zone established by the Treaty of Tlatelolco—meet a series of basic conditions, it would seem logical to expect that in the near future they will take the necessary steps in order to become parties to protocol II. With regard to the United States, the fact that it has signed the protocol suggests that it is likely to ratify it. Regarding the People's Republic of China, in light of the statement made by its government to the negotiating committee of COPREDAL in August 1966, it seems probable that the Chinese signature and ratification of protocol II will have to wait until the "Question of the Representation of China in the United Nations" is solved. In effect, the main reproach which the Chinese Government made to the activities which led to conclu-

¹³ For full information on the signature and ratification of the treaty, see the list of states which have signed or ratified the arms regulation treaties, p. 458 to 471. Information on the signature and ratification of the additional protocols is found in Annex 2, page 254.

¹⁴ See the section on conflicting interpretations above.

¹⁵ Among reasons put forward by Cuba as obstacles to its participation in the preparatory commission were the "illegal detention" of Guantanamo by the USA, the need to "denuclearize" United States military bases in Latin America "such as those in Puerto Rico, the Canal Zone and the Virgin Islands", and the "aggressive policies" of the United States towards Cuba. (COPREDAL/46, 21 July 1966)

¹⁶ See the section on additional protocol II, page 254.

sion of the treaty, as reported by the negotiating committee, was that they were "closely linked to a resolution of the United Nations General Assembly adopted in its eighteenth session" and that the United Nations "had violated all rights of the People's Republic of China".¹⁷

Additional protocol I has already been ratified by the United Kingdom and signed by the Netherlands where the ratification is already passing through the normal constitutional processes. It appears reasonable to expect that, in a not too distant future, the governments of the other two states to which the protocol is open for signature, France and the United States, may become convinced that it is to their advantage to become parties to it, thus permitting the populations of the territories in question to enjoy the benefits derived from the treaty which would, in fact, protect them from becoming a target for nuclear attacks.

Conclusions

To conclude this brief review of the preparation and purposes of the Treaty of Tlatelolco, it seems fitting to consider its importance. A basic element in this connection is no doubt the fact that because of this treaty there now exists in the world a nuclear-weapon-free zone, the first and only one established in territories heavily populated by man, covering an area of some 6 million square kilometers with a population of approximately 100 million people. This zone is intended to embrace one day an area of more than 20 million square kilometers in which, at the present density level, there would live no less than 260 million human beings.

In addition, it is necessary to take into account the aim of the Treaty of Tlatelolco which, unlike a treaty of non-proliferation, is to guarantee the total absence of nuclear weapons in the Latin American zone to which it applies, regardless of which state owns or controls such weapons. Instruments of mass destruction will consequently be and forever remain banned from the territories which the treaty will thus protect both from the threat of nuclear destruction and from the waste of resources in a senseless nuclear arms race.

If these basic elements are borne in mind, it is easy to understand the praise which the treaty has received in the international forums where it has been examined. Some of the judgements which have been pronounced regarding the importance of the treaty illustrate this.

On the day the treaty was unanimously approved, 12 February 1967, the

¹⁷ This question is discussed in more detail in Alfonso García Robles, *The Denuclearization of Latin America*, Carnegie Endowment for International Peace, New York, 1967, pages 154-58.

Secretary-General of the United Nations said in a message addressed to the preparatory commission:¹⁸

The Treaty for the Prohibition of Nuclear Weapons in Latin America marks an important milestone in the long and difficult search for disarmament. . . . The provisions of the Treaty also mark a major step forward in the field of verification and control. . . . The nations of Latin America can, with ample justification, take pride in what they have wrought by their own initiative and through their own efforts.

A few months later, during the twenty-second session of the UN General Assembly, the representatives of the forty-six states which participated in the debates of the first committee devoted to the treaty praised it, as well as the task whose culmination it was, in terms full of enthusiasm. On that occasion, the treaty was described as "a most important Latin American contribution", "a noteworthy feat", "an unprecedented example", "an achievement of pioneers having utmost importance for disarmament", and "an exceptional success in the field of nuclear arms control".

Crowning the debates on the Treaty of Tlatelolco, the UN General Assembly adopted on 5 December 1967, without a single opposing vote, resolution 2286(XXII) in which, after welcoming the treaty "with special satisfaction", it declared that it "constitutes an event of historic significance in the efforts to prevent the proliferation of nuclear weapons and to promote international peace and security . . ."

Finally, when the Agency for the Prohibition of Nuclear Weapons in Latin America came into being with the inauguration of the first session of its General Conference, on 2 September 1969, UN Secretary-General U Thant, who was present at the ceremony, rounded out his remarks of 1967 with the following words:¹⁹

In a world that all too often seems dark and foreboding, the Treaty of Tlatelolco will shine as a beacon light. It is a practical demonstration to all mankind of what can be achieved if sufficient dedication and the requisite political will exist.

The Treaty of Tlatelolco is unique in several respects. . . . The Treaty of Tlatelolco is unique in that it applies to an important inhabited area of the earth. It is also unique in that the Agency which is being established at this session will have the advantage of a permanent and effective system of control with a number of novel features. . . .

The States of Latin America, which also include the States of the Caribbean Sea, have laboured hard and built well in erecting the edifice of the Agency for the Prohibition of Nuclear Weapons in Latin America. Perhaps history will record that they, too, "builted better than they knew".

¹⁸ UN press release SG/SM/661.

¹⁹ UN document A/7681, pages 78 and 80.

Annex 1. Text of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco) and Additional Protocols I and II²⁰

Preamble

In the name of their peoples and faithfully interpreting their desires and aspirations, the Governments of the States which sign the Treaty for the Prohibition of Nuclear Weapons in Latin America,

Desiring to contribute, so far as lies in their power, towards ending the armaments race, especially in the field of nuclear weapons, and towards strengthening a world at peace, based on the sovereign equality of States, mutual respect and good neighbourliness,

Recalling that the United Nations General Assembly, in its Resolution 808(IX), adopted unanimously as one of the three points of a coordinated programme of disarmament “the total prohibition of the use and manufacture of nuclear weapons and weapons of mass destruction of every type”,

Recalling that militarily denuclearized zones are not an end in themselves but rather a means for achieving general and complete disarmament at a later stage,

Recalling United Nations General Assembly Resolution 1911(XVIII), which established that the measures that should be agreed upon for the denuclearization of Latin America should be taken “in the light of the principles of the Charter of the United Nations and of regional agreements”,

Recalling United Nations General Assembly Resolution 2028(XX), which established the principle of an acceptable balance of mutual responsibilities and duties for the nuclear and non-nuclear powers, and

Recalling that the Charter of the Organization of American States proclaims that it is an essential purpose of the Organization to strengthen the peace and security of the hemisphere,

Convinced:

That the incalculable destructive power of nuclear weapons has made it imperative that the legal prohibition of war should be strictly observed in practice if the survival of civilization and of mankind itself is to be assured,

That nuclear weapons, whose terrible effects are suffered, indiscriminately and inexorably, by military forces and civilian population alike, constitute, through the persistence of the radioactivity they release, an attack on the integrity of the human species and ultimately may even render the whole earth uninhabitable,

²⁰ Copy of the authentic English text deposited with the Government of Mexico.

That general and complete disarmament under effective international control is a vital matter which all the peoples of the world equally demand,

That the proliferation of nuclear weapons, which seems inevitable unless States, in the exercise of their sovereign rights, impose restrictions on themselves in order to prevent it, would make any agreement on disarmament enormously difficult and would increase the danger of the outbreak of a nuclear conflagration,

That the establishment of militarily denuclearized zones is closely linked with the maintenance of peace and security in the respective regions,

That the military denuclearization of vast geographical zones, adopted by the sovereign decision of the States comprised therein, will exercise a beneficial influence on other regions where similar conditions exist,

That the privileged situation of the signatory States, whose territories are wholly free from nuclear weapons, imposes upon them the inescapable duty of preserving that situation both in their own interests and for the good of mankind,

That the existence of nuclear weapons in any country of Latin America would make it a target for possible nuclear attacks and would inevitably set off, throughout the region, a ruinous race in nuclear weapons which would involve the unjustifiable diversion, for warlike purposes, of the limited resources required for economic and social development,

That the foregoing reasons, together with the traditional peaceloving outlook of Latin America, give rise to an inescapable necessity that nuclear energy should be used in that region exclusively for peaceful purposes, and that the Latin American countries should use their right to the greatest and most equitable possible access to this new source of energy in order to expedite the economic and social development of their peoples,

Convinced finally:

That the military denuclearization of Latin America—being understood to mean the undertaking entered into internationally in this Treaty to keep their territories forever free from nuclear weapons—will constitute a measure which will spare their peoples from the squandering of their limited resources on nuclear armaments and will protect them against possible nuclear attacks on their territories, and will also constitute a significant contribution towards preventing the proliferation of nuclear weapons and a powerful factor for general and complete disarmament, and

That Latin America, faithful to its tradition of universality, must not only endeavour to banish from its homelands the scourge of a nuclear war, but must also strive to promote the well-being and advancement of its peoples,

at the same time co-operating in the fulfillment of the ideals of mankind, that is to say, in the consolidation of a permanent peace based on equal rights, economic fairness and social justice for all, in accordance with the principles and purposes set forth in the Charter of the United Nations and in the Charter of the Organization of American States,

Have agreed as follows:

Obligations

ARTICLE 1

1. The Contracting Parties hereby undertake to use exclusively for peaceful purposes the nuclear material and facilities which are under their jurisdiction, and to prohibit and prevent in their respective territories:

- (a) The testing, use, manufacture, production or acquisition by any means whatsoever of any nuclear weapons, by the Parties themselves, directly or indirectly, on behalf of anyone else or in any other way, and
- (b) The receipt, storage, installation, deployment and any form of possession of any nuclear weapons, directly or indirectly, by the Parties themselves, by anyone on their behalf or in any other way.

2. The Contracting Parties also undertake to refrain from engaging in, encouraging or authorizing, directly or indirectly, or in any way participating in the testing, use, manufacture, production, possession or control of any nuclear weapon.

Definition of the Contracting Parties

ARTICLE 2

For the purposes of this Treaty, the Contracting Parties are those for whom the Treaty is in force.

Definition of territory

ARTICLE 3

For the purposes of this Treaty, the term "territory" shall include the territorial sea, air space and any other space over which the State exercises sovereignty in accordance with its own legislation.

Zone of application

ARTICLE 4

1. The zone of application of this Treaty is the whole of the territories for which the Treaty is in force.

2. Upon fulfillment of the requirements of article 28, paragraph 1, the zone of application of this Treaty shall also be that which is situated in the western hemisphere within the following limits (except the continental part of the

territory of the United States of America and its territorial waters): starting at a point located at 35° north latitude, 75° west longitude; from this point directly southward to a point at 30° north latitude, 75° west longitude; from there, directly eastward to a point at 30° north latitude, 50° west longitude; from there, along a loxodromic line to a point at 5° north latitude, 20° west longitude; from there, directly southward to a point at 60° south latitude, 20° west longitude; from there, directly westward to a point at 60° south latitude, 115° west longitude; from there, directly northward to a point at 0 latitude, 115° west longitude; from there, along a loxodromic line to a point at 35° north latitude, 150° west longitude; from there, directly eastward to a point at 35° north latitude, 75° west longitude.

Definition of nuclear weapons

ARTICLE 5

For the purposes of this Treaty, a nuclear weapon is any device which is capable of releasing nuclear energy in an uncontrolled manner and which has a group of characteristics that are appropriate for use for warlike purposes. An instrument that may be used for the transport or propulsion of the device is not included in this definition if it is separable from the device and not an indivisible part thereof.

Meeting of signatories

ARTICLE 6

At the request of any of the signatory States or if the Agency established by article 7 should so decide, a meeting of all the signatories may be convoked to consider in common questions which may affect the very essence of this instrument, including possible amendments to it. In either case, the meeting will be convoked by the General Secretary.

Organization

ARTICLE 7

1. In order to ensure compliance with the obligations of this Treaty the Contracting Parties hereby establish an international organization to be known as the "Agency for the Prohibition of Nuclear Weapons in Latin America", hereinafter referred to as "the Agency". Only the Contracting Parties shall be affected by its decisions.
2. The Agency shall be responsible for the holding of periodic or extraordinary consultations among Member States on matters relating to the purposes, measures and procedures set forth in this Treaty and to the supervision of compliance with the obligations arising therefrom.

3. The Contracting Parties agree to extend to the Agency full and prompt co-operation in accordance with the provisions of this Treaty, of any agreements they may conclude with the Agency and of any agreements the Agency may conclude with any other international organization or body.
4. The headquarters of the Agency shall be in Mexico City.

Organs

ARTICLE 8

1. There are hereby established as principal organs of the Agency a General Conference, a Council and a Secretariat.
2. Such subsidiary organs as are considered necessary by the General Conference may be established within the purview of this Treaty.

The General Conference

ARTICLE 9

1. The General Conference, the supreme organ of the Agency, shall be composed of all the Contracting Parties; it shall hold regular sessions every two years, and may also hold special sessions whenever this Treaty so provides or, in the opinion of the Council, the circumstances so require.
2. The General Conference:
 - (a) May consider and decide on any matters or questions covered by this Treaty, within the limits thereof, including those referring to powers and functions of any organ provided for in this Treaty.
 - (b) Shall establish procedures for the control system to ensure observance of this Treaty in accordance with its provisions.
 - (c) Shall elect the Members of the Council and the General Secretary.
 - (d) May remove the General Secretary from office if the proper functioning of the Agency so requires.
 - (e) Shall receive and consider the biennial and special reports submitted by the Council and the General Secretary.
 - (f) Shall initiate and consider studies designed to facilitate the optimum fulfillment of the aims of this Treaty, without prejudice to the power of the General Secretary independently to carry out similar studies for submission to and consideration by the Conference.
 - (g) Shall be the organ competent to authorize the conclusion of agreements with Governments and other international organizations and bodies.
3. The General Conference shall adopt the Agency's budget and fix the scale of financial contributions to be paid by Member States, taking into account the systems and criteria used for the same purpose by the United Nations.
4. The General Conference shall elect its officers for each session and may

establish such subsidiary organs as it deems necessary for the performance of its functions.

5. Each Member of the Agency shall have one vote. The decisions of the General Conference shall be taken by a two-thirds majority of the Members present and voting in the case of matters relating to the control system and measures referred to in article 20, the admission of new Members, the election or removal of the General Secretary, adoption of the budget and matters related thereto. Decisions on other matters, as well as procedural questions and also determination of which questions must be decided by a two-thirds majority, shall be taken by a simple majority of the Members present and voting.

6. The General Conference shall adopt its own rules of procedure.

The Council

ARTICLE 10

1. The Council shall be composed of five Members of the Agency elected by the General Conference from among the Contracting Parties, due account being taken of equitable geographic distribution.

2. The Members of the Council shall be elected for a term of four years. However, in the first election three will be elected for two years. Outgoing Members may not be re-elected for the following period unless the limited number of States for which the Treaty is in force so requires.

3. Each Member of the Council shall have one representative.

4. The Council shall be so organized as to be able to function continuously.

5. In addition to the functions conferred upon it by this Treaty and to those which may be assigned to it by the General Conference, the Council shall, through the General Secretary, ensure the proper operation of the control system in accordance with the provisions of this Treaty and with the decisions adopted by the General Conference.

6. The Council shall submit an annual report on its work to the General Conference as well as such special reports as it deems necessary or which the General Conference requests of it.

7. The Council shall elect its officers for each session.

8. The decisions of the Council shall be taken by a simple majority of its Members present and voting.

9. The Council shall adopt its own rules of procedure.

The Secretariat

ARTICLE 11

1. The Secretariat shall consist of a General Secretary, who shall be the chief administrative officer of the Agency, and of such staff as the Agency

may require. The term of office of the General Secretary shall be four years and he may be re-elected for a single additional term. The General Secretary may not be a national of the country in which the Agency has its headquarters. In case the office of General Secretary becomes vacant, a new election shall be held to fill the office for the remainder of the term.

2. The staff of the Secretariat shall be appointed by the General Secretary, in accordance with rules laid down by the General Conference.

3. In addition to the functions conferred upon him by this Treaty and to those which may be assigned to him by the General Conference,—the General Secretary shall ensure, as provided by article 10, paragraph 5, the proper operation of the control system established by this Treaty and the decisions taken by the General Conference.

4. The General Secretary shall act in that capacity in all meetings of the General Conference and of the Council and shall make an annual report to both bodies on the work of the Agency and any special reports requested by the General Conference or the Council or which the General Secretary may deem desirable.

5. The General Secretary shall establish the procedures for distributing to all Contracting Parties information received by the Agency from governmental sources and such information from non-governmental sources as may be of interest to the Agency.

6. In the performance of their duties the General Secretary and the staff shall not seek or receive instructions from any Government or from any other authority external to the Agency and shall refrain from any action which might reflect on their position as international officials responsible only to the Agency; subject to their responsibility to the Agency, they shall not disclose any industrial secrets or other confidential information coming to their knowledge by reason of their official duties in the Agency.

7. Each of the Contracting Parties undertakes to respect the exclusively international character of the responsibilities of the General Secretary and the staff and not to seek to influence them in the discharge of their responsibilities.

Control system

ARTICLE 12

1. For the purpose of verifying compliance with the obligations entered into by the Contracting Parties in accordance with article 1, a control system shall be established which shall be put into effect in accordance with the provisions of articles 13–18 of this Treaty.

Special article

2. The control system shall be used in particular for the purpose of verifying:

- (a) That devices, services and facilities intended for peaceful uses of nuclear energy are not used in the testing or manufacture of nuclear weapons,
- (b) That none of the activities prohibited in article 1 of this Treaty are carried out in the territory of the Contracting Parties with nuclear materials or weapons introduced from abroad, and
- (c) That explosions for peaceful purposes are compatible with article 18 of this Treaty.

IAEA safeguards

ARTICLE 13

Each Contracting Party shall negotiate multilateral or bilateral agreements with the International Atomic Energy Agency for the application of its safeguards to its nuclear activities. Each Contracting Party shall initiate negotiations within a period of 180 days after the date of the deposit of its instrument of ratification of this Treaty. These agreements shall enter into force, for each Party, not later than eighteen months after the date of the initiation of such negotiations except in case of unforeseen circumstances or *force majeure*.

Reports of the Parties

ARTICLE 14

1. The Contracting Parties shall submit to the Agency and to the International Atomic Energy Agency, for their information, semi-annual reports stating that no activity prohibited under this Treaty has occurred in their respective territories.
2. The Contracting Parties shall simultaneously transmit to the Agency a copy of any report they may submit to the International Atomic Energy Agency which relates to matters that are the subject of this Treaty and to the application of safeguards.
3. The Contracting Parties shall also transmit to the Organization of American States, for its information, any reports that may be of interest to it, in accordance with the obligations established by the Inter-American System.

Special reports requested by the General Secretary

ARTICLE 15

1. With the authorization of the Council, the General Secretary may request any of the Contracting Parties to provide the Agency with comple-

mentary or supplementary information regarding any event or circumstance connected with compliance with this Treaty, explaining his reasons. The Contracting Parties undertake to co-operate promptly and fully with the General Secretary.

2. The General Secretary shall inform the Council and the Contracting Parties forthwith of such requests and of the respective replies.

Special inspections

ARTICLE 16

1. The International Atomic Energy Agency and the Council established by this Treaty have the power of carrying out special inspections in the following cases:

(a) In the case of the International Atomic Energy Agency, in accordance with the agreements referred to in article 13 of this Treaty;

(b) In the case of the Council:

(i) When so requested, the reasons for the request being stated, by any Party which suspects that some activity prohibited by this Treaty has been carried out or is about to be carried out, either in the territory of any other Party or in any other place on such later Party's behalf, the Council shall immediately arrange for such an inspection in accordance with article 10, paragraph 5.

(ii) When requested by any Party which has been suspected of or charged with having violated this Treaty, the Council shall immediately arrange for the special inspection requested in accordance with article 10, paragraph 5.

The above requests will be made to the Council through the General Secretary.

2. The costs and expenses of any special inspection carried out under paragraph 1, sub-paragraph (b), sections (i) and (ii) of this article shall be borne by the requesting Party or Parties, except where the Council concludes on the basis of the report on the special inspection that, in view of the circumstances existing in the case, such costs and expenses should be borne by the Agency.

3. The General Conference shall formulate the procedures for the organization and execution of the special inspections carried out in accordance with paragraph 1, sub-paragraph (b), sections (i) and (ii) of this article.

4. The Contracting Parties undertake to grant the inspectors carrying out such special inspections full and free access to all places and all information which may be necessary for the performance of their duties and which are directly and intimately connected with the suspicion of violation of this

Special article

Treaty. If so requested by the authorities of the Contracting Party in whose territory the inspection is carried out, the inspectors designated by the General Conference shall be accompanied by representatives of said authorities, provided that this does not in any way delay or hinder the work of the inspectors.

5. The Council shall immediately transmit to all the Parties, through the General Secretary, a copy of any report resulting from special inspections.

6. Similarly, the Council shall send through the General Secretary to the Secretary-General of the United Nations, for transmission to the United Nations Security Council and General Assembly, and to the Council of the Organization of American States, for its information, a copy of any report resulting from any special inspection carried out in accordance with paragraph 1, sub-paragraph (b), sections (i) and (ii) of this article.

7. The Council may decide, or any Contracting Party may request, the convening of a special session of the General Conference for the purpose of considering the reports resulting from any special inspection. In such a case, the General Secretary shall take immediate steps to convene the special session requested.

8. The General Conference, convened in special session under this article, may make recommendations to the Contracting Parties and submit reports to the Secretary-General of the United Nations to be transmitted to the United Nations Security Council and the General Assembly.

Use of nuclear energy for peaceful purposes

ARTICLE 17

Nothing in the provisions of this Treaty shall prejudice the rights of the Contracting Parties, in conformity with this Treaty, to use nuclear energy for peaceful purposes, in particular for their economic development and social progress.

Explosions for peaceful purposes

ARTICLE 18

1. The Contracting Parties may carry out explosions of nuclear devices for peaceful purposes—including explosions which involve devices similar to those used in nuclear weapons—or collaborate with third parties for the same purpose, provided that they do so in accordance with the provisions of this article and the other articles of the Treaty, particularly articles 1 and 5.

2. Contracting Parties intending to carry out, or to co-operate in carrying

out, such an explosion shall notify the Agency and the International Atomic Energy Agency, as far in advance as the circumstances require, of the date of the explosion and shall at the same time provide the following information:

- (a) The nature of the nuclear device and the source from which it was obtained,
- (b) The place and purpose of the planned explosion,
- (c) The procedures which will be followed in order to comply with paragraph 3 of this article,
- (d) The expected force of the device, and
- (e) The fullest possible information on any possible radioactive fall-out that may result from the explosion or explosions, and measures which will be taken to avoid danger to the population, flora, fauna and territories of any other Party or Parties.

3. The General Secretary and the technical personnel designated by the Council and the International Atomic Energy Agency may observe all the preparations, including the explosion of the device, and shall have unrestricted access to any area in the vicinity of the site of the explosion in order to ascertain whether the device and the procedures followed during the explosion are in conformity with the information supplied under paragraph 2 of this article and the other provisions of this Treaty.

4. The Contracting Parties may accept the collaboration of third parties for the purpose set forth in paragraph 1 of the present article, in accordance with paragraphs 2 and 3 thereof.

Relations with other international organizations

ARTICLE 19

1. The Agency may conclude such agreements with the International Atomic Energy Agency as are authorized by the General Conference and as it considers likely to facilitate the efficient operation of the control system established by this Treaty.

2. The Agency may also enter into relations with any international organization or body, especially any which may be established in the future to supervise disarmament or measures for the control of armaments in any part of the world.

3. The Contracting Parties may, if they see fit, request the advice of the Inter-American Nuclear Energy Commission on all technical matters connected with the application of this Treaty with which the Commission is competent to deal under its Statute.

Measures in the event of violation of the Treaty

ARTICLE 20

1. The General Conference shall take note of all cases in which, in its opinion, any Contracting Party is not complying fully with its obligations under this Treaty and shall draw the matter to the attention of the Party concerned, making such recommendations as it deems appropriate.
2. If, in its opinion, such non-compliance constitutes a violation of this Treaty which might endanger peace and security, the General Conference shall report thereon simultaneously to the United Nations Security Council and the General Assembly through the Secretary-General of the United Nations, and to the Council of the Organization of American States. The General Conference shall likewise report to the International Atomic Energy Agency for such purposes as are relevant in accordance with its Statute.

United Nations and Organization of American States

ARTICLE 21

None of the provisions of this Treaty shall be construed as impairing the rights and obligations of the Parties under the Charter of the United Nations or, in the case of States Members of the Organization of American States, under existing regional treaties.

Privileges and immunities

ARTICLE 22

1. The Agency shall enjoy in the territory of each of the Contracting Parties such legal capacity and such privileges and immunities as may be necessary for the exercise of its functions and the fulfillment of its purposes.
2. Representatives of the Contracting Parties accredited to the Agency and officials of the Agency shall similarly enjoy such privileges and immunities as are necessary for the performance of their functions.
3. The Agency may conclude agreements with the Contracting Parties with a view to determining the details of the application of paragraphs 1 and 2 of this article.

Notification of other agreements

ARTICLE 23

Once this Treaty has entered into force, the Secretariat shall be notified immediately of any international agreement concluded by any of the Contracting Parties on matters with which this Treaty is concerned; the Secretariat shall register it and notify the other Contracting Parties.

Settlement of disputes

ARTICLE 24

Unless the Parties concerned agree on another mode of peaceful settlement, any question or dispute concerning the interpretation or application of this Treaty which is not settled shall be referred to the International Court of Justice with the prior consent of the Parties to the controversy.

Signature

ARTICLE 25

1. This Treaty shall be open indefinitely for signature by:
 - (a) All the Latin American Republics, and
 - (b) All other sovereign States situated in their entirety south of latitude 35° north in the western hemisphere; and, except as provided in paragraph 2 of this article, all such States which become sovereign, when they have been admitted by the General Conference.
2. The General Conference shall not take any decision regarding the admission of a political entity part or all of whose territory is the subject, prior to the date when this Treaty is opened for signature, of a dispute or claim between an extra-continental country and one or more Latin American States, so long as the dispute has not been settled by peaceful means.

Ratification and deposit

ARTICLE 26

1. This Treaty shall be subject to ratification by signatory States in accordance with their respective constitutional procedures.
2. This Treaty and the instruments of ratification shall be deposited with the Government of the Mexican United States, which is hereby designated the Depository Government.
3. The Depository Government shall send certified copies of this Treaty to the Governments of signatory States and shall notify them of the deposit of each instrument of ratification.

Reservations

ARTICLE 27

This Treaty shall not be subject to reservations.

Entry into force

ARTICLE 28

1. Subject to the provisions of paragraph 2 of this article, this Treaty shall enter into force among the States that have ratified it as soon as the following requirements have been met:

- (a) Deposit of the instruments of ratification of this Treaty with the Depositary Government by the Governments of the States mentioned in article 25 which are in existence on the date when this Treaty is opened for signature and which are not affected by the provisions of article 25, paragraph 2;
- (b) Signature and ratification of Additional Protocol I annexed to this Treaty by all extra-continental or continental States having *de jure* or *de facto* international responsibility for territories situated in the zone of application of the Treaty;
- (c) Signature and ratification of the Additional Protocol II annexed to this Treaty by all powers possessing nuclear weapons;
- (d) Conclusion of bilateral or multilateral agreements on the application of the Safeguards System of the International Atomic Energy Agency in accordance with article 13 of this Treaty.

2. All signatory States shall have the imprescriptible right to waive, wholly or in part, the requirements laid down in the preceding paragraph. They may do so by means of a declaration which shall be annexed to their respective instrument of ratification and which may be formulated at the time of deposit of the instrument or subsequently. For those States which exercise this right, this Treaty shall enter into force upon deposit of the declaration, or as soon as those requirements have been met which have not been expressly waived.

3. As soon as this Treaty has entered into force in accordance with the provisions of paragraph 2 for eleven States, the Depositary Government shall convene a preliminary meeting of those States in order that the Agency may be set up and commence its work.

4. After the entry into force of this 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 this Treaty for those countries which have ratified it without waiving requirements of paragraph 1, sub-paragraph (c) of this article, and which request such suspension; the Treaty shall remain suspended until the new power, on its own initiative or upon request by the General Conference, ratifies the annexed Additional Protocol II.

Amendments

ARTICLE 29

1. Any Contracting Party may propose amendments to this Treaty and shall submit its proposals to the Council through the General Secretary, who shall transmit them to all the other Contracting Parties and, in addition, to all other signatories in accordance with article 6. The Council, through the

General Secretary, shall immediately following the meeting of signatories convene a special session of the General Conference to examine the proposals made, for the adoption of which a two-thirds majority of the Contracting Parties present and voting shall be required.

2. Amendments adopted shall enter into force as soon as the requirements set forth in article 28 of this Treaty have been complied with.

Duration and denunciation

ARTICLE 30

1. This Treaty shall be of a permanent nature and shall remain in force indefinitely, but any Party may denounce it by notifying the General Secretary of the Agency if, in the opinion of the denouncing State, there have arisen or may arise circumstances connected with the content of this Treaty or of the annexed Additional Protocols I and II which affect its supreme interests or the peace and security of one or more Contracting Parties.

2. The denunciation shall take effect three months after the delivery to the General Secretary of the Agency of the notification by the Government of the signatory State concerned. The General Secretary shall immediately communicate such notification to the other Contracting Parties and to the Secretary-General of the United Nations for the information of the United Nations Security Council and the General Assembly. He shall also communicate it to the Secretary-General of the Organization of American States.

Authentic texts and registration

ARTICLE 31

This Treaty, of which the Spanish, Chinese, English, French, Portuguese and Russian texts are equally authentic, shall be registered by the Depositary Government in accordance with article 102 of the United Nations Charter. The Depositary Government shall notify the Secretary-General of the United Nations of the signatures, ratifications and amendments relating to this Treaty and shall communicate them to the Secretary-General of the Organization of American States for its information.

Transitional Article

Denunciation of the declaration referred to in article 28, paragraph 2, shall be subject to the same procedures as the denunciation of this Treaty, except that it will take effect on the date of delivery of the respective notification.

In witness whereof the undersigned Plenipotentiaries, having deposited their full powers, found in good and due form, sign this Treaty on behalf of their respective Governments.

Done at Mexico, Distrito Federal, on the Fourteenth day of February, one thousand nine hundred and sixty-seven.

Additional protocol I

The undersigned Plenipotentiaries, furnished with full powers by their respective Governments,

Convinced that the Treaty for the Prohibition of Nuclear Weapons in Latin America, negotiated and signed in accordance with the recommendations of the General Assembly of the United Nations in Resolution 1911 (XVIII) of 27 November 1963, represents an important step towards ensuring the non-proliferation of nuclear weapons,

Aware that the non-proliferation of nuclear weapons is not an end in itself but, rather, a means of achieving general and complete disarmament at a later stage, and

Desiring to contribute, so far as lies in their power, towards ending the armaments race, especially in the field of nuclear weapons, and towards strengthening a world at peace, based on mutual respect and sovereign equality of States,

Have agreed as follows:

Article 1. To undertake to apply the statute of denuclearization in respect of warlike purposes as defined in articles, 1, 3, 5 and 13 of the Treaty for the Prohibition of Nuclear Weapons in Latin America in territories for which, *de jure* or *de facto*, they are internationally responsible and which lie within the limits of the geographical zone established in that Treaty.

Article 2. The duration of this Protocol shall be the same as that of the Treaty for the Prohibition of Nuclear Weapons in Latin America of which this Protocol is an annex, and the provisions regarding ratification and denunciation contained in the Treaty shall be applicable to it.

Article 3. This Protocol shall enter into force, for the States which have ratified it, on the date of the deposit of their respective instruments of ratification.

In witness whereof the undersigned Plenipotentiaries, having deposited their full powers, found in good and due form, sign this Protocol on behalf of their respective Governments.

Additional protocol II

The undersigned Plenipotentiaries, furnished with full powers by their respective Governments,

Convinced that the Treaty for the Prohibition of Nuclear Weapons in Latin America, negotiated and signed in accordance with the recommendations of the General Assembly of the United Nations in Resolution 1911 (XVIII) of 27 November 1963, represents an important step towards ensuring the non-proliferation of nuclear weapons,

Aware that the non-proliferation of nuclear weapons is not an end in itself but, rather, a means of achieving general and complete disarmament at a later stage, and

Desiring to contribute, so far as lies in their power, towards ending the armaments race, especially in the field of nuclear weapons, and towards promoting and strengthening a world at peace, based on mutual respect and sovereign equality of States,

Have agreed as follows:

Article 1. The statute of denuclearization of Latin America in respect of warlike purposes, as defined, delimited and set forth in the Treaty for the Prohibition of Nuclear Weapons in Latin America of which this instrument is an annex, shall be fully respected by the Parties to this Protocol in all its express aims and provisions.

Article 2. The Governments represented by the undersigned Plenipotentiaries undertake, therefore, not to contribute in any way to the performance of acts involving a violation of the obligations of article 1 of the Treaty in the territories to which the Treaty applies in accordance with article 4 thereof.

Article 3. The Governments represented by the undersigned Plenipotentiaries also undertake not to use or threaten to use nuclear weapons against the Contracting Parties of the Treaty for the Prohibition of Nuclear Weapons in Latin America.

Article 4. The duration of this Protocol shall be the same as that of the Treaty for the Prohibition of Nuclear Weapons in Latin America of which this Protocol is an annex, and the definitions of territory and nuclear weapons set forth in articles 3 and 5 of the Treaty shall be applicable to this Protocol, as well as the provisions regarding ratification, reservations, denunciation, authentic texts and registration contained in articles 26, 27, 30 and 31 of the Treaty.

Article 5. This Protocol shall enter into force, for the States which have ratified it, on the date of the deposit of their respective instruments of ratification.

In witness whereof, the undersigned Plenipotentiaries, having deposited their full powers, found to be in good and due form, hereby sign this Additional Protocol on behalf of their respective Governments.

Annex 2. Status of Additional Protocols I and II of the Treaty of Tlatelolco, as of 31 March 1970^a

States to which the Protocol is open for signature	Signatures	Ratifications
Additional Protocol I		
France		
Netherlands	15 Mach 1968	
United Kingdom	20 Dec. 1967	11 Dec. 1969
USA		
Additional Protocol II		
People's Republic of China		
France		
United Kingdom	20 Dec. 1967	11 Dec. 1969
USA	10 April 1968	
USSR		

^a Data provided by the Depository Government (Mexico). For a complete list of the signatures and ratifications of the Treaty of Tlatelolco, see the list of states which have signed or ratified the arms-regulation treaties, pages 458 to 471.

Annex 3. Text of Resolution 1 (I): Status of Additional Protocol II of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco)²²

The General Conference,

Having considered the report of the depositary Government on the status of Additional Protocol II of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco),

Considering that the Treaty of Tlatelolco is the only international instrument in force designed to ensure the total absence of nuclear weapons in an inhabited area of the earth, and that it is also the only treaty dealing with disarmament measures that establishes an effective system of international control under its own permanent supervisory organ,

Recalling that the General Assembly of the United Nations, in resolution 2286(XXII), declared that the Treaty of Tlatelolco "constitutes an event of historic significance in the efforts to prevent the proliferation of nuclear weapons and to promote international peace and security",

Recalling also that the Conference of Non-Nuclear-Weapon States expressed in its resolution B the conviction that "for the maximum effectiveness of any treaty establishing a nuclear-weapon-free zone, the co-operation

²² Approved by the General Conference of the Agency for the Prohibition of Nuclear Weapons in Latin America (OPANAL) on 5 September 1969. UN document A/7681, pages 6-8.

of the nuclear-weapon States is necessary and that such co-operation should take the form of commitments, likewise undertaken in a formal international instrument which is legally binding, such as a treaty, convention or protocol”,

Bearing in mind that, for reasons similar to those adduced by the Conference, the Preparatory Commission for the Denuclearization of Latin America (COPREDAL) adopted Additional Protocol II of the Treaty of Tlatelolco, which was opened for signature by the nuclear-weapon States on 14 February 1967,

Noting that accession to that Protocol only entails the following obligations for the nuclear-weapon States:

- (a) to respect, “in all its express aims and provisions”, the “statute of denuclearization of Latin America in respect of warlike purposes, as defined, delimited and set forth” in the Treaty of Tlatelolco;
- (b) “not to contribute in any way to the performance of acts involving a violation of the obligations of article 1 of the Treaty in the territories to which the Treaty applies”; and
- (c) “not to use or threaten to use nuclear weapons against the Contracting Parties of the Treaty”;

Convinced that these obligations are essentially nothing more than the application to a specific case of the general obligations laid down in the Charter of the United Nations, which every Member of the Organization has solemnly undertaken to “fulfil in good faith”, as set forth in Article 2 of the Charter,

Bearing in mind that the General Assembly of the United Nations, in two of its resolutions—resolution 2286(XXII) of 5 December 1967 and resolution 2456B(XXIII) of 20 December 1968—and the Conference of Non-Nuclear-Weapon States, in one—resolution B of 27 September 1968—have invited Powers possessing nuclear weapons to sign and ratify Additional Protocol II of the Treaty of Tlatelolco as soon as possible,

Noting that, despite such appeals, despite the support that should be given to any nuclear-weapon-free zone that may be established on the initiative of the States within that zone, as has been repeatedly proclaimed by the nuclear-weapon Powers themselves, and despite the fact that the Treaty of Tlatelolco is the only one it has been possible to conclude for the establishment of such a zone in a densely populated area, Additional Protocol II, which was opened for signature two-and-a-half years ago, has so far been signed by only two of the nuclear-weapon States and has not yet been ratified by any of them,²³

²³ Subsequent to the adoption of this resolution the Government of the United Kingdom deposited its instrument of ratification of the Protocol on 11 December 1969.

Convinced that, if such a situation persists, it will be necessary for the General Assembly of the United Nations, as it does each year with respect to the Declaration on the Granting of Independence to Colonial Countries and Peoples and as it did at its twenty-first session with regard to the Declaration on the Inadmissibility of Intervention in the Domestic Affairs of States, to review the status of implementation of its resolution 2456B (XXIII), in which it emphatically reiterated paragraph 4 of resolution 2286 (XXII) and the pertinent provisions of resolution B of the Conference of Non-Nuclear-Weapon States,

1. *Deplores* the fact that not all nuclear-weapon States have yet signed Additional Protocol II of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco);

2. *Urges* all nuclear-weapon States to comply fully with the appeals made to them by the General Assembly of the United Nations and the Conference of Non-Nuclear-Weapon States to sign and ratify the Protocol as soon as possible;

3. *Calls upon* the States members of the Agency for the Prohibition of Nuclear Weapons in Latin America, if by 30 June 1970 Additional Protocol II has not yet been signed and ratified by all nuclear-weapon States, jointly to propose the inclusion of the following item: "Status of the implementation of resolution 2456B(XXIII) concerning the signature and ratification of Additional Protocol II of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Treaty of Tlatelolco)" in the agenda of the twenty-fifth session of the General Assembly of the United Nations;

4. *Requests* the President of the General Conference to transmit the text of this resolution to the Governments of nuclear-weapon States.

Part III. Reference Material

Section 1. Military expenditure and the trade in arms

1A. *World military expenditure, 1949–1970*

SOURCES AND METHODS

Introduction

The main purpose of the collection of military expenditure material is to answer questions about long- and short-term trends in military expenditure, in individual countries, regions and the world as a whole. Because of differences in coverage, and the difficulty of finding appropriate exchange-rates, expenditure figures are often unsuitable for cross-country comparisons, that is, for comparing the military efforts of two countries at a particular point in time. The expenditure figures of, for example, the USA and USSR do not provide a good basis for comparing the military efforts of the two countries. They do, however, provide a good basis for commenting on the rate at which military expenditure is rising.

Definitions

The aim is to present expenditure figures: series showing the amount of work actually done (or likely to be done, for 1970) for military purposes. In many countries there are other series—such as those for obligations or appropriations in the USA—which may be at a different level and show a different movement from the expenditure series. For a good deal of defence procurement, there is usually a long lag between the decision to spend the money and the actual use of resources in producing the items. It is the actual use of resources which we are attempting to measure.

Even in countries with highly developed accounting systems, the expenditure figures for any particular year are likely to have a margin of error of 1–2 per cent: when a major procurement contract has been spread over a number of years, the accounting authority may well find it difficult to state precisely the value of work done in any particular year. Small movements in the figures from one year to the next are not usually significant.

Expenditure is defined to include 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. Where possible, adjustments were made to bring the figures closer to this definition.

For example when expenditure for research and development of nuclear weapons is separate from the regular budget, figures or estimates were included for this expenditure. For many countries, however, it was not possible to get a precise definition of the coverage of the figures, and no adjustments were made.

All figures were adjusted to the calendar years. The figures for 1970 were based on budget figures. Where the budget series differs from the expenditure series chosen, then the percentage change shown by the budget series was applied to the expenditure series.

The countries covered by each region in the world summary table are shown in the subsequent tables. Albania is included as a member of the Warsaw Pact, since it was a member during most of the period covered by the series.¹

For colonial territories no figures are shown before the date of independence, except where it is known that the territory concerned financed some military expenditure out of its own budget.

Wherever possible, the series of figures was carried back to 1949. The *SIPRI Yearbook 1968/69* carries some series back to 1948.

Sources

The published sources, covering figures for more than one country, used for military expenditure figures were as follows:

1. United Nations. Statistical yearbook. 1948–1968.
2. *Nato letter* 11: 1, Jan. 1963. NATO press release: M4(67) 2, 13 Dec. 1967; M1(69) 1, 16 Jan. 1969.
3. Loftus, Joseph E. Latin American defense expenditures, 1930–1965. (Rand memorandum RM-5310–PR/15A). Jan. 1968.
4. United States Arms Control and Disarmament Agency:
World-wide defense expenditures and selected economic data, calendar year 1964. (Research report 66–1).
World-wide military expenditures and related data, calendar year 1965. (Research report 67–6).
World military expenditures 1966–67 and 1969. (Research reports 68–52 and 69–53).
5. Institute for Strategic Studies. The military balance (annual) 1959/60–1969/70. London.
6. Coward, H. Roberts. Military technology in developing countries. Cambridge, Mass.: Center for International Studies, Massachusetts Institute of Technology, 1964.
7. Economic and social consequences of disarmament: replies of governments

¹ Albania announced her formal withdrawal from membership of the Warsaw Pact in a unilateral declaration on 12 September 1968.

- and communications from international organizations. (UN document E/3593/Rev.1.) 1962.
8. United Nations. Yearbook of national accounts statistics. 1957, 1958, 1959, 1961, 1964, 1966.
 9. OECD. Statistics of national accounts. 1950-61, 1955-62, 1956-65, 1957-66. Paris: OECD.
 10. Agency for International Development, Washington:
 - AID economic data book: Latin America. Dec. 1967.
 - AID economic data book: Africa. Dec. 1967.
 - AID economic data book: Far East. Dec. 1967.
 - AID economic data book: Near East and South Asia. Dec. 1967.
 11. Statesman's year-book. 1963/64-1968/69. New York.
 12. Institute for Strategic Studies, London.
 - Brown, N. and Gutteridge, W. F. The African military balance. Adelphi paper no. 12. August 1964.
 - Wood, D. The Middle East and the Arab world: the military context. Adelphi paper no. 20. July 1965.
 - Wood, D. The armed forces of African states. Adelphi paper no. 27. April 1966.
 - Wood, D. Armed forces in Central and South America. Adelphi paper no. 34. April 1967.
 13. Regional arms control arrangements for developing areas. Cambridge, Mass: Center for International Studies, Massachusetts Institute of Technology, Sept. 1964.
 14. Benoit, E. and Lubell, H. The world burden of national defence. *In* Disarmament and world economic interdependence. E. Benoit, ed. Oslo/New York/London, 1967.
 15. Schoor, Stuart H. The arms race and defense strategy in North Africa. (American University field staff report SH S-3-67) (North Africa series, vol. 8: 9). Dec. 1967.
 16. Great Soviet encyclopedia.

In addition, the budget statements or defence statements for individual countries were consulted wherever possible. Copies of the series which we proposed to use were sent to all governments concerned, with a request for any comments or corrections, which were included where provided. Requests for figures were also sent to a large number of academic institutions in countries for which figures were not available in international sources. Some recent figures were taken from press reports.

Methods

A. Selection of sources and coverage

A working sheet was prepared for each country, on which all figures from all sources were entered. A single continuous series was then prepared for as long a period as possible.

For NATO countries, the series used were those corresponding to NATO definitions (source [2]). For Warsaw Pact countries, official national series were used.

The Warsaw Pact countries publish a single figure for military expenditure, with no functional or service breakdown, and no subsequent comparison of actual with estimated expenditure. The main problem is with the comparability of the Soviet figure with the military expenditure figures for NATO countries. All United States analysts come to the conclusion that there are important items included in NATO figures which are excluded from Soviet figures.² In particular, they are fairly confident that a good deal of research and development expenditure is excluded from the Soviet military budget and included in the science budget. (The point is discussed in greater detail on pages 288–306.) Further suggestions for omissions from the Soviet figures are: military aid, military stockpiling, military nuclear activities, and possibly also some investment in arms procurement industries. However, the evidence showing that particular activities are financed outside the defence budget is not conclusive, and the upward adjustments made for these alleged omissions are highly speculative. In general the new estimates made tend to follow the trend of the official Soviet estimates but at a higher level. The figures in tables 1A.1 and 1A.4 have not been adjusted upwards for coverage: although the evidence is reasonably convincing that the coverage of the Soviet figures is lower, the size of the upward adjustment which would be right to compensate for this seemed so uncertain that it seemed better to allow the official figures to stand. There seemed rather more evidence on which to base an adjustment to the official exchange-rate (page 263).

For countries outside NATO and the Warsaw Pact, the source usually preferred, when figures were available, was the United Nations *Statistical Yearbook*. For a number of countries only rough estimates were available: thus no official figure has been published for China since 1960. The more conjectural estimates are shown in square brackets.

For Latin American countries for the years up to 1964 the figures were

² Godaire, J. G. *The Claim of the Soviet Military Establishment*. In *Dimensions of Soviet Economic Power*. US Congress, Joint Economic Committee, Washington, 1962. Sosnovy, Timothy. *The Soviet military budget*, *Foreign Affairs* 42(3): 487–494, April 1964.

Lee, W. T. and Anderson, S. A. *Probable Trend and Magnitude of Soviet Expenditures for National Security Purposes*. Research Memorandum SSC-Rm 5205–54. Stanford Research Institute, Strategic Studies Center, Menlo Park, California, 1969. (Prepared for Office of Chief of Research and Development, US Army.)

Becker, Abraham S. *Soviet Military Outlays Since 1955*. Rand Memorandum RM-3886-PR. Santa Monica, California, 1964. (Prepared for US Air Force.)

taken from Loftus (source [3]), who also used UN *Statistical Yearbook* figures, price-corrected by consumer price indices and converted at 1960 official exchange-rates.

B. Price correction

Since the main purpose of the series is to show whether the quantity of resources absorbed by military expenditure—the “real cost” of this expenditure—is rising or falling, and how fast, the series needed to be corrected for price changes. There is no price index that is self-evidently right for this. Some countries have a defence price index: but the use of this index leads to an understatement of the rise in the real cost of defence.³ We have used a consumer price index. For a fairly large number of countries this is the only price index available. If we had used a general price index, instead, for those countries which possess one—that is, a price index for the output of all goods and services, not just consumer goods and services—the general trends shown by the constant price figures here would not have been significantly different.

All consumer price indices were rebased on the year 1960.

³ These considerations are relevant to the choice of a price index:

(a) It is not at all easy to say what the “real output” of the military sector of an economy is: there is no measurable end-product, as there is, for example, with the steel industry. One possible theoretical approach would be to attempt to measure the increase in the potential output of lethal power, since this is what military expenditure is about. This is not a very practical approach. It would give an astronomical rate of increase over this period. Also, any such measure would omit, for example, the increase in resources devoted to a wide range of ancillary equipment. If, for example, one measured the output of a bomber by the megatonnage of the bombs it could carry, this output would not be increased if the bomber were subsequently equipped with elaborate electronic counter-measures.

(b) The “real output” indices for military expenditure which are included in some countries’ national accounts incorporate price indices for procurement and for research and development. For the armed forces themselves, the whole of the increase in armed forces’ pay-per-head is usually assumed to be a price increase: that is, it is assumed that there is no increase in the productivity of any member of the armed forces.

(c) If, instead of thinking of the “real output” of the military sector we think of the “real cost”, in terms of the real quantity of civil output foregone, then some allowance has to be made for the general increase in output-per-head in the civil sector of the economy. A member of the armed forces who is transferred to the civil sector now will have a higher real output than one who was transferred ten years ago. It follows that for measuring the increase in this real cost, a defence price index is unsuitable: it rises too fast. It postulates no increase in the real output-per-head of the armed forces, whereas the real cost of foregoing their potential contribution to civil output rises through time.

(d) It is worth noting here that in any country with conscription, where the conscript is paid less than he could earn in civil life, the real cost of military expenditure and its share in the gross national product is understated, since the valuation put on the services of the armed forces in the military budget is too low.

Table A. Official and Benoit-Lubell exchange-rates for Warsaw Pact countries

	Currency	Value of US \$ in national currency	
		Official basic rate end-1960	Benoit-Lubell exchange-rate
Albania	<i>leks</i>	50.00	39.67
Bulgaria	<i>levs</i>	6.80	1.16
Czechoslovakia	<i>crowns</i>	7.20	8.50
Germany, East	<i>marks</i>	2.22	3.39
Hungary	<i>forintos</i>	11.74	17.36
Poland	<i>zlotys</i>	4.00	15.92
Romania	<i>lei</i>	6.00	9.43
USSR	<i>roubles</i>	0.90	0.42

C. Comparability between countries: the exchange-rate problem

If we wish to make any statements about world or regional trends in military expenditure, the series for individual countries have to be summed—and, consequently, converted into a common currency. The exact exchange-rate chosen is important if the object is to compare the military efforts of two countries. It is less crucial, however, if the need is simply for a weighting system to add together the various countries in a region. Small changes in the weighting are not likely to lead to significant differences in the movement of total military expenditure for a region.⁴ The official exchange-rates for 1960—the base year used for the consumer price indices—were therefore generally used.

The Warsaw Pact countries presented something of a special problem. The relationships suggested by using the basic official exchange-rate are rather surprising: they imply, for example, that Poland's defence expenditure in 1968 was equivalent to 40 per cent of that of the USSR. They also imply that USSR military expenditure in 1968 was less than a quarter that of the USA. This does not seem to match other knowledge about the relative size of the resources devoted to military purposes by the countries concerned.

An alternative series is therefore presented in tables 1A.1 and 1A.4, using exchange-rates estimated by E. Benoit and H. Lubell,⁵ who attempted to calculate defence-purchasing-power-parity exchange-rates for these countries. The differences between these exchange-rates and the basic official rates are shown in table A above. The Benoit-Lubell exchange-rate for the

⁴ An experiment was made using estimated defence-purchasing-power-parity exchange-rates for European NATO countries. These rates were derived from E. Benoit and H. Lubell, "The world burden of national defence," in *Disarmament and World Economic Interdependence*, ed. E. Benoit (source [14]). The series derived for total European NATO from using these exchange-rates was not significantly different from the series derived from the use of official exchange-rates.

⁵ Source [14].

Soviet Union, for example, allows for the very different cost-per-head of the average soldier in the United States and the Soviet Union. In 1964 and 1965, the average cost-per-head for military manpower in the United States was roughly \$5 000. In the Soviet Union, for 1959–1964, it was roughly 1 000 roubles, or \$1 100 at the official exchange-rate.⁶ These figures suggest that 4.5:1 is a more accurate dollar-rouble exchange-rate for military manpower. An adjustment similar in direction but smaller in degree was estimated for the other categories of military expenditure. The average for military expenditure as a whole produced a dollar-rouble exchange-rate lying between 2:1 and 2.5:1.

Conventions

[] = Rough estimates.

() = Budget estimate, adjusted to the expenditure figures.

■ = Date of independence.

Figures for all countries are given (a) at current prices, in local currency, (b) at constant (1960) prices, converted into US dollars at 1960 exchange-rates, and (c) for the year 1969, at current prices, converted into US dollars at current exchange-rates. When 1969 figures were not available for this final column, 1968 or 1967 figures were given instead.

Tables 1A.3, 5, 7, 9, 11, 13, 15, 17, 19 and 21 give current price figures in local currency.

Tables 1A.1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 give constant price figures converted into dollars at 1960 exchange-rates, and also give a column, 1969X, for 1969 expenditure, at current prices converted into dollars at current exchange-rates.

⁶ The US figures are derived simply by dividing military personnel expenditure net of retired pay by the size of the armed forces. The Soviet figure is an approximation arrived at by a number of Western analysts: J. G. Godaire and A. S. Becker, quoted in *Soviet Interest in Arms Control and Disarmament. The Decade under Khrushchev. 1954–64*. Center for International Studies, Massachusetts Institute of Technology, Cambridge, Mass. 1965. page 179. E. Benoit and H. Lubell, in *Disarmament and World Economic Interdependence*. E. Benoit, ed. Oslo, 1967.

World military expenditure

Table 1 A. 1. World summary: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
USA	16 629	17 733	37 781	52 992	54 409	46 915	44 428	45 307	46 843	46 432
Other NATO	7 276	8 959	12 450	15 495	15 878	14 796	14 557	15 375	15 539	14 379
Total NATO	23 905	26 692	50 231	68 487	70 287	61 711	58 985	60 682	62 382	60 811
USSR	18 857	19 731	22 948	25 952	25 666	23 881	25 476	23 167	23 029	22 286
Other Warsaw Pact	[2 500]	[2 500]	[2 500]	[2 500]	[2 500]	[2 500]	[2 500]	[2 750]	2 827	2 918
Total Warsaw Pact	21 357	22 231	25 448	28 452	28 166	26 381	27 976	25 917	25 856	25 204
Other European	723	726	828	1 280	1 260	1 243	1 243	1 240	1 335	1 368
Middle East	270	300	330	320	350	390	500	640	670	790
South Asia ^a	620	650	680	740	680	690	740	830	750	810
Far East (excl. China)	650	1 120	1 400	1 420	1 650	1 670	1 580	1 590	1 790	2 050
China	[2 500]	[2 750]	[3 500]	[3 000]	[2 500]	[2 500]	[2 500]	[2 500]	[2 750]	[2 500]
Oceania	281	342	496	595	596	536	547	535	496	491
Africa	50	50	90	90	80	80	90	130	150	170
Central America	270	270	270	270	280	260	270	280	300	300
South America	790	710	760	760	830	810	870	1 030	990	1 100
World total	51 416	55 841	84 033	105 414	106 679	96 271	95 301	95 374	97 469	95 594

^a India, Pakistan, Afghanistan, Ceylon.

Table 1 A. 2. NATO: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
North America:										
United States	16 629	17 733	37 781	52 992	54 409	46 915	44 428	45 307	46 843	46 432
Canada	476	619	1 386	2 066	2 193	1 950	2 008	2 055	1 931	1 783
Europe:										
Belgium	186	202	301	446	442	435	376	365	380	377
Denmark	77	72	86	118	155	153	150	145	152	140
France	1 870	1 987	2 651	3 394	3 796	3 206	2 977	3 876	4 028	3 718
Germany, West	12	1 000	1 887	2 059	1 646	1 671	1 920	1 837	2 236	1 677
Greece	103	115	137	132	126	135	138	178	157	155
Italy	646	767	908	994	897	981	974	1 000	1 036	1 064
Luxembourg	3	4	6	10	11	12	13	9	9	9
Netherlands	266	325	344	402	428	486	511	551	514	452
Norway	84	78	107	142	179	183	152	148	158	146
Portugal	53	57	60	65	76	81	85	86	88	89
Turkey	146	165	183	191	211	217	228	215	211	218
United Kingdom	3 354	3 568	4 394	5 476	5 718	5 286	5 031	4 910	4 639	4 551
Total NATO	23 905	26 692	50 231	68 487	70 287	61 711	58 985	60 682	62 382	60 811
Total NATO excl. USA	7 276	8 959	12 450	15 495	15 878	14 796	14 557	15 375	15 539	14 379
Total NATO Europe	6 800	8 340	11 064	13 429	13 685	12 846	12 555	13 320	13 608	12 596

Tables of values

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
47 085	45 380	47 335	51 203	50 527	48 821	48 618	57 951	66 889	68 535	64 386	(59 556)	79 774
15 342	15 955	16 354	17 898	18 408	18 752	18 662	18 825	19 662	19 072	18 988	(19 234)	25 326
62 427	61 335	63 689	69 101	68 935	67 573	67 280	76 776	86 551	87 607	83 374	(78 790)	105 100
22 310	22 143	27 619	30 238	33 095	31 667	30 476	31 905	34 450	39 780	42 143	(42 509)	42 143
3 198	3 379	3 752	4 186	4 445	4 439	4 416	4 733	5 082	6 023	(6 698)	(7 221)	7 028
25 508	25 522	31 371	34 424	37 540	36 106	34 892	36 638	39 532	45 803	48 841	49 730	49 171
1 412	1 397	1 510	1 637	1 677	1 772	1 785	1 840	1 834	1 897	(1 922)		2 654
870	890	950	1 060	1 180	1 409	1 610	1 811	2 305	2 713	3 226	(3 836)	3 397
800	812	854	1 080	1 640	1 638	1 735	1 768	1 558	1 614	(1 608)	...	2 002
2 180	2 290	2 440	2 525	2 315	2 535	2 800	2 920	3 125	3 555	(4 150)	...	4 638
[2 800]	[2 800]	[3 300]	[3 800]	[4 300]	[4 800]	[5 500]	[6 000]	[6 500]	7 000	[7 300]	...	[7 800]
498	496	498	512	536	605	735	874	1 033	1 110	1 123	...	1 359
210	320	[380]	[550]	[600]	740	[850]	[900]	[960]	[1 000]	[1 050]	...	[1 230]
310	330	340	380	380	395	415	430	475	480	[490]	...	[535]
960	970	940	1 010	1 030	1 085	1 260	1 250	1 385	1 330	1 375	...	2 235
97 975	97 162	106 282	116 084	120 138	118 658	118 877	131 262	145 288	154 119	154 438	...	180 121

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
47 085	45 380	47 335	51 203	50 527	48 618	48 618	57 951	66 889	68 535	64 386	(59 556)	79 774
1 665	1 660	1 708	1 778	1 653	1 720	1 536	1 576	1 695	1 596	1 538	(1 508)	1 805
380	386	391	415	427	459	444	448	471	498	505	...	655
144	161	164	200	203	209	220	217	218	233	232	(245)	354
3 793	3 908	3 876	4 182	4 110	4 225	4 293	4 415	4 615	4 645	4 608	(4 610)	5 701
2 685	2 905	3 082	3 894	4 371	4 193	4 131	4 057	4 225	3 746	3 908	(4 102)	5 600
161	170	165	168	172	179	193	210	270	315	353	...	418
1 097	1 144	1 182	1 298	1 447	1 482	1 537	1 662	1 623	1 654	1 639	(1 622)	2 267
8	5	6	7	7	9	9	9	7	6	7	...	8
403	458	534	569	575	626	610	594	660	651	682	(731)	1 020
155	148	161	178	185	188	217	216	223	236	261	(278)	366
101	105	168	191	187	204	204	214	263	271	230	(220)	377
251	266	289	306	303	323	343	332	333	359	382	...	631
4 499	4 639	4 628	4 712	4 768	4 935	4 925	4 875	5 023	4 876	4 643	(4 679)	5 509
62 427	61 335	63 689	69 101	68 935	67 573	67 280	76 776	86 551	87 607	83 374	(78 790)	104 485
15 342	15 955	16 354	17 898	18 408	18 752	18 662	18 825	19 662	19 072	18 988	(19 234)	24 711
13 677	14 295	14 646	16 120	16 755	17 032	17 126	17 249	17 967	17 476	17 450	(17 726)	22 906

World military expenditure

Table 1 A. 3. NATO: current price figures

	<i>Currency</i>	1949	1950	1951	1952	1953	1954	1955	1956	1957
North America:										
United States	<i>mn. dollars</i>	13 503	14 559	33 398	47 852	49 621	42 786	40 518	41 773	44 548
Canada	<i>mn. dollars</i>	372	495	1 220	1 875	1 970	1 771	1 819	1 888	1 829
Europe:										
Belgium	<i>mn. francs</i>	7 653	8 256	13 387	19 965	19 815	19 925	17 067	17 065	18 356
Denmark	<i>mn. kroner</i>	360	359	475	676	889	885	920	936	1 012
France	<i>mn. francs</i>	4 787	5 591	8 811	12 531	13 865	11 710	11 020	14 690	15 600
Germany, West	<i>mn. marks</i>	45	3 498	7 098	7 898	6 195	6 287	7 383	7 211	8 962
Greece	<i>mn. drachmas</i>	1 630	1 971	2 615	2 655	2 767	3 428	3 688	4 939	4 477
Italy	<i>bn. lire</i>	301	353	457	521	480	543	551	584	611
Luxembourg	<i>mn. francs</i>	112	170	264	436	488	566	614	395	439
Netherlands	<i>mn. guilders</i>	680	901	1 060	1 253	1 330	1 583	1 699	1 854	1 845
Norway	<i>mn. kroner</i>	370	357	572	831	1 067	1 141	953	967	1 049
Portugal	<i>mn. escudos</i>	1 419	1 516	1 553	1 691	1 975	2 100	2 224	2 297	2 391
Turkey	<i>mn. lire</i>	556	599	652	725	827	936	1 077	1 159	1 266
United Kingdom	<i>mn. pounds</i>	779	849	1 149	1 561	1 681	1 571	1 567	1 615	1 574

Table 1 A. 4. Warsaw Pact: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Albania	...	...	...	...	...	...	...	...	[70]	[70]
Bulgaria	...	...	...	130	...	...	...	...	130	146
Czechoslovakia	874	1 000	1 099	...	878	816	...	1 008	1 050	1 005
Germany, East	...	...	...	...	...	...	...	...	[390]	471
Hungary	...	...	...	...	...	...	...	...	109	[120]
Poland	...	...	...	...	654	...	877	...	673	725
Romania	...	...	...	...	...	...	...	...	405	381
USSR	18 857	19 721	22 948	25 952	26 238	23 881	26 691	23 167	23 029	22 381
Total Warsaw Pact	21 357	22 231	25 448	28 452	28 738	26 381	29 191	25 917	25 856	25 299
Total Warsaw Pact excl. USSR	[2 500]	[2 500]	[2 500]	[2 500]	[2 500]	[2 500]	[2 500]	[2 750]	2 827	2 918

Tables of values

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
45 503	46 614	45 380	47 808	52 381	52 295	51 213	51 827	63 572	75 451	80 597	79 774	(76 232)
1 740	1 642	1 654	1 716	1 810	1 712	1 813	1 659	1 766	1 965	1 927	1 937	1 937
18 312	18 686	19 161	19 561	21 111	22 230	24 853	25 036	26 313	28 432	30 110	32 530	...
938	986	1 113	1 180	1 551	1 651	1 764	1 974	2 080	2 249	2 591	2 657	(2 877)
16 569	17 926	19 162	20 395	22 184	22 849	24 280	25 300	26 732	28 912	30 200	31 700	(32 778)
6 853	11 087	12 115	13 175	17 233	19 924	19 553	19 915	20 254	21 394	19 310	20 666	(22 071)
4 469	4 735	5 110	5 034	5 102	5 385	5 647	6 290	7 168	9 390	11 022	12 611	...
647	667	710	749	861	1 031	1 118	1 212	1 342	1 359	1 403	1 418	(1 430)
429	402	263	290	355	348	462	477	497	413	376	401	...
1 656	1 505	1 728	2 013	2 186	2 307	2 661	2 714	2 790	3 200	3 280	3 691	(4 134)
1 024	1 107	1 058	1 179	1 371	1 465	1 570	1 897	1 947	2 097	2 300	2 614	(2 878)
2 485	2 820	3 023	4 922	5 744	5 724	6 451	6 680	7 393	9 575	10 370	9 671	(9 763)
1 470	2 153	2 405	2 718	2 980	3 157	3 443	3 821	3 996	4 596	5 159	5 730	...
1 591	1 589	1 655	1 709	1 814	1 871	2 000	2 091	2 153	2 276	2 310	2 314	(2 420)

US \$ mn, at constant 1960 prices and Benoit-Lubell exchange-rates (Final column, X, at current prices and Benoit-Lubell exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
[70]	[70]	[70]	[70]	[70]	71	73	69	69	77	106	(122)	106
140	154	186	214	219	210	188	195	215	215	246	(270)	261
1 014	1 035	1 125	1 276	1 315	1 262	1 180	1 244	1 392	1 473	1 584	(1 697)	1 647
[550]	[630]	[710]	807	808	809	820	967	1 055	1 699	1 860	(1 976)	1 873
144	[174]	204	284	348	343	277	276	293	347	426	(438)	458
915	936	1 062	1 121	1 250	1 308	1 397	1 473	1 528	1 662	1 797	1 976	2 004
365	[380]	[395]	414	435	436	481	509	530	550	679	(742)	679
22 310	22 143	27 619	30 238	33 095	31 667	30 476	31 905	34 450	39 780	42 143	(42 509)	42 143
25 508	25 522	31 371	34 424	37 540	36 106	34 892	36 638	39 532	45 803	48 841	(49 730)	49 171
3 198	3 379	3 752	4 186	4 445	4 439	4 416	4 733	5 082	6 023	6 698	(7 221)	7 028

World military expenditure

Table 1 A. 5. Warsaw Pact: current price figures

	<i>Currency</i>	1949	1950	1951	1952	1953	1954	1955	1956	1957
Albania	<i>mn. new leks</i>	...	...	...	...	...	...	...	...	...
Bulgaria	<i>mn. new levs</i>	...	...	...	161	...	...	...	...	154
Czechoslovakia	<i>mn. korunas</i>	8 359	9 565	10 506	...	8 400	7 800	...	9 100	9 300
Germany, East	<i>mn. marks</i>	...	...	...	...	...	...	...	...	...
Hungary	<i>mn. forintas</i>	...	...	...	...	...	...	...	...	1 912
Poland	<i>mn. zlotys</i>	...	...	...	...	10 300	...	12 600	...	10 100
Romania	<i>mn. lei</i>	...	...	...	...	...	...	...	...	3 817
USSR	<i>mn. roubles</i>	7 920	8 287	9 638	10 900	11 020	10 030	11 210	9 730	9 672

Table 1 A. 6. Other European: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Austria	38	25	32	21	20	2	8	41	69	78
Finland	91	54	67	45	51	53	70	66	64	67
Ireland	19	20	22	26	29	27	26	24	24	23
Spain	81	79	78	98	95	103	99	106	112	100
Sweden	298	340	378	436	489	512	527	532	546	548
Switzerland	127	135	172	219	195	172	185	166	223	236
Yugoslavia	69	73	79	435	381	374	328	305	297	316
Total	723	726	828	1 280	1 260	1 243	1 243	1 240	1 335	1 368

Table 1 A. 7. Other European: current price figures

	<i>Currency</i>	1949	1950	1951	1952	1953	1954	1955	1956	1957
Austria	<i>mn. shillings</i>	525	383	623	476	443	47	188	1 001	1 714
Finland	<i>mn. marks</i>	146	99	151	107	121	124	163	170	184
Ireland	<i>mn. pounds</i>	4.5	4.9	5.8	7.5	8.9	8.4	8.1	7.9	8.1
Spain	<i>mn. pesetas</i>	2 640	2 834	3 037	3 770	3 716	4 105	4 084	4 665	5 441
Sweden	<i>mn. kronor</i>	962	1 138	1 441	1 786	2 026	2 147	2 264	2 389	2 557
Switzerland	<i>mn. francs</i>	478	505	666	880	775	688	750	682	930
Yugoslavia	<i>mn. new dinars</i>	373	395	431	1 822	1 674	1 627	1 593	1 580	1 590

Table 1 A. 8. Middle East: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Cyprus	...	...	...	...	...	...	...	...	...	...
Iraq	18.8	21.8	22.5	31.9	47.1	53.1	53.2	75.1	82.4	88.5
Iran	50.1	66.5	63.4	60.0	56.9	64.7	90.0	105.7	127.2	202.7
Israel	36.2	49.2	78.0	49.9	39.7	35.8	38.6	77.1	109.2	122.5
Jordan	13.3	16.6	27.9	29.2	31.2	31.8	32.3	38.5	39.3	45.9
Kuwait	...	...	...	...	...	...	...	...	...	...
Lebanon	6.3	5.7	6.5	6.4	8.2	8.8	10.7	14.3	13.8	15.5
Saudi Arabia	...	...	...	...	...	...	...	...	...	...
Syria	14.9	24.2	21.2	20.0	27.1	25.5	27.9	48.1	39.8	71.3
Yemen	...	...	...	...	...	...	...	...	...	...
United Arab Republic	106.5	92.8	88.8	95.2	108.9	142.8	216.2	249.3	222.7	204.1
Total	270	300	330	320	350	390	500	640	670	790

^a 1967.

Tables of values

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
...	...	...	...	...	...	282	288	272	272	304	420	...
173	163	179	217	258	270	260	231	240	264	264	303	...
8 900	8 800	8 800	9 500	10 900	11 300	10 900	10 300	10 900	12 400	13 000	14 000	(15 000)
1 650	...	...	...	2 764	2 764	2 764	2 800	3 300	3 600	5 800	6 350	(6 747)
...	2 500	...	3 563	4 998	6 050	6 005	4 926	5 064	5 437	6 439	7 952	...
11 200	14 300	14 900	17 000	18 400	20 700	21 900	23 600	25 200	26 400	29 100	31 936	35 389
3 597	3 446	...	...	3 900	4 100	4 110	4 540	4 800	5 000	5 187	6 400	(7 000)
9 400	9 370	9 300	11 600	12 700	13 900	13 300	12 800	13 400	14 500	16 700	17 700	(17 854)

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
77	73	71	74	90	114	94	107	106	104	105	(122)	144
79	83	96	135	108	106	108	106	99	108	107	110	127
24	26	27	27	29	28	28	29	30	31	(31)	...	36
94	111	114	133	137	139	138	162	191	188	190	...	279
566	560	587	632	673	708	750	774	760	757	774	(755)	1 073
231	215	250	277	278	301	304	313	302	317	307	(317)	410
341	329	365	359	362	376	363	349	346	392	408	...	585
1 412	1 397	1 510	1 637	1 677	1 772	1 785	1 840	1 834	1 897	1 922	...	2 654

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
1 986	1 989	1 893	1 890	2 076	2 608	3 408	2 957	3 474	3 532	3 558	3 719	(4 393)
206	246	267	314	460	383	417	446	456	447	533	561	578
8.3	8.6	9.2	9.9	10.5	11.3	11.5	12.4	13.0	14.2	14.9	...	...
5 534	5 557	6 688	6 968	8 586	9 609	10 460	11 736	14 704	18 368	19 026	19 597	...
2 706	2 820	2 898	3 107	3 500	3 839	4 173	4 646	5 103	5 224	5 295	5 546	(5 512)
1 009	972	924	1 096	1 264	1 316	1 466	1 533	1 653	1 658	1 787	1 770	(1 870)
1 785	1 956	2 077	2 477	2 701	2 862	3 321	4 305	5 070	5 387	6 786	7 318	...

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
...	...	[5.0]	[6.0]	[7.0]	7.6	9.2	7.6	7.3	7.5	[7.5]	...	7.5 ^a
103.1	118.7	123.5	132.2	153.6	181.2	218.3	236.6	236.8	250.8	245.7	...	292.6
226.7	182.9	181.0	180.1	183.0	201.2	252.0	338.7	409.9	437.5	457.7	(606.5)	531.4
138.8	163.1	163.1	183.7	228.1	316.0	375.0	458.0	589.0	744.0	950.0	(1 204.0)	790.0
57.2	53.5	52.3	55.9	56.5	55.6	45.8	54.8	58.0	68.1	110.2	(108.5)	126.0
...	[5.0]	[5.0]	[10.0]	[20.0]	29.4	30.8	36.4	60.2	64.4	70.3	...	70.3
14.2	15.2	17.9	25.4	21.3	23.2	26.8	33.0	35.7	36.5	41.5	(43.3)	49.2
...	[50.0]	69.9	92.4	99.7	103.0	113.0	112.0	232.5	253.4	263.1	(288.0)	343.3
70.1	70.1	71.6	78.8	82.3	90.6	99.2	81.2	117.4	141.7	179.0	...	193.7
...	[7.0]	[7.0]	[7.0]	[7.0]	[7.0]	[10.0]	[10.0]	[10.0]	[11.0]	[11.0]	...	[11.0]
204.1	225.9	256.6	288.9	317.1	395.4	431.7	444.6	547.9	698.0	890.0	...	982.1
870	890	950	1 060	1 180	1 409	1 610	1 811	2 305	2 713	3 226	...	3 397

World military expenditure

Table 1 A. 9. Middle East: current price figures

	Currency	1949	1950	1951	1952	1953	1954	1955	1956	1957
Cyprus	<i>mn. pounds</i>	...	...	...	...	...	...	...	...	...
Iraq	<i>mn. dinars</i>	6.6	7.0	7.7	11.8	15.2	16.7	17.2	25.8	29.7
Iran	<i>mn. rials</i>	2 271	2 477	2 477	2 533	2 545	3 430	4 905	6 167	7 898
Israel	<i>mn. pounds</i>	22	28	49	49	49	50	57	122	183
Jordan	<i>mn. dinars</i>	4.0	5.0	8.6	9.1	9.9	10.2	10.5	12.8	13.4
Kuwait	<i>mn. dinars</i>	...	...	...	...	...	...	...	...	...
Lebanon	<i>mn. pounds</i>	17.3	14.6	17.9	17.6	21.2	21.7	26.7	38.0	39.1
Saudi Arabia	<i>mn. rials</i>	...	...	...	...	...	...	...	...	...
Syria	<i>mn. pounds</i>	49	68	69	70	87	76	82	161	140
United Arab Rep.	<i>mn. pounds</i>	34	31	33	35	37	47	71	83	78

Table 1 A. 10. South Asia: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Afghanistan	...	...	...	...	...	...	...	...	...	...
Ceylon	0.8	1.2	2.2	2.9	4.0	6.5	6.0	7.2	9.8	13.8
India	443.0	452.0	452.0	475.0	470.0	503.0	524.0	624.0	567.0	621.0
Nepal	...	...	...	...	...	...	...	...	...	...
Pakistan	167.0	186.0	219.0	246.0	193.0	170.0	200.0	192.0	159.0	166.0
Total	600.0	650.0	680.0	730.0	680.0	690.0	740.0	830.0	750.0	810.0

^a 1967.

Table 1 A. 11. South Asia: current price figures

	Currency	1949	1950	1951	1952	1953	1954	1955	1956	1957
Afghanistan	<i>mn. afghanis</i>	...	...	...	...	...	...	...	...	...
Ceylon	<i>mn. rupees</i>	3.5	5.4	10.6	13.8	19.0	30.2	27.4	32.8	45.9
India	<i>mn. rupees</i>	1 672	1 748	1 833	1 878	1 926	1 969	1 932	2 118	2 665
Nepal	<i>mn. rupees</i>	...	...	...	...	...	...	...	...	...
Pakistan	<i>mn. rupees</i>	621	662	812	935	817	705	787	793	718

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
...	...	...	...	...	...	2.7	3.3	2.7	2.6	...	...	...
31.0	35.8	42.4	44.8	48.2	58.3	67.9	81.0	88.7	91.0	97.7	104.5	...
12 589	15 629	13 857	14 137	14 170	14 469	16 523	21 098	28 267	34 780	37 352	40 254	54 219
212	243	294	313	386	511	746	952	1 255	1 642	2 116	2 765	3 556
15.9	20.1	19.1	18.9	20.6	21.1	21.1	17.6	21.6	23.0	27.5	45.0	(45.0)
...	...	...	...	...	...	10.5	11.0	13.0	21.5	[23.0]	[25.1]	...
45.6	43.0	47.8	56.4	80.6	68.9	76.6	90.1	114.3	128.4	136	160	172
...	...	...	324	441	490	522	589	603	1 287	1 444	1 545	1 742
234	237	251	261	279	297	346	365	316	478	587	(740)	...
71	70	78	91	100	110	143	178	200	248	327	427	...

US \$ mn, at constant 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969 X
...	7.4	[8.0]	[8.0]	[8.0]	7.6	6.8	5.9	5.3	5.0	[5.0]	...	25.5 ^a
15.0	15.0	15.2	13.9	11.9	11.6	11.9	12.7	13.2	13.4	[13.4]	...	12.7 ^a
577.0	582.0	625.0	862.0	1 409.0	1 380.0	1 346.0	1 307.0	1 179.0	1 209.0	1 191.0	(1 193)	1 437.0
...	2.6	[3.0]	[3.0]	3.4	3.3	3.2	3.8	4.7	5.0	[5.0]	...	6.6 ^a
195.0	205.0	203.0	193.0	208.0	235.0	367.0	439.0	356.0	382.0	(394.0)	...	529.0
800.0	812.0	854.2	1 079.9	1 640.3	1 637.5	1 734.9	1 767.7	1 558.2	1 614.4	1 608.4	...	2 010.8

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
...	...	552	...	...	...	907	1 019	1 087	1 150	(1 229)	...	...
66.2	71.9	71.3	73.2	67.8	59.5	59.6	61.5	65.8	72.3	(75.8)	...	...
2 797	2 699	2 774	3 046	4 336	7 306	8 084	8 651	9 279	9 547	10 045	10 818	(11 392)
...	...	21.4	...	...	32.9	37.2	37.9	43.3	61.3	66.8	...	...
771	878	978	984	938	1 029	1 208	1 986	2 553	2 215	2 340	(2 525)	...

Table 1 A. 12. Far East: constant price figures^a

Country	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Burma	18.3	25.3	32.3	49.0	70.3	87.9	76.9	76.3	76.1	85.1
Cambodia	...	...	...	...	...	...	...	...	...	...
Hong Kong	...	...	...	...	...	...	...	...	...	...
Indonesia	...	...	347.5	...	377.7	337.4	266.3	264.2	329.5	419.4
Japan	...	...	423.7	441.1	502.3	484.8	457.1	451.7	446.6	451.0
Korea, North	...	...	...	...	...	...	...	...	...	...
Korea, South	41.1	...	...	66.8	154.4	185.4	150.8	145.4	187.0	220.2
Laos	...	...	...	...	...	...	...	...	...	...
Malaysia	3.4	3.1	28.4	46.1	64.4	58.5	52.5	47.9	50.0	52.2
Mongolia	...	...	...	...	...	...	...	...	...	...
Philippines	46.3	54.4	67.9	82.8	83.9	80.1	78.4	79.0	80.9	84.7
Thailand	21.6	22.3	31.0	52.0	53.3	52.3	45.8	41.2	74.1	62.4
Viet-Nam, North	...	...	...	...	...	...	...	...	...	...
Viet-Nam, South	...	...	...	...	...	...	...	...	...	...
Taiwan	...	...	...	...	66.5	80.0	110.9	114.4	126.2	207.2
Total	[650.0]	[1 120.0]	[1 400.0]	[1 420.0]	[1 650.0]	[1 670.0]	[1 570.0]	[1 590.0]	[1 790.0]	[2 050.0]

^a Dates of independence are shown in table 13.

^b 1968.

Table 1 A. 13. Far East: current price figures

	<i>Currency</i>	1949	1950	1951	1952	1953	1954	1955	1956	1957
Burma	<i>mn. kyats</i>	105.0	122.2	152.7	222.3	308.9	369.6	338.0	357.3	378.3
Cambodia	<i>mn. riels</i>	...	...	...	...	...	...	...	...	...
Indonesia	<i>bn. rupiah</i>	...	...	3.3	...	3.9	3.6	3.9	4.4	6.1
Japan	<i>bn. yen</i>	...	...	118.5	131.0	157.6	162.0	151.3	149.5	152.3
Korea, North	<i>mn. won</i>	...	...	...	...	...	...	...	...	...
Korea, South	<i>bn. won</i>	...	...	...	0.8	2.7	4.4	6.0	7.1	11.3
Laos	<i>mn. kips</i>	...	...	...	...	...	...	...	...	...
Malaysia	<i>mn. dollars</i>	8.2	8.6	97.5	160.9	210.1	184.4	160.5	148.1	160.6
Mongolia	<i>mn. tugrik</i>	...	...	...	...	...	...	...	...	...
Philippines	<i>mn. pesos</i>	94.0	113.6	153.6	174.6	171.9	162.3	157.2	161.6	169.1
Thailand	<i>mn. baht</i>	278.4	297.5	455.5	844.4	961.0	943.6	855.2	816.7	1 566.7
Viet-Nam, North	<i>mn. dong</i>	...	...	...	...	...	...	...	...	...
Viet-Nam, South	<i>bn. piastres</i>	...	...	...	...	...	...	...	...	...
Taiwan	<i>bn. dollars</i>	...	...	...	...	1.5	...	2.8	3.2	3.8

Table 1 A. 14. Oceania: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Australia	245	299	434	511	501	454	470	458	422	417
New Zealand	36	43	62	84	95	82	77	77	74	74
Total	281	342	496	595	596	536	547	535	496	491

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
96.6	89.2	82.9	89.5	101.0	97.6	108.3	105.1	102.7	107.1	111.2	...	111.6
...	[35.0]	43.0	45.1	43.2	47.1	42.6	43.1	49.1	49.3	[50.0]	...	40.5 ^b
...	[8.0]	[8.0]	[8.0]	[8.0]	[9.5]	[10.0]	[10.0]	[10.0]	[10.0]	[10.0]	...	[10.0]
418.8	484.8	540.7	362.2	265.4	204.8	182.5	[200.0]	230.3	181.4	381.0	...	211.6
462.3	455.9	472.7	517.0	390.0	553.0	623.0	658.0	720.0	750.0	810.0	(924.0)	1 310.7
...	[200.0]	[225.0]	[250.0]	[275.0]	[300.0]	[350.0]	[300.0]	[450.0]	[600.0]	[660.0]	...	[691.0]
233.6	227.1	236.9	273.9	226.5	213.0	224.7	277.5	296.6	360.4	403.1	...	282.6
...	[20.0]	[20.0]	24.6	17.7	9.9	16.1	18.6	18.7	19.0	18.8	...	41.2
46.0	42.9	36.3	36.6	49.2	68.9	97.1	119.6	110.9	114.6	125.4	[163.4]	133.1
...	[15.0]	[15.0]	[15.0]	[20.0]	[20.0]	[20.0]	[20.0]	[20.0]	[20.0]	[20.0]	...	[20.0]
87.6	87.1	89.4	87.1	87.1	83.3	93.0	111.4	124.6	147.1	176.4	...	146.5 ^b
66.2	65.2	68.8	72.0	74.2	78.7	86.2	91.9	110.0	134.9	147.3	...	161.3
...	[200.0]	[225.0]	[250.0]	[275.0]	[300.0]	[350.0]	[400.0]	[450.0]	[500.0]	[550.0]	...	[550.0]
...	157.0	162.0	248.0	231.0	283.0	313.0	227.0	186.0	327.0	449.0	...	668.9
219.2	203.3	214.2	245.5	249.4	267.6	285.5	236.1	232.7	235.4	[240.0]	...	300.0 ^b
[2 180.0]	[2 290.0]	[2 440.0]	[2 525.0]	[2 315.0]	[2 535.0]	[2 800.0]	[2 820.0]	[3 125.0]	[3 555.0]	[4 150.0]	...	[4 650.0]

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
406.5	410.8	426.3	408.0	431.9	477.7	466.3	517.4	502.2	490.8	511.9	(531.3)	...
...	...	...	1 610	1 736	1 764	1 964	1 845	1 855	2 100	2 250	...	...
11.1	14.1	21.7	31.7	57.4	91.4	144.7	521.2	...	20 325.0	36 070.0	80 030.0	...
153.8	159.3	163.3	178.3	208.6	169.1	249.0	299.1	332.0	378.0	415.0	459.0	553.0
...	...	...	...	...	...	...	...	...	...	1 617.0	1 798.0	...
12.8	14.0	14.8	16.7	20.5	20.5	24.9	29.9	41.1	48.7	60.4	81.1	...
...	...	...	...	2 280	3 144	3 480	6 384	8 400	9 120	9 750	9 900	...
166.2	142.3	131.3	110.9	112.0	154.9	217.0	303.0	380.8	366.6	379.3	410.0	535.0
...	...	...	...	...	...	100	100	100	80	...	...	...
182.4	186.9	193.4	201.5	207.7	219.3	227.1	260.0	330.8	391.1	464.6	571.2	708.9
1 389.7	1 420.5	1 378.4	1 473.0	1 580.0	1 643.0	1 777.6	1 964.0	2 170.6	2 702.8	3 387.5	3 764.4	...
...	...	...	...	...	...	882	1 103	882	1 323	1 470	...	...
...	...	5.5	6.0	9.5	9.5	12.0	15.5	18.1	21.4	47.7	(78.6)	...
6.3	7.4	8.1	9.2	10.8	11.2	12.0	12.8	10.2	11.0	12.0	...	...

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
423	419	425	441	465	521	641	774	881	1 010	1 030	(1 051)	1 258
75	77	73	71	71	84	94	100	97	100	[93]	...	101
498	496	498	512	536	605	735	874	978	1 110	[1 123]	...	1 359

Table 1 A. 15. Oceania: current price figures

	Currency	1949	1950	1951	1952	1953	1954	1955	1956	1957
Australia	<i>mn. dollars</i>	114	152	265	368	373	342	362	372	354
New Zealand	<i>mn. dollars</i>	16	20	32	47	55	50	48	50	49

Table 1 A. 16. Africa: constant price figures^d

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Algeria
Burundi
Cameroon
Central African Rep.
Chad
Congo, Kinshasa
Congo, Brazzaville
Dahomey
Ethiopia
Gabon
Ghana	7.0	7.2
Guinea
Ivory Coast
Kenya	5.3	5.7	5.0
Liberia
Libya
Madagascar
Malawi
Mali
Mauritania
Mauritius	0.4	0.4
Morocco	42.4
Niger
Nigeria
S. Rhodesia
Senegal
Sierra Leone
Somalia
South Africa	45.4	41.5	75.7	79.6	68.0	64.0	66.5	74.3	76.9	58.0
Sudan	2.9	7.1	5.4	4.8	5.8	7.3	8.5	8.7	11.8	14.3
Tanzania, Un. Rep. of
Togo
Tunisia	4.1	5.9	10.0
Uganda
Upper Volta
Zambia
Rhodesia and Nyasaland, Fed. of	7.8	10.2	11.5	12.0
Total	[50.0]	[50.0]	[90.0]	[90.0]	[80.0]	[80.0]	[90.0]	[130.0]	[150.0]	[170.0]

^a=1968. ^b=1967. ^c=1966. ^d Dates of independence are shown in table 17.

Tables of values

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
352	365	376	391	406	431	494	629	781	922	1 082	1 135	(1 187)
50	54	56	53	53	55	67	77	84	87	94	91	...

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1969X
...	...	...	[67.0]	72.5	87.7	83.3	85.2	85.2	(85.2)	(85.2)	(85.2)	99.2
...	...	...	1.6	1.8	2.0	2.9	2.9	3.5	3.7	[4.0]	...	3.1 ^a
...	9.7	7.9	14.3	11.9	11.4	12.0	12.3	12.2	[12.2]	...	...	16.2 ^b
...	...	0.8	0.9	0.9	1.6	2.2	2.1	[2.1]	...	...	...	3.0 ^b
...	...	...	1.4	1.3	1.6	2.3	3.7	4.3	4.4	(5.4)	...	7.8
...	[40.0]	[40.0]	[40.0]	44.5	60.7	98.3	137.0	117.2	95.0	88.1	...	133.5 ^a
...	0.4	[2.0]	3.3	[3.6]	4.0	3.8	5.1	[6.0]	4.2	[4.5]	...	6.0 ^b
...	[0.5]	[0.8]	[1.0]	1.1	4.0	4.0	4.0	[4.0]	...	...	...	4.0 ^c
10.0	15.0	18.2	19.2	20.9	22.9	27.9	30.4	31.2	30.0	27.4	...	37.5
...	[0.5]	[1.0]	1.4	2.2	1.7	2.5	2.4	2.3	[2.4]	...	...	3.0 ^b
8.3	14.6	20.6	19.7	17.9	18.1	16.8	15.5	20.2	22.5	26.0	...	48.2
...	[3.0]	[4.0]	5.9	6.0	5.0	11.0	13.0	[15.0]	...	...	...	13.0 ^c
...	[2.0]	[5.0]	8.0	7.3	10.0	11.2	11.1	13.8	...	...	...	16.7 ^b
4.6	2.6	0.9	0.7	1.8	5.6	9.0	11.3	14.1	14.5	...	...	16.2
1.1	[1.4]	[1.7]	[2.0]	2.4	2.6	2.8	2.7	2.6	2.5	[2.5]	...	2.9 ^a
4.2	[6.0]	[8.0]	[10.0]	12.8	12.5	16.6	17.5	21.1	22.7	(28.2)	(31.4)	40.0
...	0.4	0.8	[2.7]	4.6	8.1	9.1	9.5	10.2	...	...	...	12.2 ^b
...	...	...	...	...	0.8	1.2	1.2	1.5	1.3	...	...	1.5 ^a
...	[2.0]	[5.0]	8.7	[8.8]	9.0	10.0	5.0	5.0	[5.0]	[5.0]	(4.6)	5.0 ^c
...	[1.0]	[2.0]	[3.0]	4.0	2.0	2.0	4.0	6.0	[6.0]	...	...	6.0 ^b
0.4	0.2	0.2	0.2	0.2	0.2	0.4	[0.4]	[0.4]	...	...	...	...
90.1	[80.0]	73.7	76.7	88.4	96.3	85.0	85.3	91.4	122.5	[125.0]	...	148.2 ^a
...	[0.6]	1.2	1.5	3.4	5.0	6.0	3.0	3.0	[3.0]	...	...	3.0 ^b
...	16.0	21.9	29.0	38.8	47.4	54.4	48.2	72.4	96.0	54.5	64.0	73.9 ^a
...	...	...	...	...	12.5	15.8	14.6	17.5	20.1	[23.0]	...	21.2 ^a
...	[1.5]	[3.0]	[6.0]	8.1	9.6	12.8	12.4	12.5	[12.5]	...	...	15.0 ^b
...	...	[1.0]	2.1	2.0	1.9	1.8	2.2	2.2	2.2	[2.2]	...	2.5 ^a
...	[1.5]	3.2	3.2	4.0	4.3	3.6	4.7	5.5	...	...	...	7.5 ^b
41.4	61.6	89.5	151.3	158.1	223.6	229.2	248.3	276.3	277.5	[286.4]	...	353.9 ^a
15.8	17.6	17.6	17.9	19.7	20.0	26.7	37.8	38.5	46.5	[46.5]	...	55.3 ^a
...	...	[0.6]	1.4	2.5	4.7	6.5	7.4	8.6	9.2	[10.2]	...	12.3 ^a
...	[0.1]	0.2	0.4	0.6	1.8	1.8	1.8	1.6	1.6	...	...	2.5 ^a
15.4	17.6	19.7	15.7	16.4	19.1	15.4	17.7	16.4	20.0	19.2	...	20.0
...	...	...	0.7	2.7	4.9	8.3	11.5	11.0	(11.3)	(10.4)	...	14.5 ^b
...	[0.7]	[1.4]	[2.1]	2.8	8.0	3.0	4.0	3.8	3.8	4.2	...	3.8 ^b
...	...	...	...	...	4.0	12.6	16.0	15.5	13.7	[13.7]	...	19.6 ^a
17.2	15.4	22.3	24.2	[19.0]	...	...	...	...	...	...	...	...
[210.0]	[320.0]	[380.0]	[550.0]	[600.0]	740.0	850.0	900.0	[960.0]	[1 000.0]	[1 050.0]	...	[1 230.0]

World military expenditure

Table 1 A. 17. Africa: current price figures

	Currency	1949	1950	1951	1952	1953	1954	1955	1956	1957
Algeria	<i>mn. dinars</i>	...	...	...	...	...	...	...	...	...
Burundi	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Cameroon	<i>bn. francs</i>	...	...	...	...	...	...	...	...	...
Central African Rep.	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Chad	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Congo, Kinshasa	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Congo, Brazzaville	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Dahomey	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Ethiopia	<i>mn. dollars</i>	...	...	...	...	...	...	...	...	...
Gabon	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Ghana	<i>mn. cedis</i>	...	...	...	...	...	...	3.6	5.6	6.9
Guinea	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Ivory Coast	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Kenya	<i>mn. pounds</i>	...	...	...	...	...	...	...	1.8	2.0
Liberia	<i>mn. dollars</i>	...	...	...	...	...	...	...	...	...
Libya	<i>mn. pounds</i>	...	...	...	...	...	...	...	...	...
Madagascar	<i>bn. francs</i>	...	...	...	...	...	...	...	...	...
Malawi	<i>mn. pounds</i>	...	...	...	...	...	...	...	...	...
Mali	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Mauritania	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Mauritius	<i>mn. rupees</i>	...	...	...	...	...	...	...	...	2
Morocco	<i>mn. dirhams</i>	...	...	...	...	...	...	...	...	...
Niger	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Nigeria	<i>mn. pounds</i>	...	0.8	0.8	0.8	1.3	...	1.4	1.5	1.8
S. Rhodesia	<i>mn. pounds</i>	...	...	...	...	...	...	...	...	...
Senegal	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Sierra Leone	<i>mn. leones</i>	...	...	...	...	...	...	...	...	...
Somalia	<i>mn. shillings</i>	...	...	...	...	...	...	...	...	...
South Africa	<i>mn. rands</i>	22	21	41	47	42	40	42	48	52
Sudan	<i>mn. pounds</i>	0.7	1.6	1.4	1.5	1.7	2.4	2.8	2.8	3.8
Tanzania, Un. Rep. of	<i>mn. pounds</i>	...	...	...	...	...	...	...	...	...
Togo	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Tunisia	<i>mn. dinars</i>	...	...	...	...	...	...	...	1.8	2.5
Uganda	<i>mn. pounds</i>	...	...	...	...	...	...	0.7	0.8	0.7
Upper Volta	<i>mn. francs</i>	...	...	...	...	...	...	...	...	...
Zambia	<i>mn. pounds</i>	...	...	...	...	...	...	...	...	...
Rhodesia and Nyasa- and, Fed. of	<i>mn. pounds</i>	...	...	...	...	...	...	2.6	3.5	4.1

Table 1 A. 18. Central America: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Costa Rica	1.8	1.4	1.9	2.0	2.0	2.2	2.2	2.2	2.5	2.4
Cuba	...	...	...	...	...	...	...	...	...	...
Dominican Republic	...	...	...	...	...	...	...	...	...	33.5
El Salvador	4.3	5.2	5.4	6.6	6.9	6.6	6.6	7.0	8.0	7.5
Guatemala	6.4	5.5	5.4	6.3	6.2	5.8	7.2	8.2	8.6	9.2
Haiti	...	...	3.4	3.6	5.1	4.5	4.4	4.8	4.8	6.2
Honduras	3.6	3.2	3.3	3.7	3.4	3.3	3.1	4.6	4.5	5.0
Mexico	58.3	56.4	58.3	55.2	62.8	50.0	56.9	64.2	76.0	74.4
Nicaragua	...	...	...	...	...	...	...	...	7.4	5.9
Panama	...	...	...	...	...	...	...	...	...	...
Total	[270.0]	[270.0]	[270.0]	[270.0]	[280.0]	[260.0]	[270.0]	[280.0]	[300.0]	[300.0]

^a = 1968. ^b = 1965.

Tables of values

Local currency, current prices

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
...	...	...	...	...	392	490	490	490	490	490	490	(490)
...	...	...	...	85.9	99.9	118.9	181.9	199.8	239.0	268.0	...	...
...	...	2.4	2.0	3.7	3.4	3.5	3.7	3.9	...	...	...	...
...	...	...	203	247	247	494	741	741	...	...	...	...
...	...	...	4	319	367	441	820	1 426	1 476	1 540	(1934)	...
...	...	...	...	...	3 280	6 120	9 703	15 650	18 300	21 800	24 023	...
...	69	98	...	1 070	...	1 235	1 235	1 729	1 482	...	...	...
...	...	...	...	...	272	988	988	988	...	...	...	...
...	26.6	37.3	45.1	49.2	54.4	61.2	83.8	101.3	105.3	101.1	93.7	...
...	...	...	...	371	618	494	741	741	741	...	...	...
7.1	8.4	14.9	21.9	23.5	21.9	25.3	30.2	29.2	35.3	40.4	(49.2)	...
...	...	...	...	1 457	1 482	1 235	2 717	3 211	...	...	...	...
...	...	...	...	2 148	1 976	2 742	3 162	3 236	4 125	...	...	...
1.8	1.6	0.9	0.3	0.3	0.7	2.1	3.5	4.7	5.9	6.1	5.8	...
...	1.0	...	...	...	2.4	2.6	2.8	2.8	3.0	2.9	...	...
...	1.5	...	...	...	5.0	5.0	7.0	8.0	10.0	11.0	14.3	(16.4)
...	...	0.1	0.2	...	1.2	2.2	2.6	2.8	3.0	...	...	...
...	...	...	...	...	...	0.3	0.5	0.5	0.6	0.5	...	...
...	...	...	...	2 149	...	2 223	2 470	1 235	(1 235)	(1 235)	(1 235)	(1 235)
...	...	...	...	...	988	494	494	988	1 482	...	...	...
2	2	1	1	1	1	1	2	...	...	...	...	...
189	430	...	380	415	508	574	523	520	553	750	...	...
...	...	...	296	371	840	1 235	1 482	741	741	...	...	...
4.2	5.2	5.7	8.3	11.4	15.2	19.0	22.7	21.9	31.6	42.3	26.4	33.9
...	...	...	...	...	...	4.9	6.1	5.9	7.2	8.9	...	...
...	...	...	...	...	2 223	2 717	3 705	3 705	3 705	...	...	...
...	...	...	...	1.6	1.5	1.6	1.6	2.0	2.1	2.1	...	...
...	...	...	24.6	25.5	32.0	38.6	36.9	46.4	53.8	...	...	...
40	29	44	65	111.5	117.7	170.8	181.6	203.8	234.3	237.8	252.5	257.3
5.0	5.5	6.1	6.7	6.9	7.9	8.3	10.9	15.7	17.7	19.3	24.5	32.8
...	...	...	...	0.5	0.9	1.7	2.5	2.9	3.5	3.9	4.4	...
...	...	...	66.3	144.3	228.6	682.2	672.1	691.1	620.4	622.3	...	...
4.4	6.6	7.4	8.6	6.6	7.1	8.6	7.4	8.8	8.4	10.5	(10.5)	...
0.7	0.7	0.4	0.1	0.3	1.0	2.0	3.8	5.1	5.2	[5.0]	[4.6]	...
...	...	...	...	...	692	1 976	741	988	943	940	1 045	...
...	...	...	...	...	...	1.5	5.0	7.1	7.2	7.0	...	...
4.4	6.4	5.5	8.6	9.5	...	...	...	...	...	...	...	...

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1969X
5.7	5.8	5.6	5.7	5.6	5.3	5.8	[5.8]	[5.8]	[5.8]	[5.8]	2.2 ^b
...	[175.0]	[175.0]	[200.0]	[200.0]	200.0	213.0	230.0	250.0	[250.0]	[250.0]	[250.0]
41.7	33.4	34.4	33.4	30.8	33.3	30.8	28.4	27.3	26.5	[26.5]	30.3 ^a
6.2	6.1	6.3	8.9	8.6	7.9	9.0	9.2	9.6	9.4	[9.4]	9.8 ^a
9.6	9.6	9.3	9.0	9.3	10.9	14.1	14.5	16.1	13.9	14.8	15.7
6.6	5.5	5.1	6.0	5.7	6.2	6.1	5.4	5.7	5.5	[5.5]	7.2 ^a
4.6	4.1	7.1	7.0	7.3	4.9	5.0	5.3	5.2	5.3	[5.3]	6.4 ^a
74.8	81.7	88.1	97.9	108.0	121.0	121.3	126.0	146.9	152.8	166.3	204.8
6.2	6.7	6.9	6.9	7.1	6.9	7.2	7.3	8.4	8.1	[8.1]	9.8 ^a
...	[1.0]	[1.0]	[1.0]	[1.0]	1.0	1.0	1.0	[1.0]	[1.0]	[1.0]	[7.0]
[310.0]	[330.0]	[340.0]	[380.0]	[380.0]	395.0	410.0	430.0	475.0	[480.0]	[490.0]	[535.0]

Table 1 A. 19. Central America: current price figures

	Currency	1949	1950	1951	1952	1953	1954	1955	1956
Costa Rica	<i>mn. colones</i>	7.6	6.8	9.6	9.8	9.9	11.2	11.6	12.0
Cuba	<i>mn. pesos</i>	...	...	...	...	...	...	...	...
Dominican Republic	<i>mn. pesos</i>	...	...	...	...	...	...	...	...
El Salvador	<i>mn. colones</i>	7.0	9.9	11.9	12.7	15.4	14.5	16.4	17.4
Guatemala	<i>mn. quetzales</i>	5.2	5.1	5.6	6.0	6.0	6.7	8.0	8.8
Haiti	<i>mn. gourdes</i>	15.6	17.7	19.8	22.9	26.3	25.7	25.9	27.2
Honduras	<i>mn. lempiras</i>	5.8	5.7	6.4	6.5	6.1	6.4	6.4	9.3
Mexico	<i>mn. pesos</i>	331	346	398	435	479	405	533	632
Nicaragua	<i>mn. cordobas</i>	...	...	...	...	...	...	...	...
Panama	<i>mn. balboas</i>	...	...	...	...	...	...	...	...

Table 1 A. 20. South America: constant price figures

	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Argentina	379.4	268.3	281.5	247.8	270.1	291.7	231.4	292.6	247.0	279.1
Bolivia	...	...	...	...	4.2	...	...	2.4	2.5	2.1
Brazil	220.2	219.4	246.2	238.8	241.7	235.3	268.4	323.8	359.1	367.6
Chile	68.2	78.1	73.7	...	132.3	84.7	126.3	120.9	129.8	121.0
Colombia	24.6	23.2	29.3	40.8	54.4	64.1	63.4	61.7	54.9	50.8
Ecuador	...	...	...	7.5	12.1	...	18.2	20.1	19.3	18.4
Paraguay	...	...	...	...	...	...	...	4.8	4.8	[5.8]
Peru	28.5	31.3	36.2	35.0	34.2	32.2	34.3	56.5	50.9	57.7
Uruguay	...	...	...	...	...	...	...	...	...	...
Venezuela	47.6	63.5	63.5	70.5	71.1	69.6	111.4	139.2	117.6	186.2
Total	790.0	710.0	760.0	760.0	830.0	810.0	870.0	1 030.0	990.0	1 100.0

^a= 1968. ^b= 1967.

Table 1 A. 21. South America: current price figures

	Currency	1949	1950	1951	1952	1953	1954	1955	1956
Argentina	<i>mn. pesos</i>	2 071	1 952	2 747	3 320	3 775	4 246	3 809	5 420
Bolivia	<i>mn. pesos</i>	...	...	...	...	1.7	...	4.7	9.7
Brazil	<i>bn. cruzeiros</i>	5.9	6.3	7.6	9.3	11.3	13.0	17.8	26.2
Chile	<i>mn. escudos</i>	2.8	3.7	4.5	6.0	11.7	13.2	34.3	51.7
Colombia	<i>mn. pesos</i>	71	81	110	150	214	275	272	283
Ecuador	<i>mn. sucres</i>	...	...	88	113	181	250	295	298
Paraguay	<i>mn. guaranis</i>	...	...	...	...	...	...	...	...
Peru	<i>mn. soles</i>	319	398	508	522	562	551	618	1 066
Uruguay	<i>mn. pesos</i>	...	...	...	...	...	...	...	...
Venezuela	<i>mn. bolivares</i>	153	182	201	212	210	270	338	382

Tables of values

Local currency, current prices

1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
13.6	13.2	13.3	13.6	13.5	14.1	14.4	15.4	14.4	...	...	...	...
...	...	...	...	...	...	...	200	213	230	250	...	...
...	34.5	42.6	33.4	31.6	33.1	34.0	37.0	35.0	32.4	31.1	30.3	...
19.2	19.0	15.6	15.3	15.5	21.7	21.3	20.0	22.6	23.0	24.1	24.5	...
9.3	9.8	9.8	9.4	9.2	9.3	10.2	12.7	14.3	14.7	16.4	14.4	15.7
29.7	35.0	34.4	32.8	31.7	31.6	33.5	38.8	36.8	35.4	35.8	35.8	...
8.9	9.1	9.3	8.2	14.4	14.5	15.4	10.8	11.4	12.4	12.4	12.9	...
792	862	883	1 021	1 111	1 258	1 388	1 589	1 651	1 789	2 148	2 284	2 558
...	...	...	...	...	51	55	53	57	60	70	69	...
...	...	...	...	...	...	...	1	1	1	...	...	...

US \$ mn, at 1960 prices and 1960 exchange-rates (Final column, X, at current prices and exchange-rates)

1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1969X
253.7	284.9	280.4	269.8	262.6	288.6	276.0	310.7	246.7	260.5	307.7	435.1
2.8	4.0	4.6	4.7	6.0	12.1	16.4	15.1	15.3	[15.3]	[15.3]	19.3 ^b
288.8	267.3	245.1	264.6	259.8	272.8	406.9	340.5	478.9	420.8	[420.8]	1 099.5 ^a
96.4	103.5	105.2	111.6	95.9	94.2	111.5	116.1	127.8	129.3	122.2	110.7
42.2	47.3	56.2	88.8	97.1	94.6	101.6	101.6	104.9	106.7	125.7	162.2
16.5	22.2	21.1	20.1	17.4	19.8	22.2	24.0	23.1	18.6	17.4	22.0
[5.1]	[4.9]	4.2	4.8	5.3	5.5	5.9	7.2	8.8	9.5	[10.0]	21.7 ^a
50.8	50.1	[60.0]	[70.0]	80.7	78.7	74.6	77.1	99.1	99.1	90.6	149.0
[9.4]	[10.8]	14.9	14.9	20.3	19.8	24.8	23.8	23.4	15.2	[16.0]	18.0 ^a
195.1	174.6	151.9	157.8	188.3	197.6	219.1	231.8	256.8	253.4	250.1	197.5
960.0	970.0	940.0	1 010.0	1 030.0	1 085.0	1 260.0	1 250.0	1 385.0	1 330.0	1375.0	2 235.0

Local currency, current prices

1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
7 115	9 831	17 686	24 027	27 367	33 608	40 188	45 158	64 703	96 229	98 933	120 431	152 300
23.9	35.0	41.0	39.0	57.9	61.0	66.0	147.0	205.0	202.0	229.0	...	...
34.6	40.8	43.9	54.8	69.6	114.5	194.5	338.5	924	1 157	2 066	(2 254)	...
73.1	82.2	91.1	109.0	119.3	144.1	178.5	256.0	369.0	472.0	614.0	774.0	(964.0)
289	306	272	317	410	664	965	1 072	1 218	1 467	1 628	1 761	2 278
289	282	247	336	336	329	307	370	428	483	482	406	400
...	...	...	...	...	...	1 348	1 436	1 613	2 016	2 471	2 741	...
1 039	1 265	1 259	1 340	...	...	2 614	2 864	3 122	3 528	4 994	5 957	(5 766)
...	...	...	...	187	221	365	509	1 000	1 662	3 087	(4 512)	...
496	601	607	540	533	509	613	650	734	796	881	880	889

1B. Western powers' military grant aid

Introduction

The military expenditure figures in tables 1A.1 to 1A.21 include military grant aid in the figures for the donor countries, and exclude them from the figures for the recipient countries. For some purposes it is useful to have the figures added to the recipient country totals, to give a better estimate of the total quantity of resources devoted to military purposes in that country.

Table 1B.1 gives estimates for the receipts of military grant aid by thirty-nine countries where this aid amounted to more than 20 per cent of indigenous military expenditure in any one year. The figures are converted into constant (1960) dollars, in order to make them comparable with, and additive to, the constant-price military expenditure series. The constant-price military expenditure figures are given in the same table for convenience.

The supplying countries included are the United States, the United Kingdom and West Germany. The United States figures include grants from excess stocks. These are usually valued well below cost: the figures to some extent therefore understate the value of military aid. For twenty-two of the countries included in the table, the United States was the sole supplier of aid. West German military aid was mainly to African countries. The United Kingdom was the main supplier of aid to Jordan and Malaysia.

In the period 1950-67, five countries received military grant aid valued at more than half their indigenous military expenditure. Four of them are in the regions called "forward defence areas" in the United States military-aid classification.

A. Military grant aid to forward defence areas

US \$ mn, at 1960 prices and 1960 exchange-rates

	Military expenditure 1950-67	Military grant aid 1950-67	Grant aid as per cent of military expenditure
South Korea	3 319.8	2 699.6	80.4
Taiwan	2 787.1	2 932.4	105.2
Thailand	1 147.6	654.2	57.0
Turkey	4 585.0	2 847.0	62.1
Greece	2 961.0	1 689.5	57.0

No figures are included for Soviet military aid. In the first place, most of the value estimates are Western conjectures. In the second place, most Soviet aid appears to be in the form of long-term credits, rather than

outright grant aid.¹ Consequently it is quite probable that the payments made do in fact appear in the indigenous military expenditure figures of the countries concerned.

Sources and methods

USA: The basic source was *Overseas Loans and Grants and Assistance from International Organizations, Obligations and Loan Authorizations, 1 July 1945 – 30 June 1967*, and *1 July 1945 – 30 June 1968*. This was supplemented by *Military Assistance Facts, 1960/61–1966/67*.

UK: *Civil Estimates, 1949/50–1968/69*.

Only developing countries are included in the recipient areas. Figures are only given where military aid was significant in relation to military expenditure—that is, 20 per cent or more in any one year.² The figures were corrected for price movements in the donor country using a consumer price index based on 1960: for donor countries other than the USA they were then converted into dollars at 1960 exchange-rates. They were then put onto a calendar-year basis. Figures for US military grant aid for the two periods 1949–1952 (Marshall Plan period) and 1953–1957 (Mutual Security Act period) were not available on a year-by-year basis. A uniform rate of delivery during the period was assumed.

¹ Military aid to the United Arab Republic appears to be an exception.

² In addition, figures are given for Indonesia, Argentina and Brazil, although they do not strictly speaking qualify by this criterion.

Table 1B.1. Western powers' military grant aid to third world countries^a

For convenience, the military expenditure figures from the constant-price tables are entered here next to the grant aid figures. *MA* = military aid. *ME* = military expenditure.

		1950	1951	1952	1953	1954	1955	1956	1957
Middle East									
Iran	<i>MA</i>	5.0	5.0	31.8	33.6	33.6	33.6	33.6	64.9
	<i>ME</i>	66.5	63.4	60.0	56.9	64.7	90.0	105.7	127.2
Iraq	<i>MA</i>	—	—	3.1	5.7	5.7	5.7	5.6	15.9
	<i>ME</i>	21.8	22.5	31.9	47.1	53.1	53.2	75.1	82.4
Jordan	<i>MA</i>	(15.5)	20.7	26.5	27.8	27.8	27.8	27.8	7.0
	<i>ME</i>	16.6	27.9	29.2	31.2	31.8	32.3	38.5	39.3
Far East									
Cambodia	<i>MA</i>	—	—	5.2	10.5	10.5	10.5	10.5	10.7
	<i>ME</i>	—	—	—	—	—	—	—	—
Indonesia	<i>MA</i>	1.4	1.4	1.4	1.0	—	—	—	—
	<i>ME</i>	—	347.5	—	377.7	337.4	266.3	264.2	329.5
Japan	<i>MA</i>	—	—	47.3	94.7	94.7	94.7	94.7	125.5
	<i>ME</i>	—	423.7	441.1	502.3	484.8	457.1	451.7	446.6
Korea, South	<i>MA</i>	3.6	3.6	60.3	117.1	117.1	117.1	117.1	238.9
	<i>ME</i>	—	—	66.8	154.4	185.4	150.8	145.4	187.0
Laos ^b	<i>MA</i>	—	—	3.6	7.2	7.2	7.2	7.2	11.5
	<i>ME</i>	—	—	—	—	—	—	—	—
Malaysia	<i>MA</i>	(16.8)	23.9	34.6	15.0	4.4	0.8	—	10.3
	<i>ME</i>	3.1	28.4	46.1	64.4	58.5	52.5	47.9	50.0
Philippines	<i>MA</i>	24.3	24.3	26.4	28.4	28.4	28.4	28.4	35.1
	<i>ME</i>	54.4	67.9	82.8	83.9	80.1	78.4	79.0	80.9
Thailand	<i>MA</i>	5.3	5.3	25.9	46.7	46.7	46.7	46.7	38.2
	<i>ME</i>	22.3	31.0	52.0	53.3	52.3	45.8	41.2	74.1
Viet-Nam, South ^c	<i>MA</i>	86.6	86.6	77.4	64.3	64.3	64.3	64.3	73.0
	<i>ME</i>	—	—	—	—	—	—	—	—
Taiwan	<i>MA</i>	15.4	15.5	148.4	280.8	280.8	280.8	280.8	234.1
	<i>ME</i>	—	—	—	66.5	80.0	110.9	114.4	126.6
Africa									
Ethiopia	<i>MA</i>	—	—	1.7	3.0	3.0	3.0	3.0	6.4
	<i>ME</i>	—	—	—	—	—	—	—	—
Guinea	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Liberia	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Libya	<i>MA</i>	—	—	—	—	—	—	—	0.6
	<i>ME</i>	—	—	—	—	—	—	—	—
Madagascar	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Mali	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Niger	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Somalia	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Sudan	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	7.1	5.4	4.8	5.8	7.3	8.5	8.7	11.8
Tanzania	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	—	—
Tunisia	<i>MA</i>	—	—	—	—	—	—	—	—
	<i>ME</i>	—	—	—	—	—	—	4.1	5.9
Central America									
Guatemala	<i>MA</i>	—	—	—	0.1	0.1	0.1	0.1	0.2
	<i>ME</i>	5.5	5.4	6.3	6.2	5.8	7.2	8.2	8.6
Honduras	<i>MA</i>	—	—	—	0.1	0.1	0.1	0.1	0.2
	<i>ME</i>	3.2	3.3	3.7	3.4	3.3	3.1	4.6	4.5

Western powers' military grant aid

US \$ mn, at 1960 prices and 1960 exchange-rates

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
87.0	96.9	67.4	46.1	50.0	48.1	38.7	43.0	37.5	35.5	(17.1)
202.7	226.7	182.9	181.0	180.1	183.0	201.2	252.0	338.7	409.9	433.7
12.4	0.4	—	—	—	0.1	0.1	0.2	0.1	0.1	—
88.5	103.1	118.7	123.5	132.2	153.6	181.2	223.1	232.0	210.8	230.1
5.8	3.7	3.7	4.0	4.0	5.5	9.1	6.6	8.3	7.9	(1.0)
45.9	57.2	53.5	52.3	55.9	56.5	55.6	45.8	54.8	58.0	68.1
7.8	4.1	4.8	8.2	11.0	7.6	1.9	0.2	—	—	—
—	—	(35.0)	43.0	45.1	43.2	47.1	42.6	43.1	49.1	49.3
5.7	8.4	7.7	13.1	16.3	11.7	4.4	(1.2)	0.5	4.1	(1.3)
419.4	418.8	484.8	540.7	362.2	265.4	204.8	182.5	(200.0)	230.3	184.8
155.5	135.4	105.6	109.7	59.3	27.1	23.8	14.5	13.5	15.6	(2.4)
451.0	462.3	455.9	472.7	517.0	390.0	553.0	623.0	658.0	712.0	753.3
287.6	213.7	221.7	207.7	186.7	159.8	168.5	179.7	144.8	154.6	(86.8)
220.2	233.6	227.1	236.9	273.9	226.5	213.0	224.7	277.5	296.6	360.4
12.0	11.2	27.7	40.5	20.0	..	..	..	..	..	..
—	—	(20.0)	(20.0)	24.6	17.7	9.9	16.1	18.6	18.7	19.3
12.0	14.4	18.2	11.8	4.7	12.6	15.2	11.7	10.4	6.0	(1.2)
52.2	46.0	42.9	36.3	36.6	49.2	68.9	97.1	119.6	110.9	112.7
31.8	21.0	26.4	27.6	24.7	18.6	14.3	21.5	23.2	25.4	(14.7)
84.7	87.6	87.1	89.4	87.1	87.1	83.3	93.0	111.4	124.6	149.4
24.7	22.5	27.0	37.9	64.0	66.5	44.2	37.7	44.0	24.2	—
62.4	66.2	65.2	68.8	72.0	74.2	78.7	86.2	91.9	110.0	130.1
61.6	67.1	71.5	117.1	180.4	195.2	255.3	263.0	104.5	..	..
—	—	157.0	162.0	248.0	231.0	283.0	313.0	227.0	186.0	331.0
239.4	274.0	201.5	124.6	92.8	103.3	103.9	85.4	75.7	95.2	(62.6)
207.2	219.2	203.3	214.2	245.5	249.4	267.6	285.5	236.1	232.7	237.3
7.8	6.9	9.3	14.5	14.9	12.0	10.5	12.1	12.5	15.0	(9.8)
—	10.0	15.0	18.2	19.2	20.9	25.3	27.0	30.4	(33.0)	(37.0)
—	—	—	—	2.2	1.1	1.0	1.0	1.0	1.0	1.0
—	—	(3.0)	(4.0)	5.9	6.0	5.0	11.0	13.0	(15.0)	—
—	—	0.1	0.4	0.8	1.0	0.5	0.6	0.7	1.0	—
—	1.1	(1.4)	(1.7)	(2.0)	2.4	2.6	2.8	2.7	(2.7)	(2.7)
0.8	1.0	1.0	1.0	1.3	1.3	2.2	2.7	2.7	2.5	(1.0)
—	4.2	(6.0)	(8.0)	(10.0)	12.8	12.5	16.6	17.5	21.1	22.7
—	—	—	—	0.7	0.7	—	—	—	—	—
—	—	0.4	0.8	(2.7)	4.6	8.1	9.1	9.5	10.2	—
—	—	—	0.4	0.2	0.3	0.3	0.5	0.6	0.4	—
—	—	(2.0)	(5.0)	8.7	(8.8)	9.0	10.0	5.0	(5.0)	—
—	—	—	—	—	—	—	—	0.4	0.4	—
—	—	(0.6)	1.2	1.5	3.4	5.0	6.0	3.0	(3.0)	—
—	—	—	—	0.9	0.9	0.9	0.4	—	—	—
—	—	(1.5)	3.2	3.2	4.0	4.3	3.6	4.7	5.5	—
0.9	0.6	0.1	3.5	2.7	2.3	2.3	0.6	0.3	0.3	0.1
14.3	15.8	17.6	17.6	17.9	19.7	20.0	26.7	37.8	38.5	46.5
—	—	—	—	—	2.0	2.0	—	—	—	—
—	—	—	(0.6)	1.4	2.5	4.7	6.5	7.4	8.6	9.2
—	—	1.4	2.6	4.0	4.6	2.1	0.6	0.5	1.1	0.4
10.0	15.4	17.6	19.7	15.7	16.4	19.1	15.4	17.7	16.4	20.2
—	0.1	0.3	1.0	1.5	2.5	1.8	1.8	1.4	1.9	—
9.2	9.6	9.6	9.3	9.0	9.3	10.9	14.1	14.5	16.1	13.9
0.1	0.1	0.2	1.0	1.0	0.4	0.6	0.8	1.0	1.1	—
5.0	4.6	4.1	7.1	7.0	7.3	4.9	5.0	5.3	5.2	(5.2)

Table 1B.1. Continued.

		1950	1951	1952	1953	1954	1955	1956	1957
Nicaragua	MA	—	—	—	0.1	0.1	0.2	0.2	0.2
	ME	—	—	—	—	—	—	—	7.4
Panama	MA	—	—	—	—	—	—	—	—
	ME	—	—	—	—	—	—	—	—
South America									
Argentina	MA	—	—	—	—	—	—	—	—
	ME	268.3	281.5	247.8	270.1	291.7	231.4	292.6	247.0
Bolivia	MA	—	—	—	—	—	—	—	—
	ME	—	—	—	4.2	—	—	2.4	2.5
Brazil	MA	—	—	13.0	26.1	26.1	26.1	26.1	23.7
	ME	219.4	246.2	238.8	241.7	235.3	268.4	323.8	359.1
Chile	MA	—	—	2.7	5.5	5.5	5.5	5.5	8.7
	ME	78.1	73.7	—	132.3	84.7	126.3	120.9	129.8
Colombia	MA	—	—	2.1	4.2	4.2	4.2	4.2	5.0
	ME	23.2	29.3	40.8	54.4	64.1	63.4	61.7	54.9
Ecuador	MA	—	—	1.1	2.2	2.2	2.2	2.2	3.0
	ME	—	—	7.5	12.1	—	18.2	20.1	19.3
Paraguay	MA	—	—	—	—	—	—	—	—
	ME	—	—	—	—	—	—	4.8	4.8
Peru	MA	—	—	2.1	4.2	4.2	4.2	4.2	6.4
	ME	31.3	36.2	35.0	34.2	32.2	34.3	56.5	50.9
Uruguay	MA	—	—	1.1	2.2	2.2	2.2	2.2	5.0
	ME	—	—	—	—	—	—	—	—
Europe									
Greece	MA	104.1	104.1	100.3	96.6	96.6	96.6	96.6	124.9
	ME	115	137	132	126	135	138	178	157
Turkey	MA	75.2	75.2	138.6	202.1	202.1	202.1	202.1	232.4
	ME	165	183	191	211	217	228	215	211

Sources: See sources and methods, page 283. Bracketed figures are estimates.

^a Military grant aid given by USA, UK and West Germany. All countries are entered for which grant aid was 20 per cent or more of military expenditure in any one year.

^b US figures are classified after 1963.

^c US military aid transferred to the Department of Defense budget in 1967.

Western powers' military grant aid

US \$ mn, at 1960 prices and 1960 exchange-rates

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
0.1	0.3	0.5	0.8	1.4	1.5	1.1	1.1	1.0	1.1	—
5.9	6.2	6.7	6.9	6.9	7.1	6.9	7.2	7.3	8.7	(9.0)
—	—	0.2	0.3	0.8	1.5	1.4	1.2	1.2	1.5	—
—	—	(1.0)	(1.0)	(1.0)	(1.0)	1.0	1.0	1.0	(1.0)	(1.0)
—	—	4.3	18.7	15.0	1.2	4.0	6.3	6.3	8.2	(4.9)
279.1	253.7	284.9	280.4	269.8	262.6	288.6	276.0	199.3	246.7	246.7
0.2	0.2	0.2	1.3	2.6	3.6	3.1	2.3	2.6	3.2	—
2.1	2.8	4.0	4.6	4.7	6.0	5.9	11.8	14.3	—	—
21.2	24.8	26.7	33.3	27.2	14.3	14.1	11.3	12.6	14.2	(7.2)
367.6	288.8	267.3	245.1	264.6	259.8	272.8	406.9	340.5	287.5	—
9.3	5.3	7.3	12.0	19.5	18.5	9.4	7.7	6.1	7.4	(3.3)
121.0	96.4	103.5	105.2	111.6	95.9	94.2	111.5	116.1	127.8	129.3
4.1	2.8	10.0	11.6	7.8	8.0	6.4	7.1	8.1	9.6	(5.6)
50.8	42.2	47.3	56.2	88.8	97.1	94.6	101.6	101.6	104.9	106.7
2.9	2.4	6.7	6.6	3.5	3.7	3.2	4.3	4.3	3.1	(1.3)
18.4	16.5	22.2	21.1	20.1	17.4	19.8	22.2	24.8	19.5	19.8
—	—	0.2	0.3	0.8	1.5	1.4	1.2	1.2	1.5	—
(5.8)	(5.1)	(4.9)	4.2	4.8	5.3	5.5	5.9	7.2	8.8	(10.0)
6.6	4.2	14.2	20.1	12.6	11.2	10.4	7.5	6.5	6.9	(4.0)
57.7	50.8	50.1	(60.0)	(70.0)	80.7	78.7	74.6	77.1	88.2	105.7
6.3	3.1	2.5	3.5	3.1	2.3	2.5	2.5	2.0	1.8	—
—	(9.4)	(10.8)	14.9	14.9	20.3	19.8	18.9	14.4	(15.0)	(16.0)
125.1	113.0	93.2	54.9	71.1	85.9	103.6	101.4	69.6	51.9	(22.3)
155	161	170	165	168	172	179	193	210	270	317
243.2	168.6	104.2	126.2	160.2	134.9	120.0	131.2	156.1	173.0	(77.7)
218	251	266	289	306	303	323	343	332	333	363

1C. Armed forces of the world, 1960-1968

Thousands of men

	1960	1961	1962	1963	1964	1965	1966	1967	1968
USA	2 480	2 480	2 680	2 700	2 690	2 680	3 090	3 400	3 500
Other NATO	3 400	3 440	3 130	3 120	3 160	3 020	2 960	3 030	3 020
Total NATO	5 880	5 920	5 810	5 820	5 840	5 700	6 060	6 430	6 520
Total Warsaw Pact	4 430	3 990	4 580	4 350	4 430	4 270	4 270	4 310	4 310
Other Europe ^a	[1 100]	[1 000]	[900]	800	830	800	760	750	740
Middle East	600	600	610	640	650	700	750	710	770
South Asia ^b	840	800	870	950	1 240	1 200	1 230	1 420	1 470
Far East (incl. China)	4 940	5 330	5 420	5 370	5 770	5 870	5 900	6 360	6 560
Oceania	60	60	60	60	70	70	80	90	100
Africa	130	230	270	290	310	320	330	370	[400]
Central America	150	160	190	200	[220]	240	240	250	[250]
South America	540	570	600	590	[600]	610	630	[640]	[660]
World total	18 680	18 670	19 310	19 080	19 960	19 760	20 300	21 320	21 780

Source: The list of sources, page 259.

^a Excludes NATO and Warsaw Pact countries.

^b India, Pakistan, Ceylon, Afghanistan.

1D. US estimates of Soviet expenditure for military research

Introduction and summary

No official information about expenditure for military research and development (R & D) is published in the Soviet Union. However, US Department of Defense officials have recently presented estimates of the level of Soviet spending on defence-related R & D and of the trend in this expenditure over the past decade. They have suggested, on the basis of these estimates, that the United States defence research and development effort has been overtaken by the Soviet effort.

No sources are given for the official US estimates. This section therefore looks at the unofficial studies published in the United States which have either dealt with the problem of estimating Soviet military R & D expenditure, or simply attempted to provide an estimate. The problem is raised in studies which attempt to estimate total Soviet military expenditure because many US experts believe that R & D expenditure is partially or entirely excluded from the official Soviet defence budget. They therefore try to identify the non-defence budget sources of finance for military R & D, and to get an estimate to add on the official defence expenditure figure. The question of military R & D expenditure is also raised in studies of Soviet science statistics, and of the total Soviet R & D effort, civil as well as military.

All the unofficial US studies which estimate Soviet military R & D expenditure derive their estimates from the Soviet science statistics. It is notice-

able that the authors who make a detailed analysis of these statistics¹ give either no estimate at all, or a rough order-of-magnitude estimate only. Furthermore, the difficulties of the Soviet science data are such that the two order-of-magnitude estimates given by these authors diverge considerably: one is twice as great as the other. The conclusion drawn from the evidence presented in the unofficial studies is that reliable estimates of Soviet military R & D expenditure cannot be inferred from Soviet science data.

It seems probable, however, that the official US estimates are in fact derived from the Soviet science statistics. The trend in the US estimates parallels almost exactly the trend of the official Soviet figures for science expenditure. The implication of this is that these estimates have a very wide margin of error—much wider than that which is claimed for them.

The unofficial US studies and official US statements examined in this section are set out in table 1D.1. The evidence given in three of the studies (sources [1]–[3]), on the likely channels of finance and magnitude of Soviet military R & D expenditure, is reviewed first, in some detail. These studies draw on statements of Soviet budgetary authorities, and on Soviet scientific manpower data, for their conclusions about the portion of Soviet science expenditure which goes to military R & D. The remaining unofficial studies, which use the Soviet science data without detailed analysis of the original Soviet materials, are then treated more briefly.² The last part of this

¹ Among the experts whose work is examined in this section, Nimitz and Korol (see table 1D.1, sources [1] and [2]); and, in addition to these, the authors of two studies of the Soviet R & D effort published by the OECD: C. Freeman and A. Young, *The Research and Development Effort in Western Europe, North America and the Soviet Union* (Paris, 1965); and E. Zaleski, J. P. Kozlowski, H. Wienert, R. W. Davies, M. J. Berry and R. Amann, *Science Policy in the USSR* (Paris, 1969). Neither of the OECD studies attempts even an order of magnitude estimate of Soviet military R & D expenditure.

² There are other unofficial US studies which discuss or estimate Soviet military R & D expenditure in the context of discussions of Soviet defence expenditure. These are not examined here because they do not appear to add to the body of evidence on the level or channels of finance of Soviet military R & D. Some of these, for example the studies by Benoit and Lubell ("The world burden of national defence", in E. Benoit, ed., *Disarmament and World Economic Interdependence*, Oslo/New York/London, 1967) and by Bloomfield et al. (*Soviet Interests in Arms Control and Disarmament*, Cambridge, Mass., 1965) derive precise estimates of defence R & D directly from the unofficial studies which are examined in this section. Others discuss the likely level and sources of finance of Soviet military R & D quite briefly, giving similar conclusions to those arrived at in the studies examined here, but without reference to either Soviet or US sources. These include, for example, the testimony of several experts on "The economic basis of the Russian military challenge to the United States", presented in *The Military Budget and National Economic Priorities*, Hearings before the Subcommittee on Economy in Government of the Joint Economic Committee (US Congress, Washington, 1969; Part 3); and *Soviet Economic Performance: 1966–67*, Materials prepared for the Subcommittee on Foreign Economic Policy of the Joint Economic Committee (US Congress, Washington, 1968).

Table 1D.1. Annotated list of selected US sources giving estimates of Soviet military R & D expenditure

A. Unofficial studies giving estimates based on detailed analysis of original Soviet data	<i>Gives an estimate of:</i>
1. Nimitz, Nancy. Soviet expenditures on scientific research. (Rand memorandum RM-3384-PR, prepared for the US Air Force.) Santa Monica, Cal.: Rand Corp., 1963.	Expenditure for "classified" R & D (roubles) 1950-1961; supposed to be largely defence R & D expenditure.
2. Korol, Alexander. Soviet research and development: its manpower, organization and funds. (Prepared under the auspices of the US National Science Foundation.) Cambridge: M.I.T. Press, 1965.	Minimum level of expenditure for "secret" R & D (roubles) 1950-1962 and possible total military-space R & D expenditure 1950 and 1956.
3. Lee, W. T. and S. A. Anderson. Probable trend and magnitude of Soviet expenditures for national security purposes. (Strategic Studies Center research memorandum SSC-RM 5205-54, prepared for Office of the Chief of Research and Development, US Army.) Menlo Park, Cal.: Stanford Research Institute, 1969.	Military-space R & D portion of total Soviet science expenditures (roubles) 1956-1962; supposed to be a part of total Soviet military-space R & D expenditure.
B. Other unofficial studies	
4. Godaire, J. G. The claim of the Soviet military establishment. <i>In</i> Dimensions of Soviet economic power, studies prepared for the use of the US Congress Joint Economic Committee. Washington: Government Printing Office (GPO), 1962.	Military-space R & D portion of total Soviet science expenditures (roubles) 1956-1962; supposed to be a part of total Soviet military-space R & D expenditure.
5. Sosnovy, Timothy. The Soviet military budget. <i>In Foreign affairs</i> , 42: 3 (April 1964).	Expenditure for research in the military field (roubles) 1964.
6. Becker, Abraham. Soviet military outlays since 1955. (Rand memorandum RM-3886-PR, prepared for the US Air Force.) Santa Monica, Cal.: Rand Corp., 1964.	Military R & D expenditures (roubles) 1955-1962.
C. Official statements by Dr. John S. Foster, US Director of Defense Research and Engineering	
7. Statement on the fiscal year 1970 Defense research, development, test and evaluation program. [Non-classified version.] (<i>Reprinted in</i> Department of Defense appropriations, Part 5; Hearings before the Committee on Appropriations, House of Representatives, 91st Cong., 1st sess., Washington: GPO, 1969, pp. 729-825.)	Military-space R & D expenditure (dollars) 1969, and recent trend in military-space R & D expenditure.
8. Testimony in Hearings on military posture 1969, Part 1. Hearings before the Committee on Armed Services, House of Representatives, 91st Cong., 1st sess. Washington: GPO, 1969. Pp. 2224-2226.	Military-space R & D expenditure (dollars) 1969-1970.
9. Statement on the fiscal year 1971 Defense research, development, test and evaluation program. [Non-classified version.] (<i>Reprinted in</i> Hearings on military posture 1970, Part 2; Hearings before the Committee on Armed Services, House of Representatives, 91st Cong., 2nd sess., Washington: GPO, 1970, pp. 7945-7963.)	Military-space R & D expenditure (dollars) 1970; and trend in military-space R & D expenditure 1960-1970 and recently.
10. Speech before the American Newspaper Publisher's Association, 23 April 1970, New York. (Extracts reprinted in <i>Aviation week and space technology</i> , 97:17 (27 April 1970), p. 13.)	Military-space R & D expenditure (dollars) 1970; recent trend in military space R & D expenditure, and share of total R & D and space expenditure.

section discusses the question of the sources and methods of the official US estimates of Soviet military R & D expenditure.

Unofficial studies with detailed analysis of Soviet science data:

Nimitz (1963), Korol (1965), Lee (1969)

The sources

Nimitz, Korol and Lee (table 1D.1, sources [1], [2] and [3]) are concerned with Soviet military R & D outlays from different points of view. Only Nimitz is interested in military R & D expenditures per se: most of her study is concerned with certain Soviet science expenditures which are presumed to consist largely of expenditures for defence-related R & D. Korol's book on *Soviet research and development* discusses primarily data on the organization and manpower of Soviet R & D; and only one chapter out of eight deals with science expenditure data. Here Korol touches on the financing of military R & D briefly in a discussion of Soviet expenditures for science and in a "speculative digression" on total Soviet R & D expenditure. Lee is concerned to construct an estimate of total Soviet expenditures for "national security"; and he attempts to locate military R & D expenditures not included in the official defence budget, in order to include them in his total national security expenditure estimate.

The estimates

None of the three investigators attempts to give a precise estimate of total Soviet military R & D expenditure. Korol, who is least concerned with these particular outlays, is most vague: he suggests that a certain Soviet series may represent the "minimum level" of outlays for "secret" R & D, and that there are additional expenditures for "secret" development work. Nimitz gives an estimate for "classified" R & D expenditures, which explicitly cover some "civilian research of the highest priority" in addition to defence-related R & D. Lee estimates the military-space R & D component within Soviet expenditures for science, and he says that substantial military R & D outlays are excluded from this estimate. Both Nimitz and Lee explicitly state, furthermore, that there is not sufficient evidence to warrant a precise estimate of Soviet military R & D outlays. Lee introduces his study with the following reservation:

The study does not provide insight into Soviet expenditures for major military missions . . . No information on the allocations of the USSR explicit defence budget to missions, forces, procurement, . . . and so forth, is published, and there appears to be no way to arrive at such a distribution from the open source data. The best one can hope for is a reasonable approximation of *total* outlays for all explicit and implicit national security purposes. (*Italics added.*)

Nimitz, who is directly concerned with defence R & D outlays, concludes her discussion of "classified" R & D expenditures with the brief comment: "The type of evidence considered in this memorandum does not permit us to estimate how much [of the "classified" R & D outlays] is addressed to defence problems."

With careful reservations, the three studies do, nevertheless, suggest upper and lower limits to total Soviet military R & D expenditure. All three examine various categories of expenditure in the Soviet State Budget and the national science expenditure data; and all identify certain categories as likely channels of finance for military R & D, and other categories as unlikely channels. The categories identified as likely channels set an upper limit to total military R & D expenditures if they are assumed to cover all military R & D, and a lower limit if they are assumed to cover some but not all. The main categories of expenditure in the consolidated State Budget of the USSR and in the published Soviet series of total national science expenditure are outlined in table 1D.2: the italicized categories are those identified, in one or more of the three studies, as likely channels of finance for military R & D.³

Nimitz, Korol and Lee agree that at least some military R & D expenditure is channeled through "budget expenditures for science", and, within this category, through "All-union" rather than "Republican" expenditures. Nimitz and Korol present series of All-union military-related R & D expenditure for 1950–1961 and 1950–1962 respectively. These series are based on the division of All-union expenditures between "itemized" and "unitemized" expenditures which can be derived from Soviet data for the period 1950–1957 (see the note to table 1D.2). Nimitz and Korol conclude, on the basis of different evidence, that unitemized All-union expenditures represent outlays for "classified" or "secret" R & D, while itemized outlays cover civil R & D only. The estimates from 1958 on are extrapolated, on the assumption that expenditures for "classified" R & D take the same portion of All-union science expenditures in later years as in 1957 (75 per cent).⁴ Lee suggests that, within All-union science expenditures, both civil and military R & D outlays are included both in the unitemized and in the itemized parts;

³ A new series of total national science expenditure has been published in the Soviet Union since these studies were prepared. This series includes, in addition to the two main categories of expenditure shown in table 1D.2, a third category, capital investment for science. Total science expenditures as given in the old series and the new series are shown in columns (3) and (4) of table 1D.4. Throughout the discussion of the unofficial US studies, "total science expenditure" refers to the old series, excluding capital investment for science.

⁴ Two per cent of Republican science expenditures—a fraction of a per cent of budget expenditures for science—are unitemized, in addition to All-union unitemized expenditures: Korol includes the Republican unitemized expenditures in his estimate, and extrapolates on the basis of the unitemized portion of total budget expenditures in 1957. The difference is negligible.

Table 1D.2. Categories of expenditure in (1) the Soviet State Budget and (2) the Soviet series of national science expenditure

Main categories	Subsections	Subdivisions
(1) Soviet State Budget:		
1. <i>Defence</i>		
2. <i>Financing the national economy:</i>	A. <i>Industry</i> B. <i>Agriculture</i> C. <i>Transportation</i> etc.	
3. <i>Social-cultural measures:</i>	A. <i>Health</i> B. <i>Social security</i> etc. C. <i>Enlightenment:</i>	i. <i>General education</i> ii. <i>Vocational education</i> iii. <i>Higher education</i> etc. iv. <i>Science</i>
4. <i>Administration</i>		
(2) Soviet expenditures for science:		
1. <i>Budget expenditures for science (= 3.C.iv, above):</i>	A. <i>All-union expenditures:</i>	(i. <i>Itemized outlays</i>) (ii. <i>Unitemized outlays</i>)
	B. <i>Republican expenditures</i>	
2. <i>Other expenditures for science:</i>	A. <i>Enterprises' and economic organizations' own funds</i> (? B. <i>Other expenditures:</i> Possibly expenditures through other State Budget categories than 'science')	

Italics indicate that the category is identified by either Nimitz, Korol, or Lee as a possible source of finance for defence R&D.

Note: 'Budget expenditures for science' are the outlays shown in the State Budget under the heading 'science'. For the period 1950-1957, 'Republican expenditures for science' and a part of 'All-union expenditures for science' are distributed among a number of type-of-expenditure categories in a 1958 Soviet Ministry of Finance publication (Rashody na social 'no-kul'turnye meroprijatija po gosudarstvennomu bjudzetu SSSR [Expenditures for Social and Cultural Measures in the State Budget of the USSR]): 'unitemized' All-union expenditures for science are the residual All-union

expenditures which are not included in the type-of-expenditure breakdown given in this publication. 'Other expenditures for science' are obtained by subtracting announced Budget expenditures for science from announced total science expenditures. The composition of these 'other expenditures' and the extent to which they may be financed through other State Budget categories than 'science' are uncertain. A portion of 'other expenditures' is definitely financed not through the Budget, but through deductions from enterprises' incomes and funds.

and he presents a series of All-union military-related R & D expenditures for 1956-1965, which is derived by taking an arbitrary percentage (70 to 80 per cent) of All-union science expenditures (both itemized and unitemized).

Nimitz suggests that the series of All-union expenditures for classified R & D represents an upper limit to total Soviet military R & D expenditures.

Very small additional military R & D expenditures may be included, according to Nimitz, in "other expenditures for science" and in State funds budgeted to "higher education"; but the bulk of defence-related R & D is covered by All-union unitemized expenditures for science. Both Korol and Lee conclude that there are very substantial additional military R & D expenditures, not included in the All-union science budget at all. Korol suggests that the series of All-union expenditures for secret R & D represents the minimum level of military-related R & D expenditures, and that the major non-wage costs of military development work—the costs of the expensive equipment, prototypes and testing—are probably excluded altogether from the published series of total science expenditure. Total military-related R & D expenditures are suggested to be 50 to 100 per cent greater than the military-related expenditures assumed to be included in All-union expenditures. Lee gives a higher estimate than Korol for the minimum amount of military-related expenditures, including, in addition to the portion which he assumes to be found in All-union expenditures, 50 to 80 per cent of "other expenditures for science" as well. Lee suggests that further substantial military R & D expenditures are entirely excluded from the published series of science expenditures, and are channeled through the two major State Budget categories "defence" and "financing the national economy". The upper limit to total military-related R & D expenditures implied by Lee's discussion is a level two or three times as great as his assumed proportion of All-union expenditures. He thus suggests an approximate level for these expenditures two or three times as great as that of Nimitz.

The evidence

The main points at issue in the order-of-magnitude estimates of Soviet military R & D expenditures presented in the three studies are the following:

1. Is any military R & D financed through All-union science expenditures or through "other expenditures for science"?

2. Are there substantial, additional military R & D expenditures, which are excluded from the published series of total science expenditures? The three studies present the following evidence in answer to these two main questions.

1. Evidence that military R & D is financed through All-union science expenditures and "other expenditures for science":

Nimitz gives several brief citations from Soviet financial authorities who have "explicitly mentioned defence in discussions of allocations to 'science' ". The quotations and their context as specified by Nimitz are reproduced in

Table 1D.3. Soviet statements on military research and the financing of science, as cited by Nimitz¹

Date	Person and source of authority	Context of quotation	Quotation
1946	A. G. Zverev, Minister of Finance	Speech on 1945 State Budget plan	"the creative work of our scientific institutions contributed considerably to the military might of the Soviet Union"
1947	Great Soviet Encyclopedia	Account of the activities of 'research institutes' during the War	"[Research institutes], like industry, were evacuated [to the rear] so that they might be mobilized to the maximum and better serve the Soviet Army"
1948	K. N. Plotnikov, formerly in Ministry of Finance	Discussion of science expenditures, 1928-1945	"The enormous creative enthusiasm which in the war years gripped scientists in absolutely every area of science enriched our country with discoveries of great importance, which helped us to overcome the enemy."
1954	K. N. Plotnikov, formerly in Ministry of Finance	Discussion of post-War science expenditures	[Soviet scientific achievements include] "the discovery of methods of producing atomic power and the achievement of a powerful thermonuclear reaction".
1957	V. V. Lavrov (Soviet economic writer)	(In <i>Finance and the building of socialism</i>)	Soviet scientific achievements include "[the development of an intercontinental ballistic missile and the launching of earth satellites]".

¹ The quotations are presented in illustration of the point that "Soviet authorities on budgetary matters have explicitly mentioned defense in discussions of allocations to 'science': this

point is one of the reasons given by Nimitz for supposing that "defense research [is] among projects supported by the budget allocation to 'science'" (table ID.1, source [1], pp. 12-13).

table 1D.3. Although the statements do not say explicitly that military R & D is financed through budget expenditures for science, they are taken by Nimitz to provide strong grounds for believing that at least some military R & D expenditures are financed through the science category, rather than the defence category, within the State Budget. In suggesting that All-union, rather than Republican, budget expenditures for science cover military R & D, both Nimitz and Korol refer to the official description of All-union science expenditures as the expenditures which support scientific research of national, as opposed to local, significance. Both Nimitz and Korol support the conclusion that *unitemized* All-union expenditures cover primarily military-related R & D with several separate calculations; the calculations suggest that the itemized and unitemized portions of All-union science expenditure represent not two different sets of expenditure categories, but the same kinds of expenditure being distributed to two different groups of research institutions. The inference is drawn that the groups of institutions financed by the unitemized outlays are those which perform military-related R & D. Lee, suggesting that unitemized expenditures cannot be equated with outlays for

military-related R & D, finds evidence that these expenditures finance, among other things, R & D performed by agricultural research institutes. Lee also finds evidence, however, that some major military R & D expenditures are included in unitemized All-union science expenditures: in the list of type-of-expenditure items among which the itemized expenditures are distributed, the conventional Budget category for "above plan investment" is missing; and Lee suggests that this category is likely to cover substantial military R & D costs, and that it may account for a large part of the unitemized outlays. Implicit in this conclusion is the suggestion that some other types of expenditure for military R & D (wages, investment in equipment, etc.) are included among the itemized outlays. In supporting the estimate of 70 to 80 per cent of All-union science expenditures for military-space R & D, Lee says that there is "no empirical basis" for the percentages taken, but that "they are conservative compared with the assumptions routinely made elsewhere".

The strongest evidence that some military R & D outlays are included in All-union science expenditures is a calculation by Nimitz showing a sharp rise in All-union *outlays per scientist* within the industrial R & D sector, over the period 1950–1961. This calculation relies on several preliminary inferences and estimates which (a) distribute Soviet R & D scientists between All-union and Republican jurisdiction, and further, between industrial and nonindustrial R & D, and (b) assume that All-union science expenditures are the main source of financial support for the establishments performing industrial R & D of national significance. The calculation therefore supports, but does not prove, the hypothesis that military R & D expenditures are included in All-union science outlays. Nimitz concludes that the rise in outlays per industrial scientist "is probably explained by a shift toward projects where investment and/or prototype and testing costs are extremely high", and infers from this: "There can be little doubt . . . that defence research . . . must be largely responsible for the shift."

Both Nimitz and Lee suggest that all military R & D must be financed through the State Budget, and that "other expenditures for science" may include some expenditures originally channeled through the State Budget categories for "defence", "financing the national economy" (particularly the "industry" subsection), or "higher education". From this they infer that it would be possible for some military R & D outlays, channeled through these Budget categories, to be included in "other expenditures for science".

2. Evidence that some military R & D expenditure is not included in science expenditure:

Korol present a calculation of *outlays per professional R & D employee*, similar to the calculation of outlays per R & D scientist given by Nimitz,

but based on different Soviet data for qualified R & D manpower, and different assumptions about (a) the R & D institutions supported by Soviet expenditures for science and (b) the R & D institutions performing nationally important industrial R & D. Korol finds *constant* outlays per professional R & D employee over the period 1950–1962, taking the entire R & D establishment; and *declining* outlays per professional employee in the industrial R & D sector. He also finds that even in 1950, outlays per industrial employee are no higher than outlays per non-industrial employee. Korol concludes that the published Soviet series of total science expenditures excludes altogether the increasingly expensive equipment, prototypes and testing for industrial R & D, and in particular, for defence, space and atomic R & D. He thus comes to a conclusion essentially opposite to that of Nimitz.

Lee supports his suggestion that substantial military R & D expenditures are included in the defence budget, and not covered by the series of expenditures for science, by reference to two Soviet budgetary authorities, who specifically say that the defence budget finances R & D establishments. For one of these authorities he gives the following citation:

In expenditures for defense there are certain peculiarities. In the composition of these expenditures there is a place for expenditures for social-cultural measures for the Armed Forces . . . To these expenditures belong expenses for political-educational work, printing, publication, *maintenance of scientific research institutes*, higher and secondary military schools, worker training, physical education, medical service, maintenance of a large network of sanatoria, rest homes, and so on.⁵ (Italics added.)

“Social-cultural measures” is the budgetary category under which expenditures for science are subsumed. Lee points out that “scientific research institutes” are a special class of large and important R & D establishments; and he infers from the statement that the defence budget may include large outlays for military R & D, which could not be accommodated within “other expenditures for science”.⁶

Conclusions

On the basis of the evidence presented by Nimitz, Korol and Lee, it is not possible to determine whether the bulk of military R & D expenditure is in fact included in the science series. The statements of Soviet financial authorities cited by Nimitz and Lee leave open the possibility that while some

⁵ The source, K. N. Plotnikov, *Gosudarstvennyi Byudzhet SSR* (Moscow, 1959), page 322, is also cited in *The research and development effort*, page 120; the author is one of the financial authorities cited (twice) by Nimitz, to show that military R & D expenditures are included within budget expenditures for science (table 1D.3).

⁶ “Other expenditures for science” account for only 20–30 per cent of total science expenditures, with budget expenditures for science accounting for the remainder.

military R & D may be covered by the science expenditure series, the bulk of military R & D may be financed through the defence budget, and excluded from the science series. Lee's citation says explicitly that R & D institutions are financed by defence budget, while the citations given by Nimitz simply mention the military and space accomplishments of Soviet scientists and scientific establishments, without describing the sources of finance for the scientific work. It is certainly not possible to infer from the wording in any of the citations whether most military R & D is financed through the defence budget or through expenditures for science. To turn to some "outside" evidence on this point, one of the OECD studies on the Soviet R & D effort suggests, with reference to Soviet financial authorities, that while defence R & D institutions could be financed by the All-union science budget, or partially by some outlays included in "other expenditures for science", it would not violate normal budgetary practice if military R & D institutions were financed through the defence budget.⁷

The budgetary and manpower evidence used to estimate the portion of published science expenditures which may go to military-related R & D appear equally inconclusive. The uncertainties involved in interpreting the Soviet science data, and in trying to identify the channels of finance for military R & D, are best shown in the demonstrations by Nimitz and Korol of opposite trends in science expenditures per industrial R & D employee. The data on professional R & D employees presented in the two OECD studies suggest that calculations of science expenditures per employee in industrial R & D cannot be made with any confidence. The OECD studies give an original, lower estimate (1965) and a revised, higher estimate (1969) of total Soviet professional R & D employees. Both estimates fall between the low professional manpower base on which Nimitz calculates high and rising science expenditures per professional industrial R & D employee, and the high professional manpower estimate with which Korol demonstrates low and falling science expenditures per professional industrial R & D employee. Furthermore, neither of the OECD studies attempts to divide professional R & D manpower between industrial and non-industrial R & D; so that no estimate of science expenditures per industrial employee—and no inference on whether military R & D expenditures are likely to be included in or excluded from science expenditures—can be derived from the OECD data.

⁷ *The Research and Development Effort*, page 120. In a brief discussion of the possible channels of finance of military R & D, this study gives, independently, an excerpt from the citation which is given by Lee (page 297 and note 5 above); it also provides a description of some of the statements from financial authorities cited by Nimitz (given here in table 1D.3). No firm conclusion on the channels of finance is drawn, although it is suggested, with reference to the work of Nimitz and Korol, that "some research relevant for military purposes comes under civilian research establishments".

The deliberate avoidance of a precise estimate of total Soviet military or military-related R & D expenditure, in the three studies examined here, seems well founded. The combined evidence given in the three studies leaves wholly uncertain what the relationship might be between Soviet military R & D expenditure and Soviet outlays on science.

Other unofficial US studies: Godaire (1962), Sosnovy (1964), Becker (1964)

Godaire, Sosnovy and Becker (table 1D.1, sources [4], [5], and [6]) are all concerned to provide an estimate of total Soviet military expenditure; and all three treat Soviet R & D expenditure much more briefly than Nimitz, Korol or Lee.

Godaire introduces his discussion of Soviet military expenditure with a table of "Selected Soviet published information of possible defence significance", in which he shows, among other things, the Soviet science expenditure series. Godaire points to the very rapid rise in science expenditures over the period 1953 to 1962 (400 per cent), and he suggests that there are "institutional reasons for believing that this allocation encompasses a considerable amount of research and development for complex military equipment such as aircraft and missiles and for nuclear energy and space activities." In constructing his estimate of "Possible total Soviet defence and space allocations" for 1950–1962, Godaire includes estimates of the military-space portion of science expenditures. The estimates represent "unitemized" budget expenditures for science, which are derived from the 1958 Ministry of Finance publication for 1950–1957,⁸ and extrapolated to 1962 "on the basis of the 1956 relationship between the unitemized amount and the published total allocation for science." In this he agrees with Nimitz and Korol.

Godaire then suggests that not all Soviet military R & D expenditures are included within budget (or "other") expenditures for science. In particular, he says, "substantial end-product development, test and evaluation of national significance (considerable amounts of which are undoubtedly military and space) seem to be covered elsewhere in the [State] budget." Further on, Godaire suggests that the excluded R & D expenditures may be channeled through two unexplained expenditure residuals within the State Budget: these residuals are obtained by subtracting expenditures listed under the various categories from announced total expenditures within (a) the State Budget as a whole, and (b) the Budget category "financing the national economy". Godaire includes these residuals in his estimate of total Soviet

⁸ See the note to table 1D.2.

military expenditures, saying that they “may cover some or all of the following: The development, test and evaluation of military and space hardware and systems; . . . procurement of some, if not most, major military and space equipment; . . .”, and so on. Godaire does not give any further evidence for his assumptions about the portion of military-space R & D expenditures included in and excluded from published science expenditures.

In estimating total Soviet military expenditures for 1964 only, Sosnovy suggests that military R & D expenditures are excluded from the defence budget, and included in budget expenditures for science. He estimates the division of budget expenditures for science between military and non-military expenditures with the caution that “no direct information for such a division is available”. Apparently referring to “unitemized” budget expenditures, Sosnovy says, “If we assume that the percentage of concealed allocations for science in the years 1958–1964 is the same as in 1957, this means that in 1950–1964 expenditures for military research increased from 0.3 billion rubles in 1950 to 2.2 billion rubles in 1964, representing a sevenfold increase. This increase lay primarily in the field of atomic energy.” Sosnovy includes the figure of 2.2 billion rubles in his estimate of total military expenditures for 1964, labelling it “Scientific research in the military field”.

In constructing estimates of Soviet military expenditure for 1955–1962, Becker relies, for the military R & D component, on the figures and analysis published by Nimitz. Becker does, however, give some further evidence that military R & D is not financed through the defence budget: he introduces a number of citations from Soviet budgetary authorities, which give apparently exhaustive lists of the kinds of expenditure included in the defence budget—and these lists omit military R & D expenditure. Becker assumes that most military R & D is financed through expenditures for science; and he gives a short description of Nimitz’s evidence for the hypothesis that unitemized All-union expenditures for science represent largely defence R & D expenditures. Including the unitemized All-union expenditures, which are extrapolated to 1962, in his estimate of total Soviet military expenditures, Becker justifies the possible inclusion of some civil R & D expenditures (within unitemized outlays), by commenting that these small expenditures are likely to be off-set by small military R & D expenditures included in “other expenditures for science” and in “higher education” budget expenditures.

The firm estimates of Soviet military (or military-space) R & D expenditure presented by Godaire, Sosnovy and Becker are, thus, essentially the same as the order-of-magnitude estimates presented somewhat more cautiously by Nimitz, Korol or Lee. In all of the six studies it is assumed that unitemized expenditures for science are largely expenditures for military

R & D. Like Nimitz, Sosnovy and Becker suggest that unitemized expenditures (or about 60 per cent of budget expenditures for science) represent total Soviet military R & D expenditures. Godaire, like Korol and Lee, suggests that substantial military R & D expenditures are not included in the published science series at all.

Although these studies attempt to be more precise than the three more detailed studies examined in the first section, this greater precision does not seem to have any warrant. The basic Soviet data relied on here is the same as that for the other studies: that All-union expenditures are those which finance R & D of national importance, and that a large and rising proportion of All-union expenditure was not accounted for in the itemized breakdown for the early 1950s given in the 1958 Ministry of Finance publication. The studies examined here do not add any new, conclusive evidence. Indeed, to some extent they add to the conflict of evidence; for whereas Lee presents a citation listing scientific research institutes as one of the objects of defence budget expenditure, Becker produces a number of quotations which appear expressly to exclude R & D from the list of items covered by the defence budget. These three studies thus serve to increase rather than reduce the uncertainty of the whole matter.

Official US estimates of Soviet military R & D expenditure (1969–1970)

The estimates

Estimates of the magnitude and trend of recent Soviet military R & D expenditures have been given, in 1969 and 1970, in official statements made by Dr John S. Foster, US Director of Defense Research and Engineering.⁹ The estimates have been presented in the context of descriptions of the Soviet military R & D “threat”, in statements supporting the US military R & D budget and programme. Four official statements by Dr Foster are examined here: two from 1969—the official statement on the 1970 US defence R & D budget and programme (table 1D.1, source [7]), and answers by Dr Foster to questions asked in Congressional hearings on the defence R & D budget (source [8]); and two from 1970—the official statement on the 1971 defence R & D budget and programme (source[9]), and a speech before the American Newspaper Publisher’s Association on “the Soviet technological

⁹ The same estimates have been presented by Dr Foster in a number of different statements, of which the most detailed are examined here. The estimates have also been quoted by other Department of Defense officials and by military spokesman, and they are included in part in the official statement on the 1971 defence budget and programme by US Secretary of Defense Melvin Laird.

threat" (source [10]). The estimates of Soviet military-space R & D expenditures given in these statements may be summarized as follows:¹⁰

Magnitude: Estimates of Soviet military-space R & D expenditures for 1969 and 1970 are given in a 1969 statement [8] as \$14.8 billion and \$16.1 billion. In a 1970 statement [9], the estimate of Soviet military-space R & D expenditures for 1970 is given as \$16–17 million.

Trend rate of growth: In 1969, Dr Foster observes that military-space R & D expenditures have shown "an increase of about 10 per cent per year . . . during the last few years" [7]. In 1970, Soviet military-space R & D expenditures are said to have risen at about 13 per cent per year "for the entire decade of the 1960's", and to be still rising at this rate [9, 10].

Share in total R & D outlays: Firm estimates of total Soviet R & D and space expenditure are given in the 1970 statement [9], for five years: 1955, 1960, 1965, 1968 and 1970. These estimates show a slower rate of rise, over the period 1960–1970, than the rate given for military R & D expenditure (10.6 per cent for total R & D and space, 13 per cent for military-space R & D). Estimated military-space R & D expenditure must therefore be assumed to have taken a rising share of estimated total R & D expenditure during the 1960s. In 1970, military-space R & D expenditures are suggested to take 80 per cent of total R & D and space expenditures [9, 10].

The sources and methods

In the four statements, Dr Foster makes only two brief comments concerning the sources and methods of the estimates of Soviet military R & D expenditure. At one point he says (concerning the rise in military-space R & D outlays): "These *budget data* have been found to be consistent, on a general program basis, with the resources required to support the growing number and types

¹⁰ At various times Dr Foster refers to his estimates as estimates of "defense, atomic energy and space" R & D, "military/space/atomic" R & D, "military and space" R & D, and "defence-related" R & D: the estimates remain the same, however, and for convenience, they are referred to here as estimates of "military-space" R & D. At only one point—in the official statement for 1970 ([9])—does Dr Foster make a separate statement about "the military component alone", when he suggests that it has risen "60 per cent during the 1960's". The rise Dr Foster shows, in the same statement, in total Soviet military/atomic/space R & D over this period is 240 per cent. From these figures, it can be inferred, first, that the growth rate in Soviet military R & D only is estimated at about 5 per cent per year in 1960–1970, which is very much lower than the rates given most publicity—the 10–13 per cent per year for total R & D and for military plus atomic and space R & D. Secondly, on the basis of Dr Foster's estimates of the level of Soviet R & D spending, these various growth rates can be shown to imply a figure for the Soviet military component alone, in 1970, which is significantly lower than the comparable figure for the US military component alone.

Table 1D.4. Soviet statistics of Soviet science expenditure and official US estimates of Soviet R&D expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
	Soviet expenditure for science:				Official US estimates of Soviet R&D expenditure:	
	All-union Budget expenditure for science	Total Budget expenditure for science (All-union + Republican)	Total science expenditure (Budget + other) excl. cap. invest. for science	Total science expenditure including capital investment for science	Soviet military R&D and space expenditure	Total Soviet R&D and space expenditure
	<i>Billion roubles, current prices</i>				<i>Billion US \$, constant (1966) prices</i>	
1960	1.9	2.3	3.3	3.9	..	7.8
1961	2.2	2.7	3.8	4.5	..	..
1962	2.5	3.0	4.3	5.2	..	..
1963	3.0	3.5	4.9	5.8	..	..
1964	3.5	4.0	5.4	6.4	..	..
1965	3.7	4.3	6.0	7.1	..	13.9
1966	..	(4.6)	(6.5)	7.7	..	..
1967	..	..	(7.2)	(9.0)	..	..
1968	..	..	(7.9)	..	..	17.7
1969	..	(6.3)	(9.0)	..	14.8	..
1970	..	..	(10.2)	(11.0)	16-17	(21.3)

() = planned or estimated rather than actual expenditure. .. = not available.

Sources: Cols. (1), (2), (3) and (4), 1960-1968: OECD, *Science Policy in the USSR* (Paris, 1969), pages 98-99, 100, 105; 1969: "On the U.S.S.R. State Budget for 1969 and on fulfillment of the U.S.S.R. State Budget for 1967", Report by Deputy V. F. Garbuzov, USSR Minister of Finance, in *Pravda* 11 Dec. 1968, pages 4-5, translated in *Current Digest of the Soviet Press* XX (51), pages 4 ff; 1970: "On the U.S.S.R. State Budget for 1969 and on fulfillment of the U.S.S.R. State Budget for 1968", Report by Deputy V. F. Garbuzov, USSR Minister of Finance, in *Pravda* 17 Dec. 1969, pages 4-5, translated in *Current Digest of the Soviet Press* XXI (51), pages 15 ff. Col. (5), 1969: table 1D.1, source [8], page 2224; 1970: table 1D.1, source [9], page 7957. Col. (6): table 1D.1, source [9], page 7957.

of aircraft, missiles, ships and other equipment which the USSR has been developing in recent years" (italics added) [9]. And at another point Dr Foster says that his US dollar estimates allow for the problem of the appropriate dollar-rouble exchange rate, and represent Soviet expenditures in terms of US costs [8]. These statements suggest that Dr Foster's estimates have been derived from Soviet financial data and converted to dollars at special R & D exchange rates; and that some check on the estimates has then been made by valuing Soviet hardware programmes at US costs. Whether or not this inference is correct, Dr Foster's estimates show a trend so close to the trend in the published Soviet science expenditure series that it must be assumed that Soviet science data have been used in their construction.

Dr Foster's estimates of the level and trend of Soviet R & D expenditure are compared to the official Soviet science expenditure series in tables 1D.4

Table 1D.5. Comparison of trends in official US estimates of Soviet R&D expenditure with trends in Soviet science expenditure

		<i>Average annual per cent increase</i>	
A. Official US estimates of total Soviet R&D and space expenditure (at constant prices)		A. Total Soviet science expenditure, including capital investment for science (at current prices)	
1960-1970	10.6	1960-1970	10.9
1960-1965	12.3	1960-1965	12.7
1965-1970	8.9	1965-1970	9.1
B. Official US estimates of Soviet military R&D and space expenditure (at constant prices)		B. Soviet science expenditure, excluding capital investment for science (at current prices)	
1960-1970	"about 13"	1960-1970	12.0
1970 statement:	"this vigorous rate of growth"—about 13—"appears to be continuing"	1968-1970	13.6
1969 statement:	"about 10 per cent a year . . . during the last few years"	1964-1968	10.0

Source: Trends in Soviet science expenditure and in US estimates of total Soviet R&D expenditure calculated on the basis of data presented in table 1D.4, cols. (3), (4) and (6). Trends in US estimates of Soviet military R&D and space expenditure: 1960-1970 and 1970 statement: table 1D.1, source [9], p. 7957; 1969 statement: table 1D.1, source [7], p. 733.

and 1D.5. (The figures of total science expenditure shown in column (4) of table 1D.4 represent a new Soviet series, introduced in 1967, which is not dealt with in any of the unofficial US studies. This series includes, in addition to the old series of total Budget and other science expenditure, expenditure under the "Capital Investment Plan for the Development of Science".)¹¹ The trend in total Soviet science expenditure (new series) over the period 1960-1970 matches almost exactly the trend in Dr Foster's estimates of total Soviet R & D and space expenditure (columns (4) and (6) in table 1D.4, and part (A) in table 1D.5). Both series show an average annual increase slightly under 11 per cent over the period 1960-1970, with a sharper rise in the first half of the period than in the second. The small difference between the trends of the two series could be entirely accounted for by an allowance for a slight inflation in Soviet R & D costs, over the period 1960-1970, since the US figures are in constant prices. Dr Foster's estimates of Soviet military-space R & D expenditure follow roughly the same pattern; and for the periods 1964-1968 and 1968-1970, when the complete old series of Soviet science expenditure is available, they parallel this series very closely (table 1D.5, part (B)). It is to be expected that Dr Foster's military-space R & D expenditure estimates would show a somewhat

¹¹ This series, with estimates for the period 1959-1967, was apparently published for the first time in the UNESCO study *Science policy and organization of research in the USSR* (Paris, 1967).

faster rate of rise than the Soviet science expenditure series, since it is implied that military-space R & D expenditure has represented a rising share of total R & D and space expenditure in 1960–1970.

Dr Foster's estimates cannot be compared directly with the Soviet science expenditure estimates because he does not indicate what exchange rate has been used; and there is no generally accepted rate for converting rouble-expenditures for R & D performed in the Soviet Union into dollars which would buy a comparable R & D effort in the United States. It is generally agreed that the official exchange rate (\$1.10 per rouble) would underestimate the magnitude of the Soviet R & D effort. At the official rate, the average pay of a Soviet R & D employee is only 20–30 per cent of the pay of a comparable US employee; and the same amount of money, at the official rate, would therefore hire many more R & D workers in the Soviet Union than in the United States. R & D exchange rates, in current expert use, which attempt to allow for the differences in wages and other costs in the two countries, vary between \$1.30 per rouble and \$3.50 per rouble. The uncertainty of the appropriate exchange rate is such that most studies drawing on Soviet data, including all of the unofficial studies examined in this section, do not attempt to convert rouble estimates into dollars at all.

Dr Foster's estimates of total Soviet R & D and space expenditure can be made to equal total Soviet science expenditures (new series) if an exchange-rate of about \$2 per rouble is used. (Judging from the range of exchange rates chosen by experts, this is not an unreasonable exchange rate, and does not exaggerate the dollar equivalent of Soviet science expenditure.) It therefore seems possible that Dr Foster's estimates are drawn directly from the science expenditure data, and that the estimates of military-space R & D expenditure have been obtained simply by taking a large and rising percentage of total science expenditures and converting the estimates at \$2 per rouble (with some allowance for inflation). In this case, practically all capital investment, All-union and "other" expenditures for science would be included in the estimates of military-space R & D expenditure. It is also possible, however that higher or lower exchange rates have been used. If a higher rate has been used, for example \$2.50 per rouble, some Soviet science expenditures would have to have been excluded—as non-R & D expenditures—from Dr Foster's estimates of total Soviet R & D and space expenditure. If a lower rate has been used, on the other hand, Dr Foster's estimates would have to include, in addition to total Soviet science expenditures, some additional R & D expenditures, assumed to be financed outside the science expenditure channels. In either case, Dr Foster's estimates of the trends in total Soviet R & D and space expenditure and in military-space R & D expenditure have almost certainly been based on the assumption that the

trends in these expenditures are accurately reflected by the trends in the Soviet science expenditure series.

Conclusions

Dr Foster's apparent use of the Soviet science expenditure data to derive the trend and possibly the level of Soviet military-space R & D expenditure does not seem to be warranted by published data or analysis. It has not been shown that the bulk of military R & D expenditure is included in announced science expenditures, or that the level or trend of military R & D outlays can, with any confidence, be inferred from the science data. Current disagreement over an appropriate rouble-dollar R & D exchange rate suggests that exchange rate uncertainties alone make it impossible to give dollar estimates of Soviet R & D expenditures which can be considered at all reliable. Dr Foster says in the official statements for 1969 and 1970 ([7] and [9]) that his estimates of Soviet R & D expenditure are "probably accurate within about 10 to 20 per cent". This margin might well be considered a narrow allowance either for the uncertainty involved in estimating Soviet military R & D expenditures in roubles, or for that involved in converting any rouble estimates to dollar estimates: it can hardly accommodate both kinds of uncertainty.

It is possible to argue in a general way that, because the Soviet figures of defence expenditure appear low and because total Soviet science expenditure, converted at R & D exchange rates, is comparable in magnitude to total US R & D expenditure including military R & D, therefore some Soviet military R & D may be excluded from the defence budget and included in the science budget or in other science expenditures. This does not mean, however, that there is any way of deriving estimates of either the level or the trend of Soviet defence-related R & D expenditure from the science figures. Among the industrialized countries for which R & D expenditure data is available, the proportion of total R & D expenditure which goes to military R & D varies very greatly—in general, between 5 and 50 per cent; and in almost all of these countries, including the United States, military R & D has represented a declining share of total R & D in the latter half of the 1960s. The US estimates of Soviet military-space R & D expenditure do not, thus, reflect some pattern which may be observed generally among industrialized countries. Even if the new Soviet science series does represent total Soviet R & D expenditure, including military R & D, no published evidence has been found which would permit an estimate of the military portion.

1E. World stock of fighting vessels

The figures are based on an analysis of world fleets in 1950, 1955, 1960, 1965 and 1968. Sources and methods are discussed on page 321.

Introduction

This section presents figures of the world stock of fighting vessels, for the main countries and regions of the world, and for five selected years during the period 1950–1968. It is part of the documentation of the state, and trend, of world armaments. The purpose of the tables is to answer such questions as—how fast are world stocks of fighting vessels rising? Is there an acceleration? Where is the rise taking place? In which type of vessels is the rise most marked? What is the state of the arms competition in this field between the United States and the Soviet Union, and between NATO and the Warsaw Pact?

The analysis restricts itself to a discussion of quantities. It does not discuss naval strategy, or the political or military reasons why nations possess or think they need to possess fleets of this or that size.

To answer some of these questions, an aggregate is needed for the stock of fighting vessels possessed by a country or region. There are a number of problems in the construction of such an aggregate.

(1) The total *number* of vessels in a particular navy is an obviously unsatisfactory measure. This method counts an aircraft carrier and a patrol boat each as one. In a period when the number of small vessels is rising and the number of major vessels falling, a series of the total number of vessels obviously gives a wrong impression.

(2) *Tonnage* is not much better than number. Tonnage figures fail to measure sophistication and “product improvement”, which is much more rapid in the military than in the civil field.¹ A nuclear-powered submarine carrying intercontinental ballistic missiles does not weigh much more than an ordinary submarine; but the introduction of these submarines represents a very big increase in the world stock of armaments.

(3) The method used here is based on *cost*: the aggregate figures therefore are approximate estimates of the value of the stock of the world’s fleets of fighting vessels. The effect of inflation is removed: the figures are at constant prices. (The method is described in detail on page 322.) As a general rule, it seems reasonable to assume that increased expenditure (in real terms)

¹ See *SIPRI Yearbook 1968/69*, page 94.

does buy an increase in performance or capability which, in a rough and ready way, has some relationship to the increase in the money spent. The figures therefore can be regarded as giving a broad indication of relative efficiencies. This method produces estimates which include the effect of "product improvement".

(4) Another problem is the problem of coverage. Ideally, a stock estimate should include countries' total naval systems, including support ships and naval bases. It has not been possible to include these here. It is reasonable, however, to assume that the number of support ships bears some relationship to the size of the fighting fleet; if they were included, the main propositions made in the analysis which follows would in all probability still hold good. It is obviously impracticable to attempt estimates of the value of the world's naval bases. In some of the text comparisons, however, some account is taken of their number.

Numbers

In numbers, the trend has been away from large vessels and towards small ones. Particularly since 1955 the number of major vessels² in the world's fighting fleets has been falling; the number of small vessels, particularly patrol boats, has been rising (table 1E.1 and charts 1E.1 and 1E.2).

The actual number of major fighting vessels in the world went up a little from 1950 to 1955, and then fell some 15 per cent between 1955 and 1960,

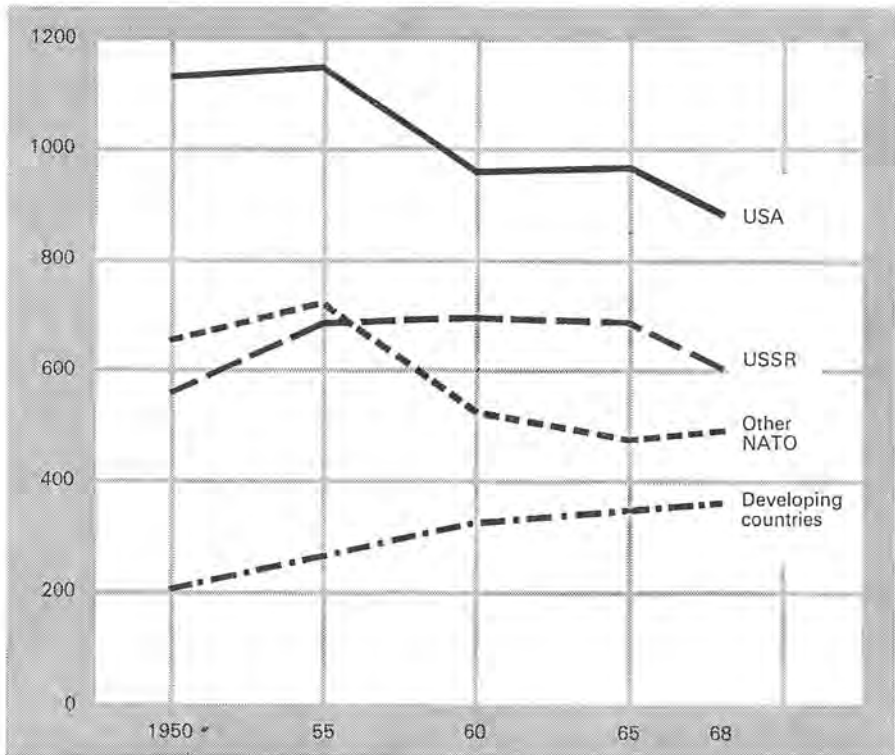
² Aircraft carriers, battleships, cruisers, destroyers, frigates and escorts, and submarines.

Table 1E.1. World stock of fighting ships: numbers

	1950	1955	1960	1965	1968
Major vessels^a					
World	2 693	2 992	2 708	2 703	2 541
<i>of which</i>					
USA	1 130	1 146	957	962	884
Other NATO	650	718	525	476	491
USSR	558	686	691	683	602
Developing countries	209	262	321	348	361
Patrol boats, etc.					
World	978	1 380	1 849	2 233	2 423
<i>of which</i>					
USA	147	120	35	18	28
Other NATO	190	267	230	233	226
USSR	395	516	769	763	775
Developing countries	156	238	427	781	951

Source: See p. 321.

^a Aircraft carriers, submarines, cruisers, destroyers, frigates and escorts, and battleships.

Chart 1E.1. World stock of fighting ships: numbers of major vessels^a

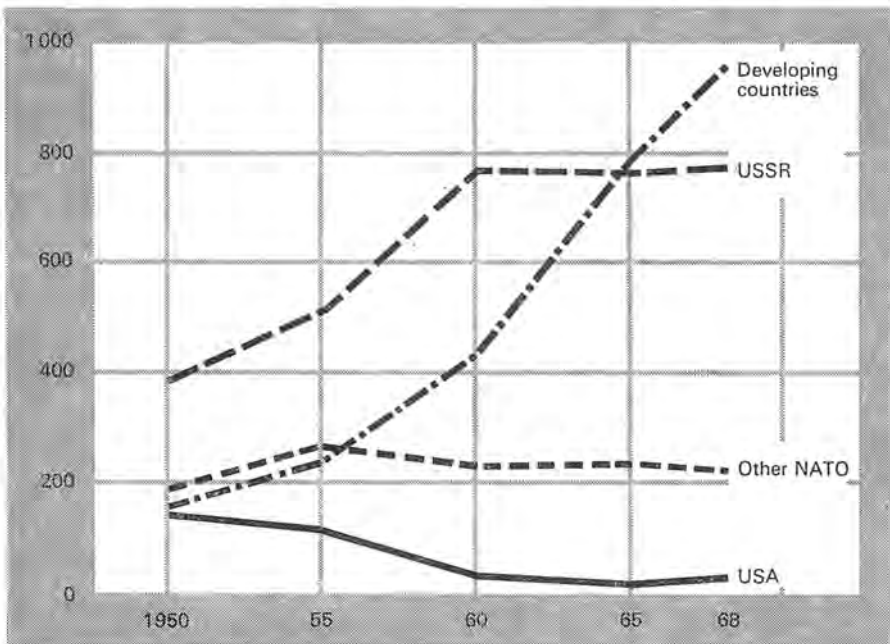
Source: See p. 324 ff.

^a Battleships, cruisers, destroyers, frigates and escorts, aircraft carriers, submarines.

when, owing to obsolescence and changing naval requirements, a large number of World War II vessels were removed from the active fleets. Some of these ships were handed down to developing countries, but most of them were scrapped. In the Soviet Union, there was no reduction before 1965. The number then came down a little, but was still higher in 1968 than in 1950. Developing countries show a different trend: the number of major vessels in their fleets has been rising steadily.

On the other hand, the number of minor fighting vessels in the world's fleet—that is, patrol boats, motor torpedo boats and gunboats—has increased fast: the number more than doubled in the last twenty years. This kind of vessel has been particularly popular in the developing countries: they are relatively cheap, and suitable for coastal waters. The Soviet Union also has a large number of these vessels for operations in coastal waters. NATO countries do not have many of them, and their number has not been rising there.

This picture—of a fall in the number of big vessels and rise in the num-

Chart 1E.2. World stock of fighting ships: numbers of patrol boats, etc.^a

Source: See p. 326.

^a Including motor torpedo boats and gunboats.

ber of small vessels—is a simplified one, of course. Within the group of major vessels there are sizeable variations in trend. For example, since 1950 the number of submarines has risen a little (table 1E.5); the number of cruisers and battleships has halved (tables 1E.7 and 1E.10). These individual changes are outlined more fully on page 320.

The value of the world stock

The value of the world stock of fighting vessels (in constant prices) shows a very different trend from the figures for the number of major vessels. The stock has risen, on average, some 5 per cent a year between 1950 and 1968—and has shown a much faster rate of rise in the 1960–1968 period (table 1E.2 and chart 1E.3).³ This is partly because the scrapping of World War II vessels in NATO countries (already referred to) took place before 1960, and partly because the costly developments—in the commissioning of submarines with intercontinental ballistic missiles, in nuclear propulsion

³ If the calculation had been made for every year, the various turning points and dates of changes in trend might have differed from those shown in charts 1E.2 to 1E.8 by one or two years. This would not change the general picture presented.

Table 1E.2. World stock of fighting ships: estimated growth-rates in value of stock

	'Importance' Per cent share in total world value of stock ^a 1968	Average annual per cent growth-rates		
		1950-60	1960-68	1950-68
World	100.0	3.3	7.2	5.0
<i>of which</i>				
Developed countries	93.7	3.1	7.3	5.0
<i>of which</i>				
NATO	62.1	0.7	7.6	3.7
<i>of which</i>				
USA	48.0	1.0	8.5	4.3
Other NATO	14.1	-0.1	5.2	2.3
<i>of which</i>				
UK	5.5	-3.2	3.7	-0.2
Warsaw Pact	27.4	11.3	7.2	9.5
<i>of which</i>				
USSR	26.4	11.0	7.2	9.4
Other European	2.0	3.9	2.4	3.3
<i>of which</i>				
Sweden	0.7	2.4	0.9	1.7
Yugoslavia	0.5	16.8	4.8	10.9
Other developed	2.1	7.9	5.2	6.7
<i>of which</i>				
Australia	0.9	-1.6	10.4	3.6
Japan	1.0	..	3.6	..
South Africa	0.2	6.3	9.3	7.6
Developing countries	6.3	6.2	5.2	5.7
<i>of which</i>				
China	1.1	18.3	7.7	13.5
Far East (excl. China & Japan)	1.5	7.1	6.7	6.9
Middle East	0.7	8.0	8.6	8.3
South Asia	0.6	8.7	3.8	6.9
South America	1.7	3.6	0.9	2.4
Central America	0.4	0.5	5.8	2.8
Africa (excl. South Africa)	0.2	..	36.0	..

Source: See p. 328.

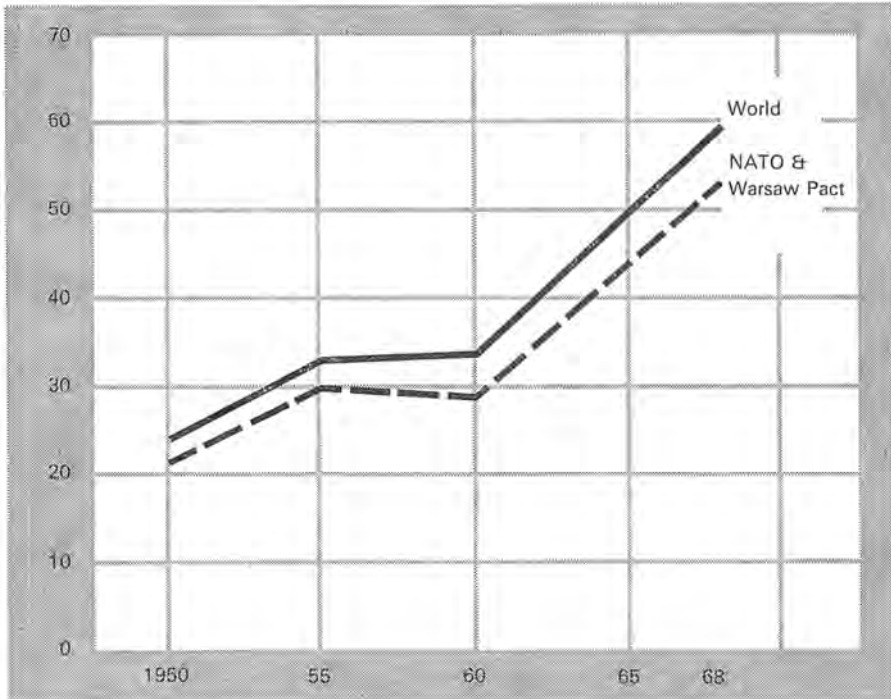
^a All percentages in the first column refer to the share of the world total.

and in the replacement of conventional armaments by missiles—all occurred mainly after 1960.

One reason for the increase is the spread of intercontinental ballistic missiles to the sea. It is not easy to say how much of the rise is explained in this way. It is possible to quantify the contribution of ballistic-missile submarines alone. If they are subtracted from the total, the growth-rate for the world stock of fighting vessels over the whole period becomes 4 per cent instead of 5 per cent a year. But the existence of these submarines has been accompanied by a large increase in the resources devoted to anti-sub-

Chart 1E.3. World stock of fighting ships: estimated value

US \$ bn, at constant (1968) prices



Source: See p. 328.

marine warfare; the function of hunter-killer submarines, for example, is to track down and destroy these ballistic-missile submarines.

What happens in the future to the world stock of fighting vessels depends to an overwhelming extent on the arms competition between the two blocs. NATO and the Warsaw Pact powers, which account for the great bulk of military expenditure (page 2), also own the great bulk of the world's stock of fighting vessels—nearly 90 per cent of it. The United States and the Soviet Union alone account for about three-quarters of it. The developing countries' share in the value of the world's capital stock is much lower than their share measured by tonnage or number, since they tend not to have the more expensive vessels.

The rate of increase in the stock of fighting ships has been about the same over the whole period in the developed and in the developing countries—between 5 and 6 per cent a year. In the developed countries, it has come mainly from “product improvement”—the increased sophistication and cost of submarines or destroyers, for example. In the developing countries, the rise is mainly explained by the increase in numbers.

NATO and Warsaw Pact: comparisons of size

The growth in the size of the Soviet fleet and its expanding deployment have attracted considerable attention in recent years. Some commentators and some politicians have argued that, as a consequence of this, naval appropriations in Western countries ought to be increased. The figures in tables 1E.4 to 1E.12—and particularly the estimates of the value of the stock of fighting vessels—are relevant to this discussion. The main items in the comparison are summarized in table 1E.3 and charts 1E.4 and 1E.5; the main points are these:

(1) From 1950 to 1960 the rise in the Warsaw Pact fighting fleet was much faster than the rise in the NATO fleet. In 1950 the Warsaw Pact fleet was relatively small—only one-sixth the size of that of NATO. In 1960 it was rather less than one-half the size of the NATO fleet.

(2) After 1960, the growth-rate of the Soviet fleet slowed down and that of the NATO fleet accelerated, so that between 1960 and 1968 the increase in the NATO fleet was slightly the faster of the two. In 1968, therefore, the Warsaw Pact fleet still was less than half the size of the NATO fleet.

(3) If one looks at the gap between the value of the two fleets in absolute terms—that is, the actual amount by which the NATO fleet exceeds the Warsaw Pact fleet—the gap was in fact greater in 1968 than in any of the previous years⁴ (table 1E.3).

(4) These are estimates of the value of the stock of fighting ships: they make allowance for the fact that Soviet vessels are newer, on average, than NATO vessels (see below, point 7). If the comparison were in tonnage, then the Warsaw Pact stock in 1968 would be less than a third of that of the NATO powers (table 1E.3).

(5) Other NATO countries apart from the United States add substantially to the total size of the NATO fleet. Other Warsaw Pact countries, on the other hand, have negligible fleets, and add very little to the naval power of the Soviet Union.

(6) In one important respect, the gap between the Warsaw Pact and NATO fleets is understated. The estimates for aircraft carriers do not include the value of the planes; there is a strong case for including them—since, for example, the missile launchers on destroyers and cruisers are included. In 1950, the cost of the aircraft on a carrier was probably equal to about 30 per cent of the cost of the carrier itself. Since then, the cost of carrier-

⁴ This is because the size of the Soviet fleet was initially so small. A 20 per cent increase on an initial figure of 25, and a 5 per cent increase on an initial figure of 100, leaves the absolute gap between the two figures the same.

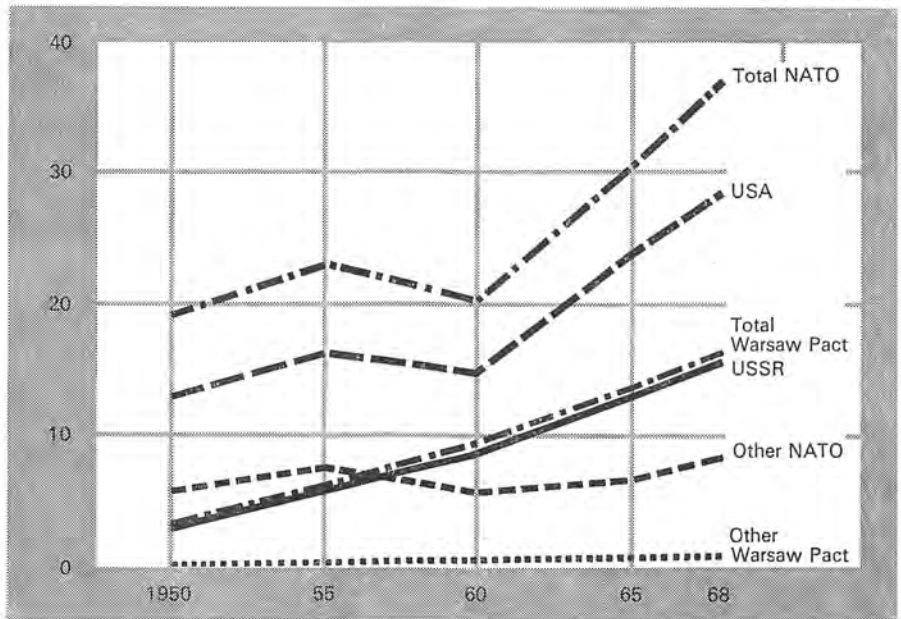
Table 1E.3. World stock of fighting vessels: comparison of NATO and Warsaw Pact fleets

	1950	1955	1960	1965	1968
<i>Estimated capital stock, at constant (1968) prices (\$ bn)</i>					
Total NATO	19.1	23.9	20.5	30.8	37.1
<i>of which</i>					
USA	13.4	16.4	14.9	24.0	28.7
Total Warsaw Pact	3.2	6.1	9.4	13.9	16.4
<i>of which</i>					
USSR	3.1	6.0	9.0	13.4	15.7
Gap between:					
NATO and Warsaw Pact	15.9	17.7	11.1	16.9	20.7
USA and USSR	10.3	10.4	5.9	7.1	13.0
Ratio of Warsaw Pact fleet to NATO fleet	1 : 5.9	1 : 3.9	1 : 2.2	1 : 2.2	1 : 2.3
Average annual growth-rates from previous year shown: (%)					
NATO		+ 4.6	- 3.0	+ 8.4	+ 6.4
Warsaw Pact		+ 13.8	+ 9.0	+ 8.2	+ 5.5
<i>Comparison in terms of tonnage: (mn tons)</i>					
NATO	6.15	6.77	5.20	5.34	5.34
<i>of which</i>					
USA	4.45	4.83	3.93	4.13	4.09
Warsaw Pact	0.81	1.37	1.64	1.75	1.65
<i>of which</i>					
USSR	0.78	1.35	1.59	1.68	1.61

Source: See p. 321 ff.

Chart 1E.4. World stock of fighting ships: estimated value, NATO and Warsaw Pact

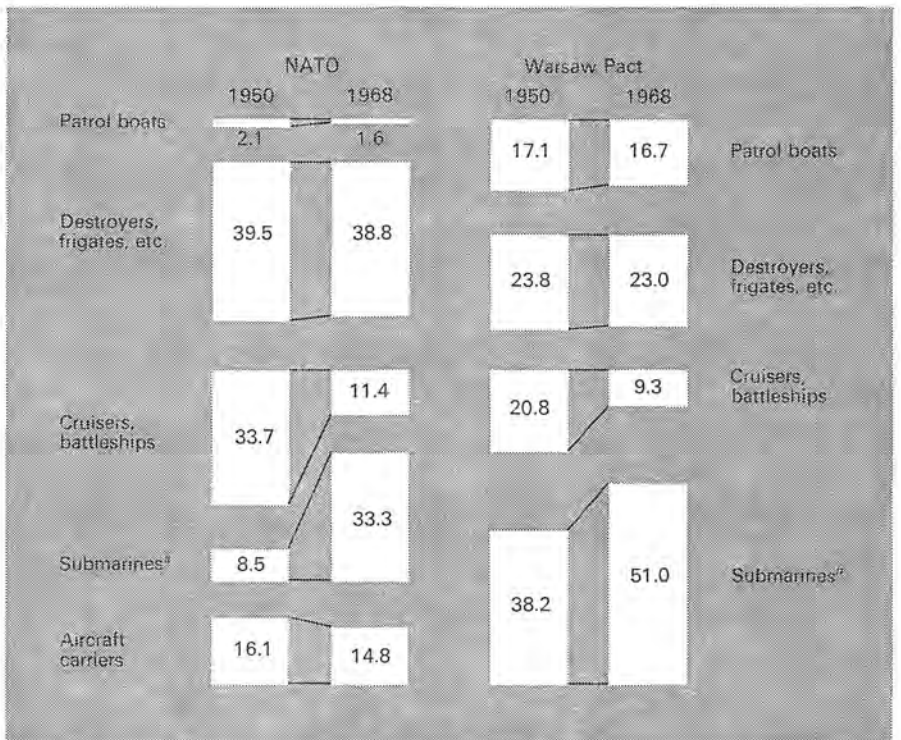
US \$ bn, at constant (1968) prices



Source: See p. 328.

Chart 1E.5. Composition of NATO and Warsaw Pact fleets, 1950 and 1968

Per cent of total value



Source: See p. 324 ff.

^a For NATO in 1968, 21.7 of the 33.3 is accounted for by nuclear powered ballistic missile submarines.

^b For the Warsaw Pact in 1968, 8.2 of the 51.0 is accounted for by nuclear-powered ballistic missile submarines.

borne aircraft has risen very fast indeed: and by 1968, the cost of the aircraft was probably equal to 80 per cent of the cost of a carrier.

The aircraft carriers in the United States active fleet in 1968 are valued in the stock estimate at \$4.5 billion, or some 15 per cent of the total value of United States front-line vessels. The addition of the planes they carry would probably add at least a further \$3.5 billion to this value—making the total estimated stock for the United States \$32.2 billion instead of \$28.7 billion, and the total NATO stock \$41.1 billion instead of \$37.6 billion. On this calculation, including the value of the planes on aircraft carriers, the Warsaw Pact fleet in 1968 was equivalent to less than 40 per cent of the NATO fleet.⁵

(7) The United States fleet is older than the Soviet fleet. (This is likely to be true in any comparison between a navy which is being built up and a long-established navy.) The age distribution of the United States fleet is most abnormal, including a large number of old ships and a large number of young ships, but almost none of middle age. This can be seen in the following figures for 1968:

Table 1E.4. Age composition of fighting vessels, USA and USSR

	<i>Percentage of total ships</i>	
Age (in years)	USA	USSR
0-10	46.3	51.6
11-15	5.1	31.4
16-20	3.5	16.5
Over 20	45.1	0.5
<i>Number of ships included^a</i>	722	601

^a The figures include submarines, cruisers, destroyers, fighters and escorts. Aircraft carriers are excluded because there are no comparable units on the Soviet side. For the United States, ships that underwent major conversion for carrying missiles are treated as new from the date of recommission. The US destroyers that went through either of the Rehabilitation and Modernization Programs are treated as new in 1960. Ships in the US reserve fleet are excluded.

A large number of the United States ships have gone through extensive conversion and modernization under the Fleet Rehabilitation and Modernization Program. Some of the conversions have left little of the old ship except the hull; the ship can be treated as virtually new from the date of conversion.

⁵ This is a conservative calculation. It assumes that the 17 attack carriers have a complement of 70 planes, on average, valued at \$2.5 million for each plane; the 11 ASW carriers have a complement of 45 planes valued at \$1 million each; and the seven amphibious assault ships have a complement of 22 helicopters, valued at \$0.4 million each.

In the estimate of the value of the stock of ships used here, a very low value is given to all old unconverted ships. If all the United States unconverted ships aged twenty years or more—whether in the reserve or active fleet—are excluded from the calculation (that is, 68 submarines, 18 cruisers and 346 destroyers), the value of the United States stock is reduced by \$4 billion. If this is subtracted from the NATO side, it still leaves the Warsaw Pact fleet at less than half the value of the NATO fleet.

(8) The Warsaw Pact is superior in the number of submarines; they made up over half the value of the Warsaw Pact fleet in 1968 (chart 1E.5). This superiority has existed for a long time. In 1950, the Warsaw Pact fleet had 100 more submarines than the NATO fleet. In 1968, it had 92 more. The proportion of submarines which were nuclear-powered in 1968 was 28 per cent for NATO as against 14 per cent for the Warsaw Pact. The Soviet ballistic-missile submarines are in general inferior in their capabilities to the United States Polaris submarines.

(9) A comprehensive comparison should include the value of naval bases. It is not possible to provide such a valuation: but there is no doubt that it would add much more to the NATO than to the Warsaw Pact side. The United States alone has some fifty-two major naval installations abroad—that is, major extra-territorial bases. The Soviet Union has no bases of this kind. It probably has some facilities in Cuba and has recently acquired some in the Mediterranean. The acquisition of foreign facilities is a significant change for the Soviet Union, which has extremely limited routes of egress for its fleets.

Summing-up: NATO and Warsaw Pact comparison

On these measurements of the value of the stock of fighting vessels, NATO has a superiority over the Warsaw Pact of about 2:1. Changes in the valuation system would be most unlikely to alter this general conclusion.

One reason for the disquiet expressed by some people in the West is simply that a virtual monopoly has been lost. In 1950 it seemed to them the natural order of things that the naval fleets of NATO nations should move freely around the world's oceans, while the naval fleets of Warsaw Pact nations did not appear much at all. It now is considered a threat in the West when Soviet naval vessels appear in some force in the Mediterranean—whereas the presence of an even larger United States naval force seems in some sense natural. In the same way, Soviet courtesy calls on ports in the Indian Ocean appear threatening, because they have not happened before; the courtesy calls of NATO ships—for example, the visit of British destroyers to Stockholm—are treated as normal. There is little the Western

powers can do about this loss of a monopoly position: increasing the size of their own fleets will not prevent Soviet ships from sailing into the Indian Ocean if they wish to do so.

Secondly, a number of Western commentators appear to have given too much attention to those areas where the Soviet Union has an advantage, and too little attention to those areas where NATO has an advantage. This kind of misperception is common in international relations and is one of the important factors fuelling arms competition. NATO has a tremendous superiority in naval air power, and this is very important indeed. Some Western appraisals, however, mention this very briefly, with no attempt at a quantitative assessment of its importance, and then discuss at great length the Soviet fleet. This kind of approach can always make an inferior force appear superior: for it is very rare for one side to have superiority in every weapon and every characteristic.

Regional analysis

European NATO (chart 1E.6). Britain is one of the few countries where the value of the stock of fighting vessels is actually lower than it was in 1950. There was very substantial scrapping in the late fifties, followed by some rise in value after 1965, mainly as a result of the nuclear-powered submarines coming into commission. This slight decline since 1950 is in line with Britain's general reduction in overseas commitments, and the comparatively slow rise in British military expenditure. Even so, Britain still accounts for over 40 per cent of total NATO European naval stock.

Other European countries (chart 1E.7). There has been a rapid rise in the Yugoslav fleet, particularly in the fifties. Over the whole period since 1950 the increase in this fleet has been rather over 10 per cent a year.

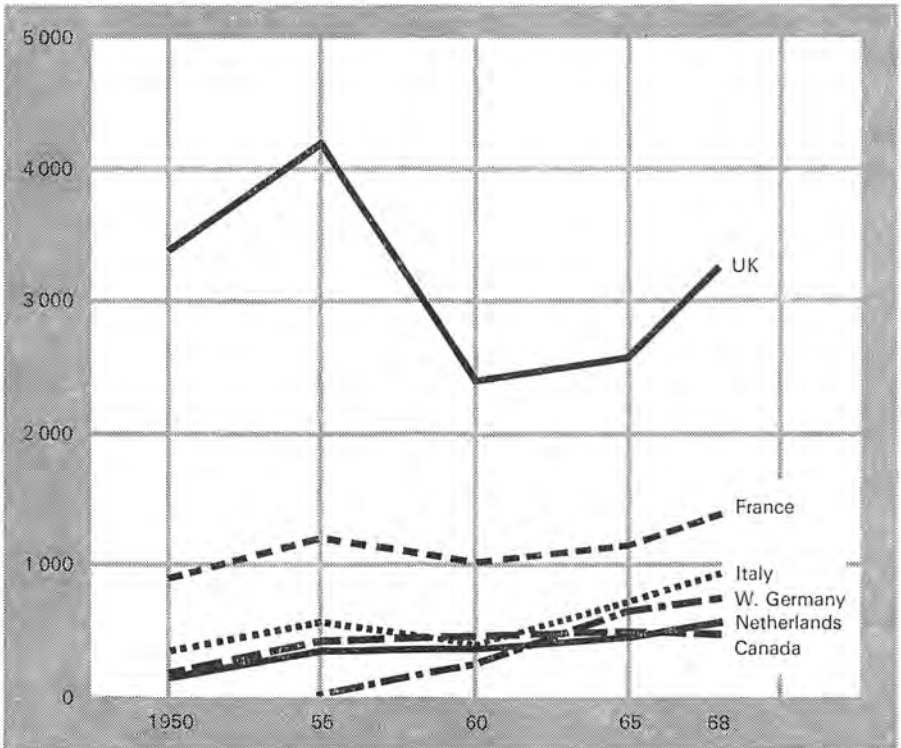
Other developed countries (chart 1E.8). Japan has come virtually level with Australia in the estimated stock of fighting vessels.⁶ The Australian stock was falling in the fifties, but has increased fast since 1960 in line with the increase in Australian military expenditure. (Charts 1E.8 and 1E.9 are on page 330.)

Developing countries (chart 1E.9). The trends in the various regions are very much in line with those of military expenditure. Apart from China, it is the Middle East which shows the fastest rise in stock of fighting vessels. Then

⁶ In 1950, the Japanese Navy was, strictly speaking, non-existent. Of the five destroyer escorts then recorded as existing, one was laid up and four were used as weather-ships. The 40 patrol boats were recorded as being without armaments.

Chart 1E.6. World stock of fighting ships: estimated value, NATO other than USA

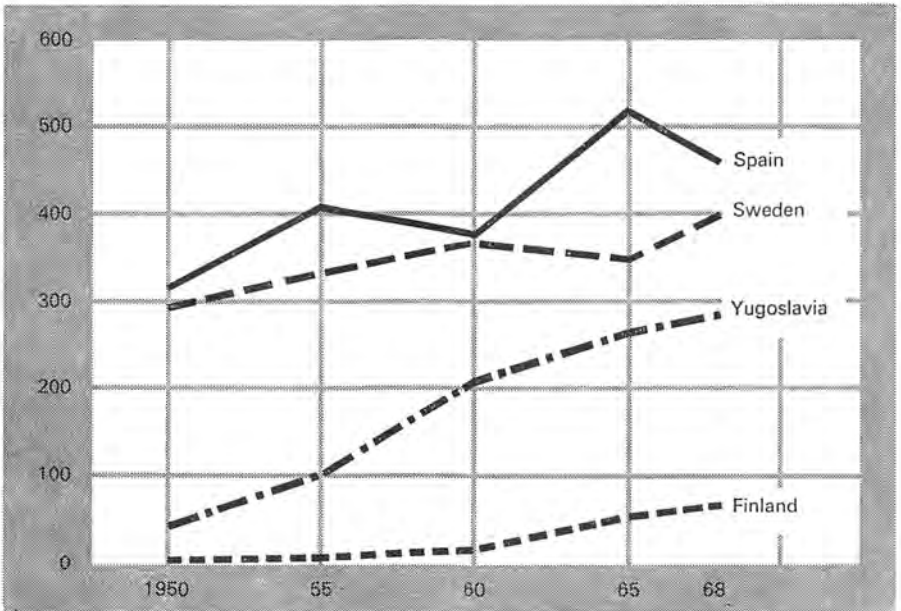
US \$ bn, at constant (1968) prices



Source: See p. 328.

Chart 1E.7. World stock of fighting ships: estimated value, Other European

US \$ mn, at constant (1968) prices



Source: See p. 328.

comes the Far East and South Asia. In Central and South America, where military expenditure since 1950 has been rising relatively slowly, the stock of naval vessels has been rising relatively slowly too. The fleets of African countries (omitting South Africa) were negligible in 1960, and still very small in relation to the world total in 1968, but the actual rate of increase has been considerable. (This also matches what has happened to military expenditure.)

Between 1955 and 1968 three countries—Cuba, Indonesia and the United Arab Republic—received a good many naval vessels from the Soviet Union: the three between them account for half the rise in the naval stock of the thirty-seven developing countries included here.⁷

Trends in different categories of vessels

The numbers of vessels, in eleven categories, in the various regions are set out in tables 1E.5 to 1E.10.

Aircraft carriers (table 1E.5). The NATO powers have a virtual monopoly of aircraft carriers. The Soviet Union had by 1968 deployed one helicopter carrier (a second appeared in 1969), and there were only six other aircraft carriers outside NATO. The total of attack aircraft carriers—those operating fixed-wing aircraft—has been stationary at about 30; but there has been a sharp fall in the number of escort utility carriers.

Submarines (table 1E.6). The world total has risen a little since 1950. This is one of the weapons which developing countries are acquiring: there were more than three times as many submarines in developing countries' fleets in 1968 as in 1950. The increase has been mainly in the Middle East, China and other Far Eastern countries. In South America, which was the first of the developing regions to have submarines, the number of submarines has fallen since 1950.

The aggregate figures for the USSR and USA, particularly for ballistic-missile submarines, give an exaggerated impression of Soviet capability. The point is discussed on pages 368–375.

Cruisers (table 1E.7). World numbers have been declining sharply: there has been some conversion to missile armament, but the conversion has been much less extensive than for destroyers. In this category NATO has had a big preponderance over Warsaw Pact powers.

⁷ The list is given on page 322. China is excluded from these calculations.

Destroyers, frigates, and escorts (table 1E.8). The trends here have been for a decline in total numbers; a rise in the number possessed by developing countries; and a big increase—by conversion or new construction—in the numbers armed with missiles.

Patrol boats, motor torpedo boats and gunboats (table 1E.9). Here the world total has been rising very fast, both for conventionally-armed and missile-equipped vessels. The big increases have been in the Warsaw Pact countries and the developing countries. The NATO powers do not have many of this type of vessel, and have not equipped them with missiles.

Battleships (table 1E.10). This category is almost extinct: numbers are down from 31 in 1950 to four in 1968, and of these, three were in the United States reserve fleet.

Sources and methods

The sources used were the individual country pages of *Jane's Fighting Ships*, various editions from 1950/51 to 1968/69. For the USSR, other Warsaw Pact countries, China, the United Arab Republic, 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.

For the construction of the estimates of world stock, ships were divided into eleven categories. Only fighting ships, strictly defined, were included.

Aircraft carriers	— Attack
	— Other
Submarines	— Nuclear
	— Conventional
Cruisers	— Missile-armed
	— Conventionally-armed
Destroyers, frigates, escorts	— Missile-armed
	— Conventionally-armed
Patrol boats, gunboats, etc.	— Missile-armed
	— Conventionally-armed
Battleships	

The years of commissioning were noted at five points: 1950, 1955, 1960, 1965 and 1968. Ships were included if commissioned in the fleet in the year concerned. The numbers include both active vessels and ships in reserve.

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.⁸

The countries or regions shown separately are as follows:

Developed countries:

USA

Other NATO countries

USSR

Other Warsaw Pact countries

Other European countries: Finland, Spain, Sweden, Yugoslavia

Other developed countries: Australia, Japan, New Zealand, South Africa

Developing countries:

Middle East: Israel, Iran, Iraq, United Arab Republic

South Asia: India, Pakistan

Far East (excluding China and Japan): Burma, Indonesia, North Korea, South Korea, Taiwan, Thailand, Philippines, North Viet-Nam, South Viet-Nam

Sub-Saharan Africa: Ethiopia, Ghana, Guinea, Kenya, Nigeria, Senegal, Somalia, Sudan

North Africa: Algeria, Libya, Morocco

Central America: Cuba, Dominican Republic, Mexico

South America: Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay, Venezuela

Countries with negligible navies were omitted, except for Sub-Saharan Africa, where some very small navies were included so that something could be said about trends in that region.

The weighting system used for the construction of the aggregate figures was based on cost. Basic 1968 US value-per-ton figures were taken for the main categories (table 1E.11). The same values were used for Soviet and indeed all vessels, except for Soviet missile-carrying submarines. For those, lower value-per-ton estimates were taken than for US missile-carrying submarines, since the Soviet submarines commissioned up to 1968 carry

⁸ The possession of any of any of the following missile systems put the vessel into the 'missile-armed' category:

Surface-to-surface: RB-08A (Sweden), "Shaddock" (USSR), "Styx" (USSR), "Strela" (USSR).

Surface-to-air: Terrier (USA), Talos (USA), Tartar (USA), Masurca (France), Sea-slug (UK), "Guideline" (USSR), "Goa" (USSR).

Anti-submarine: Ikara (Australia).

fewer missiles with a shorter range than United States submarines. The calculations need to allow for a rapid process of technical improvement: a typical destroyer in commission in 1968 in one of the major navies has considerably more sophisticated equipment than one in commission in 1958. On naval advice, a 3.5 per cent a year "improvement factor" was taken.

This method provided a set of comparable value-per-ton figures for the years 1950, 1955, 1960, 1965 and 1968 (table 1E.11). These value-per-ton figures were then combined with tonnages. All separate categories and subclasses within the categories of ships were calculated at their respective displacements. The exception was the light patrol boat category, for which a representative displacement of 110 tons was adopted for all navies.

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 front-line ships included here. Technical improvements are incorporated in the programmes of modernization and refitting. In the first ten years of its life, therefore, a ship is 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". Thereafter, after ten years, ships are assumed to stay at their ten-year-old valuations: that is, beyond ten years the aging of the ship offsets any incorporation of further technical improvements.⁹ 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 the developing countries, it was assumed that ships were not regularly modernized and refitted in this way: these ships therefore remained fixed at their date-of-birth valuation.

The resulting figures of capital stock are shown in table 1E.12. 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 second hand value of the stock, which will tend to diminish with age as the expected life of a ship becomes shorter.

⁹ 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.

Table 1E.5. World stock of aircraft carriers

	World		Developed		Developing		USA		Other NATO	
	Attack	Other ^a	Attack	Other ^a	Attack	Other ^a	Attack	Other ^a	Attack	Other ^a
1950	28	86	28	86	—	—	18	85	9	1
1955	36	84	36	84	—	—	19	83	15	1
1960	30	45	28	45	2	—	15	43	12	1
1965	30	44	27	44	3	—	16	40	10	3
1968	30	41	27	41	3	—	17	35	9	3

Source: See p. 321.

^a Anti-submarine, amphibious assault, escort, utility.

Table 1E.6. World stock of submarines^a

	World		Developed		USA		Other NATO		Total NATO	
	Nucl.	Conv.	Nucl.	Conv.	Nucl.	Conv.	Nucl.	Conv.	Nucl.	Conv.
1950	—	764	—	742	—	194	—	111	—	305
1955	1	797	1	768	1	190	—	111	1	301
1960	18	801	18	751	14	158	—	109	14	267
1965	85	784	85	716	51	139	3	111	54	250
1968	142	680	142	604	82	97	5	123	87	220

	Developing ^b	Middle East	South Asia	Far East	Sub-Saharan Africa	North Africa	Central America	South America	China
1950	22	—	—	4	—	—	—	18	—
1955	29	—	—	4	—	—	—	17	8
1960	50	11	—	4	—	—	—	9	26
1965	68	13	1	12	—	—	—	13	29
1968	76	17	5	14	—	—	—	11	29

Table 1E.7. World stock of cruisers^{a, b}

	World		Developed		Developing		USA		Other NATO	
	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
1950	—	157	—	151	—	6	—	71	—	45
1955	2	165	2	154	—	11	2	72	—	39
1960	8	101	8	89	—	12	8	38	—	16
1965	18	75	18	62	—	13	12	28	4	9
1968	16	66	16	53	—	13	10	25	5	8

Source: See p. 321.

^a The demarcation line between cruisers and destroyers is in some cases arbitrary.

^b Miss. = Missile-armed. Conv. = Conventionally-armed.

Number

Total NATO		USSR		Other Warsaw Pact		Total Warsaw Pact		Other European		Other developed	
Attack	Other ^a	Attack	Other ^a	Attack	Other ^a	Attack	Other ^a	Attack	Other ^a	Attack	Other ^a
27	86	—	—	—	—	—	—	—	—	1	—
34	84	—	—	—	—	—	—	—	—	2	—
27	44	—	—	—	—	—	—	—	—	1	1
26	43	—	—	—	—	—	—	—	—	1	1
26	38	—	1	—	—	—	1	—	1	1	1

Number

USSR		Other Warsaw Pact		Total Warsaw Pact		Other European		Other developed	
Nucl.	Conv.	Nucl.	Conv.	Nucl.	Conv.	Nucl.	Conv.	Nucl.	Conv.
—	405	—	—	—	405	—	29	—	3
—	427	—	7	—	434	—	29	—	4
4	426	—	26	4	452	—	27	—	5
31	401	—	28	31	429	—	30	—	7
55	327	—	17	55	344	—	30	—	10

Source: See p. 321.

^a Conv. = Conventionally-powered. Nucl. = Nuclear-powered.^b All conventionally-powered.

Number

Total NATO		USSR		Other Warsaw Pact		Total Warsaw Pact		Other European		Other developed	
Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
—	116	—	17	—	—	—	17	—	13	—	5
2	111	—	29	—	—	—	29	—	11	—	3
8	54	—	25	—	—	—	25	—	8	—	2
16	37	2	20	—	—	2	20	—	4	—	1
15	33	1	18	—	—	1	18	—	2	—	—

Table 1E.8. World stock of destroyers, frigates and escorts^a

	World		Developed		USA		Other NATO		Total NATO	
	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
1950	—	1 627	—	1 449	—	746	—	475	—	1 221
1955	—	1 877	—	1 657	—	763	—	543	—	1 306
1960	8	1 688	8	1 431	7	666	—	386	7	1 052
1965	87	1 568	87	1 312	46	626	15	321	61	947
1968	121	1 415	121	1 172	66	548	19	319	85	867

Number

	Developing ^c	Middle East	South Asia	Far East	Sub-Saharan Africa	North Africa	Central America	South America	China
	1950	178	18	15	50	—	—	30	61	4
1955	220	20	16	53	—	—	30	85	16
1960	257	15	23	71	—	—	29	96	23
1965	264	18	24	76	1	2	39	82	22
1968	269	19	24	85	1	2	37	79	22

Table 1E.9. World stocks of patrol boats, motor torpedo boats, gunboats^{a, b}

	World		Developed		USA		Other NATO		Total NATO	
	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
1950	—	978	—	822	—	147	—	190	—	337
1955	—	1 380	—	1 142	—	120	—	267	—	387
1960	—	1 849	—	1 422	—	35	—	230	—	265
1965	141	2 092	112	1 340	—	18	—	233	—	251
1968	206	2 217	146	1 326	—	28	—	226	—	254

Source: See p. 321.

^a Miss. = Missile-armed. Conv. = Conventionally-armed.

^b Excluding riverine craft.

	Developing		Middle East		South Asia		Far East		Sub-Saharan Africa	
	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
1950	—	156	—	11	—	—	—	55	—	—
1955	—	238	—	17	—	—	—	120	—	—
1960	—	427	—	77	—	1	—	149	—	5
1965	29	752	3	86	—	9	12	260	—	20
1968	60	891	20	90	—	14	12	322	—	42

Number

USSR		Other Warsaw Pact		Total Warsaw Pact		Other European		Other developed	
Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
—	133	—	5	—	138	—	54	—	36
—	227	—	7	—	234	—	59	—	58
1	235	—	14	1	249	—	69	—	61
21	208	—	14	21	222	—	71	5	72
26 ^b	174	—	11	26	185	2	62	8	58

Source: See p. 321.

^a Miss. = Missile-armed. Conv. = Conventionally-armed.

^b Some missile-equipped destroyers are sufficiently large to be classified as cruisers. We have followed the classification of *Jane's*.

^c All conventionally-armed.

Number

USSR		Other Warsaw Pact		Total Warsaw Pact		Other European		Other developed	
Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
—	395	—	16	—	411	—	60	—	14
—	516	—	54	—	570	—	117	—	68
—	769	—	141	—	910	—	180	—	67
110	653	2	191	112	844	—	194	—	51
125	650	21	171	146	821	—	196	—	55

North Africa		Central America		South America		China	
Miss.	Conv.	Miss.	Conv.	Miss.	Conv.	Miss.	Conv.
—	—	—	16	—	42	—	—
—	—	—	16	—	32	—	—
—	2	—	18	—	26	—	150
—	2	12	49	—	47	2	279
2	15	18	51	—	45	8	312

Table 1E.10. World stock of battleships

	<i>Number</i>										
	World	Deve- loped	Deve- loping	USA	Other NATO	Total NATO	USSR	Other Warsaw Pact	Total Warsaw Pact	Other European	Other developed
1950	31	28	3	16	9	25	3	—	3	—	—
1955	30	28	2	16	9	25	3	—	3	—	—
1960	9	9	—	8	1	9	—	—	—	—	—
1965	4	4	—	4	—	4	—	—	—	—	—
1968	4	4	—	4	—	4	—	—	—	—	—

Source: See p. 321.

Table 1E.12. World stock of fighting ships: estimated value

US \$ mn, at constant (1968) prices

	World	Developed	USA	Other NATO	Total NATO	USSR	Other Warsaw Pact	Total Warsaw Pact	Other European	Other developed
1950	24 722	23 343	13 454	5 628	19 081	3 143	71	3 214	655	393
1955	33 436	31 562	16 363	7 519	23 882	6 004	130	6 134	848	698
1960	34 274	31 761	14 930	5 605	20 535	8 994	419	9 413	972	841
1965	50 467	47 037	23 986	6 824	30 810	13 369	567	13 936	1 186	1 105
1968	59 674	55 893	28 662	8 392	37 054	15 737	636	16 373	1 205	1 261

Source: See page 321.

Table 1E.11. Ship values: basic value-per-ton

	<i>US \$, at constant (1968) prices</i>				
	1950	1955	1960	1965	1968
Aircraft carrier					
Attack	2 030	2 430	2 900	3 470	4 000
Anti-submarine:					
amphibious assault	1 780	2 125	2 540	3 035	3 500
Escort/utility ^a	1 800	1 800	1 800	1 800	1 800
Submarines					
Nuclear ballistic missile	—	—	19 450	23 240	26 800
Nuclear—other	—	10 660	12 735	15 200	17 550
Conventional	3 910	4 675	5 530	6 680	7 700
Soviet nuclear ballistic missile	—	—	14 500	17 340	20 000
Soviet nuclear	—	—	10 885	13 000	15 000
Soviet conventional missile	—	6 070	7 255	8 670	10 000
Cruisers					
Missile-armed	—	7 470	8 925	10 670	12 300
Conventionally-armed	2 950	3 520	4 210	5 030	5 800
Destroyers/Frigates/ Escorts					
Missile-armed	—	9 255	11 060	13 215	15 240
Conventionally-armed	3 660	4 370	5 225	6 240	7 200
Patrol boat/Motor torpedo boat/Gunboat					
Missile-armed	—	—	21 335	25 490	29 400
Heavy conventional	7 880	9 410	11 250	13 440	15 500
Light conventional	9 860	11 780	14 080	16 820	19 400
Nuclear-powered surface ships					
USS Enterprise	—	—	5 675	6 780	7 820
USS Long Beach	—	—	25 060	29 950	34 540
USS Truxtun	—	—	—	—	19 150
USS Bainbridge	—	—	22 500	26 880	31 000
Battleships^a	3 500	3 500	3 500	3 500	3 500

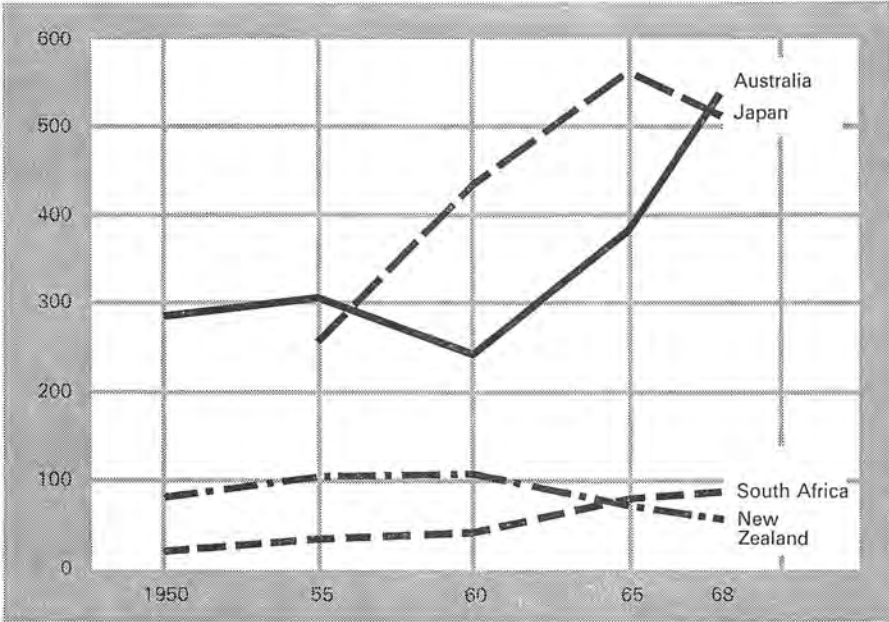
Source: See p. 321.

^a No technical improvement was incorporated in these calculations.

	Developing	Middle East	South Asia	Far East	Sub- Saharan Africa	North Africa	Central America	South America	China
1950	1 379	95	113	276	—	—	159	667	69
1955	1 874	131	165	390	—	—	160	904	124
1960	2 513	207	261	547	7	3	167	951	370
1965	3 430	284	370	871	48	14	239	1 048	556
1968	3 781	402	378	920	80	40	262	1 028	671

Chart 1E.8. World stock of fighting ships: estimated value, Other developed countries

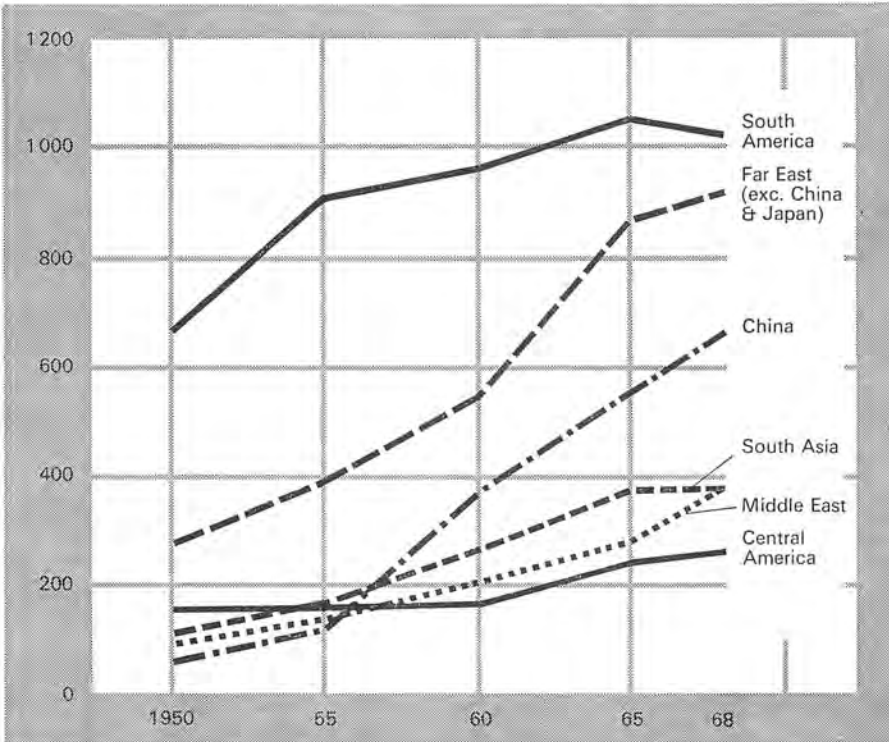
US \$ mn, at constant (1968) prices



Source: See p. 328.

Chart 1E.9. World stock of fighting ships: estimated value, Developing countries

US \$ mn, at constant (1968) prices



Source: See p. 328.

1F. *Arms trade in major weapons, 1950–1969*

SOURCES AND METHODS

Introduction

Neither the register nor the tables on the arms trade in major weapons makes any claim to be official, complete or final. They are published on our responsibility. When there were conflicting reports—and this was often the case for the number of items supplied—we have used our judgement, based on general experience of the reliability of different sources. Any corrections, additions or deletions, from official or unofficial sources, would be welcome.

Sources of information

In collecting the basic information, three types of sources have been used. First, unofficial sources were used: technical journals, press reports, and other publications concerning defence equipment, military aid and alliances, etc. Second, information was gathered from official sources: parliamentary statements, hearings and debates, official publications and press releases. Third, correspondents in different parts of the world interviewed officials, manufacturers, and other people connected with the arms trade, and read the relevant local publications.

Coverage

A. Weapons

Both the tables and the register cover the deliveries of major weapons: ships, aircraft, armoured fighting vehicles and missiles. The coverage of warships, combat aircraft and heavy tanks is probably reasonable. Even if it were possible, very few countries attempt to conceal deliveries of these items. The coverage of smaller items such as light aircraft, helicopters, armoured cars and missiles is not quite so good, but probably sufficient to provide a basically accurate picture of the trade in these weapons.

Information on transfers of other weapons, especially small arms, is fragmentary and unreliable. Even if the types of small arms possessed by different countries could be established, it would be extremely difficult to dis-

cover the numbers, the dates of deliveries and the countries from which they were purchased. Small arms often have long production series, often change hands a number of times, and often take complicated routes to reach their destination. For this reason, the tables are limited to the delivery of major weapons. However, where we have come across reliable information for 1969 on the transfer of small arms or other equipment, it has been included in the register. This applies to radar and communications equipment as well.

The tables include spares and equipment for aircraft and ground equipment (launchers) for missiles. But they do not include a whole range of equipment that may be needed to acquire a particular weapons system. For instance, a country purchasing a fighter squadron will, in addition to spares and equipment for the aircraft itself, need to acquire various kinds of munitions for the aircraft, a radar tracking and warning system, ground equipment, repair and maintenance facilities, training for its pilots and technicians, etc. Thus, the figures in the tables may appear rather low when compared with, for instance, figures for US grant aid or sales.

In a number of countries, the air force is responsible for some of the country's civil transport and for training pilots for civil planes. This is particularly true for many South American countries. The Brazilian Air Force, for instance, provides transport to remote areas where civil airlines do not operate, delivers food, mail and medical supplies, and is responsible for surveying much of the vast unmapped territory of Brazil. Both Argentina and Brazil have purchased heavy military transports which will probably undertake civilian duties. The recent reorganization of the Argentinian Air Force has included the expansion of the air transport brigade, which will take over duties previously performed by the Secretariats of Public Works and Agriculture and by LADE (Lineas Aéreas del Estado) which operated certain domestic services. The general principle of inclusion or exclusion in the arms trade tables has been to include all planes supplied to the armed forces of the countries concerned, except when it was known that the planes were for civil use. Often, however, it was not known: and it should be borne in mind in considering the register that transport and trainer aircraft may be used for civil purposes.

On the other hand, almost all training aircraft can be adapted for counter-insurgency action without great difficulty. The MF1-9 plane used by Swedish pilots in Biafra for strafing operations is a basic primary trainer. The Macchi MB.326, produced under licence in Brazil and South Africa, is eminently suitable for counter-insurgency operations. Where it is known that a particular trainer has been purchased especially for counter-insurgency duties, this is indicated in the register in the column for comments.

Joint and licenced production of weapons has been included in both the

tables and the register. In the register both countries involved in the production are shown in the column for suppliers.

B. Countries

The countries covered by the register and the tables are the non-arms producing countries. Many of the countries under consideration do have domestic defence industries, but they are still heavily dependent on imports in meeting their defence requirements. Two of the countries—South Africa and Israel—are rapidly coming closer to self-sufficiency.

Viet-Nam—North and South—is shown separately in the tables of major weapon imports, and totals are given including and excluding Viet-Nam. In the table of major weapons exports by supplier, both North and South Viet-Nam are excluded. For the United States supply of arms to Viet-Nam, only the major weapons supplied to South Vietnamese forces are entered as arms trade: the weapons supplied to US troops do not appear in the tables. Since the United States is intervening directly in this conflict, while the Soviet Union is simply supplying arms to North Viet-Nam, any comparison of the arms supplies of the two great powers to the two sides would be inappropriate. The cost of the United States intervention (see page 6), at around \$24 billion, in 1969 vastly exceeds the whole of the trade in major weapons recorded in the tables.

The regions listed in the tables are as follows:

Far East. All countries east of Pakistan, except China and Japan. Viet-Nam is shown separately.

Middle East. Abu Dhabi, Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Muscat and Oman, Qatar, Saudi Arabia, South Yemen, Syria UAR, Yemen.

North Africa. Algeria, Libya, Morocco, Tunisia.

Sub-Saharan Africa. The rest of Africa, except for *South Africa*, which is shown separately.

Indian Subcontinent. Afghanistan, Ceylon, India, Pakistan.

Central America. All countries from Panama northwards up to the United States.

South America. The rest of Latin America.

Europe. Only Greece and Turkey are included in the table. In the register, Portugal is also included, because Portugal's arms procurement is relevant to the discussion of the arms trade with Africa.

Arms supplies to colonies or dependencies are included when these countries have armed forces separate from the metropolitan power—for example, Rhodesia and Malaysia during the 1950s.

The tables

There may be some slight upward bias in the figures for recent years due to extra information. This upward bias could account for approximately 10 per cent of the total. But it is unlikely to be higher than this. It concerns primarily the smaller items—helicopters, light aircraft and inexpensive military vehicles, whose values are low compared with those of heavy tanks and combat aircraft. It is unlikely that there is any upward bias in the estimates for ships and missiles. The ship estimates are based almost entirely on one source, *Jane's Fighting Ships*.¹ There were very few transfers of missiles in the earlier years.

In order to obtain aggregate statistics of the trade in major weapons, it was necessary first to reconcile conflicting data and to estimate the numbers and types of weapons and the dates of the deliveries when such information was not available, and then to value individual transactions.

A. Reconciliation and estimation

There is little difficulty in obtaining reliable and unconflicting information about the deliveries of warships, combat aircraft and heavy tanks. In value terms, these amount to around 80 per cent of total arms deliveries. The problems of reconciliation and estimation primarily concern light tanks and other vehicles, missiles, light aircraft and helicopters. When there was conflicting information, we have, if possible, made our decision on the basis of general experience of the reliability of different sources.

For tanks, other than heavy tanks, the main problem has been the lack of sources. For certain countries whose armed forces are well publicized, such as India, Pakistan, the UAR or Israel, the information on deliveries of armoured fighting vehicles has been fairly good. These are the countries in the third world which have been the main importers of heavy tanks. For some countries (which, for the most part, imported light tanks or armoured cars) there is only information on the types the country possesses and the numbers of battalions or armoured divisions in that country. To estimate the dates and numbers of tank deliveries, we took into account the dates of production of particular types, or, in the case of second-hand equipment, the dates of replacement of the particular type in the supplier country, the dates of aid or sales agreements or other political and diplomatic ties between the supplier and the recipient countries, the dates at which the presence of these types was first reported, and the number of tanks, armoured cars, and armoured personnel carriers in an armoured battalion or division. Where we have not known the latter, we have assumed that the size of a

¹ London: Sampson Low, Marston & Co., annual.

battalion or division is the same as that of the main supplier, or in the case of ex-colonies, the same as that of the former metropolitan power.

Estimates for light aircraft—helicopters, trainers, liaison and light transport types—have followed a similar pattern. Here we have taken into account the size of squadrons and the relative requirements in an air force for combat aircraft and other types.

The problems concerning missiles are somewhat different. Once it is known that a country possesses a particular missile, it is fairly easy to pin down the date of delivery. The period between the initial date of production and the date the missile was reported is usually limited. The main problem concerns the estimation of numbers of missiles, which are small and easily concealed. For missiles launched from tanks, ships or aircraft, the estimates are based on the numbers of tanks, ships and aircraft a country possesses which are capable of delivering a particular missile. The remaining missiles are almost entirely anti-tank and anti-aircraft missiles. The deliveries of anti-aircraft missiles such as V750VK (referred to in the West as Guideline), Hawk or Bloodhound have tended to attract considerable attention. There is usually, therefore, fairly good information on the numbers of missile sites, launchers, or even of the missiles themselves. As far as we know, only a few countries possess anti-tank missiles and for most of these we have reasonable information.

B. Valuation

The purpose of valuing all items in a common unit is to be able to measure changes in the total flow of weapons and its geographical pattern. Various methods of valuation are conceivable. The obvious ones are military value and monetary value. Military value is generally unmeasurable because it depends on the circumstances in which the weapons may be used. Monetary value, on the other hand, measures something that is relatively precise and is interesting in itself—the quantity of resources used. It is therefore what we have used. The monetary values chosen may not correspond to actual prices paid. Actual prices paid vary considerably according to different pricing methods, the lengths of production series and the terms involved in individual transactions. We have tried to draw up a list of comparable prices based on actual prices and on criteria such as weight and sophistication. These criteria have been different for each of the four different types of weapons—ships, aircraft, missiles and armoured fighting vehicles. One consequence of this method of valuation is that our values of Soviet weapons exports tend to be higher than their quoted prices. For this reason, our figures of the relative flows of major weapons from the United States and the Soviet Union may be much closer together than other

statistics comparing weapon flows from these two countries. There is an additional reason for the smaller difference between the two in our figures. Soviet weapons exports to developing countries include a smaller proportion of small arms than exports from the United States; a comparison of *total* weapons exports from the two countries would look very different from a comparison of major weapons exports alone.

SHIPS

Ships were divided into eleven different categories.² For each category, we calculated a 1968 dollar price per ton, based on actual prices in 1968. We also assumed a technical improvement factor of 3.5 per cent per annum. This means that the price of a ship completed in 1967 is 3.5 per cent less than the price of a similar ship completed in 1968. This improvement factor has nothing to do with general price inflation; it is merely intended to measure the increase in the sophistication of ships.

A large proportion of the ships sold to the countries under consideration are second-hand. It was therefore necessary to take into account the depreciation of ship values. A simple exponential depreciation was taken, based on the length of life of ships in each of the eleven categories and a scrap value of 1 per cent. This yields a rather rapid depreciation in the first few years of a ship's life. For this reason, among others, the export of warships by the United Kingdom, which has exported many new ships to developing countries, is higher in value terms than the export of warships from either the United States or the Soviet Union, which have both exported large numbers of second-hand warships.

AIRCRAFT

For aircraft we derived a price for each individual type of aeroplane. This price was based on two factors. First, it was based on actual prices, taking into account factors which cause these prices to vary such as the length of the production series, the sales or aid terms, and the support

² The categories were:

- | | |
|--|---|
| 1. Aircraft carriers | 8. Patrol boats, torpedo boats, gunboats,
etc. under 100 tons |
| 2. Submarines | 9. Minesweepers |
| 3. Cruisers | 10. Minelayers |
| 4. Destroyers, 1300 tons and over | 11. Landing ships, landing craft, trans-
ports, supply ships, survey ships,
oilers, tugs etc. |
| 5. Frigates, corvettes, patrol vessels,
600-1300 tons | |
| 6. Patrol boats, torpedo boats, gunboats,
etc. 300-550 tons | |
| 7. Patrol boats, torpedo boats, gunboats,
etc. 100-300 tons | |

facilities, spares and extra equipment included in the price. Secondly, we used kilo prices for the empty weight of different categories of aircraft,³ as a rule of thumb. These categories were roughly divided into older construction and fully modern construction. We included a certain percentage of the price for spares and equipment for each of the three categories of aircraft. Explosives, missiles and ground equipment were not included.

The problem of depreciation is much harder for aircraft than for ships. The life of an aircraft is shorter than that of a ship and the scrap value approaches zero. A simple exponential depreciation yielded too rapid a depreciation in early years. Many of the second-hand aircraft sold in the period had been part of a long production series. It was often impossible to discover the date the aircraft had been built, the extent they had been used, and the extent of refurbishing. Since second-hand aircraft are a rather small proportion of total aircraft deliveries⁴ a blanket assumption of 10 per cent of the original price for each second-hand aeroplane was taken. An assumption of 50 per cent of the original price was made for planes having undergone a more thorough refurbishing.

TANKS

We calculated individual prices for each armoured fighting vehicle. The prices were based on the type and the date when the vehicle had first been used. The five types were: main battle tank, light tank, tank destroyer, armoured car, and armoured personnel carrier. We made the same assumption about depreciation as we made for aircraft, for similar reasons.

MISSILES

Here again, we calculated individual prices for each missile. The prices were based on type, date of production, range and guidance. There were seven types: artillery rockets, anti-tank missiles, surface-to-surface missiles, air-to-

³ These categories were:

- | | |
|--|--|
| <p>(a) Combat aircraft (fighters, bombers)</p> <p style="padding-left: 20px;">Supersonic</p> <p style="padding-left: 20px;">Subsonic</p> <p style="padding-left: 40px;">(i) conventional</p> <p style="padding-left: 40px;">(ii) STOL (short take-off and landing)</p> | <p>(c) Others (transport, trainers, etc.)</p> <p style="padding-left: 20px;">(i) piston engined</p> <p style="padding-left: 20px;">(ii) turbo jet</p> <p style="padding-left: 20px;">(iii) turbo fan jet</p> |
|--|--|
- (b) Helicopters

⁴ Unless our sources indicated that a particular aircraft *was* second-hand or unless they gave a delivery date after the production line had closed down, we assumed that it was new. If we did not know when the production line had closed down, we took as the closing date the last date the aircraft had appeared in *Jane's All the World's Aircraft* (London: Sampson Low, Marston & Co., annual).

surface missiles, long range surface-to-air missiles, short range surface-to-air missiles and air-to-air missiles.

We had separate prices for launchers and missiles.

JOINT AND LICENSED PRODUCTION

Licensed production can vary from assembly to complete manufacture. In most cases, it is known what proportion of a particular weapon is imported and what proportion is produced at home. The tables include only the import content of the weapon. In obtaining values for weapons produced under licence, we took a percentage of the total value of the weapon equivalent to the proportion of the weapon which was imported. In the few cases where this percentage was not known, it was assumed to be 50 per cent.

C. Rounding

All figures above \$10 million in the main tables are rounded to the nearest \$10 million. Figures below \$10 million are rounded to the nearest \$5 million. The erratic year-to-year movement makes it difficult to see the trend in the yearly figures: so five-year moving averages are presented in the tables (and in the charts in chapter 1). The five-year moving average shown under the year 1952 is the average for the years 1950 to 1954 inclusive; the figure under the year 1953 is the average for 1951 to 1955 inclusive, and so on.

The register

For the register, no attempt was made to estimate where information was not available or to reconcile conflicting data from equally unreliable sources. In such cases, two dots .. indicate that the information is not available.

The register is not simply a record of deliveries in 1969: it includes, as well as deliveries in that year, items known to be on order or ordered. The final columns indicate the information available about the dates of orders or deliveries. When no information is given about either the date of the order or of the delivery, this implies that the item is known to be on order. When deliveries have been spread over a number of years and it is not known how they have been divided among the years, the whole transaction has been entered, and the years over which the supplies were spread are shown in the delivery columns, thus: 1966-1969. The preliminary register for January to June 1970 includes any orders or deliveries in the first half of 1970 of items which are not included in the 1969 register.

The information is arranged by region.

Conventions

.. = Information not available

— = Nil, or less than \$2.5 mn

() = A greater degree of uncertainty about, for example, the date of an order or the identity of a supplier

+ = When + is added to a figure, it means at least the number given and probably more.

u.c. = Unit cost

t. = Tons

1968— = 1968 and subsequent years

Transport = Transport plane

A-A = Air-to-air missile

S-S = Surface-to-surface missile

A-S = Air-to-surface missile

S-A = Surface-to-air missile

ASW = Anti-submarine warfare

COIN = Counter-insurgency action

STOL = Short take-off and landing

MAP = (US) Military Assistance Program

Table 1F.1. Values of imports of major weapons by certain areas, 1950–1969^a

US \$ mn, at constant (1968) prices. A = yearly figures, B = five-year moving averages

		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Greece and Turkey	A	10	20	70	140	110	50	110	70	330	90	110	30	20	100	70	150	80	80	40	60
	B	—	—	70	80	90	100	130	130	140	130	110	70	70	70	90	100	90	80		
Middle East	A	30	30	10	60	70	130	270	230	190	210	90	110	240	230	200	260	210	600	590	520
	B	—	—	40	60	110	150	180	210	200	170	170	180	170	210	230	300	370	440		
North Africa ^b	A	—	—	—	—	—	—	20	—	—	5	5	20	20	20	10	70	50	50	20	20
	B	—	—	—	—	—	—	—	—	5	5	10	10	10	30	30	40	40	40		
Sub-Saharan Africa	A	—	5	5	10	10	10	—	—	—	30	20	30	30	30	30	70	20	40	20	20
	B	—	—	5	10	10	5	5	10	10	20	20	30	30	40	40	40	30	30		
South Africa	A	5	—	10	10	10	10	40	10	10	10	—	—	10	70	20	100	110	100	10	40
	B	—	—	10	10	20	20	20	20	20	10	5	20	20	40	60	80	70	70		
Indian Subcontinent	A	20	20	10	80	90	60	70	160	310	90	160	190	130	140	60	100	250	170	190	170
	B	—	—	40	50	60	110	140	140	160	180	180	150	140	130	140	150	160	180		
Far East, excl. Viet-Nam	A	100	160	60	170	120	180	140	170	330	300	340	130	220	190	240	150	250	120	70	300
	B	—	—	120	140	130	150	190	220	250	250	260	230	220	190	210	190	170	180		
Central America	A	5	—	20	10	10	10	10	5	10	10	30	90	150	20	20	10	10	5	—	—
	B	—	—	10	10	10	10	10	10	10	30	60	60	60	60	40	10	10	5		
South America	A	40	80	20	60	110	140	90	90	110	30	120	140	50	40	20	50	70	60	80	90
	B	—	—	60	80	80	100	110	90	90	100	90	80	80	60	50	50	60	70		
Total, excl. Viet-Nam	A	210	310	210	540	520	590	750	740	1 290	780	870	750	880	850	670	950	1 050	1 230	1 030	1 220
	B	—	—	360	430	520	630	780	830	890	890	910	830	800	820	880	950	990	1 100		
Viet-Nam, North and South ^b	A	—	—	—	—	10	10	10	5	40	5	20	90	100	40	50	40	270	530	580	230
	B	—	—	—	—	—	—	10	10	20	30	50	50	60	60	100	200	300	330		
Total	A	210	310	210	540	530	600	760	750	1 330	790	890	840	980	880	720	1 000	1 330	1 760	1 620	1 450
	B	—	—	360	440	530	640	790	840	900	920	960	890	880	900	1 000	1 160	1 300	1 430		

Source: SIPRI (unpublished) worksheets of arms transfers, 1950–69. The figures published in the *SIPRI Yearbook 1968/69*, pages 226–229 have been extensively revised in the light of new information.

^a Figures rounded to nearest 10, except for figures under 10 which are rounded to nearest 5. Items may not add to total because of rounding.

^b Five-year moving averages are calculated from the year arms imports began.

Table 1F.2. Values of exports of major weapons to areas listed in table 1F.1, by main suppliers, 1950–1969^{a, b}

US \$ mn, at constant (1968) prices. A = yearly figures, B = five-year moving averages

		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
USA	A	50	170	130	210	300	250	270	240	630	300	480	230	200	280	240	440	260	260	300	570
	B	—	—	170	210	230	260	340	340	390	380	370	300	280	280	280	300	300	370		
USSR	A	20	30	20	120	—	50	80	170	120	110	110	280	500	220	180	200	390	680	370	320
	B	—	—	40	40	50	80	80	100	120	160	220	240	260	280	300	340	370	390		
UK	A	60	30	40	130	130	110	120	170	240	120	160	180	60	80	80	130	120	70	170	180
	B	—	—	80	90	110	130	160	150	160	170	150	120	110	110	100	100	110	140		
France	A	—	—	—	30	50	40	120	50	100	40	20	30	70	110	80	30	110	100	120	80
	B	—	—	20	20	50	60	70	70	70	50	50	50	60	60	80	90	90	90		
Canada	A	20	5	—	—	20	20	80	30	5	50	5	10	—	100	30	40	5	5	30	10
	B	—	—	10	10	20	30	30	40	30	20	10	30	30	40	40	40	20	20		
Italy	A	5	40	—	5	—	—	20	20	20	—	10	—	—	10	10	5	10	10	20	30
	B	—	—	10	10	5	10	10	10	20	10	5	5	5	5	5	10	10	20		
China	A	40	40	—	10	—	—	—	40	80	60	10	—	—	—	—	30	5	10	5	—
	B	—	—	20	10	—	10	20	40	40	40	30	10	5	5	5	10	10	10		
Germany, West ^c	A	—	—	—	—	5	10	5	—	10	20	20	10	5	10	30	10	110	10	10	—
	B	—	—	—	—	—	5	5	10	10	10	10	20	20	10	30	40	30	30		
Czechoslovakia ^c	A	—	—	—	—	—	30	40	5	20	40	30	5	5	10	5	—	5	5	5	—
	B	—	—	—	—	—	—	—	30	30	20	20	20	10	5	5	5	5	5		
Japan ^c	A	—	—	—	—	20	—	5	5	10	—	—	10	20	20	10	10	10	30	10	—
	B	—	—	—	—	—	5	10	5	5	5	10	10	10	10	10	20	10	10		
Sweden	A	—	—	10	5	5	5	5	—	30	—	—	—	—	—	—	—	—	—	—	—
	B	—	—	5	5	5	5	10	10	5	5	5	—	—	—	—	—	—	—		
All other	A	20	10	5	20	—	70	5	5	30	30	5	5	30	10	10	40	20	30	10	30
	B	—	—	10	20	20	20	20	30	20	10	20	20	10	20	20	20	20	30		
Total	A	210	310	210	540	520	590	750	740	1 290	780	870	750	880	850	670	950	1 050	1 230	1 030	1 220
	B	—	—	360	430	520	630	780	830	890	890	910	830	800	820	880	950	990	1 100		

Source: SIPRI (unpublished) worksheets of arms transfers, 1950–69. The figures published in the *SIPRI Yearbook 1968/69*, pages 226–229 have been extensively revised in the light of new information.

^a Excluding North and South Viet-Nam.

^b Figures rounded to nearest 10, except for figures under 10, which are rounded to nearest 5. Items may not add to total because of rounding.

^c Five-year moving averages are calculated from the year arms exports began.

342 1G. Arms Trade Register: register of major weapons transfers to developing countries

I. Register for 1969

This includes all arms ordered or delivered during 1969 and all those on order at the end of 1969. A number of the items, therefore, are the same as those appearing in the Arms Trade Register in the *SIPRI Yearbook 1968/69*.

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
Middle East							
Abu Dhabi	UK	10	HS Hunter FGA.9	Fighter	} From refurbished British stocks	(June 1969)	1970: 2
		2	HS Hunter T.7	Trainer			
	Canada	4	DHC-4A Caribou	STOL transport		(1968: 2) (Aug. 1969: 2)	(June 1969: 2)
	Italy	2	Agusta-Bell 206A Jet Ranger	Helicopter	In addition to two received in 1968	(April 1968)	Jan.-March 1969
Iran	USA	32	McDonnell-Douglas F-4 Phantom	Fighter	\$80 mn for 16. Armed with Side-winder and Sparrow missiles	1966	Sept. 1968- Nov. 1969
		..	Sparrow and Sidewinder missile	A-A			
		2	Corvette	Displacement: 900 t.	MAP	..	1968: 1, 1969: 1
		2	Patrol boat	Displacement: 85-107 t.	Being built under MAP	..	..
	UK	..	Short Tigercat missile	S-A	\$60 mn for Tigercat and naval vessels	1966	1968-69
		4	Vosper Mk5 frigate	Displacement: 1200 t.				$37 mn, armed with Seacat missiles For frigates
		..	Short Seacat missile	S-A	1966	..	
		6	S.R.N.6 and B.H.7 Hovercraft	Displacement: 9 t. and 40 t.	..	..
	France	16	Sud Super Frelon	Helicopter	\$28 mn	(Feb. 1969)	..
		..	Nord SS.11 and SS.12 missile	S-S				(Feb. 1969)
	Italy/USA	22	Boeing Vertol CH-47C	Helicopter	To be built under licence by Elicotteri Meridionali	(Dec. 1969)	..
	Italy	100	Agusta Bell 206A Jet Ranger	Helicopter	} \$50 mn	(1968)	1969-70
		40	Agusta Bell 205 Iroquois	Helicopter				1968	1969-70
Iraq	France	..	Small arms, ammunition, spare parts			..	1970

Israel	USA	50	McDonnell-Douglas F-4 Phantom	Fighter	} \$300 mn, two-thirds in cash, remainder spread over 5 years. Another 25 requested	(Dec. 1968)	Sept. 1969–end 1970		
		..	Bullpup missile	A-S					
		..	Sparrow missile	A-A					
		25	Douglas A-4 Skyhawk	Fighter				Second contract. First order, for 48, delivered	(Nov. 1968)	1969–70
		7	Sikorsky CH-53	Helicopter	Confirmed by US officials; used to capture Egyptian radar station	..	1969		
	UK	440	Centurion	Tank	Ex-British	..	1965–69: 240		
	France	5	Gunboat, "Saar" type	Displacement: 220 t.	For Israeli-built Gabriel SAMs	(1967)	1969		
Jordan	USA	36	Lockheed F-104 Starfighter	Fighter	} Second 18, refurbished ex-Chinese Nationalist Air Force	May 1968	1969: 18 1970: 18		
		..	Hawk missile	S-A					
	USSR	..	Anti-aircraft guns, small arms, spare parts			Jan. 1969	..		
	UK	18	HS Hunter FGA.9	Fighter	} From ex-RAF and Dutch/Belgian stocks	(1967)	} 1968: 11 1969: 10 1970: 4 1969–70		
		3	HS Hunter T.7	Trainer					
4	HS Hunter FGA.73	Fighter							
..	Short Tigercat missile	S-A	\$16 mn, paid with credit from Saudi Arabia	mid-1968					
		100	Centurion Mk9 and Mk10	Tank		1968	Feb.–April 1969		
Kuwait	UK	12	BAC Lightning F.53	Fighter	} \$48 mn, with missiles	Aug. 1966	Oct. 1968–mid-1969		
		2	BAC Lightning T.55	Trainer					
		..	Firestreak or Redtop missile						
	6	BAC 167	Trainer	\$3.6 mn, including spares, technical support, and maintenance training in the UK				Oct. 1968	1969
			50	Vickers 37 ton				Tank	\$15–17.5 mn	May 1968	Before 1972
	Italy	6	Agusta-Bell 204B	Helicopter		..	1968–69		
	UK	2	Patrol boat		\$500,000	Sept. 1966	1969		
Lebanon	France/South Africa	..	Thomson-CSF/Matra Crotale missile	S-A		(Sept. 1969)	1971–		
343 Muscat and Oman	UK	5	BAC 167 Strikemaster	Trainer		(May 1968)	(1969)		

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
Qatar	UK	6 150	HS Hunter Short Tigercat missile	Fighter S-A	Refurbished \$1.4 mn	(Aug. 1969)	..
						(June 1969)	..
Saudi Arabia	USA	2	Lockheed C-140 Jet Star	Transport	For VIP transport	(Nov. 1968)	1969
	UK	34	BAC Lightning F.53	Fighter	} \$2.4 mn u.c.: fully-equipped multi-role export version Part of Lightning deal	Dec. 1965	1968-69
		6	BAC Lightning T.55	Trainer		Dec. 1965	1969-70
		25	BAC 167 Strikemaster	Trainer		Jan. 1968	1971
		22	Patrol boat	45 ft.		(1969)	..
	France	220	Panhard AML 90	Armoured car	\$96 mn	(Jan. 1968)	..
		6	Sud Alouette III	Helicopter	..	..	..
Italy	24	Agusta-Bell 205 and 206A	Helicopter	(Jan. 1968)	(1968-69)		
West Germany	..	Fast patrol boat	..	1969	..		
South Yemen	UK	4	BAC 167 Strikemaster	Trainer	\$38 mn, including small arms	(Dec. 1967)	1969
	USSR	12	MiG-17	Fighter	} 52 South Yemenis training in the USSR	Jan. 1969	1969
		2	MiG-15 UTI	Trainer		(Jan. 1969)	1969
Syria	UK	1	Beagle 206S	Transport	For aerial survey	..	1969
	USSR	..	MiGs Other heavy weapons	..	} \$200 mn agreement (low rate of interest, 10 year re- payment period)	July 1969	1970-
		China	..	Arms		Worth \$15 mn	May 1969	1969
United Arab Republic	USSR	(50)	MiG-21	Fighter	..	Jan. 1969	1969
		150	MiG-21J	Fighter	Radar-equipped all-weather version for night inter- ception; possibly flown by Russian pilots	(Jan. 1969)	1970
	(20)	Sukhoi Su-7	Fighter	..	..	1969-70	
	(10)	Tupolev Tu-16	Bomber	..	..	..)
..	V 750 VK missile	S-A	Referred to in West as "Guideline"	..	..	..

Africa

		250	T-54	Tank		..	1969	
		250	T-55	Tank		..	1969	
		100	PT-76 Amphibious APCs	Armoured personnel carrier		..	April-May 1969	
		7	Amphibious vessels			..	1969	
Algeria	France	28	Fouga Magister	Trainer	Ex-Luftwaffe; refurbished by Sud. French are assisting with training school	July 1969	..	
		2	Sud SA-330 Puma	Helicopter		..	(Jan. 1970)	
	UAR	..	V 750VK missile	S-A	Referred to in West as "Guideline". For several air bases to protect UAR aircraft	..	(May-June 1969)	
Congo (Brazzaville)	Algeria	20	Truck			}	1969	
		10	Landrover					
		..	Radio-communication apparatus					
Congo (Kinshasa)	France	30	Light machinegun carriers			Nov. 1968	1969	
	Italy	17	Aermacchi MB.326 GB	Trainer	Italy training about 50 pilots	(April 1968)	1969: 3	
		12	Siai-Marchetti SF.260	Cabin monoplane	To replace P.148	Dec. 1969	..	
Ethiopia	UK	10-12	BAC Canberra	Bomber	Ex-RAF	..	1968-70	
Kenya	UK	5	Beagle Bulldog	Trainer	Delivery uncertain after liquidation of Beagle but production now taken over by Scottish Aviation	Oct. 1969	(1970)	
Liberia	USA	1	Motor gunboat	Displacement: 100 t.	Being built under MAP	..	..
Libya	USA	18	Northrop F-5 Freedom Fighter	Fighter	Revolutionary Government has indicated it would like to take delivery of remaining 8	1967	1968: 5 1969: 5	
		6-8	Lockheed C-130 Hercules	Transport	\$17 mn, including \$13 mn for pilot and technician training	Pre-Sept. 1969	1970	
		1	Lockheed C-140 Jet Star	Transport		..	1969	
	UK	..	Rapier missile	S-A	\$300 mn + . Contract cancelled Dec. 1969	April 1968	..	
		..	Thunderbird missile	S-A				
		200	Chieftain	Tank				
		..	Abbott self-propelled 105 mm gun		\$96 mn	April 1969	..	

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
		1	Frigate Mk 7	Displacement: 1 500 t.	Approximately \$15 mn with missiles	} Feb. 1968	1971
		..	Short Seacat missile	S-A	To arm frigate		1967
		1	Depot ship	Displacement: 2 500 t.	\$5 mn		
		3	Patrol boat	Displacement: 95 t.	Equipped with Vosper Nord SS.12(M)	1966	1968-69
	France	..	Nord SS.12 (M) missile	S-S	For patrol boats	1966	1968-69
Mauritania	USSR	1	I1-18	Transport	Soviet experts to train technicians	..	April 1969
Niger	West Germany	3	Nord Noratlas	Transport	From surplus Luftwaffe stocks	..	June 1969
Nigeria	(USSR/UAR)	4-5	Sukhoi Su-7	Fighter		..	June 1969
		1	I1-28	Transport		..	1969
		24	MiG-17	Fighter	May have come from Algeria	..	1969-70
		..	MiG-19P	Fighter		..	1969
	UK	2	Corvette		Approximately \$9 mn	March 1969	1972
	Belgium	5	Douglas DC-3	Transport	Purchased from SABENA	..	Oct. 1969
	..	1	Piper Aztec D	Transport		..	July 1969
Biafra	..	2	Gloster Meteor	Fighter	Possibly ex-Danish. One lost en route, the other stayed in Guinea Bissau	..	..
	Sweden	19	MFI-9B Mili Trainer	Trainer	\$11,700 u.c. in first lot. Fitted with rockets. May have come from West Germany	April 1969: 5	1969
	..	6	NA T-6	Trainer	Fitted with machine guns	..	Dec. 1969
	..	2	Douglas C-47	Transport	\$5,000 first u.c.; \$45,000 final u.c. Ex-Luftwaffe; equipped with bombracks	..	(July 1969)
Somalia	USSR/UAR	12	Patrol boat, "P-6"	Displacement: 66 t.	Ex-USSR; not delivered by end-1969	..	..

South Africa	UK	4	HS 125	Transport	\$4.3 mn	March 1969	Nov. 1969: 1 Early 1970: 2				
	France	(16) (16) 9	Sud SA-330 Puma Sud Alouette III Transall C-160	Helicopter Helicopter Transport		(1969) .. (May 1966)	1970 (1969-70) 1969: 5 1970: 4				
	France/South Africa	..	Thomson-CSF/Matra Crotale missile	S-A	\$100 mn estimated initial value. Developed as Cactus by French companies for the South African Government which is financing the project with some French assistance	..	1971				
	France	3	Submarine, "Daphne" class	Displacement: 850 t.	\$11 mn u.c.	..	1969: 1				
South Africa	Italy/South Africa	234	Atlas-Macchi 326 Impala	Trainer	Being produced under licence	1965	1967-(71)				
	Italy	9	Piaggio P.166	Transport		1968	1969				
Sudan	UK	5	BAC 145	Trainer		1967	1969				
	USSR	25	MiG-21 An-12 T-55 Anti-aircraft guns, field artillery, small arms	Fighter Transport Tank	\$50 mn +	(Jan. 1968)	1970 1969 1969 1969				
Tunisia	France	.. 13 13 10 2	Nord Noratlas AMX-13 Panhard self-propelled gun Patrol boat Seaward defence boat	Transport Tank			Military aid 1969-70	Oct.-Nov. 1969	1969-70		
		8	Nord SS.12 (M) missile	S-S					Armed with Nord SS.12 (M), possibly included in previous item For Seaward defence boats	1969	..
Zambia	UK	8	Beagle Bulldog	Trainer					\$1.92 mn +. Delivery uncertain after liquidation of Beagle, but production now taken over by Scottish Aviation	(July 1969)	1970
	Italy	.. 5	Aermacchi MB.326 Agusta-Bell 205	Trainer Helicopter		(1969) Feb. 1969	.. ..			

1G. Continued

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
Indian Subcontinent							
India	USSR	200	Sukhoi Su-7	Fighter	Value of first 100: \$100 mn payable in rupees	April 1968: 100 (Sept. 1969: 100)	} 1968-70
		..	(T-54)	Tank		..		} 1968-70
		4	Submarine, F-class	Displacement: 2 000 t.		Aug. 1965	} 1968: 1 1969: 2
		2	Frigate, "Petya" class	Displacement: 1 050 t.		April 1968	
		1	Submarine tender		On order
		6	Motor torpedo boat		On order; not delivered by end-1969	..	..
	USSR/India	300	MiG-21	Fighter	Airframe production almost entirely indigenous; engines and electronics imported in major assemblies	1963	1967-
		..	Small missile	A-A	Licensed production, for use with MiG-21	(1963)	..
		..	MiG-21M	Fighter	Improved version to be produced	(Oct. 1969)	..
	UK/India	27	HAL HS 748	Transport	Produced under licence	1959	1969: 2
	France/India	..	Nord missile	A-S and S-S	Agreement on licensed production; to start with the AS.30 and SS.11	(April 1969)	..
	France	..	Nord missile	Anti-tank and S-S	Probably SS.11	(April 1969)	(1969)
Pakistan	USSR	..	Spare parts		For MiG-21, MiG-19 and Il-28	..	1969
		100	T-54/55	Tank	Out of a requested 250	June 1968	1969
		200	130 mm gun		75lb. shell, 17-mile range	(June 1968)	1969

	Turkey	100	Patton	Tank	Probably under consideration by US Government, and not delivered by end-1969	..	..
	France	3	Submarine, "Daphne" class	Displacement: 850 t.		1967	1970: 1
Far East							
	Brunei	UK	1	Westland Wessex Series 50	Helicopter	(1968)	Autumn 1969
	Burma	USA	..	Cessna T-37C	Trainer	For training and COIN; MAP	1968 (1969)
	Cambodia	France	12	Sud Horizon	Light plane	For initial training	.. 1968-69
			50	Military vehicles		..	1969
			..	Landing craft		..	(1969)
	Indonesia	France	7	Sud Alouette III	Helicopter	\$1.4 mn approximately	(March 1969) 1969
		Australia	5	Cessna 401A	Transport	\$1.2 mn, including spares and servicing equipment. For liaison and VIP transport	(May 1969) (July 1969)
			6	Cessna 402A	Transport		
			..	Cessna 310P	Cabin monoplane			.. (Sept. 1969)
	Korea, South	USA	18	McDonnell-Douglas F-4 Phantom	Fighter	\$52 mn in \$100 mn military aid agreement	Feb. 1968 Aug.-Sept. 1969
			..	Bell UH-1D Iroquois	Helicopter		(1969)
			2	Coastal minesweeper	Displacement: 320 t.	Being built under MAP	..
			700,000	M-1 and other	Rifle		(1969)
		USA/South Korea	..	M-16	Rifle	\$10 mn factory; will take several years to put in operation	(June 1969) ..
	Malaysia	UK	2	HS 125	Transport	For VIP transport and communications	.. (Nov. 1969)
			1	Frigate, "Yarrow" type	Displacement: 1 600 t.	\$10 mn, approximate. Armed with Seacat missile	Feb. 1966 1969
			..	Short Seacat missile	S-A		(Feb. 1966) (1969)
			1	Survey vessel, "Ton" class	Displacement: 360 t.	Ex-UK coastal minesweeper	1969 1970
			13	Anti-aircraft gun		Radar-controlled; under 1963 defence aid	.. (April 1969)
			..	Small arms		Rifles and automatic weapons for three infantry battalions	May 1969 ..
			2	Marconi S600	Mobile radar unit	For joint Malaysia-Singapore defence system	June 1969 1971
		France	5	Sud Alouette III	Helicopter		Dec. 1968 1969
		Canada	8	DHC-4A Caribou	STOL transport	\$8.5 mn; Canada provides loan covering 90% of purchase price	(March 1968) June 1969

1G. Continued

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
	Australia	10	Commonwealth CA-27 Sabre Mk32	Fighter	Grant aid with a nominal value of \$9.35 mn including support equipment; service life of at least 6 years.	April 1969	1969
Philippines	USA	2	Patrol boat		For ASW	..	1969-70
Singapore	USA/New Zealand	8	Cessna 172	Cabin monoplane	Sold by Cessna subsidiary in New Zealand but delivered from the USA	(Dec. 1968)	1969
	UK	10	HS Hunter FGA.9	Fighter	} Refurbished; will have 10 years of life } } \$7.2 mn; UK to contribute to total cost	} (June 1968)	} 1970-71
		10	HS Hunter T.66	Trainer			
		16	BAC 167	Trainer/ground attack				(July 1968)	Oct. 1969-
		60	BAC Bloodhound 2 missile	S-A	\$24 mn; including spares, after sales services and training. Refurbishing and modification by BAC will give system a long operational life. Operated now by RAF in Singapore.	(April 1969)	1971
		2	Fast patrol boat	Displacement: 100 t.	\$9.6 mn, total value of 6; 4 will be built in Singapore by Vosper Thornycroft.	May 1968	1971
	France	4	Sud Alouette III	Helicopter		(Dec. 1968)	1969-
	Israel	50	AMX-13	Tank		1968	1969
Taiwan	USA	70	Northrop F-5	Fighter	Replacing F-86F	..	1969
		20	Lockheed F-104 Starfighter	Fighter	} Supplied without charge to MAP from US surplus stocks	} ..	} 1969
		35	NA F-100 Super Sabre	Fighter			
		30+	Fairchild C-119 Packet	Transport			
		50	Medium tank				
		120	Howitzers				
		..	M-14	Rifle			
	USA/Taiwan	36	Pazmany PL-1	Light aircraft	1 for evaluation, followed by 35 built in Taiwan for military training	(1968)	..

		..	Bell 205 Iroquois	Helicopter	Licensed production	(Sept. 1969)	1970-
		4	Destroyer		20 years old; transferred in 1969	..	(1969)
		1	Coastal minesweeper	Displacement: 335 t.	Being built	..	..
Thailand	USA	16	NA-Rockwell OV-10A Bronco	COIN aircraft		(Dec. 1969)	1970
		..	Bell 205 Iroquois	Helicopter		..	1969
		36+	Hawk missile	S-A		Jan. 1968	1969-70
	UK	1	Frigate		\$15.6 mn	Aug. 1969	..
Viet-Nam, South	USA	60	Cessna A-37	Ground attack	Gift; for COIN	..	1969
		300	Helicopter		Of which 80 UH-1H Iroquois	..	1969
		500,000	M-16	Rifle	for \$44.4 mn	..	(1969)
		..	Patrol boats, gunboats, riverine craft		Perhaps around 200	..	1968-69
Central America							
El Salvador	USA	6	Cavalier F-51D Mustang	Fighter	Replacement for aircraft shot down during war with Honduras	..	July 1969
	West Germany	..	Small arms and ammunition			..	Early 1969
Mexico	USA	20	Beech Musketeer Sport	Cabin monoplane		..	Jan. 1970
South America							
Argentina	USA	25	Mc Donnell-Douglas A-4B Skyhawk	Fighter	Refurbished; held up since 1966 because of Viet-Nam shortages	Nov. 1965	(March 1970)
		14	Hughes 269 HM	Helicopter		..	(Dec. 1969: 6)
		5	Piper Turbo-Navajo	Transport	For Army aviation	..	(Oct. 1969)
		7	Bell 206A Jet Ranger	Helicopter	\$626,500	(1968)	..
	USA/ Argentina	..	Cessna A-182 Skylane	Cabin monoplane	Licensed production; slowdown in 1968 as imported plane was cheaper	1965	1966-
	UK	10	B.62 Canberra	Bomber	\$9.6 mn estimated. Ex-RAF refurb- ished; 10 years operational life guaranteed	(Sept. 1969)	..
		2	T.64 Canberra	Trainer			
		2	Guided missile destroyer, type 42	Displacement: 3 500 t.	\$72 mn. The second to be assem- bled in Argentina	Feb. 1969	1973-
	France	..	Nord AS.11 and AS.12 missile	A-S	For arming Macchi MB.326 GB	(June 1968)	(1969)
		60	AMX-13	Tank	First of about 30 to be built in Argentina delivered	March 1968	(1969)

1G. Continued

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
	Canada	24 9	155 mm self-propelled Howitzer DHC-6 Twin Otter	STOL transport	\$5mn	Aug. 1968 (May 1968)	(1969-70) 1968: 3 1969: 4
	Italy	6	Aermacchi MB.326GB	Trainer	\$3.5 mn including spares. Armed with Nord AS.11 and AS.12. Eventual Navy requirement: 24	June 1968	1969
	Netherlands	8	Fokker F.27 Mk400	Transport	\$14.4 mn financed by Netherlands Bank	July 1968	1969
		2 1	Fokker F.27 Mk600 Aircraft carrier	Transport Displacement: 15 892 t.	Originally, leased decided to buy \$2.64 mn purchase price and \$0.99 mn initial refurbishing cost	(1969) (Nov. 1968)	1968 May 1969
	West Germany	.. ..	MBB Bo 810 Cobra 2000 missile Daimler-Benz Unimog	Anti-tank General purpose vehicle	A substantial number armed with Cobra	.. Late 1969	1969- (1969-)
		2	Submarine, type 205	Displacement: 1 000 t.	Built in West Germany; assembled in Argentina	Jan. 1969	..
Brazil	USA	15	McDonnell-Douglas A-4F Skyhawk	Fighter		(Jan. 1969)	..
		25	Cessna T-37C	Trainer/ground attack	\$6 mn. For COIN training	(Aug. 1968)	Oct. 1969- March 1970
		4	Sikorsky S-61	Helicopter	For ASW	Aug. 1968	Oct. 1969- Jan. 1970
		..	Fairchild Hiller FH-1100	Helicopter	Several on order, to replace Bell 47 in the Navy	(Dec. 1968)	..
		6	Bell UH-1D Iroquois	Helicopter	Armed for COIN	(March 1968)	March-Aug. 1969
		7	Bell 206 A Jet Ranger	Helicopter	3 for VIP, 4 for COIN	(March 1968)	July 1968- Aug. 1969
		5 10,000	Lockheed C-130 Hercules M-16	Rifle	\$1.5 mn	1968 1966	1969 1969
		2	Gunboat		To be built under MAP	..	..
	UK	6	Hawker Siddely HS 125	Transport	\$3.6 mn approximately	(Feb. 1968)	Nov. 1968- Aug. 1969
		2	Westland Whirlwind Series 3	Helicopter		..	May 1969
		2	Submarine, "Oberon" class	Displacement: 1 610 t.	\$25 mn, approximately	(Aug. 1969)	(1973)

	France	7	Fouga Magister CM 170-2	Trainer		(June 1968)	Nov. 1968: 5 1969: 2
	Canada	12	DHC-5 Buffalo	STOL transport	\$30 mn including spares and support. In addition to 12 ordered in 1967, received in 1968	(Nov. 1968)	1970
	Italy/Brazil	112	Aermacchi MB.326GB	Trainer	Licensed production; work started spring 1970	(Oct. 1969)	..
	West Germany	4	Fast minesweeper	1 610 t.		1969	..
Chile	UK	18	HS Hunter FGA.9	Fighter	} \$9.6 mn; refurbished	(Nov. 1966)	Jan.-Feb. 1969
		3	HS Hunter T.7	Trainer			
		2	Submarine, "Oberon" class	Displacement: 1 610 t.				Oct. 1969	..
Colombia	USA	30	Cessna T-41D	Trainer	} \$3 mn, MAP	(April 1968)	1969
		10	Cessna T-37	Trainer			
		12	Hughes OH-6A	Helicopter				(1966)	1968: 4 1969: 8
Peru	UK	6	BAC Canberra	Bomber	\$4.8 mn	May 1968 (1969)	1970 ..
		2	Destroyer, "Daring" class	Displacement: 2 800 t.			
	France	12	Dassault Mirage V	} Fighter/ground attack	} \$20-25 mn over 7 or 8 years	Oct. 1967	1969-70
		2	Dassault Mirage VD				
		78	AMX-13					Tank 2 800 t.	(Oct. 1967)	1969-70
	Argentina	1	Aircraft carrier	Displacement: 14 000 t.	Independencia, sold when Argentina bought Karel Doorman	(1968)	..
Venezuela	UK	..	Short Seacat missile	S-A	\$2.4 mn	1968	..
Europe							
Greece	USA	5	Lockheed F104 Starfighter	Fighter	To balance losses 40 released, 15 still held	.. (1964)	(Feb. 1969) (1969)
		56	Northrop F-5 A/B Freedom Fighter	Fighter/ reconnaissance			
		2	Bell 47G	Helicopter			
		2	NA-Rockwell Courier Commander	Transport			
			France	4				Fast gunboat	Displacement: 220 t.	Armed with Nord MM-38 Exocet SSM	(May 1969)	1971
		26	Nord MM-38 Exocet missile	S-S	\$2.2 mn, u.c. Option on further 26	(May 1969)	1971

1G. Continued

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
	Italy	6	Agusta-Bell 205A	Helicopter	\$364,000 u.c.	(Nov. 1968)	Jan.-March 1969
	West Germany	40 4	Nord Noratlas Submarine	Transport Displacement: 1 000 t.	NATO military aid. Ex-Luftwaffe Delivery subject to approval of Western European Union.	.. (July 1969)	1970 ..
Portugal	France	12 (56)	Sud SA-330 Puma Sud Alouette III	Helicopter Helicopter	Ordered by "a country in South West Europe"	.. Nov. 1969	(Mid-1969) ..)
	West Germany	20	Dornier Do-27	Transport	Ex-Luftwaffe, following criticism in West Germany of proposed sale of these planes to Nigeria	April 1969	..
		3	Corvette	Displacement: 1 252 t.		April 1968	1970
	Spain	3	Corvette	Displacement: 1 252 t.	On order	..	..
Turkey	USA	25	Northrop F-5 Freedom Fighter	Fighter/ reconnaissance		1965	1969
		2	Destroyer		\$7.5 mn, u.c., paid in Turkish lire Building in the USA	(Sept. 1969)	..
		5	Gunboat	Displacement: 117 t.		..	..
		1	Patrol vessel, "Akhizar" class	Displacement: 280 t.		..	..
	Italy	50	Agusta-Bell 206A Jet Ranger	Helicopter	For Army and police	July 1968	(1968-69)

II. Preliminary register for January to June 1969

This includes any order or delivery in the period January to June 1970, which is not included in the 1969 register.

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered	
Middle East								
Iran	USA	12	Cessna O-2 A	Cabin monoplane		..	Spring 1970	
	UK	..	Marconi Air Defence	Mobile radar and communications system	A multi-million pound contract	(May 1970)	Spring 1970	
Muscat and Oman	UK	1	Short Skyvan	STOL transport	\$367,000 u.c.	(May 1970)	..	
United Arab Republic	USSR	..	SA-3 missile	S-A	Referred to in West as "Goa"	..	Feb. 1970	
Africa								
Central African Rep.	France	1	Dassault Falcon	Transport	For use by President	..	(April 1970)	
Ivory Coast	France	(5)	Sud SA-330 Puma	Helicopter		..	..
		1	Dassault Falcon	Transport		..	(April 1970)	
Libya	France	50	Mirage V	} Fighter/ground attack	} \$144 mn+	} Jan. 1970	} 1970: 4	
		30	Mirage IIIE					
		20	Mirage IIIB/IIIR					} Trainer/tactical reconnaissance
		1	Dassault Falcon	} Transport				
20	Fouga Magister	Trainer	Refurbished, part of Mirage order		Jan. 1970	..	1974: rest	
Indian Subcontinent								
India	UK	12	BAC Canberra B.Mk15 and Mk16	Bomber	Ex-RAF; refurbished	..	..
		4	Westland Sea King	Helicopter	\$4.8 mn, including spares; may also have purchased the 2 used for evaluation; option for 2	(Feb. 1970)	..	

1.G.II. Continued

Recipient	Supplier	Number	Item	Description	Comment	Date ordered	Date delivered
Far East							
Brunei	UK/Singapore	2	Fast patrol boat		Built by Vosper Thornycroft of Singapore	(Feb. 1970)	End-1970
Cambodia	USA	10,000	M-2 Turbo-Skyscraper	Carbine	Also to receive mortars, recoilless rifles and small arms	..	April-May 1970
Indonesia	Australia	5	Cessna T.207	Utility aircraft	\$332 000 including spares	..	1970
Laos	USA	..	Douglas AC-47	..	For ground attack	..	(1970)
		..	M-16	Rifle		..	(1970)
Taiwan	USA	6	Hughes OH-6A	Helicopter	To receive under MAP; option for further deliveries	..	Oct.-Dec. 1970
Central America							
Dominican Republic	USA	7	Hughes OH-6A	Helicopter	To receive under MAP	..	..
Nicaragua	USA	4	Hughes OH-6A	Helicopter	To receive under MAP	..	..
South America							
Argentina	UK	2	Westland WG.13	Helicopter	For the guided missile destroyers, for ASW	(May 1970)	(1973)
Brazil	France	12	Mirage IIIE	} Fighter/ground attack	\$2 mn, u.c., favourable credit terms	May 1970	1972
		4	Mirage IIIB				
Chile	USA	9	Beechcraft	Light transport	\$7.1 mn, including spares	March 1970	June-Aug. 1970
	UK	2	Frigate, "Leander" class	Displacement: 2 450 t.	\$7.2 mn, including submarines ordered 1969	(Jan. 1970)	..
Peru	USA	6 (6)	Lockheed C-130 Hercules Helicopters	Transport	\$76 mn, letter of intent signed but some doubt whether credits will be available	(March 1970)	..
	Canada	16	DHC-5 Buffalo	STOL transport				$60 mn, including spares	(March 1970)	..
Europe							
Turkey	West Germany	2	Dornier Do-28	Monoplane	\$184,000 u.c.	(March 1970)	..

Section 2. Background to SALT and the European Security Conference

2A. *Some Soviet missiles: US views*

The SS-9

The main “threat” emphasized by the US administration in its arguments for the Safeguard ABM has been the large Soviet missile with the Western designation SS-9. Members of the administration have repeatedly made alarming statements about the number of SS-9s and their characteristics. These notes examine the available evidence, mostly from seven different sets of Congressional hearings, on these points. The sources are indicated in the text in brackets such as [1]. They are listed on page 375. The evidence comes mostly from Mr Laird and Mr Packard, two politicians who assumed office at the Department of Defense with the new administration, and from Dr Foster, Director of Defense Research and Engineering at the Department of Defense, who stayed over from the previous administration as a top official and who may therefore be expected to have a more continuous view of things.

Numbers

Early in its life the new administration indicated that new intelligence had revealed more SS-9s than it was previously thought were going to be constructed. At first these were referred to as missiles deployed.

26 March 1969, Mr Packard: [1]

... There were two things that gave me very great concern when I looked at the status of these SS-9 missiles. One was that in going over the statements that had been made about the previous Sentinel deployment, there seemed to be the feeling that the SS-9 was going to level off at a number somewhere below 200. When I looked at the figures and the latest intelligence information there had been a recent increase in the number of SS-9s deployed.

A few weeks later it was explained that they were not missiles deployed but missile silos started, i.e., “deployed or under construction” in the ter-

minology normally used by the administration. As noted later, the period of construction seems to be about eighteen months.

17 April 1969, Dr Foster: [2]

Mr. Nedzi. The numbers in Secretary Clifford's statement correspond to the number that Secretary Packard has given us.

Dr. Foster. Yes: let me explain.

The items that were found in late [deleted] indicate that the Soviets are starting a new set of SS-9s. And so, with that, there is the expectation that there will be more to follow.

Dr Foster also indicated how expectations and projections changed: [2]

Some years ago, it seemed to me, and in fact I believe it was rather generally agreed, the Soviets would not build a very large number of SS-9s. The reason for that conclusion was simply that the United States had started our program with large liquid fueled missiles, the ATLAS and the TITAN I, followed by the TITAN II in hardened silos, and we believe that such missiles represented rather attractive targets for relatively smaller and cheaper missiles of the MINUTE-MAN type. Since we had seen the Soviets building a MINUTEMAN type of missile, the SS-11, and since we had at that time a number of MINUTEMAN, we assumed that they would not choose to construct a large number of SS-9s.

So, as I recall, in 1964 and 1965 the general feeling was that the Soviets might build a total of 100 SS-9s. As the years went by, this estimate increased until now, as you know, people are suggesting they might acquire 500 of them, perhaps more.

There follow more quotations about actual numbers of SS-9s and projections.

13 May 1969, Dr Foster, asked about the rate of deployment per year: [3]

... It has been very uneven in numbers installed through the years.

22 May 1969, Mr Laird: [4]

The Soviets now have more than 230 of these missiles operational or under construction. According to the latest intelligence estimates they are expected to have somewhere around 400 SS-9 types operational by the mid-1970s, including a new version with considerably greater accuracy.

23 June 1969, Mr Laird: [5]

The risks inherent in these judgements can be illustrated by some of the testimony given to the committee of Congress by Secretary McNamara in early

1968. Testifying on the fiscal year 1969 defense program and budget, Secretary McNamara said: "We believe the Soviet ICBM force will continue to grow but at a considerably slower rate . . . [deleted]. New SS-9 construction starts appear to be tapering off [deleted] . . ." So stated Secretary McNamara.

As we have seen, new SS-9 construction starts have not tapered off, but rather have continued at about the same rate as in 1967 and 1968.

8 January 1970, New York Times: [6]

Last May he [Mr. Laird] told Congress that the Russians had "more than 230" SS-9s in place or under construction and that, at the then existing deployment rate, they could have 420 of the weapons by 1974. . . .

Today Mr. Laird said his earlier estimate was overly "conservative". At the subsequent rate, the Russians could achieve such a force even earlier, he said.

While he declined to provide an updated figure, reliable sources say that the SS-9 force now stands at about 280 missiles including those under construction. This suggests a new deployment rate of 50 to 60 a year, which could result in a missile force of 420 in two to three years, these sources said.

19 January 1970, International Herald Tribune: [7]

Secretary of Defense Melvin R. Laird said yesterday that success in the nuclear arms control talks would be impossible if the United States acted to disarm unilaterally "while the Soviet Union is going ahead of us" in missile power.

Mr. Laird made it clear that he will not be a party to any unilateral disarmament, saying, "I believe the United States must keep its defense up."

The secretary spoke in a television interview on KNBC in Los Angeles, taped two days ago.

Mr. Laird indicated that the Russians soon will have 300 of the big SS-9 rockets in their arsenal. He had said earlier that the Soviet deployment and construction of the SS-9—a weapon considered a direct threat to destroy U.S. land-based Minuteman missiles in a surprise attack—had moved ahead at a faster rate than he had forecast to Congress last year, and that the knock-out threat to the Minuteman may be critical earlier than 1974, since "we find they are closer to 300 than estimates that I gave."

Last summer, Mr. Laird told Congress that 230 SS-9s were either built or under construction. There are now indications that the number has gone beyond 270.

20 February 1970, Mr Laird: [8]

We now estimate the number of SS-9 ICBM deployed or under construction to be over 275, rather than 230 as I reported publicly less than a year ago.

The figure of 275 operational or under construction was repeated during February and March by Mr Laird, Mr Packard and Dr Foster at various hearings. [9, 10, 11]

20 April 1970, Mr Laird: [12]

In 1965, there were no operational launchers for the large Soviet SS-9 missile which, in its single warhead version, can carry up to 25 megatons.

Today, I can report to you that there are some 220 SS-9's operational with at least 60 more under construction. Testing of an SS-9 multiple reentry vehicle—the triplet version—continues. The U.S. has no counterpart to this program involving large missiles. So, in this area, the Soviets have and will maintain a monopoly.

But then some quite different stories appeared.

27 April 1970, Stewart Alsop: [13]

It is therefore a hopeful fact that U.S. intelligence has detected no new starts on the SS-9 launch sites, which take eighteen months to complete, since last August.

8 May 1970, International Herald Tribune: [14]

A top-secret report locked up at the Pentagon throws a different light on the grim picture Defense Secretary Melvin R. Laird painted recently of the Soviet missile threat. . . . According to the Samos photographs, the Soviet Union in fact built fewer sites for its biggest missiles, the SS-9 in 1969 than it did in 1965. . . .

He did not mention that 66 SS-9 missile sites were spotted in 1965, compared to 54 in 1969. The secretary evidently added up each year's construction since 1964 to reach his total of 280 for "today."

His reference to "no operational launchers" in 1965 apparently meant they were not ready to fire. His comparison could be read as a sudden jump in SS-9 missile site construction. Instead, the intelligence estimates show an up-and-down trend for the SS-9.

The Samos, the sources said, counted a few more than 40 SS-9 sites in 1964, then the 66 for 1965. The next three years showed a tapering-off before rising again to 54 in 1969. . . .

19 July 1970, International Herald Tribune: [15]

The Soviet Union has "gone forward with new starts" on its SS-9 missile since the current arms control talks began, Defense Secretary Melvin R. Laird said today.

His statement at a Pentagon news conference contradicted earlier reports that the Russians suspended their SS-9 expansion program as long ago as last August. . . .

Asked "when was the last time they built a brand new SS-9 missile site," Mr. Laird said of the Soviets:

"They have developed more SS-9 missile sites as well as SS-13 and SS-11s. They have proceeded with this program since the talks started in Helsinki (Nov. 18, 1969) and have gone forward with new starts since the talks opened in

Vienna (April 16, 1970)." He said these new starts included SS-9s and were in addition to the 60 under construction he mentioned earlier this year. . . .

Figures on SS-9 deployment—which the Pentagon keeps secret—show that the buildup has varied from year to year. Here are the figures, year by year, of SS-9s actually deployed or under construction: 42 in 1964; 66 in 1965; 54 in 1966; 30 in 1967; 36 in 1968; and 54 in 1969. That made for a total of 222 SS-9s operational as of early 1970. . . .

3 August 1970, Time Magazine (in an open letter to Dr Foster):

. . . You said that the Soviet SS-9s "are going at the rate of at least 50 a year," and you added that the smaller SS-11s "are going in at the rate of about 100 a year." Those were the same figures you used in February before the House Appropriations Committee. You no doubt chose the words "at the rate of" with precision, but you gave the impression last week that there would be at least 50 more SS-9s and 100 more SS-11s deployed by the Soviets this year. Yet your colleagues in the Government say, on the best satellite intelligence information available to them, that from November 1969 through June 1970 there were no additional SS-9s deployed and only a few S-11s installed. Just three weeks ago new intelligence became available indicating that work had been resumed at three missile areas. Since it is Soviet practice to install six SS-9s at each area, it was believed that silos were being dug and sites prepared for 18 additional SS-9s. That is certainly something to worry about. But on the basis of this information, is it entirely accurate to say SS-9s are "going in at the rate of about 50 a year"? You undoubtedly did not mean to convey an impression that 50 more SS-9s would be deployed this year. Preciseness in language here, too, might help alleviate any credibility problem that the Pentagon may have.

On the basis of this evidence, it seems that whereas the United States authorities expected that the Soviet Union would stop producing these large liquid-fuelled missiles, just as the United States stopped producing Atlas and Titan, it appears to have gone on producing them: and that Mr Laird's projection for 1975 is that it will keep on producing them at the same average rate as since 1964. The United States intelligence community apparently refuses to commit itself to any projection at this time (see page 52).

The facts and figures can be pieced together into a picture which is remarkably consistent (far more consistent than statements made about them up to late 1969. (See table 2A.1.)

What has happened since then is obscure. Department of Defense spokesmen give the impression that starts of missile sites and, by implication, work on them have gone ahead without interruption. Newspaper reports, apparently derived from the intelligence community, suggest that there has been a pause but that the pause ended in June 1970. One explanation, for which there is good authority, is that SS-9 silos were seen to have been started, that work on them then appeared to have stopped and then to have

Table 2A.1. US estimates of numbers of SS-9 missiles

	Spotted (= started)		Operational (= completed) at end year	Under construction at end year
	During year	Cumulative total ^a		
1964	42	42	0	42
1965	66	108	0	108
1966	54	162		
1967	30	192		
1968	36	228		
February 1969		225		
May 1969		230 +		
1969	54	282	222	60
January 1970		280		
February 1970		275 +		
April 1970		280 +		

^a At end of year or in the month stated.

started again. The last newspaper report cited above (*Time* of 3 August 1970) supports this explanation. It refers to work being resumed, not started. Mr Laird's statement of 10 July indicates that there have been new starts, but it is not clear whether these were before or after June 1970.

As noted below, work on missile silos may stop or diminish in the winter because of the weather, but that would not explain a pause up to June.

The general picture given by the figures in table 2A.1 is that:

1. Since 1964, starts have averaged 47 per year, but have been erratic from year to year, and within the year. There is nothing surprising in that.
2. At first there was a large accumulation of sites under construction and work in progress, before any missiles became operational.
3. In the past two years when SS-9 has been featured in ABM debates, there have been numerous statements about numbers in the first four or five months of each year when hearings are taking place. During these months the figures cited have changed little. This may be because new appraisals are agreed and made public only at fairly long intervals, so that spokesmen repeat one figure, subject to poetic licence, for several months. Or it may be that winter weather reduces the rate of starts—or rate of collection of evidence—in these months. Or it may be that the latest figures for actual numbers of missiles announced by government spokesmen are extrapolations rather than statements based on up-to-date information. A statement that "today the Soviets have started x or y missile silos" could scarcely be accurate if it is based on satellite reconnaissance. The time needed to scan all the relevant areas, to send the pictures back and to interpret them may be

considerable. The posture statements, published in January or February in the last two years, have given estimates of the number of missiles for the beginning of the previous September, a time lag of five months.

4. The number of silos estimated to be under construction at the end of 1969—sixty—would not point to any quick increase or decrease in completions.

5. There have been stories from some US sources, suggesting that there was a pause in work on SS-9 silos between the late autumn of 1969 and June 1970. All sources agree that work has been resumed since June. Until some new numbers are given, it is best to suspend judgement as to the rate of introduction of SS-9s this year.

6. Simple extrapolation—for which there is no justification—would lead to a total of 500 in the mid-1970s.

That the facts and figures form a consistent picture does not necessarily mean that it is a true picture. The information obtained by reconnaissance satellite may be wrong, particularly as regards new developments such as starts of new missile silos: things may be missed or misinterpreted. The data, in being interpreted, may be smoothed and fitted to a consistent pattern. In the remarks above we must, to a greater or lesser extent, be reading the mind of the interpreter of the data, not the raw data: data are chaos until they are sifted, judged, classified and presented.

Footprints and MIRV

In early 1969 it was stated by various US Government spokesmen, including the President, that the three warheads on the SS-9s being tested by the Soviet Union had been observed to land in a pattern of “footprint” (an interestingly sinister term) which matched the pattern of Minuteman silos and so suggested it was aimed at them and was a “first strike” weapon.

21–22 June 1969, International Herald Tribune: [16]

Test-firings of Soviet missiles with multiple warheads have been in a pattern matching American missile silos, making the proposed Safeguard missile defense system (ABM) a necessity, President Nixon declared last night.

At this time it was suggested that the three warheads being tested were independently targeted, i. e., that the SS-9 could soon have a MIRV capability. Without this, the three warheads could not be an overwhelming menace to the 1 000 Minuteman silos, whose pattern and orientation were not all the same.

It should be noted that MRV do not and probably cannot disperse their warheads far apart: and that the possibilities of seeing a similarity in two patterns of points (e.g., the landing of the MRV warheads and the location of ABM silos) is bound to be pretty high if the number of points is as low as three.

23 June 1969, prepared statement by Mr Laird: [5]

The data we have does not show conclusively that the several reentry vehicles are individually targeted. However, these data are consistent with a MIRV capability, [deleted] and therefore they can mean the Soviets are evolving a capability against Minuteman such that up to three Minuteman can be destroyed by a single SS-9.

I cite these examples to show that intelligence is composed of a variable mixture of information, judgements and conclusions which lead to a point of view about a given state of affairs.

23 June 1969, Mr Laird: [5]

What did the President mean when he referred to footprints in his TV address to the Nation [deleted].

Secretary Laird. Well, Senator Case, the President was referring to the fact that in the three SS-9 shots in the Pacific the area of impact corresponded to a very marked degree to the various triangles that can be worked out as far as our Minuteman sites are concerned. These are triangles that are different and these particular footprints could correspond to various footprints that are made by our Minuteman silos.

Senator Symington. Footprints made by the Minuteman silos?

Secretary Laird. Patterns of the Minuteman silos.

Senator Symington. I see.

Secretary Laird. And the footprints of the firings are compatible with the footprints of the Minuteman silos.

Later it became clear that the intelligence community did not back this assertion and was uncertain when Soviet missiles would have MIRV warheads.

20 February 1970, Mr Laird: [8]

As noted earlier, there are no clear indications at this time concerning the longer term Soviet objectives for their ICBM force, either in quantity or quality. The intelligence community in its most recent projections has identified a range of possible future Soviet ICBM *reentry vehicles* on launchers, based on a series of assumptions with respect to force deployments and technology. No "most likely" case was projected. These deployment estimates range from a "Low Force-Low Technology" effort to a "High Force-High Technology" effort.

If the Soviets follow a "Low Force-Low Technology" approach they could have a few soft target multiple RVs by mid-1970 and the first hard target mul-

multiple RVs as early as mid-1972. If they followed a "High Force-High Technology" approach they would probably skip the MRV and move directly to MIRV, in which case they could have their first MIRVs by mid-1971 and a very formidable hard target kill capability by the mid-1970s. Even with a "Low Force-Low Technology" approach, the hard target kill capability would be considerable.

24 February 1970, prepared statement by Dr Foster: [11]

As you know, our particular concern with regard to these missiles is the threat that they pose to Minuteman. Tests of three reentry vehicles per SS-9 have continued, but they have not demonstrated to us the flexibility necessary to target each warhead against a different Minuteman silo.

The SS-11s could be used against Minuteman but to date the required accuracy improvement has not been demonstrated.

10 March 1970, Dr Foster: [9]

There is complete agreement in the community that by 1973, the Soviets could have a measure of [MIRV] capability. The dispute has to do with the degree to which they have it now.

20 April 1970, prepared statement by Dr H. Scoville: [17]

All Minuteman sites do not have the same spacing so that the Soviets would require the ability to vary the footprint reliably and accurately if they were to have a capability to wipe out the entire Minuteman force.

Accuracy

It is important to note the nature of the estimates of accuracy since these have such a large effect on calculations of the "first strike" capability of a weapon of this kind. (See page 40.)

17 April 1969, Dr Foster: [2]

Mr. Nedzi. When you make this kind of estimate, are you given the best figure the missile is capable of, or in what range does this fall [deleted].

Dr. Foster. It is generally an average of a number of opinions.

November 1969, Mr Getler: [18]

Current accuracy of the SS-9 is estimated at about 0.5 mi CEP at the very best

Yield

The yield is believed to be estimated by measuring the size of the missile and hence its maximum carrying capacity over the range observed in tests. The estimate almost universally given for SS-9 is that it carries one 25-megaton warhead and will carry three 5-megaton warheads when it has a multiple head.

A recent study suggests that these are the upper end of the range of probabilities. [19]

... As originally deployed, the SS-9 was apparently designed to deliver only a single warhead of between 10 and 25 MT. In August 1968, however, the Soviet Union began flight tests of a multiple re-entry system for the SS-9 which is reportedly capable of delivering three separate warheads with individual yields estimated to be as high as 5 MT. ... This estimate would imply a more favourable ratio between the yield of multiple warheads and the yield of a single warhead carried by the same missile than is the case with either the *Poseidon* or *Minuteman 3* system. It may therefore be somewhat high.

Some of the SS-9 launchers may, according to Western experts, be intended to launch FOBS (fractional orbiting bombardment systems) or for anti-satellite defence.

The threat to Minuteman

Both Mr McNamara and Mr Laird have held that if the SS-9 were deployed in large numbers and possessed MIRV warheads of high accuracy and reliability, it would be a threat to the Minuteman force. Mr McNamara did not see a threat to the United States "assure destruction" capability unless the Soviet Union also deployed an effective and extensive ABM system.

23 June 1969, Mr McNamara cited by Mr Laird: [5]

Secretary McNamara's FY 1967 Posture Statement, presented to the Congress in January and February 1966, included the following:

"Perhaps the worst possible threat the Soviets could mount against our Assured Destruction capability would be the simultaneous deployment of a force of several hundred SS-9 ICBMs equipped with highly accurate MIRVs, and a reasonably sophisticated ABM system equipped with exoatmospheric area defense missile. ..."

Secretary McNamara's FY 1968 Posture Statement, presented to the Congress in January 1967, included the following:

"Although we still have no direct evidence of such an effort, the Soviets might also develop and install multiple independently-aimed reentry vehicles (MIRVs) on their SS-9s. ..."

"The most severe threat we must consider in planning our Assured Destruction forces is an extensive, effective Soviet ABM deployment combined with a deployment of a substantial hard-target kill capability in the form of highly accurate SS-11s or MIRVed SS-9s. ..."

Secretary McNamara's FY 1969 Posture Statement, presented to the Congress in January 1968, included the following:

"The SS-9, with a CEP of (deleted) n. mi. and a warhead yield of 12-25 megatons, would be suitable for use against hardened missile silos as well as against cities.

"Although we still have no evidence of such an effort, the Soviets might

develop and install multiple reentry vehicles (with or without an independent aiming capability) in their SS-9s . . .”.

“As was the case last year, the most severe threat we must consider in planning our “Assured Destruction” forces is a Soviet deployment of a substantial hard target kill capability in the form of highly accurate small ICBMs or MIRVed large ICBMs, together with an extensive effective ABM defense. A large Soviet ICBM force with a substantial hard target kill capability might be able to destroy a large number of our MINUTEMAN missiles in their silos. . . .”

Soviet missile-carrying submarines

The USSR has a variety of types of submarines; these carry missiles of different vintages. This section summarizes the published information available on numbers of different types. It comes from Western sources.

The missiles can be divided into three categories with large differences in performance between them:

1. Cruise missiles—an early type of missile with wings and air-breathing engines, capable of subsonic speeds only. Their range is put at 180 nautical miles by *Jane's* [20], at rather more by some other authorities. They can be launched only when the submarine is on the surface. The submarine and missile are both vulnerable to defences.
2. Ballistic missiles of early vintages carried in the conning tower. Their range is put at 380 nautical miles by *Jane's* and at various figures by other authorities. Most authorities say the missile can be launched when the submarine is semi-submerged or submerged, but it has been denied that there is any evidence for this and a recent statement by Mr Laird largely confirms this doubt [12, 22].
3. Ballistic missiles of new types. Their range is put at 1 200 or 1 500 nautical miles by the US authorities; recently a test firing over 3 000 miles was reported in the US press [21], but the interval between testing and deployment can be a matter of years. These two ranges are comparable to the earlier and later versions of the Polaris missile. They can be launched from below the surface.

The types of submarines can be divided into two categories, those with diesel engines and those with nuclear propulsion. Many diesel-powered (i.e., “conventional”) submarines and some nuclear-powered submarines do not carry missiles but are designed and intended for attack on shipping and other submarines. These are often called attack submarines. The term nuclear submarine is best avoided, since it is ambiguous whether it means a submarine propelled by a nuclear engine, carrying a nuclear missile or both.

The new long-range missile launched from below the surface is believed

Table 2A.2. Estimates of numbers of Soviet submarines carrying cruise missiles

	Diesel-powered submarines		Nuclear-powered submarines		Total	
	Jane's	ISS	Jane's	ISS	Jane's	ISS
1966-67	14	28	15	12	29	40
1967-68	22	24	25	20	49	44
1968-69	22	20	25	25	47	45
1969-70	22	22	30	25	52	47
Average	20	24	23	21	44	44

Source: Jane's Fighting Ships (annual volumes for 1966-1970). London: Sampson Low, Marston and Co. The Military Balance (annual volumes for 1966-1970). London: Institute for Strategic Studies.

to be carried only by a new type of nuclear-powered submarine, believed to be comparable to the Polaris submarine, and designated Y-class in the West.

Both cruise missiles and the older ballistic missiles are carried by both conventional and nuclear-powered submarines.

Estimates for recent years of the numbers of Soviet submarines carrying cruise missiles, and Soviet submarines carrying ballistic missiles other than the Y-class, are given in tables 2A.2 and 2A.3. The estimates come from two Western private sources—*Jane's Fighting Ships* and the publications of the Institute for Strategic Studies—but they must ultimately rely heavily on US material. The latest information from US official statements is noted in the text. The reliability of the estimates is uncertain: it cannot be easy to keep tabs on submarines.

Cruise-missile submarines

The estimates for submarines carrying cruise missiles as presented by *Jane's* and the Institute for Strategic Studies are shown in table 2A.2. The differences between the two sets of estimates are such that it looks as if the variation from year to year may often be due to revised opinions rather than changes in reality. The latest figures are just over 20 diesel-powered submarines and 25 or more nuclear-powered submarines, making a total of about 50. It looks as if the total is now believed to be about stable.

The diesel-powered submarines and the nuclear-powered submarines are each divided into several classes in those Western sources where details are given; and the classes are estimated to carry different numbers of missiles. The weighted average appears to be just over three missiles per submarine for diesel-powered submarines and just over seven missiles per nuclear-powered submarine. That would mean there were about 70 cruise missiles on diesel-powered submarines and about 200 cruise missiles on nuclear-powered submarines.

Table 2A.3. Estimates of numbers of Soviet submarines, other than Y-class submarines, with ballistic missiles

	Diesel-powered submarines		Nuclear-powered submarines		Total	
	Jane's	ISS	Jane's	ISS	Jane's	ISS
1966-67	40	25	13	15	53	40
1967-68	35	30	13	10	48	40
1968-69	35	30	15	13	50	43
1969-70	31	35	15	15 ^a	46	50 ^a
Average	35	30	14	13	49	43

Source: Jane's Fighting Ships (annual volumes for 1966-1970). London: Sampson Low, Marston and Co. The Military Balance (annual volumes for 1966-1970). London: Institute for Strategic Studies. The Strategic Survey 1969. London: Institute for Strategic Studies, 1970.

^a The Military Balance 1969-1970 gives the figure 18, but this appears to include an estimate of a few Y-class submarines. The Strategic Survey 1969 (page 27) implies that there are 15 submarines other than Y-class submarines.

It appears to be assumed in Western sources that these cruise missiles carry nuclear warheads, but no direct statements to that effect have been found, only statements that they could carry them.

BALLISTIC MISSILES—EARLY VINTAGES

Estimates for submarines carrying ballistic missiles are given in table 2A.3. In this case, even more clearly than with cruise missiles, the changes up and down in the figures from year to year—figures taken from successive yearly publications—appear to reflect changed opinions that invalidate the earlier figures, not new estimates that can be compared with the earlier figures. The movement over the years cited does not look significant. The latest figures and the average for all four years are 30-35 diesel-powered submarines and 13-15 nuclear-powered submarines making a total of about 45-50. Various United States private authorities come to totals in the range 45-55; they indicate no significant change up or down over these years. So the most common private Western estimate of the total number of Soviet submarines with ballistic missiles other than the Y-class is around 50, of which 15 are believed to be nuclear-powered.

All these nuclear-powered submarines and most of these diesel-powered submarines are believed to carry three missiles each; but some of the diesel-powered ones, variously estimated at between six and ten, are believed to carry two only.

There are two official statements. In the posture statement for fiscal year 1971 it is indicated that there are believed to be 45 ballistic missiles on nuclear-powered submarines other than the Y-class. [8] That fits the figure

of 15 submarines in this category. The second was in Mr Laird's speech of 20 April 1970 where he said that in 1965 the Soviet Union had about 80 SLBMs on diesel-powered submarines. He added: "Most were designed for surface launch only." And he then said that now (in 1970) they had "about 70 operational launchers on diesel submarines". [12] That implies that the number had fallen and that there are now fewer than 30 submarines in this category. This information is new and authoritative. It suggests that the private estimates for this category have been too high and that numbers in this class are diminishing.

It is generally assumed that the warheads on all missiles in this category are nuclear.

TARGETS

The United States authorities estimate the primary targets of the ballistic missiles on diesel-powered submarines to be strategic land targets in Eurasia; and the primary targets of all the submarine-launched cruise missiles to be naval and merchant vessels. This leaves only the 45 ballistic missiles on nuclear-powered submarines (other than Y-class). These are counted in the United States reckoning of "strategic" forces, i. e., of weapons that could hit the United States.

Y-class submarines

The submarine with the Western designation Y-class, which is believed to be very much like the US Polaris, is an important element in the Soviet nuclear "threat" described by the United States administration. There are a good many statements about it.

One of the main uncertainties is how many Y-class submarines are yet operational. It is a new class of boat. "After they are launched they require many months for fitting out, during all of which they are subject to observation. To have a reliable operational capability they must be shaken down and cruise in the open oceans." [17]

From the statements cited below it appears that the United States authorities think that the Y-class submarine is under construction at one large facility with a capacity for ten complete hulls at a time and possibly also at another smaller facility with a capacity for two. The estimated possible rate of production is six to eight submarines a year. The statements imply that ten to twelve is the number that simultaneously can be under construction out of the water, before launching. The implied period of production up to launching is thus about eighteen months. If, as seems likely, the yards are covered, the number under construction may be inferred rather than known

precisely. This may explain the uncertainty about the second yard. Once launched, the numbers are likely to be well known to the United States authorities, but the submarines may be in a variety of states: fitting out in the water, on trial, undergoing modifications, and so on, until they finally become fully operational. So at this stage, there is scope here for great ambiguity in the meaning of any statements made about the number of submarines.

The main statements about production capacity and numbers are given here:

15 April 1969, The Chairman (Mr L. Mendel Rivers, South Carolina): [2]

We knew about this Russian submarine. We found out all about it. And it wasn't until Clifford got in there we finally got started on the authorization on this new, faster submarine, to counter the Russian fleet, that you know so well what has happened. You knew it on the Appropriations Committee, and are now more conversant with it as the Secretary of Defense, and you know what I am talking about, with capability of putting them out on an assembly line, up in that big new yard they have up there—what is the name of that yard?

Mr. Blandford. Do you mean the Russian?

Secretary Laird. Severodvinsk.

The Chairman. That is 4 or 5 miles long at the waterfront. It is a colossal thing. They have two or three of them. I don't know how big it is, but I know it is big. They are going to turn out quality stuff.

Secretary Laird. It is quite an amazing development in the last 18 months.

On 22 May 1969, Mr Laird, in a passage cited last year,¹ states the capacity and estimated rate of production mentioned above and says: "Eight or nine Y-class submarines have already been launched and several are believed to be operational."

21 July 1969, Newsweek: [23]

The Russians now have nine "Y"-class subs, each with sixteen missiles. And although five of the subs are operable, none has yet sailed from Russian waters.

18 August 1969, Newsweek: [24]

Two Y-boats, similar to the U.S. Polaris, are undergoing shakedown cruises in the North Atlantic off Norway. The Soviets have a total of five operational Y-class submarines in their northern fleet.

9 October 1969, New York Times: [25]

... The Russians have ventured into the Norwegian Sea and the North Atlantic with some of their first six deployed Y-class submarines. Three or four others are being made ready for deployment and an undetermined number are under construction in covered construction yards.

¹ *SIPRI Yearbook 1968/69*, page 36.

20 February 1970, Mr Laird: [8]

Based on a construction rate of up to eight units per year, it is believed that there are currently several Y-class units operational. . . .

It is estimated that the total number of Soviet SLBM launchers on deployable nuclear submarines increased from 45 on 1 September 1968 to about 110 on 1 September 1969, and further increases are projected through mid-1971. All of this growth is accounted for by the deployment of the Y-class submarines. In early 1969, it was projected that the Soviets could have some 35–50 of these ships, 560–800 SLBM launchers, in 1975–1977. It is now projected that this “end strength” could be achieved in 1974–1975.

As noted earlier, the 45 launchers are on earlier classes of submarine. Y-class submarines are built to carry 16 missiles. The figure of 110 therefore implies that four Y-class submarines were estimated to be operational on 1 September 1969.

24 February 1970, Dr Foster: [11]

Last year the Soviets had six to nine Yankee (Polaris-type) submarines launched with an additional eight to 12 under construction. As of this date they have launched several more and have an additional 10 to 12 under construction.

February 1970: [10] A statistical table, titled “The Threat” is presented by Mr Packard. In it the number of “Soviet Y-class submarines with SLBMs” is given as “over 9” as of February 1970. Whereas other weapons listed in the table are designated “operational” or, in the case of the ICBM designated SS-9, “operational or under construction”, no qualification either way is made with respect to the entry for the Y-class submarines.

9 March 1970, Prepared statement by Mr Packard: [10]

Production of nuclear-powered ballistic-missile submarines is continuing at two Soviet shipyards which together can produce 6–8 boats a year. Several of these Polaris type vessels each with 16 missiles are now believed to be operational.

20 April 1970, Mr Laird: [12]

Today, the Soviets have over 200 operational launchers on nuclear submarines for submerged launch SLBMs and about 70 operational launchers on diesel submarines. In the next two years, the Soviets are expected to have some 400–500 operational launchers on POLARIS-type submarines, and at present construction rates—6–8 submarines a year—could match or exceed the number in the U.S. force by 1974–75.

Over 200 operational launchers on Y-class submarines would imply that 13 or more were operational. Allowing for the fact that 45 missiles of older classes might be included here despite the doubt whether they are “submerged launch SLBMs” (see above), that would still mean that Mr Laird

had said that the Soviet Union had over 155 operational launchers on Y-class submarines, implying that ten or more Y-class submarines were operational.

A comparison of the numbers said or implied to be in different states is shown below:

		<i>Launched</i>	<i>"Operational"—or in state indicated below</i>
<i>1969</i>			
May	Mr Laird	8 or 9	Several
July	<i>Newsweek</i>	9	5 "operable", none left Russian waters
August	<i>Newsweek</i>		5—two on shake-down cruises off Norway
1 Sept.	Posture statement for fiscal 1971	9 or 10	4
Oct.	<i>New York Times</i>	9 or 10	6 "deployed", some have ventured into Norwegian Sea and North Atlantic
<i>1970</i>			
Feb.	Dr Foster	6 to 9 and "several more"	
Feb.	Mr Packard	—"over 9"—status unspecified—	
March	Mr Packard		Several
April	Mr Laird		10 or more/13 or more
April	Mr Friedheim		1 on regular station in Atlantic

Several points emerge. The terms and definitions used change often and present problems. Mr Laird on April 20 may have called "operational" the number of submarines his colleagues from the Department of Defense called launched or left undefined; or his colleagues must have given numbers that were too low. The number that appears to have been launched, according to all these remarks, changes remarkably little from May 1969 to early 1970. This does not fit the estimated production rate of six to eight submarines a year.

An indication that few Y-class submarines are yet performing operational duties is a statement by Mr Friedheim, Deputy Assistant Secretary of Defense, on 23 April 1970 that he "would not be surprised" if the Soviet Union now maintained one of their Y-class missile-carrying submarines on regular station in the Atlantic. [26] This was three days after Mr Laird's speech in which he indicated that ten or more, or perhaps thirteen or more, were "operational".

The projections for future numbers of Y-class submarines cited above all appear to be based on estimates of shipyard capacity, which in this case may be fairly reliable: but emphasis seems to be placed on the upper limits of the rate at which that capacity could yield operational submarines.

The comparison with Polaris needs some qualification. Polaris was first deployed in 1960 and has been greatly improved since then in performance and, no doubt, reliability.² The Y-class is coming in only now and appears to be starting with missiles the range of which is comparable to those that were fitted to Polaris only up to 1964. (See page 44.)

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² See *SIPRI Yearbook 1968/69*, pages 96–111.

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2B. *World stockpiles of nuclear material*

One indication of the extent of the nuclear arms race is the size of nuclear stockpiles. Information on this subject has been closely guarded. What follows is a summary of the information that could be found from published sources. The information is scanty and subject to qualifications.

Several different indicators are used.

There are estimates of stocks of fissile material. These are available only for the United States and are derived from published information about production plants and their operations.

Although rather accurate in themselves, these figures for fissile material are of limited value. So long as there were only fission bombs, there was a relationship between the amount of fissile material in a bomb and its explosive power (measured in equivalent tons of TNT) that permitted rough conversion from one category of estimate to the other.

Once thermonuclear (hydrogen) weapons were developed in the early 1950s, there ceased to be any close relationship between fissile material and

explosive yield. In thermonuclear devices fissile material is used for the trigger. The megatonnage of the device depends on how much lithium deuteride has been included to undergo the fusion reaction, and whether any natural uranium has been added to the weapon as a "jacket" to undergo subsequent fission in a three-stage process. It thus becomes impossible to estimate the megatonnage of a nation's arsenal from evidence about its stocks of fissionable material. It is necessary to seek more direct information.

There are estimates of the number of nuclear warheads.

There are various estimates of the total megatonnage of weapons.

Fissile material

Nuclear weapons can be produced from enriched uranium or plutonium, but different sizes and yields of nuclear weapons require varying species and proportions of fissionable material.

What is certain is that countries wishing to have a range of sophisticated nuclear weapons will require both Uranium 235 and plutonium. Uranium 235 alone will probably make a fairly unsophisticated range of fission weapons and also H-bombs. Plutonium alone will probably produce a somewhat more flexible range of fission weapons. Over a long period of time, the whole array of weapons which the Americans and Russians have developed must be assumed to be available only to those who possess both Uranium 235 and plutonium. [1]

Production of weapons based on uranium as the fissionable material requires domestic or imported mineral raw materials, and separation facilities for concentrating the right isotope. Plutonium can be produced only in certain types of reactors. It too requires subsequent chemical processing. Production, processing and stockpiling of both types of fissile material may be carried out by nations not producing nuclear weapons.

Production of Uranium 235 can be estimated from the following types of information:

1. statistics of uranium feed material; tons of uranium ore procured;
2. electrical power consumption of the gaseous diffusion enrichment plants;
3. estimates of production capacity from data on capital investment;
4. annual fiscal data on plant operations.

The yearly figures should give four independent indicators of production. Using these methods, one professional observer, Professor Lapp, has been able to make estimates of US production of Uranium 235 for the period 1952-1967 which appear to be rather accurate. "When the AEC revealed recently that it could produce enough uranium each year for 10 000 Hiroshima-sized bombs, it was announcing a figure within 10 per cent of the estimates Dr Lapp had been making for years." [2]

The amount of Pu²³⁹ (plutonium) produced can be estimated from a knowledge of the number of plutonium-production reactors, their time of operation and their operating power levels. [3] It is possible to get some cross-checks on estimates of Pu²³⁹ production by two other methods. One method is to look at the plutonium-production process. As of January 1960, the USA had stored 67 million gallons of high-level wastes, the major portion of which was the result of weapons material production. It is possible to relate the amount of waste accumulated to the electrical and thermal energy output of the plutonium-producing reactor. The other method is to look at the chemical processing system. The US separation facilities at Hanford cost \$233 million and those at Savannah River \$260 million. There are figures available which relate construction costs with ton-per-day processing capacity, and formulas which make the relationship applicable to various levels of production capacity.

The estimates of US production and stocks of fissile material, arrived at by these method, are set out in table 2B.1. The stock is estimated to have reached 1 000 tons in 1966 or 1967. [34] During the 1960s, production of fissile material was cut back in order to slow down the growth of the vast stockpile. It has been estimated that in 1967 output was running at "half of full capacity and a year later it dropped to one third of maximum output". [7]

Table 2B.1. Estimates of US fissionable material

			<i>Number of tons</i>
Year	Output per year	Stockpile	Source
1945	Less than 1 ton/year (U ²³⁵)		[8]
	Pounds Pu ²³⁹		[36]
1956	70 000 kg/year		[3]
1957-59			
1960		350 tons U ²³⁵	[8]
		340-370 tons U ²³⁵	[3]
		40-50 tons Pu ²³⁹	[3]
1963	U ²³⁵ 50 000 kg/year		[10]
	Pu ²³⁹ 5 400 kg/year		[27]
1964		500 tons	
1966		1000 tons U ²³⁵	[34]
1967		1000 tons	[7,8]

Number of warheads

The figures for numbers of warheads are more numerous and more varied in definition and status.

It is important, to begin with, to recognize the variety of weapons for

which nuclear warheads have been fabricated. Reference has been found to nuclear weapons in the following categories for the United States.

1. ICBMs
2. MRBMs and IRBMs
3. free-fall bombs
4. air-to-surface standoff missiles
5. air-breathing cruise missiles
6. surface-to-air missiles
7. air-to-ground missiles
8. air-to-air missiles
9. army and naval artillery
10. depth charges
11. torpedoes and rocket torpedoes
12. ocean mines
13. atomic demolition devices or land mines

In a few years, the United States, on present plans, will also have anti-ballistic missiles with nuclear warheads. The Soviet Union is also believed to possess a wide range of nuclear weapons. The size of warheads varies very widely. Artillery shells may have an explosive charge of 2 kilotons or so. [4] The largest warheads appear to be around 25 megatons—1 250 times larger. [3–8] These have been deployed in US bombers, though there is some evidence that they have been, or are being, replaced by smaller warheads. [9] It is also estimated in the West that the large Soviet ICBM with the Western designation SS-9 could carry a warhead of this size, though it is unknown whether it does so. Generally speaking, the trend is to more and smaller warheads, as accuracies have increased and the possibility of multiple warheads has been developed. This is now the way to maximize damage.

The United States stock of warheads has often been estimated by dividing the estimates of the stock of fissile material by estimates of the amount required to make a 20-kiloton fission bomb. This procedure may not be too bad for estimating numbers of warheads (as opposed to megatonnage), though even then the estimate must be regarded as being in terms of “nominal” warheads rather than the actual mix of warheads in stock. On this basis different experts have estimated that the number of US warheads was variously 100 000 [2, 10], 150 000 and 200 000 [8, 11], in the late 1960s. Disagreement to this extent is not surprising. The figures available in the literature for the amount of fissile material required for a 20-kiloton weapon vary. Conversion factors in the literature for an approximately 20-kiloton device are:

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1.	5–10 kg	U ²³⁵				[12]
2.	25 kg	U ²³⁵	or	8 kg	Pu ²³⁹	[13]
3.	25 kg	U ²³⁵	or	7 kg	Pu ²³⁹	[13]
4.	16 kg	U ²³⁵	or	6 kg	Pu ²³⁹	[14]
5.				Minimum of 7 kg	Pu ²³⁹	[15]
6.				“10 pounds or so” of	Pu ²³⁹	[7]
7.	10–30 kg	U ²³⁵				[16]

Professor York states: “We may estimate that the United States had some hundreds of bombs by about 1950” and quotes a megatonnage estimate for these at 10 mt. [35] By 1953 Blackett states that the “American stockpile now amounts at least to a few thousand atomic bombs”. [17]

Indications of the number of real warheads were given in various official statements in the United States in the early 1960s. Mr. Gilpatric, Assistant Secretary of Defense, stated that:

The total number of our nuclear delivery vehicles, tactical as well as strategic, is in the tens of thousands, and of course we have more than one warhead for each vehicle. [17]

The Arms Control and Disarmament Agency put the total number of American warheads at 40 000 in 1962 . . . [18]

Mr McNamara referred to “tens of thousands of nuclear explosives for tactical use”. [19] Since the tonnage of fissile material appears to have increased two- or three-fold since that time, there seems nothing implausible in the idea that the number of United States warheads may be of the order of 100 000.

At various dates there have been statements about how many warheads were in the “alert force”: 850 in 1961 [20]; a 100 per cent increase in three years ending some time around 1964 [21]; 2 200 and 2 600 [22, 20] in 1967. Exactly which weapon systems comprise the “alert force” and how this group is defined are not clear.

There have also been statements about the number of US warheads in Europe—several thousand in 1963 [23], 7 000 and 7 200 in 1968. [24, 25]

The only estimates available for the Soviet Union come from Western sources. These are often made by stating that the Soviet stock of warheads is believed to be a certain per cent of the United States stock. The percentages given in the different sources are inconsistent with one another: 3 per cent in 1953 [26], 10 to 20 per cent in the early 1960s [27, 28], as high as 60 per cent in 1961 [29], and back to less than 10 per cent in 1966. [4] The available estimates of absolute numbers are 100 to 300 warheads in 1953 [26], 5 000–10 000 in 1964 [27], 5 000–10 000 in 1966. [4]

In 1963 Senate testimony, Senator Stuart Symington quoted an article in the journal *US News & World Report* of August 12, 1963 which stated that the US

had 50 000 weapons and the Soviet Union 5 000 and which gave as its source of information an unnamed government department. [28]

Little is known about other countries. In 1964 it was estimated that Britain had “perhaps 1 500” warheads. [8] No estimate of warhead numbers is available for France, but judging from the number of delivery vehicles the figure may run into the hundreds. It is estimated in this year’s US posture statement that in China “the amount of U 235 now estimated to be available for stockpiling would be sufficient for only a few dozen weapons of any type”. [30]

Megatonnage

Estimates of total megatonnage are few and need to be interpreted with care.

In March 1960 Senator (later President) J. F. Kennedy stated that the world’s nuclear stockpiles amounted to about 10 tons of TNT for every person on the globe. [8] This means a total of about 30 000 megatons. York states that the sixth Pugwash meeting in 1960 used 60 000 megatons as a working assumption, and that “we are therefore safe in assuming that the United States possessed at the beginning of the sixties a strategic weapon stockpile containing 20 000 to 40 000 megatons of explosives”. [35]

Professor Pauling estimated the total megatonnage in the possession of the Soviet Union and United States at 250 000 megatons in 1962 and 320 000 megatons in 1968 [31], but he appears to have arrived at his figures by assuming that most or all of the fissile material would be made up into thermonuclear weapons of high yield. His figures thus appear to indicate what might theoretically be produced rather than what was produced. Senator Kennedy’s figure and Professor Pauling’s figure are estimates of the megatonnage of all warheads, including those for reloads, reserves, surpluses and so on. If the total stands at 50 000 megatons, which seems a reasonable guess, it would represent about 15 tons of TNT per person on the globe, or—and this is more meaningful—about 60 tons per person in the NATO and Warsaw Pact nations taken together. [32] Such an “overkill” is so fantastic that whether the true figure is twice or half as high seems to matter little.

There have been various statements about what megatonnage could be delivered in a single attack by the forces of different nuclear powers. For the United States an estimate in 1961 was that the Strategic and Tactical Air Commands could lift 18 000–20 000 megatons against the Soviet Union in 24 hours. [29] Other estimates, both higher and lower than this, were made in the United States in the early 1960s; but it is not always clear what

they mean. Some refer to “alert forces” only, a term which may not have a constant meaning over time, as weapons systems change. Others refer to the total number of warheads in delivery systems whether “on alert” or not, but it is not always clear whether in fact all delivery systems are included. Some delivery systems, “tactical” or otherwise, usually seem to be excluded. The high figures for the United States in the early 1960s are dominated by the heavy bombers. Each B-52 appears to have carried 40 [4–8] megatons or more (and may have carried up to 100 megatons if all four weapons were of high yield.) [33] In the early 1960s the United States adopted the policy of replacing these high-yield bombs with the smaller ones then becoming available; but it is not known to what extent the total megatonnage carried by these bombers has been reduced. In 1970 York states: “Even in 1970 the great bulk of the total megatonnage in our nuclear stockpile is still programmed for delivery by aircraft . . . The largest part of our strategic stockpile . . . is still programmed to be delivered by . . . B-52.” [35] In missiles, the trend now is to smaller multiple warheads. (See page 379.)

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2C. Nuclear weapon testing programmes

For a complete discussion and background material on the nuclear-weapon testing programmes of the five nuclear powers, see the *SIPRI Yearbook 1968/69*, pages 241–258. The tables and chart in this section bring that information up-to-date, to the first of July 1970. During 1969 three of these countries—the USA, USSR and China—conducted nuclear tests. Since the beginning of 1970, the USA, USSR and France have conducted tests: three more French tests were expected in August.

The information on nuclear-weapon testing programmes is presented in the light of the text of the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Moscow Treaty). The two preambular paragraphs to the treaty read:

Proclaiming as their principal aim the speediest possible achievement of an agreement on general and complete disarmament under strict international control in accordance with the objectives of the United Nations which would put an end to the armaments race and eliminate the incentive to the production and testing of all kinds of weapons, including nuclear weapons.

Seeking to achieve the discontinuance of all test explosions of nuclear weapons for all time, determined to continue negotiations to this end, and desiring to put an end to the contamination of mans' environment by radioactive substances.

Table 2C.1 lists reported nuclear-test explosions from 1945 through the first half of 1970. In the last eighteen months the USA has conducted an extensive series of weapons tests: 27 in 1969, and 21 in the first half of 1970 only. So the annual rate of testing has risen sharply this year (chart 2C.1). The USA also conducted two Plowshare tests and one test-detection test in these eighteen months.

Of these 51 tests,¹ 9–10 were reported as venting: these are listed in table 2C.2. On 14 August 1969, the AEC announced that a test had vented, and then retracted its announcement.

The AEC reports 12 tests conducted by the Soviet Union in 1969, and two additional tests in the first half of 1970. However, SIPRI's collection of press cuttings shows a total of 14. These cuttings are mostly from Japanese sources, which, in turn, often cite the Swedish seismic detection center at Uppsala as their source. The total figure for Soviet tests is given as 16, therefore, for the period covered. This included 14 tests in 1969, and the two additional tests reported by the AEC in 1970.

¹ These are the figures reported by the AEC. FOA (the Swedish Institute for National Defence) figures were not available for this time period. However, in the past the series given by the two sources for the United States have not differed greatly.

China conducted two nuclear explosions in 1969, including its first underground test. France, which had postponed its 1969 test series, conducted tests again in 1970: five have been held thus far, and an additional three were expected in August. All these tests were in the atmosphere.

The figures for 1969 and the first half of 1970 do not alter—indeed they slightly strengthen—the conclusion reached last year: that the annual rate of weapons testing in the world has been higher since the Moscow Treaty than it was before the Treaty. The Post-Test-Ban-Treaty yearly world average is 48 tests per year, as against 40 per year before the Treaty.

Table 2C.3 lists the reported nuclear test explosions by environment. In 1969 and the first half of 1970, six nuclear tests (one Chinese test and five French tests) were conducted in the atmosphere, and 67 tests (the US and Soviet tests, and one Chinese test) were conducted underground. No tests were conducted underwater.

Sources of the tables

1. Appendix B: Announced nuclear detonations. *In* *Effects of nuclear weapons*. rev. ed. Washington: US Atomic Energy Commission in cooperation with the US Department of Defense, 1962.
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8. SIPRI press cuttings.

Table 2C.1. Reported nuclear test explosions, 1945-3 July 1970.

Number

	USA										Total, all nations ^e
	AEC ^f										
	Test de- tection	Plow- share	Safety ^b	Weapon	Total	FOA ^c	USSR ^d			France		China
						AEC ^f	FOA ^c	UK			
Pre-PTBT^a											
1945				1	1	1					1
1946				2	2	2					2
1947				—	—	—					—
1948				3	3	3					3
1949				—	—	—	1	1			1
1950				—	—	—	—	—			—
1951				16	16	16	2	2			18
1952				10	10	10	—	—	1		11
1953				11	11	11	2	2	2		15
1954				6	6	6	1	2	—		8
1955				15	15	15	4	4	—		19
1956			1	13	14	14	7	8	6		28
1957			4	24	28	28	13	13	7		48
1958			14	52	66	66	25	27	5		98
Pre-1959								30 ^f			30
1959				—	—	—	—	—	—		—
1960				—	—	—	—	—	—	3	3
1961		1		8	9	9	31	32	—	1	42
1962		3		86	89	88	40	42	2	2	135
1963 (pre-10 Oct.)		1		16	17	17	—	—	—	1	18
15 Sept. 1961- 20 Aug. 1963					23	23 ^g					23
Total pre-PTBT	5	19		263	310	309	126	163	23	7	503
<i>Annual rate of testing, pre-PTBT: 1951-1963</i>					24.4			12.8			39.6
Post-PTBT											
1963 (post- 10 Oct.)	1	1		7	9	8	—	—	—	1	10
1964	1	6		21	29	28	3	6	1	—	37
1965	1	1		24	27	27	4	9	1	2	40
1966	1	4		35	40	40	7	12	—	5	60
1967	—	3		25	28	28	4	13	—	3	46
1968	1	8 ^h		28	37	37	6	9	—	5	52
1969		1		27	28	—	12 ^j	—	—	0	44 ^k
1 Jan.-3 July 1970	1	1		21	23	—	2	—	—	5	30
Total, post- PTBT	6	25		188	221		38	64^m	2	21	319
<i>Annual rate of testing, post-PTBT: 1963- 3 July 1970</i>					33.5			9.7			48.2
Total, all tests	6	30	19	451	531		164	227	25	28	822

Source: See page 385.

^a Partial Test Ban Treaty (10 October 1963). ^b These are experiments to determine the safety of nuclear weapons in case of accident. ^c Swedish Research Institute for National Defence (Försvarets Forskningsanstalt). ^d No official information is available for the Soviet Union. ^e When two sources give different figures, the higher of the two is taken. ^f These tests are reported by FOA as additional tests which took place at unspecified dates before 1959. ^g These tests are reported by the AEC as having taken place between 15 September 1961 and 20 August 1963. ^h Including 5 devices separately used in the same test (Project Buggy), counted here as 5. ⁱ Atomic Energy Commission. ^j Although the AEC reports 12 tests for the USSR, the SIPRI press cuttings—largely Japanese sources—report a total of 14. ^k A total of 14 tests has been included for the USSR. ^l FOA figures were not available for 1969 and the first half of 1970. The total 64 includes the earlier FOA figures, the SIPRI figure of 14 for 1969, and the AEC figure of two for the first half of 1970.

Table 2C.2. US underground nuclear tests reported as venting, 1969–July 1970

1. 30 April 1969
2. 14 August 1969 (AEC announced venting, then retracted its announcement)
3. 27 August 1969
4. 15 September 1969
5. 29 October 1969
6. 21 April 1970
7. } 1 May 1970 (2 tests)
8. }
9. 21 May 1970
10. 26 May 1970

Source: See page 385.

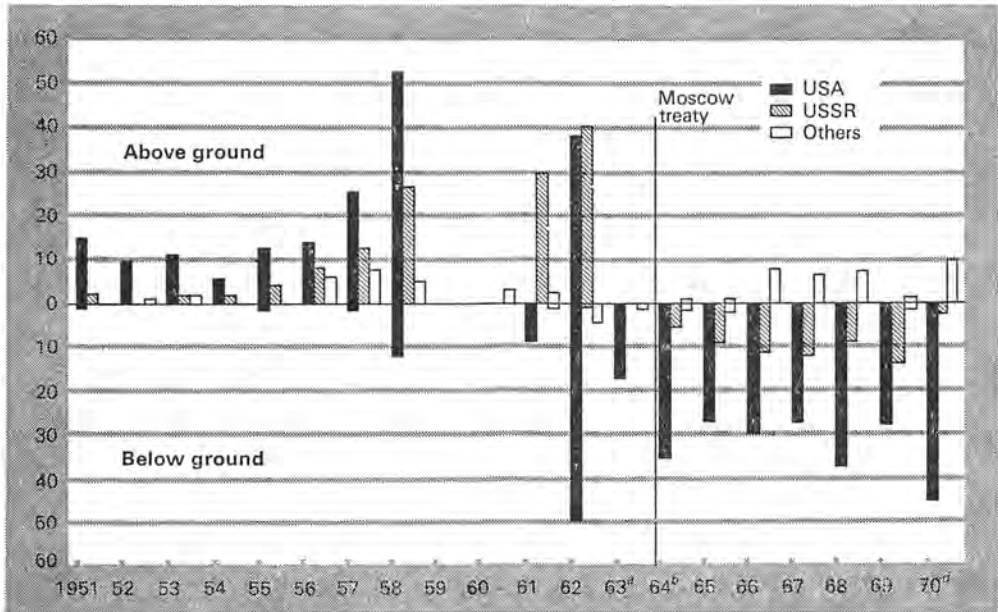
Table 2C.3. Reported nuclear test explosions, 1945–3 July 1970, by environment

	Air	Underwater	Underground	Total
USA	193	5	333	531
USSR	161	1	67	229
UK	21	0	4	25
France	19	0	9	28
China	9	0	1	10
Total	403	6	414	823

Source: See page 385.

Chart 2C.1. Nuclear weapons tests, 1951–3 July 1970^c

Nuclear weapon testing



Source: Table 1.

^a 1 January 1963 to 10 October 1963.

^b 10 October 1963 to 31 December 1964.

^c The tests shown as being below ground include some 6 underwater tests: see table 2C.3.

^d These are tests conducted from 1 Jan. to 3 July 1970, at an annual rate.

2D. Past proposals for disarmament or arms regulation in Europe

Introduction

There have been a very large number of proposals for disarmament and arms regulation in Europe in the last twenty-five years. They are not easy to disentangle, partly because some of them have been part and parcel of world-wide schemes—but more importantly, because over most of the period they were inextricably linked with the question of Germany. The accounts which follow concentrate on the actual proposals themselves: but of course something has to be said about the successive changes of view about the German problem in order to make the sequence comprehensible.

The proposals are grouped under three heads: proposals for disengagement (and withdrawal) of the four big powers from certain parts of Europe; proposals for the denuclearization of Europe; and proposals for inspection against surprise attack.

Disengagement (and withdrawal) of the great powers from certain parts of Europe

Introduction

The issue of disengagement has a long history. Originally it was entirely linked to the German problem. The exchange of views between the allies during the war (Moscow, Teheran, Yalta) and immediately after it had ended (Potsdam) confirmed that both sides were agreed that they needed to provide for the complete disarmament and demilitarization of Germany and establish a neutral zone in that part of Europe.

However, the Eastern and Western allies failed to reach an agreement in the early post-war years. The policy of disarmament and demilitarization of Germany was gradually abandoned, particularly in the West. The emphasis was now put on measures which would provide for the disengagement of Western and Soviet troops from mutual contact and for the creation between them of a militarily neutral and politically independent area. At first the new concept of disengagement was restricted to an area covering only Germany; later it was extended to include the territory of a number of other Central European states too. However, there were considerable differences in the approach of the two sides. While the Soviet Union based its plans on the presumption that the disengagement of the big powers would be accompanied by the neutralization of a reunified Germany, the Western countries

considered that a reunified Germany should be allowed to exercise the right to self-defence and associate itself with military alliances. They were fairly sure that this would mean association with the Western bloc. The Soviet Government waged an intensive campaign throughout 1952–1955 to keep West Germany from joining NATO by offering German reunification on the basis of free elections, provided the reunified country would hold aloof from military alliances; this was to be followed by the disengagement of the big powers from Germany and the states adjacent to it. The official Western approach was diametrically opposite. Of several conceivable solutions to the problem of disengagement, the only possibility which the West, including the authorities in Bonn, were in fact prepared to consider was Soviet withdrawal from Eastern Germany; a later stage of negotiations also included the setting-up of a demilitarized zone between East and West with its centre on the German-Polish border, concurrent with the absorption of East Germany into Western Europe. This was the essence of almost all proposals put forward by Western statesmen at various conferences during this period, and it was also the firm position of Chancellor Adenauer.

After the German states joined the respective military alliances—West Germany joined NATO in 1955 and East Germany the Warsaw Treaty in 1956—the concept of disengagement changed again. The issue of disengagement was gradually separated from discussions about the solution of the German problem, and was treated rather as a separate item of arms regulation and disarmament. Apart from various unofficial Western proposals and those advocated by independent thinkers, this new concept of disengagement was pursued most actively by the Soviet Union. The West still tended from time to time to link it with the German question again.

The proposals put forward during this period dealt with various aspects of disengagement: they can be divided into three groups. The first group dealt with the limitation or reduction of foreign forces and armaments in the territory of Germany and the neighbouring countries and in the territory of member countries of NATO and the Warsaw Treaty. The second group was aimed at creating a zone of limitation and inspection of forces and armaments between East and West. Finally, the third group of proposals advocated the withdrawal of foreign forces, at first from Germany and the countries adjacent to it and later from all European countries. No progress has been made so far in any of these fields.

The account in this section goes up to 1968. The more recent history is given in the section on European security on page 64. Roles to some extent have been reversed: the Western powers have been proposing balanced and mutual force reductions, and the Warsaw Treaty powers have been responding somewhat tardily.

Disarmament and demilitarization of Germany

The first full proposal for dealing with the German problem was presented in 1946. It was a draft treaty for the disarmament and demilitarization of Germany, prepared by US Secretary of State Byrnes, and submitted to the Paris meeting of the Council of Foreign Ministers on 29 April 1946. [3] Article I set out the disarmament and demilitarization provisions; article II dealt with a system of inspection. It provided that inspection should be conducted through a Commission of Control, to be established on a quadripartite basis. The Commission would become operative when the allied occupation of Germany ended. The treaty was to remain in force for twenty-five years.

The Soviet Union agreed in principle with the basic provisions, but considered that the draft did not go far enough in meeting all recommendations and decisions taken by the allies during the war; in addition to disarmament and demilitarization of Germany, they requested liquidation of the war potential and de-nazification. A Soviet draft treaty on the demilitarization of Germany, put forward on 14 April 1947 at the Moscow meeting of the Council of Foreign Ministers, clearly reflected these differences in approach. [3] This draft reiterated the view that German war potential should be destroyed. Furthermore, the draft provided for the four-power joint control of the Ruhr industrial region, "since it is the main base of the production of German armaments and the main industrial bulwark of German militarism". The treaty was to be operational for forty years.

The Soviet proposal was rejected. Basically the Western countries were afraid that any concession to the Soviet Union might extend its sphere of influence further to the West: hence their refusal to accept the four-power control of the Ruhr. More generally, since the German question was one of the main items on the agenda between the allies, progress towards its solution was unavoidably dependent on the general state of relations between them. As these relations worsened, the prospects for an agreement on Germany began to diminish.

Withdrawal of the occupying forces

However, the negotiations on the disarmament and demilitarization of Germany were not completely abandoned. A new element was introduced in mid-1948. A few days before the beginning of the Berlin blockade, a conference of Foreign Ministers of the East European countries took place in Warsaw. The communiqué of the conference, issued on 24 June, proposed that a four-power conference be called to discuss, amongst other things, "the conclusion of a peace treaty with Germany so that the occupying

troops of all the Powers should be withdrawn from Germany within one year after the conclusion of the peace treaty." [15] This was the first time that either side suggested so explicitly a mutual withdrawal of troops. There were also indications that the Soviet Union was willing to consider a withdrawal of some of its troops stationed in Eastern Europe if a reunified Germany was disarmed and demilitarized. However, the West "ignored this overture partly because the defection of Yugoslavia suggested that further weaknesses might develop within the Soviet system" which would eliminate any need for making concessions to the Soviet Union, and partly because "withdrawal of Soviet troops meant withdrawal only to the river Oder, forty miles from Berlin. Withdrawal of American troops probably meant withdrawal across the Atlantic". [2] In view of the Soviet Union's alleged conventional military superiority, this possibility was firmly ruled out.

Two years later, in October 1950, following another meeting of Foreign Ministers of the East European countries, the Soviet Union made the same offer. The proposal was again ignored. By that time NATO had been set up (4 April 1949) and the policy of "containment of communism" had become the principal theme of US foreign policy. The division of Germany, as a part of and a consequence of the division of the world into two hostile blocs, had been accepted as a reality. Only one question remained to be settled, in the Western view: West Germany's participation in the joint defence system of the West.

Disengagement of the big powers from Germany

Against this background the original idea of the disarmament and demilitarization of Germany was replaced by the idea of the disengagement of the big powers from Germany. The Soviet Union was first to embark officially on this policy. An outline of a peace treaty submitted to the three Western powers on 10 March 1952 contained several important provisions about disengagement. [3] The outline suggested that all armed forces of the occupying powers should be withdrawn from the German territory and all foreign military bases liquidated not later than one year subsequent to the entry into force of the peace treaty. Germany would also pledge itself not to enter any coalitions or military alliances directed against any power which took part in the war against Germany. This provision was clearly aimed at preventing Germany's integration into the NATO defence system. In return for German neutrality, the main goal of all subsequent Soviet efforts, the Soviet Union was ready to make substantial concessions to the West. It was willing to agree to the establishment of a reunified Germany, democratic in the Western sense (multilateral party system), which would practically mean

the liquidation of the East German system. Nor did the outline request complete demilitarization of Germany. It would be allowed to have national land, air and sea forces essential to the defence of the country, as well as to produce war material and equipment necessary for arming these forces.

The Soviet offer was rejected by the Western powers; this was due to US pressure.

Unfortunately, the United States embarked on a rigid policy of rearming Germany, which neither France nor Britain nor the great majority of Germans wanted at that time. This decision was based upon a wrong assessment of the Soviet military threat in Europe, which in fact never seriously existed: after all, if Russia wanted to invade Europe she could have easily done so before NATO came into being or even when NATO was being formed and the French contingents were melting away to Indo-China. The Soviet Union was deterred from an aggression—if it had ever seriously contemplated it—not merely by the A-bomb but by fear of a mass uprising in Eastern Europe, which was a more serious danger to Russia than a few German divisions in West Germany. [15]

There was no further change in the situation until after the death of Stalin in March 1953, and after the events in East Germany in June of that year. The conciliatory attitude adopted by the new Soviet leaders towards the West led it to reconsider its approach. British Prime Minister Churchill, in a speech to Parliament on 11 March, acknowledged the changes in the Soviet Union and proposed a European settlement based upon the principles of the 1925 Locarno Pact. He also suggested the convening of a four-power conference to discuss all the differences between the Soviet Union and the West. This conference took place in Berlin in January–February 1954.

During the conference, attended by the Foreign Ministers of the four big powers, the German question was discussed at length. Both sides put forward several plans for the general solution of the problem. Certain provisions of those plans were devoted to disengagement. On 1 February 1954, the Soviet Union re-introduced its draft treaty of peace with Germany, which had originally been submitted on 10 March 1952. [3] In addition, Soviet Foreign Minister Molotov submitted on 10 February another draft document [14] which was designed only to provide an interim status for Germany pending its reunification and the conclusion of a peace treaty. Unlike the previous plans, either Soviet or Western, this draft dealt only with the disengagement of the occupying forces. It suggested the simultaneous withdrawal, within six months, of all troops from the territory of East and West Germany, with the exception of limited contingents necessary for protective functions connected with the control responsibilities of the four powers. In addition, for the maintenance of internal order and frontier defence, both German states would have police units. In order to ensure compliance with the agree-

ment, inspection teams composed of representatives of the four powers should be formed.

The Soviet Union also proposed the conclusion between European states of a treaty on collective security (European Security Treaty) which would provide adequate guarantees against aggression and violation of peace in Europe. [14] The aim of the proposal was twofold: to ensure the neutralization of Germany, and to hamper "the formation of groupings of some European States directed against other European States". In other words it was a continued effort by the Soviet Union to prevent West German integration into NATO and against NATO itself. However, Western policy at the time aimed not only to include West Germany in the Western defence system but also to ensure that a reunited Germany would be free to enter an alliance sponsored by the West. British Foreign Minister Eden, presenting his government's memorandum for German reunification, clearly stressed this intention. [14] He stated that "it must be free to associate with other nations for peaceful purposes". Under the circumstances there was no doubt that this would mean association with the West.

The conference was unsuccessful. In the following months both sides continued to advance their positions. The Soviet Union on numerous occasions reconfirmed its willingness to compromise with the West, provided Germany would not become part of a Western military bloc. In the West, on the other hand, the expansion of the system of military alliances was speeded up. On 23 October 1954 the old Brussels Treaty Organization was supplemented by the Paris Protocol; it was modified and completed bearing a new name—the Western European Union (WEU). In addition to the old member countries, West Germany and Italy were admitted, and became members of NATO. This development was viewed with great concern by the Soviet Union. Addressing the Supreme Soviet on 8 February 1955, the Soviet Foreign Minister, Molotov, declared that the ratification of the Paris agreements by the Bundestag would make German reunification impossible for a long time to come, and he announced that the Soviet Union would consequently take necessary counter-measures. Following this announcement, a military alliance between the Soviet Union and the countries of Eastern Europe was signed in Warsaw on 14 May 1955. East Germany joined the treaty in January 1956.

Disengagement of the big powers from other countries in Europe

The German question and hence the issue of disengagement were raised again in July 1955 at the Geneva Conference of Heads of Government. At this point the concept of disengagement evolved further. The proposals put forward by both sides referred to the disengagement of the big powers not only

from Germany but from some other European countries as well. They also dealt with the limitation of armed forces and armaments and the establishment of a demilitarized area between East and West. However, the whole concept was still linked to the solution of the German problem; in this respect the position of the Western powers remained unchanged. US President Eisenhower, in the opening speech of 18 July, emphasized this when he said that "a united Germany is entitled at its choice to exercise its inherent right of collective self-defence". [3]

The most important Western proposals for disengagement were put forward on 18 July by the British Prime Minister, Eden. [4] To try to allay the fears which the Soviet Union might feel if Germany were reunified, on the basis of the Western plan, Eden suggested three measures: first, the conclusion of a mutual security pact. A reunified Germany might be a party to the pact as well. Each country would declare itself ready to go to the assistance of the victim of aggression who ever it might be. Second was the conclusion of an agreement about the total forces and armaments on each side in Germany and the countries neighbouring Germany, subject to reciprocal control to supervise the arrangements effectively. A united Germany should also be a party to this undertaking. The third measure was the setting-up of a demilitarized area between East and West.

This was the first time that a Western proposal dealing with the German question also included some arms-regulation provisions; it was intended "to make a practical experiment in the operative control of armaments . . . [which] . . . if locally successful in Europe, might as it were, extend outwards from the center to the periphery".[4] However, in the subsequent negotiations this aspect was somehow abandoned by the Western countries, although the Soviet Union expressed a lively interest in pursuing the matter.

Soviet Premier Bulganin, in the opening speech of 18 July, also dealt extensively with the problem of disengagement. His proposals corresponded in substance to the draft European Security Treaty laid before the Berlin Conference on 10 February 1954, now supplemented with provisions for the large-scale disengagement of the big powers. [4] The process of establishing a system of collective security in Europe could be divided into two stages. In the first stage, the member countries of NATO and the Warsaw Treaty would retain their membership in these alliances, "but they would be in duty bound not to employ armed force and to settle any disputes that might arise between them by peaceful means". In this stage both sides, pending the conclusion of an agreement on the withdrawal of foreign troops from the territories of European countries, could pledge not to take any further steps to increase their armed forces on the territories of other European states under treaties and agreements concluded by them previously. In the second

stage the treaty commitments connected with the setting-up of a system of collective security in Europe would be fully assumed. Simultaneously the NATO, Western European Union and the Warsaw Treaty would become inoperative and replaced by a general European system of collective security. In addition to the "freeze" of foreign armed forces and gradual abolition of military alliances in Europe, Bulganin also dealt with the withdrawal of foreign troops. Up to then the Soviet Union had referred to the withdrawal of foreign troops from Germany alone. Now, however, Bulganin spoke for the first time about the withdrawal of foreign troops "from the territory of the European countries and the restoration in this respect of the situation existing before the Second World War". This implied the withdrawal of Soviet troops from the East European countries, but also the complete withdrawal of US troops from Europe, since they had not been stationed there before the war.

The Heads of Government ended their conference on 23 July by adopting the "Directive of the Heads of Government of the Four Powers to the Foreign Ministers", instructing them to continue discussions. [4] Under the heading "European security and Germany" the directive suggested consideration of the following topics: (a) a security pact for Europe or for a part of Europe, (b) limitation, control and inspection in regard to armed forces and armament, and (c) establishment between East and West of a zone in which the disposition of armed forces will be subject to mutual agreement.

In the discharge of their mandate, the four Foreign Ministers met in Geneva from 27 October to 16 November 1955. The problem of disengagement, particularly the limitation, control, and inspection of armed forces and armaments, was one of the main issues discussed. Both sides made specific suggestions. The Western proposal of 27 October [4] advocated balanced limitation of forces and armaments in a zone comprising areas of comparable size and depth and importance on both sides of the demarcation line between a reunified Germany and the Eastern European countries. It also envisaged the possibility for special measures about the disposition of military forces and installations in parts of the zone which lie closest to the demarcation line. The parties would provide information on an agreed progressive basis on their armed forces in the zone, to be accompanied by an agreement on progressive procedures of mutual inspection to verify such data and warn about preparations for surprise attack. The Soviet proposal of 31 October [4] favoured the establishment of a zone of limitation and inspection of forces and armaments which would include the territory of the German Federal Republic, the German Democratic Republic, and states bordering on them, or at least certain of these. The agreement would set maximum levels for

the number of troops of the USA, USSR, UK and France stationed within the territory of other states in the zone. The proposal also envisaged joint inspections to supervise the fulfilment of obligations on the limitation of armed forces and armaments.

Although it seemed that the two proposals had much in common, in fact they differed considerably. First, the Western draft spoke of a zone "along both sides of the demarcation line between a reunified Germany and the Eastern European countries". This implied that the demarcation line between East and West would be moved further to the East, and that a reunified Germany would become part of the Western bloc. However, the Soviet Union proceeded, in drafting its proposal, from the premise that a zone of limitation and inspection of forces and armaments between East and West should extend outwards from the demarcation line which "correspond(s) to what everybody knows to be the actual state of affairs", that is, from the line dividing East and West Germany. The Soviet Union insisted on the inclusion in the zone of both German states on equal terms. Second, the Western proposal for limitation of forces and armaments was put forward within an outline of a treaty on the reunification of Germany. The treaty would be carried out by stages and its "final stage would become effective when a reunified Germany decides to enter NATO and the Western European Union".

[4] In other words the establishment of a zone of limitation of forces and armaments was expressly made dependent on the reunification of Germany and its inclusion in the Western bloc. The Soviet proposal for limitation of forces and armaments was advanced in connection with a treaty on security in Europe, which did not seek to provide a solution to the German problem. The establishment of a zone of limitation of forces and armaments was not conditional on the reunification of Germany, but was a separate measure which might "facilitate the possibility of solving the problem of disarmament, since the example of a given region in Europe would indicate the possibility of applying such disarmament measures as would in the future be carried out on a wider scale". [4] The Soviet Union dealt with the German problem in a separate set of proposals, which, unlike the Western drafts, insisted on the neutralization of a reunified Germany.

The conference failed to establish any common ground between the two sides. Nevertheless the negotiations were not completely abandoned; they were resumed at the beginning of 1956, but under changed political and military circumstances. By that time both West Germany and East Germany had been effectively incorporated into the two respective blocs. Consequently, the question of disengagement emerged as an independent item on the agenda of discussions between the big powers. It was true that Western countries continued to link the question of disengagement with

the question of progress in solving the German problem. Nevertheless, after 1956 there was a fairly clear distinction between efforts to solve the German problem and efforts in the form of disengagement plans which were intended to facilitate progress in the field of arms regulation and disarmament.

Disengagement of the big powers from certain parts of Europe—an arms regulation and disarmament measure

The change in approach towards the problem of disengagement could be seen in the Soviet Union's new proposals. A Soviet draft agreement on the reduction of conventional armaments and armed forces, introduced on 27 March 1956 in the Disarmament Sub-Committee of the UN Disarmament Commission by Foreign Minister Gromyko, included for the first time provisions dealing with the disengagement of the big powers which were not linked to the German problem, but were considered desirable "as an important step towards solving the problem of disarmament". The draft elaborated the proposal of 31 October 1955 for creation of a zone for limitation and inspection of forces and armaments comprising the territory of both parts of Germany and of states adjacent to them. In the new version the Soviet Union suggested that a treaty establishing the zone should provide for: (a) ceilings to the forces of the USA, USSR, UK and France stationed in the territory of other states in the zone, (b) prohibition of the stationing of atomic and hydrogen weapons of any kind in the zone (a new element), and (c) joint international inspection of the armed forces and armaments of the states parties to the treaty stationed in the zone. In addition, pending conclusion of such an agreement, the Soviet Union invited the four powers which had forces in German territory to reduce those forces to a figure to be determined by each of them at its own discretion. [4, 22]

Although the West did not respond to the Soviet proposal, it was also reconsidering its approach to the problem of disengagement. The British delegate to the UN Disarmament Sub-Committee, Nutting, clearly confirmed this. In Parliament on 7 May 1956, answering a question as to whether one had to accept the fact that the reunification of Germany was so vitally important that it was obstructing disarmament which would be of great benefit to other countries, he stated that the Western powers were prepared to take certain steps towards partial disarmament, prior to the settlement of either the German or some other open questions. However, at no time did the West take the initiative. The Soviet Union again made an overture to the West. In a declaration on questions of disarmament and reduction of international tension, transmitted by Premier Bulganin with his letter of 17 November to President Eisenhower, the Soviet Government made several suggestions relating to arms

regulation and disarmament in Europe. [4, 22] Concerning disengagement the letter proposed: (a) reduction during 1957 by one-third of the armed forces of the USA, USSR, UK and France stationed on the territory of Germany, with establishment of appropriate control for this reduction, and (b) a significant reduction during 1957 of the armed forces stationed in the NATO and Warsaw Treaty area.

The timing of the proposal was particularly significant. It followed an announcement by the Soviet Government on 6 June of the decision to make a further large cut in its armed forces, amounting to 1 200 000 troops, in addition to the 1955 cut of 640 000. This measure included demobilization of three air divisions and other combat units numbering over 30 000 men stationed on the territory of the German Democratic Republic. [4, 22]

However, the Soviet offer coincided with the Hungarian crisis, which provoked strong reactions in the West, so that the proposal was ignored. On 18 December at a press conference, the US Secretary of State, Dulles, firmly denied that the United States was contemplating any negotiations for troop withdrawals from Central Europe.

In the following years a number of new plans and proposals were put forward. However, the Western countries had a strong tendency to link the whole issue of disengagement with the solution of the German problem again. Since the main differences in approach of the two sides concerning the future status of Germany remained unchanged, prospects for an agreement on the disengagement arrangements linked with the reunification of Germany were minimal. A proposal put forward by West German Chancellor Adenauer at a press conference on 11 January 1957 confirmed this conclusion: [15] the plan dealt with the military aspects of reunification. He suggested that, after reunification, in order to give the Soviet Union proof of the West's purely defensive attitude, all of East Germany should be demilitarized—that is, neither NATO nor Bundeswehr units would be stationed there. The proposal was based on the presumption that West Germany would be incorporated into Western Europe. The Soviet Union rejected it.

Over this period—from around 1956 to 1964—the Soviet Union put forward variants of its past proposals on a number of occasions. Thus the Soviet proposal on the reduction of armaments and armed forces and the prohibition of atomic and hydrogen weapons, introduced in the Disarmament Sub-Committee on 18 March 1957, contained two well-known Soviet suggestions. [5, 22] The first dealt with creation of a zone of limitation and inspection of forces and armaments. The second suggestion referred to the reduction of foreign troops stationed in Germany and in the

territory of the member countries of NATO and the Warsaw Treaty, originally proposed by the Soviet Union on 17 November 1956. Reduction of forces was set forth in two stages. In the first stage, to be carried out in 1957–1958, the foreign armed forces stationed in Germany would be reduced by one-third, and those stationed in the other countries of the NATO and Warsaw Treaty area would be reduced substantially. In the second stage, envisaged for 1959, the respective parties would carry out measures for further reductions. The size of that reduction would be the subject of a supplementary agreement.

During the year the Soviet Union on two occasions (30 April and 20 September) re-introduced its proposal for the reduction of armed forces of the four powers in the territory of Germany and in the NATO and Warsaw Treaty countries. The time table, however, was omitted.

About this time a proposal came from an outside source: a suggestion for “phased withdrawal of foreign troops from Europe” was put forward in the course of debate at the United Nations on 10 September 1957 by the Irish Foreign Minister, Aiken. [15] He suggested that the withdrawals take place along a latitudinal line from either side of the existing demarcation line between East and West. In the first stage this drawing back might be a few hundred kilometers—to be extended in the second phase also on reciprocal basis. He also suggested that member nations be invited to contribute to a United Nations inspection unit which would supervise the withdrawal of the foreign contingents. The inspection unit could make certain that these withdrawals were completed and remain in the area to see that no new military infiltrations occurred. However, the proposal did not make much headway in the United Nations, and no resolution adopting or recommending this plan was approved by the General Assembly.

At this time Poland and the Soviet Union started a new campaign. It was an action for the creation of a nuclear-free zone in Central Europe, launched by Poland in October 1957 (see page 402). In later years the initial proposal was elaborated to include the reduction of forces and freezing of armaments which in substance corresponded to some of the Soviet plans advanced in connection with the disengagement negotiations. The shift from strictly disengagement issues to the problem of denuclearization of Europe was a reaction to Western intentions to establish a multilateral nuclear force. In this period Soviet efforts were to a great extent directed towards preventing the establishment of such a force; consequently not many new disengagement proposals were suggested. There is an example of such a proposal in a memorandum of 5 May 1958, when the Soviet Union reiterated its proposal for the reduction of foreign forces in Germany and in the NATO

and Warsaw Treaty countries. It also suggested that the reduction of forces could be followed by discussions for "the complete withdrawal of foreign armed forces from the territories of the states members of NATO and the Warsaw Treaty". [5]

The West did not respond until the Geneva Foreign Ministers meeting in May 1959, when it submitted a new plan. The Western proposal, however, linked the whole question with German reunification again; it suggested that, upon establishment of an all-German government, "in a zone comprising areas of comparable size and depth and importance on either side of a line to be mutually determined, agreed ceilings for the indigenous and non-indigenous forces would be put into effect". [5] The Soviet Union rejected the proposal on the grounds that as in previous cases its main aim was to move the demarcation line between East and West further to the East.

In subsequent years the Soviet Union on various occasions re-submitted some of its earlier proposals for disengagement and in particular for the withdrawal of foreign troops. Parallel with this a new impetus was given to a long-standing Soviet proposal for abolition of foreign bases and the withdrawal of all troops from foreign territories. This demand together with efforts for the establishment of nuclear-free zones to a certain extent overshadowed consideration of the disengagement problems in their initial form. However, they were not abandoned.

A Soviet memorandum of 26 September 1961 submitted to the UN General Assembly reminded the West of the Soviet proposal for an agreement on the withdrawal of foreign troops from Europe (Soviet troops would leave East Germany, Hungary and Poland, and those of the USA, UK and Canada would be withdrawn from the NATO countries in continental Europe. [6] If this was not acceptable to the West, the memorandum suggested an agreement at least on the reduction of the number of foreign troops stationed in the territory of the NATO and Warsaw Treaty countries. As a first step in this direction the four powers should agree to reduce their forces stationed in Germany by one-third or by some other accepted proportion. These proposals were repeated, for example, in a memorandum submitted to the ENDC on 28 January 1964, and again in the memorandum of 7 December 1964, on measures for the further reduction of international tension and limitation of the arms race presented to the UN General Assembly.

The general Western reaction throughout the period was cool. Indeed at one point the Soviet Union accused the West of a "conspiracy of silence". In the Western view, the whole question was still too closely linked with such questions as the recognition of East Germany. A state-

ment by ACDA Director Foster to the ENDC on 10 September 1964, when the problem of the reduction and withdrawal of foreign troops came up, is indicative of the Western attitude throughout the period up to 1964. He said: "The United States does not consider this to be a fruitful subject of discussion. The whole question of forces in Europe and its related political aspects, as the Soviet Union is quite aware, is closely related to serious unsolved political problems in that area." [6]

The first signs of a change in the Western position came about 1965. In the United States, more and more voices were raised about the need to reduce the number of American troops in Europe. An unofficial report—the report of the Committee on Arms Control and Disarmament of the National Citizen's Commission on International Cooperation, published on 28 November 1965—gave an indication of public feeling. In preparing the report the committee consulted government officials, and the report no doubt reflected also one strand of official thinking. It suggested, *inter alia* "that the United States should encourage an examination of the problem of parallel troop reductions in West and East Germany by the United States and the Soviet Union. Reductions are not to be conceived as tantamount to withdrawal, which would change the military balance; but rather, as adjustments equitable for both sides which would preserve the balance at less cost and strain for each." The increasing US involvement in Viet-Nam was no doubt a factor in the growth of interest in mutual troop reductions. [10]

At this point the Soviet Union became rather restrained. Its proposals began to avoid such topics as the reduction of foreign forces stationed in Germany and other European countries. This was essentially because it did not wish to be accused of facilitating the supply of US troops to Viet-Nam. This restraint was noticeable both in the declaration on European security of 6 July 1966 by the Political Consultative Committee of the Warsaw Treaty states, [11, 22] and in the statement of 26 April 1967 on European security, issued at the conference of the European communist parties [12, 22] held at Karlovy Vary.

This, then, was the position at the beginning of 1968: more recent developments are discussed at the beginning of the chapter. In the 1950s and the early 1960s the Soviet Union proposed mutual force reductions on a large number of occasions; Western powers were uninterested. Now the roles have reversed, with the Western powers putting forward this proposal, and obtaining no response from the Warsaw Treaty until the middle of 1970 (page 65).

Nuclear-free zones and freezing of nuclear weapons

Before 1957, proposals for nuclear-free zones and the freezing of nuclear weapons had been part of more general proposals dealing with the larger problem of arms regulation and disarmament in Europe. As separate measures on their own, they began to attract attention towards the end of 1957. On 2 October of that year the Polish Foreign Minister, Adam Rapacki, suggested the establishment of a denuclearized zone in Central Europe.

In the following years these proposals were further elaborated, occupying a prominent place in the discussions of the problem of security in Europe. With the exception of the Soviet Union, which put forward a number of proposals and actively supported others, the whole question of nuclear-free zones and freezing of nuclear weapons was initiated and later pursued primarily by non-nuclear states.

The proposals were submitted by various countries and were not limited to only one area in Europe. Most of them dealt with Central Europe; but some suggested denuclearization of other parts of Europe too, such as the Balkans, the Mediterranean or Scandinavian countries and the Baltic.

All these proposals had one common denominator: their intention was to exclude nuclear weapons from respective parts of Europe or to freeze them at existing levels. In other respects—motives, timing and scope—the proposals differed for each area. Consequently, they will be considered region by region.

Central Europe

Poland was first to initiate large-scale discussions and formulate detailed plans for the denuclearization of Central Europe. The proposal was first put forward by the Polish Foreign Minister, Adam Rapacki, on 2 October 1957. In a disarmament debate in the UN General Assembly, Rapacki declared that “if the two German States agree to impose a ban on the production and stockpiling of atomic and thermo-nuclear weapons on their territories, the Polish People’s Republic is prepared simultaneously to impose a similar ban on its own territory” (Rapacki Plan). [15, 21] Czechoslovakia and East Germany expressed agreement with the Polish initiative on 6 October. The Soviet Union expressed its support on several occasions. Marshal Bulganin referred to the Rapacki proposal in notes to several countries during December 1957 and again on 8 January 1958. [5]

The Western reaction to the Polish proposal was, for various reasons, unenthusiastic. There was a general long-standing disagreement on priorities for arms regulation and disarmament measures. Views also differed on

the problem of international control. Finally, the clash on the composition of the UN Disarmament Commission (November 1957) considerably reduced mutual confidence. In addition, the Western powers had a specific reason for reluctance: when the proposal was launched, NATO had already initiated serious preparations for a large-scale reorganization in its armaments and strategy which would enable it to operate tactical nuclear weapons. NATO justified the move by alleging corresponding measures on the Soviet side. This was clearly indicated in a North Atlantic Council communiqué on 19 December 1957. [5] Referring to NATO defence, the communiqué stated:

The Soviet leaders, while preventing a general disarmament agreement, have made it clear that the most modern and destructive weapons, including missiles of all kinds, are being introduced in the Soviet armed forces. . . . As long as the Soviet Union persists in this attitude, we have no alternative but to remain vigilant and to look to our defences. . . . To this end, NATO has decided to establish stocks of nuclear warheads, which will be readily available for the defence of the Alliance in case of need. In view of the present Soviet policies in the field of new weapons, the Council has also decided that intermediate range ballistic missiles will have to be put at the disposal of the Supreme Allied Commander Europe.

This decision was a decisive factor in the subsequent approach the Western powers took towards establishment of denuclearized zones in Central Europe and elsewhere in Europe. Formal reasons for the rejection of various proposals submitted in the following years varied in each case. However, all of them basically reflected the fear that such a measure would upset the balance of power in the Soviet favour. The presence of nuclear weapons in Western Europe was considered essential for its defence. The NATO powers considered that the Warsaw Pact powers had a clear superiority in conventional armed forces, which had to be offset one way or another. The European NATO countries did not think it wise to meet this threat by expanding their own conventional forces, at the risk of jeopardizing their economic recovery; the presence of tactical nuclear weapons in Europe was thus thought of as a means to dissuade the Warsaw Pact countries from putting to use their conventional superiority.

Although the NATO decision of 19 December was obviously discouraging, Poland continued its action and on 14 February 1958 presented a more detailed elaboration of its earlier proposal. [5, 21] In order to meet some of the Western criticism, the plan tried to include a number of new suggestions emerging from the discussions which had taken place in the meantime. Particular attention was paid to the question of control, a main

concern of the Western powers. Accordingly the plan set forth the following provisions:

1. The zone would comprise the territories of Poland, Czechoslovakia, the German Democratic Republic and the Federal Republic of Germany. These states would pledge not to manufacture, maintain, import, or permit the location on their territories of nuclear weapons.

2. The four big powers (France, UK, USA and USSR) would have two-fold obligations. First, they would undertake not to maintain nuclear weapons in the armaments of their forces stationed on the territories of states in the zone, and not to maintain or install any equipment designed for servicing nuclear weapons, including missile-launching equipment. Second, they would not transfer such weapons or installations and equipment to governments or other organs in the area. As a general obligation, the nuclear powers would undertake not to use these weapons against any territory in the zone.

3. In order to prevent possible mis-use, the non-nuclear-weapon states, whose forces were stationed on the territory of any state in the zone, would make a similar commitment: not to maintain nuclear weapons, transfer them, or install equipment and installations.

4. To implement the provisions, the states concerned would create "a system of broad and effective control", to comprise both ground and aerial control, as well as "adequate control posts with rights and possibilities of action which would ensure the effectiveness of inspection". The control and supervisory machinery would include representatives of the NATO and Warsaw Treaty organizations, and possibly representatives of states not belonging to any military grouping in Europe.

5. In the Polish Government's view, these obligations and arrangements could best be embodied in an international convention. But, to avoid complications connected with recognizing the German Democratic Republic, Poland offered an alternative solution: all the states concerned could issue a unilateral declaration, bearing the character of an international obligation. The nuclear powers could also choose to undertake their obligations in the form of a "mutual document".

Czechoslovakia and the German Democratic Republic announced their full agreement with the "Rapacki Plan". The USSR announced its readiness to undertake all the commitments concerning the establishment of the zone, provided France, the UK and the USA did the same. [24]

The Western attitude did not change very much. Admittedly the plan contained certain control clauses, as had been previously demanded, but in view of the latest Soviet advances in space technology, the Western approach remained negative. A debate in the Bundestag from 20 to 25

March 1958, which was particularly devoted to the question of whether or not the West German army should be equipped with nuclear weapons, was very revealing of Western thinking at the time. [16] Chancellor Adenauer said that the Soviet Union was equipped with nuclear weapons and guided missiles and that if the NATO forces did not have equally strong arms, especially in an important section of NATO such as the Federal Republic, NATO itself would "lose its importance and its purpose". This view was accepted by all Western nuclear powers, and with some additional objections became the main obstacle to agreement on creating an "atom-free" zone in Central Europe. This was clearly stated in their answers to the Polish Government.

The US note, delivered on 3 May 1958 [5] emphasized that the plan was too limited in scope to reduce the danger of nuclear war or to provide a dependable basis for security in Europe. This was because the plan failed to deal with the question of continued production of nuclear weapons by the present nuclear powers. In addition, it did not affect the central sources capable of launching a nuclear attack, nor did it provide a method for balanced and equitable limitations of military capabilities. The exclusion of nuclear weapons without other types of limitation would endanger the security of the Western European countries, in view of the large and widely-deployed military forces of the USSR. "Unless equipped with nuclear weapons, Western forces in Germany would find themselves under present circumstances at a great disadvantage to the numerically greater mass of Soviet troops stationed within easy distance of Western Europe. . . ."

The British note of 17 May also maintained that for the security of Western Europe it would be "essential that any measures which might be taken to reduce nuclear armaments in Central Europe should be accompanied by measures to reduce the Soviet preponderance in conventional weapons in the whole of Central and Eastern Europe". [17]

Thus it became obvious that there would be no progress towards establishment of an "atom-free" zone unless denuclearization was at least linked with reduction of other armaments and armed forces. To facilitate further discussion of the problem, the Polish Government urgently renewed its action. On 4 November 1958 Rapacki announced a number of changes in his earlier proposal. The second version of the "Rapacki Plan" contained important new elements: [5, 21] most important was the implementation of the plan, now set in two stages. The first stage would provide only for a ban on production and proliferation of nuclear weapons to the countries composing the zone, and for the freezing of existing nuclear armaments in the territory of the zone. Complete denuclearization would be accomplished in the sec-

ond stage. The implementation of this stage would be preceded by talks on the appropriate reductions of conventional forces. Such reductions would be effected simultaneously with the denuclearization.

There was no official Western reply to the new Polish initiative, and the proposal was rejected without any discussion. In the opinion of the Western powers the whole action was to a great extent aimed at neutralizing West Germany's role in NATO's changing defence strategy, and at the same time sanctioning the division of Germany. It was felt that West Germany's attachment to NATO and integration into Western Europe might cease if the objective of "reunification" were abandoned. Having met uncompromising opposition, the Polish Government remained inactive for a while. This, however, did not mean that the idea was abandoned. Within the next few years both the Soviet Union and Poland continued to remind the Western powers of their willingness to support the establishment of a denuclearized zone in Central Europe. [21, 25, 30, 41, 42, 43]

The Irish initiative is also worth mentioning. Speaking to the UN General Assembly on 23 September 1959 the Irish Foreign Minister, Frank Aiken, expressed his Government's support for the creation of denuclearized zones in the world and in particular in Central Europe. [5] The proposal was not elaborated in detail, but it contained two new points. First, the countries forming a zone should subject themselves to UN inspection to ensure that they were keeping the agreement; second, the nuclear powers, and all the other members of the United Nations, should bind themselves in advance, by specific commitments, to defend the members of the area from attack, by means of a standing UN force.

In the early sixties the situation changed. Discussion on the regulation of nuclear armaments increased considerably. Although these discussions centered on questions of discontinuing nuclear tests (test-ban treaty) and prohibiting dissemination of nuclear weapons (non-proliferation treaty) many countries expressed marked interest in the creation of denuclearized zones. African countries were particularly active in this respect. As a result, the sixteenth session of the UN General Assembly adopted a resolution¹ calling upon UN member states to consider and respect Africa as a denuclearized zone. At the same time a number of Latin American countries expressed willingness to create a denuclearized zone in their continent.

These new initiatives stimulated Poland to renew its proposal for the creation of a denuclearized zone in Central Europe. In agreement with Czechoslovakia, the Polish Government submitted a modified Plan for a

¹ General Assembly resolution 1653/XVI.

Denuclearized and Limited Armaments Zone in Europe to the Committee of the Whole of the ENDC on 28 March 1962 (the third version of the "Rapacki Plan"). [7, 21] In general, the plan repeated the basic suggestions contained in the Polish proposal of 4 November 1958, but in more detailed form. Particular attention was paid to provisions dealing with the rights and duties of states in implementing the measures of the first and second stages. In the first stage the plan provided for a freezing of all nuclear armaments and rockets at their present level and prohibition of the creation of new bases. At the same time, states in the zone would be prohibited from producing nuclear weapons and delivery vehicles or acquiring them through other states. In the second stage the complete elimination of nuclear armaments and rockets, including all means for their servicing and delivery, would be combined with an agreed reduction of armed forces and conventional armaments. The plan reiterated earlier suggestions for a strict international control system and establishment of a special control body; it also envisaged inspection on the ground and in the air, with appropriate control posts. Guarantees were to be given by the nuclear powers in the form of an undertaking to respect the zone and not to use nuclear weapons against it.

The reactions of other states to the plan were much as before. The Soviet Union continued to support the Polish proposal. The Western countries, on the other hand, maintained that the plan would result in a serious military imbalance. The description of this imbalance was now somewhat different. It no longer stressed the "Soviet preponderance in conventional weapons" but the fact "that the measures envisaged [by the plan] do not address themselves to the nuclear weapons located in the Soviet Union". In other words, establishment of a "nuclear-free" zone in Central Europe was dependent not only on reduction of armed forces, but also on denuclearization of certain parts of the Soviet territory.

The West German spokesman, Felix von Eckart, clarified this position at a press conference on 6 April 1962; [28] the "Rapacki Plan" was unacceptable because it did not envisage elimination of Soviet military forces and nuclear weapons stationed near the Polish border. It seems that the rejection of the "Rapacki Plan" was motivated not only by considerations of general NATO strategy, but to a great extent by West German opposition to the plan. For some years the German Federal Republic had been demanding access to nuclear weapons, either directly or through a scheme transforming NATO itself into a nuclear power (MLF). It was also symptomatic of German feelings that, only shortly after Poland renewed its proposal in Geneva, the West German Government requested the right to veto the possible withdrawal of atomic weap-

ons from its territory. The West German Defence Minister, Franz Josef Strauss, voiced this demand during a debate in the Bundestag on 6 April 1962. [21] A few days later, Chancellor Adenauer repeated the German Federal Republic's opposition to any plan of arms regulation in Central Europe unless it was accompanied by progress towards resolving the problem of divided Germany.

This stand led the Polish Government once more to adjust its proposal. Without withdrawing the "Rapacki Plan" for the creation of a nuclear-free zone, Poland launched a new, and in its opinion less complicated, proposal which offered better chances of realization. Its sole aim was to freeze nuclear and thermonuclear armaments in Central Europe. The proposal was put forward by the Polish Party Secretary, Wladyslaw Gomulka, in a speech on 28 December 1963 ("Gomulka Plan"). [21] On 24 February 1964, after broad diplomatic consultations, an elaborate memorandum was handed out in Warsaw to the ambassadors of the countries concerned. [21]

The plan was intentionally more limited in scope. It restricted itself to the territory of the German Federal Republic on the NATO side, and the territories of the German Democratic Republic, Poland and Czechoslovakia on the Warsaw Pact side. It did not mention Soviet territory, but envisaged the possibility of extending the original area by means of the accession of other European states.

The plan by-passed the issue of conventional armaments and proposed only a nuclear-arms freeze. Limited exclusively to nuclear and thermonuclear weapons it did not bear on their means of delivery, since the control over delivery vehicles would undoubtedly create additional problems. In addition to prohibiting any increase in the nuclear armaments already stockpiled in the area, the "freeze" formula envisaged a ban on the production of nuclear and thermonuclear weapons in the territory and prohibition of their dissemination to other states in the area. This would freeze the stocks at existing levels, thus preserving the actual balance of strength.

The provisions dealing with the system of control were particularly important, providing for establishment of extensive systems of supervision and guarantees. The plan proposed control of the production of the weapons covered in the freeze by control posts at industrial establishments capable of producing fissionable material for military purposes; that is, at plants operating atomic piles. To control the transfer of nuclear and thermonuclear weapons, the plan provided for check-points at airports, seaports and railway junctions. For supervision and control, it envisaged mixed control commissions representing, on a parity basis, the member countries of the two military blocs. The commissions could be enlarged to include representatives of non-committed nations.

The strongest objections to the "Gomulka Plan", as in previous cases, were raised by West Germany. [20] The official West German answer to the Polish memorandum was entirely negative. The German Federal Government maintained: (1) that the forces of the Warsaw Treaty constituted a threat to members of NATO, (2) that acceptance of the Polish proposal would upset the existing balance unless the freeze-zone was extended to cover the western part of the Soviet Union's territory, (3) that the plan did not specify the system of verification which ought to be effective, and (4) that any steps undertaken to increase security in Europe must be linked with progress towards German reunification. Other NATO countries forwarded their formal replies—which were essentially negative—through diplomatic channels.

An aide-mémoire from the Polish Government to the West German Government [20] explained the Polish Government's position on the points raised by the Western powers, the most important being the suggestion that a part of Soviet territory should be included in the zone. The Polish answer was clear: the suggestion "can find no justification either in arguments involving the balance of power or in political logic". No disarmament measure is possible which affects only one big power. In reply to the request to make progress on German reunification a preliminary condition for partial solutions, the answer reiterated that the reunification could result only from an evolutionary process in which the armaments race and growing tension in Europe would be resolved first.

In the following years, the suggestion for the denuclearization of Central Europe was occasionally revived by the Polish Government. It was also one of the main items in almost all Soviet proposals dealing with partial measures of arms regulation and disarmament. The idea was supported by other Warsaw Treaty countries as well. Thus a declaration on European security, adopted on 6 July 1966 by the Political Consultative Committee of the Warsaw Treaty countries, specially emphasized, among various measures designed to bring about a military detente on the European continent, the creation of denuclearized zones. [11, 22] The proposal was renewed in a statement on European security issued on 26 April 1967 at the conference of European communist parties, held at Karlovy Vary. [22] The proposal suggested establishment of a denuclearized zone not only in Central Europe, but also "in the Balkans, the territory of Danubian countries, in the Mediterranean and in Northern Europe". Finally, on 30 July 1970 Poland announced in the Conference of the Committee on Disarmament (CCD) that it would be prepared to propose new measures of regional nuclear disarmament after the Non-Proliferation Treaty entered into force on the territory of European non-nuclear states. The proposal

would take into account the results which would already be achieved through the Non-Proliferation Treaty and other arrangements possibly resulting from the European Security Conference.

Balkans, Adriatic and Mediterranean

The establishment of denuclearized zones in the Balkans, Adriatic and Mediterranean has been suggested on various occasions. However, unlike the proposals concerning a “nuclear-free” zone in Central Europe, these suggestions have never been developed into elaborate plans. They remained unilateral appeals arising from the convictions of the statesmen who voiced them.

There was an early proposal by Romanian Prime Minister, Chivu Stoica, in September 1957, suggesting a conference with the aim of converting the Balkans into a “peace zone” [18, 36]; but a “nuclear-free” zone was not explicitly mentioned in this proposal.

He first explicitly raised the subject of denuclearization of the Balkans on 6 June 1959; this was closely followed by a Soviet statement, which referred to the Romanian declaration, on 25 June 1959. The Soviet initiative was motivated by the fear that NATO would be stationing nuclear weapons in Italy and Greece. Italy’s intention of equipping its armed forces with “all forms of modern armaments” and establishing missile bases on its territory had first been announced by the Minister of Defence, Antonio Segni, in a statement on 30 September 1958. Six months later, on 30 March 1959, an agreement was announced under which American intermediate-range ballistic missiles (Jupiters) would be stationed in Italy. [27]

The Soviet Union expressed dissatisfaction and concern over this development in notes presented to the Italian Government on several occasions. The last one, presented on 28 April 1959 in connection with the Italian Senate’s ratification of the Jupiter agreement on 17 April, warned that “by concluding an agreement on the establishment of rocket bases, the Italian Government has assumed a very grave responsibility for the consequences of this step”. [27] Similar representations were made to the Greek Government. A Soviet aide-mémoire of 13 May 1959 referred to “the increasing danger of American nuclear and rocket bases being set up on the Greek territory”, and expressed the hope that the Greek Government would not give “direct assistance to certain foreign circles in the implementation of their aggressive plans”. The aide-mémoire also expressed the Soviet Government’s conviction that “the Balkan peninsula can and must become a real zone of peace and friendly co-operation

among the Balkan States".² [26] This suggestion was further clarified by Khrushchev when, during a visit to Albania from 25 May to 4 June 1959, he proposed creating a zone "free from missiles and atomic weapons" covering the Balkans and the region of the Adriatic. This proposal was formally conveyed by the Soviet Government on 25 June in notes to France, Greece, Italy, Turkey, the UK and the USA. [5, 22]

The Soviet proposal was worded in general terms. It did not elaborate any specific suggestions for the control system or guarantee mechanism; these questions were probably left to be solved through negotiations. The proposal received an immediate endorsement by the Warsaw Treaty countries concerned.³ Yugoslav President Tito, in a speech on 8 June, expressed the view that an "atom-free" zone should in principle include Italy, Greece and the whole Balkan region. [23] The six NATO countries, however, rejected the proposal, replying in similar terms. They emphasized that "the range of weapons at the disposal of the USSR makes the concept of an atom-free Balkan zone meaningless as far as the security of the free nations in that area is concerned". [5] They also remarked on the Soviet proposal's failure to deal with basic questions such as the production and stockpiling of nuclear weapons by the powers possessing them.

Realizing that the proposal, under the prevailing circumstances, could not obtain the necessary NATO support, the Soviet Government did not make further official representations on this question. However, on numerous occasions the Soviet Union confirmed its general support for the creation of denuclearized zones in Europe, including the Balkan-Adriatic region. In 1963 the Soviet Government revived its initiative for creating a denuclearized zone, enlarging it to yet another area—the Mediterranean. This move followed the 24 January announcement that US missile bases in Italy and Turkey would be replaced by Polaris atomic submarines in the Mediterranean. The Soviet proposal for creation of a denuclearized zone in the region was submitted on 20 May to the governments of the USA, the UK and respective Mediterranean countries. [8, 35] It denounced the stationing of Polaris submarines in the Mediterranean and stressed that it was not a simple coincidence that this plan "emerged simultaneously with the projects for setting up a so-called 'multinational' and 'multilateral' NATO nuclear force in which a considerable role is assigned to the West

² It was announced on 14 June that Greece and the United States had concluded an agreement on 6 May whereby the USA would train Greek personnel in the use of nuclear weapons and would supply tactical ballistic rockets of the Honest John and Nike types to the Greek armed forces.

³ In addition, on 8 June the Romanian Government renewed its earlier proposal (September 1957) for a conference of Balkan Prime Ministers. The proposal was again rejected.

German revenge-seekers and militarists". Nevertheless the Soviet Government "proposes that the whole area of the Mediterranean Sea should be declared a zone free from nuclear missile weapons. It is prepared to assume an obligation not to deploy any nuclear weapons or their means of delivery in the waters of this area provided that similar obligations are assumed by the other Powers". Reliable guarantees were to be provided jointly by the USSR and the Western powers.

The Soviet proposal was rejected by the Western countries. The US note of 24 June stated that the Soviet proposal "seems to be designed precisely and solely to change the existing military balance at the expense of the United States and its Allies". [8] Similar arguments were used in the British note published on 27 June. [37]

However, a number of Arab countries, particularly Algeria and the UAR, welcomed the Soviet proposal. [32] Algeria was host to a non-governmental conference devoted to the problem of denuclearization of the Mediterranean held in July 1964. The communiqué of the conference formulated proposals aimed at the disengagement of the nuclear powers from the area and supported the establishment of a denuclearized zone in the Mediterranean. This was the last large-scale proposal for the denuclearization of the Mediterranean. In the following years some of the countries concerned, mostly Arab states, raised their voices against the presence of nuclear weapons and foreign bases in the area.

Scandinavia and the Baltic

The initiative for the denuclearization of this region was taken by the USSR in 1959. In the framework of Soviet activities for the creation of denuclearized zones in different parts of Europe, the proposal for a "nuclear-free" zone in the Scandinavian and Baltic region was particularly interesting because it created an initial impression in the West that part of the Soviet territory might also be included in the zone. Khrushchev first made the proposal on 11 June 1959 in a speech at Riga, saying that the Soviet Union "supports the idea of setting up a rocket and atom-free zone in the Scandinavian peninsula and the Baltic area". [33] However, the proposal did not arouse much enthusiasm with the countries concerned. Referring to the Soviet suggestion on 26 June, the Swedish Foreign Minister, Östen Undén, indirectly asked for further clarification. He said: "As far as I know, only one State on the shores of the Baltic Sea has atomic weapons—the Soviet Union. I dare not hope that the Soviet Government is prepared to exclude atomic weapons from an important part of its territory should an atom-free zone be established in the Baltic area." [19]

Khrushchev repeated his proposal on 17 July, this time expressing the

view that the three suggested zones—Scandinavian–Baltic, Central European and Balkan–Adriatic—should be connected into one “nuclear-free” zone. [34] But it was not before 14 August that the Soviet position on the inclusion of its Baltic area into the Scandinavian–Baltic zone became clear; an article published by *Izvestia* completely repudiated this possibility. [5, 31] Until the USA and UK concluded an agreement on banning nuclear and rocket weapons and on liquidating military bases situated near the Soviet frontiers, the Soviet Government would not be able to include any regions of its territory in the proposed “nuclear-free” zone. The article concluded: “Therefore it is only those who wish to find justification for the atomic arms race policy who can fight for the inclusion of a part of the territory of the USSR in an atom-free zone under existing conditions.”

The Scandinavian countries did not accept this explanation and rejected the Soviet proposal. However, it is true that Denmark and Norway did not accept American nuclear weapons stationed in their territories and were rather cautious about the proposed NATO multilateral nuclear force. Sweden itself played an active role in disarmament negotiations, particularly concerning nuclear weapons, and it made its own proposal in 1961; it was put forward by Swedish Foreign Minister, Undén, on 26 October in a speech at the General Assembly Political Committee (Undén Plan). [44] Although the proposal basically dealt with the problems of banning nuclear tests and dissemination of nuclear weapons, it also aimed at establishing denuclearized zones—on a wider territorial basis, in fact, than Scandinavia. Undén advocated widening the ban on nuclear tests to include a ban on the importation and stockpiling of nuclear weapons into countries not possessing them: “such an extension would turn the suspension of tests into a virtual sealing-off of those countries from nuclear weapons, a sealing-off related to the basic thoughts behind the so-called Rapacki plan.” He also proposed an inquiry into the conditions under which non-nuclear states might be willing to enter into such undertakings. On the basis of this proposal, Sweden and seven other countries submitted a draft resolution to the UN General Assembly requesting the Secretary-General to make such an inquiry as soon as possible and to submit a report to the Disarmament Commission. The draft was approved by the General Assembly on 4 December 1961.⁴

In compliance with this resolution the Secretary-General requested, on 2 January 1962, all the UN member states to express their views on the matter. [38] The Scandinavian countries expressed full support in principle for the creation of denuclearized zones in different parts of the world, including the Scandinavian–Baltic region provided it would not affect the

⁴ General Assembly resolution 1664/XVI.

balance of power. [38] Finland emphasized that it had already pledged, by the Peace Treaty, not to manufacture or possess nuclear weapons. [38] The position of the Western nuclear powers, however, was negative: they constantly stressed three conditions for nuclear-free zones. They should be formed with the consent of all parties concerned; they should not alter the balance between NATO and the Warsaw Pact, and not give a military advantage to one side or the other; and there should be effective control. [38]

The establishment of a “nuclear-free” zone in the Scandinavian region was raised again in 1963. The suggestion came from the Finnish President, Urho Kekkonen, in a speech on 28 May; he stated that the creation of a “nuclear-free” zone would not require changes in defence strategies of the Scandinavian countries, since none of them possessed nuclear weapons on its territory. [29] However, the “Kekkonen proposal” was not accepted. Sweden rejected it because, unlike the “Undén Plan”, it did not deal with a ban on nuclear tests; in Swedish opinion, the test ban should be a precondition for creation of a nuclear-free zone in Scandinavia. (The test ban would limit other medium-sized powers’ ability to become nuclear powers.) Denmark and Norway thought that the question should be discussed within disarmament negotiations in the ENDC.

Finally, during his 1964 visit to three Scandinavian countries—Norway, Sweden and Denmark—Khrushchev renewed his earlier proposal for creation of a “nuclear-free” zone in the region. His suggestion did not contain any new elements, but reiterated the point that the denuclearization of Soviet territory would have to be accompanied by the same undertaking from the other nuclear powers. [13]

Since that time there has not been much discussion on the creation of a “nuclear-free” zone in the Scandinavian-Baltic region. Since all the Scandinavian countries have signed and ratified the Non-Proliferation-Treaty some of the objectives of setting-up such a zone have been obtained. It does not, however, prevent the existing nuclear powers from stationing nuclear weapons in the region with the consent of the countries concerned.

Inspection against surprise attack

The problem of international inspection to safeguard arms-regulation and disarmament measures has been a subject of controversial formulations and interpretations ever since disarmament negotiations started in 1945. In the mid-fifties the whole question of inspection was revived once more but this time in a somewhat different context.

The Western proposals came at a time—in 1955—when the United States began to withdraw on the question of disarmament: indeed later in that

year the United States representative put a "reservation" on all earlier disarmament proposals. It was in this context that the United States began to put forward inspection plans which were not linked to any specific arms-regulation or disarmament measure. The purpose of the plans would be to demonstrate the technical feasibility of an inspection system. As a framework for pursuing this action, the United States chose the problem of surprise attack, to which both sides attached considerable importance.

Both the USA and the UK launched specific proposals on 21 July 1955 at the Geneva Conference of Heads of Governments. The Eisenhower proposal, which has come to be known as the "Open Skies" plan, was exclusively directed at the Soviet Union. It proposed mutual exchange of blueprints of military establishments and verification of these by reciprocal aerial photographic inspection. The purpose of this measure was to provide "against the possibility of a great surprise attack", thus relaxing tension. [4, 40] Similarly, the Eden proposal, calling for a trial inspection zone on the ground in Central Europe, was aimed at providing "valuable experience and lessons for use over a wider field in the future". [4, 40] While the Eden plan quietly died during the conference, the "Open Skies" proposal was extensively debated in subsequent negotiations.

The Soviet Union was also interested in the problem of surprise attack. At the Geneva Conference, Bulganin pointed out that the Soviet plan for comprehensive disarmament of 10 May 1955 had dealt with this question at some length [4, 22], and had offered concrete proposals:

In order to prevent a surprise attack by one State upon another, the international control organ shall establish on the territory of all the States concerned, on a basis of reciprocity, control posts at large ports, at railway junctions, on main motor highways and at aerodromes. The task of these posts shall be to see that there is no dangerous concentration of land, air or naval forces. [4, 22]

The main difference between the two positions, then, was that the "Open Skies" proposal was advanced as an inspection plan only, not tied to any specific proposal for force reduction; it was designed primarily as a "confidence-building" measure that might establish the basis for further progress. The Soviet proposal was presented from the very beginning in conjunction with other arms-regulation and disarmament measures, primarily the reduction of conventional armaments and armed forces. The positions of the two sides were opposed in other ways as well. The USSR favoured creation of ground control posts, with emphasis on concentrations of conventional forces; the USA advocated a system of aerial inspection to guard primarily against nuclear attack.

These initial positions of the two sides were advanced without basic change in the following years. When the negotiations were resumed in Au-

gust in the Sub-Committee of the Disarmament Commission, the USA submitted an outline plan for implementing the "Open Skies" proposal which merely elaborated the elements of information to be exchanged and an exchange procedure. [4] This time, however, the emphasis was placed on the proposal's function as a safeguard against surprise attack rather than on the "confidence-building" function that was originally to be its prime contribution.

The USSR maintained its position that the proposal was unacceptable because it demanded control without disarmament. This argument was elaborated in a letter, dated 19 September 1955, from Soviet Premier Bulganin to US President Eisenhower. [4] Concerning the exchange of blue prints of armed forces and armaments, in the Soviet view, it would be better if such information were submitted by all states to an international organ of control and inspection, and not just by the USA and USSR. In addition, the letter stressed that this measure could become significant "only if agreement is achieved on the reduction of armaments and on taking measures for the prohibition of atomic weapons". Similar remarks were made about the verification system by aerial inspection: first, the inspection should be extended to include the territories of other countries, since US armed forces were stationed abroad; second, the proposal should be tied to reduction of armed forces and prohibition of nuclear weapons.

The Soviet suggestions were not accepted. In the course of subsequent discussions the USA reiterated that an initial agreement between the Soviet Union and the United States was an essential part of the "Open Skies" proposal. [4] Once the plan was in operation between the two countries, it could provide for the adherence and participation of other countries too. The US position concerning the Soviet proposal for ground control posts changed somewhat: it was ready to accept the proposal, but only in combination with aerial inspection. The proposal for

... posts at major ports, railways junctions, main highways and aerodromes would certainly have some value. But if they were tied down to fixed locations their utility would be strictly limited. ... The Soviet theory seems to be that surprise attack inevitably requires the massing of large concentrations of troops and planes at very conveniently specified junctions, railroads, and airports. No potential aggressor would be so naive. Moreover, an atomic attack with presently available weapons, to say nothing of weapons of the future, could be launched with devastating effect without such massive concentrations. The United States, therefore, does not understand why the Soviet Union would be content with ground inspection without aerial reconnaissance. [4]

Although negotiations and discussions continued throughout 1955 and 1956, it was not before late 1956 that the positions of the two sides began to

move closer together. The Soviet Union made the first step when, in a declaration of 17 November [4, 22], it agreed for the first time to extend its original proposal for ground control posts to include aerial inspection too. However, it reiterated its earlier position that such inspection should not be limited to Soviet and US territory, but should include the territories of NATO and Warsaw Pact countries. The USSR proposed that the depth of the inspected zone should be 800 kilometres on each side of the demarcation line between the NATO and Warsaw Treaty military forces. The Soviet Union maintained its view, however, that implementation of this measure should be followed by concrete steps towards liquidating armed forces and armaments and prohibiting nuclear weapons.

This Soviet shift towards common ground found no immediate positive response in the West. It was viewed as an attempt designed, *inter alia*, to perpetuate the division of Germany. Consequently, the United States decided to advance the concept of beginning aerial inspection by progressively expanding zones. In March 1957, during the opening weeks of the negotiations in the Sub-Committee of the Disarmament Commission, two initial zones were discussed informally among the delegations. To facilitate discussion of the new concept, the US delegation suggested, as illustration: (a) a zone in Europe bounded on the west by 5 degrees east longitude, in the east by 30 degrees east longitude, and in the south by 45 degrees north latitude; and (b) a United States–Soviet Union zone in the Bering Straits area. Both zones converged on the North Pole. [1]

On 30 April 1957, the Soviet Union responded with a proposal [5] urging a European zone to the west and south of the territory proposed by the United States, and, for the first time, suggesting a zone whose centre line did not correspond to the demarcation line of Germany but instead ran through the centre of East Germany. In response to the illustrative Bering Straits zone, the Soviet Union proposed an expansion to include US territory west of 90 degrees west longitude and Soviet territory east of 108 degrees east longitude.

With the appearance of this new Soviet negotiating position on aerial-inspection zones, the United States proceeded to convert its illustrative concept into a firm proposal. On 2 August 1957, Secretary of State Dulles, on behalf of the US, British, French and Canadian Governments, submitted to the Disarmament Sub-Committee a new proposal on systems of inspection to safeguard against the possibility of surprise attack. [5] The proposal suggested the establishment of inspection zones in the Northern Hemisphere and in Europe. The proffered European zone was conditional on Soviet acceptance of either a broad or a more limited context of inspection in the Northern Hemisphere. The broader zone involved “all the

territory of the continental United States, all Alaska including the Aleutian Islands, all the territory of Canada and all the territory of the USSR". Alternatively, the proposal suggested a more limited area, restricted to the territory north of the Arctic Circle of the USSR, the USA (Alaska), Canada, Denmark (Greenland), and Norway as well as the remainder of Alaska, the Kamchatka Peninsula and all of the Aleutian and Kurile Islands. With regard to inspection in Europe, the four powers also offered two alternatives. The broad one referred to "an area including all of Europe bound in the south by latitude 40 degrees north and in the west by 10 degrees west longitude and in the east by 60 degrees east longitude". If the Soviet Union could not accept this broad concept, the four powers were ready to discuss a more limited zone provided it "would include a significant part of the territory of the Soviet Union, as well as the other countries of Eastern Europe".

The proposed system was described only in broad terms; but clearly it would include, in addition to aerial inspection, ground observation posts and mobile inspection teams. It was also significant that for the first time the proposal was introduced as a measure designed to follow the entry into force of a first-stage disarmament agreement. This aspect was further advanced by the Western countries on 29 August with renewal of the proposal on safeguards against surprise attack, this time within the framework of a wider plan for partial measures of disarmament, which included in the first place a proposal for the limitation and reduction of armed forces and armaments. [5] This was designed to meet the long-standing Soviet objections that the Western proposal actually advocated control without disarmament. But the Soviet and Western views remained irreconcilable on a number of other points. This became particularly obvious during a conference convened by the two sides specifically to study measures to prevent surprise attack.

The conference opened in Geneva on 10 November 1958 with ten participating states: five Western and five Eastern powers.⁵ The terms of reference for the conference had emerged from the long series of communications between Eisenhower and Bulganin and, later, Khrushchev. However, certain discrepancies in approach remained until the very last moment. Once the two sides had agreed to hold the conference a conflict arose about the agenda. The Western-prepared agenda was oriented towards discussing more technical aspects of the problem, while the Soviet agenda was drafted to provide for discussion of a range of political problems as well. The immediate problem was solved by going into the conference without an agenda.

⁵ Participants were delegations of experts from Canada, France, Italy, the UK and the USA and from Albania, Czechoslovakia, Poland, Romania and the USSR.

The Western powers proceeded to submit their technical papers, and the Soviet Union submitted its proposals containing steps to prevent a surprise attack. The contrast between these two sets of documents was evident.

The Western experts submitted six technical papers. The first was a "Survey of the Relevant Technical Aspects of Possible Instruments of Surprise Attack as a Prerequisite for Examining Means of Detection and Systems of Inspection and Control". [5] In tabular form the survey listed the various possible means of delivering a surprise attack, both with missiles and manned aircraft. It noted the range of the instruments, the general characteristics pertinent to the problem of surveillance and observation and some types of evidence that might indicate the imminence of a surprise attack. A second paper described some techniques which could be effective in observing and inspecting the instruments of surprise attack. [5] These techniques were divided into three groups: aerial and satellite, ground, and underwater inspection. The first two corresponded more or less to suggestions put forward in 1957 by both the Soviet Union and the Western countries for a combination of aerial reconnaissance and ground posts to lessen the danger of surprise attack. The remaining four papers described other technical aspects of the problem. [5]

The Soviet Union submitted a plan for prevention of surprise attack on 28 November 1958. [5, 22] It met several of the points made by the Western powers, particularly their rejection of the proposal to link ground and aerial inspection with the prohibition of nuclear weapons. As a basis of agreement for reducing the danger of sudden attack, the Soviet Government proposed the creation of ground control posts and aerial photography in certain regions. The posts should be set up at agreed points throughout: Albania, Belgium, Bulgaria, Czechoslovakia, France, German Democratic Republic, Federal Republic of Germany, Greece, Hungary, Iran, Italy, Luxembourg, Netherlands, Poland, Romania, Turkey, and the UK, as well as in the frontier zones of the Soviet Union and along the east coast of the United States. Inclusion of Greece and Turkey in the zone was requested on the grounds that, as members of NATO, they "take part in all military measures carried out by this group and since, moreover, military bases directed against the countries participating in the Warsaw Treaty organization are established on their territories". It was necessary to establish control posts in Iran because "that country, being together with Turkey a member of the Baghdad Pact, has recently been getting more and more involved in the military measures carried out by the members of this Pact".

The Soviet Union proposed twenty-eight posts in the territory of the Warsaw Treaty countries, including six posts on Soviet territory, and fifty-four posts on the territory of NATO and Baghdad Pact countries, including six

posts on United States territory. The request for the establishment of control posts originated from the Soviet Government's conviction that

even with nuclear weapons, preparations for present-day major wars are inextricably linked up with the need to concentrate large military units at certain points, together with great quantities of weapons and military equipment: aeroplanes, tanks, artillery, warships, submarines, land and air transport.

The new plan largely repeated the earlier Soviet suggestion, of 17 November 1956, for the establishment of an aerial photography zone in Europe covering 800 kilometres east and west of the division line between the armed forces of NATO and the Warsaw Treaty countries. The only addition was an extension of the zone to include Greece, Turkey and Iran, for the same reasons as those given for the establishment of ground control posts in those countries. The Soviet plan also provided for establishment of a Far Eastern aerial inspection zone, comprising eastern Siberia and the western half of the USA (including Alaska), as well as all of Japan and the Okinawa Islands. Establishment of this zone was conditional, however, on establishing ground control posts and an aerial photography zone in Europe and the Middle East. "This derives from the particular significance of the European continent as the most dangerous region in which, as already stated, the principal forces of the two politico-military groupings—Nato and the Warsaw Pact Treaty organization—are facing each other."

The USSR maintained that ground control posts and aerial photography could not reduce the danger of surprise attack, unless they were linked with certain measures of arms control. Consequently it proposed, in addition to establishment of ground control posts and aerial photography inspection, an agreement on: (a) reduction by not less than one-third of the foreign armed forces in the territory of European states included in the control zone, and (b) prohibition of weapons of mass destruction on the territories of the Federal Republic of Germany and the German Democratic Republic.

During the conference on 12 December the Soviet Union submitted another document [5] which appeared to be of particular importance. It contained, for the first time, a detailed description of the ground control posts and the provisions for aerial inspection which the Soviet Union had been advocating in general terms for several years. According to this document the ground posts would consist of six to eight control officers, equally divided in nationality between the NATO/Baghdad Pact countries and the Warsaw Treaty countries. They would be assisted by interpreters and ancillary personnel, the latter composed exclusively of citizens of the state in whose territory the post is situated. The post commander would be appointed from among the representatives of the side over which control is to

be exercised. The control officers would keep direct visual watch, assisted by optical and photographic equipment, on the movements of troops and equipment by land and by sea. Local communication facilities would be used, with reports in "a mutually agreed code, the key to which shall be in the possession of the representatives of all States taking part in the control".

The aerial inspection was designed to reveal the concentration of armed forces in the agreed zone or the regrouping or mobilization of such forces. Two air groups, one for the Warsaw Treaty countries and the other for the NATO/Baghdad Pact countries, would take pictures of their own territory. In each air group, however, there must be control officers, representing the opposite side, who will also be onboard the aircraft. The photographs would be processed, interpreted and studied at a photography centre, in the inspected country, on which both sides would be equally represented. Reports on the results of the aerial inspection would be transmitted, in a mutually agreed code, to a supervisory body; this body would be instituted on a bilateral basis with the NATO/Baghdad Pact countries and the Warsaw Treaty countries equally represented.

The conference lasted only six weeks, from 10 November to 18 December; it then recessed and did not reconvene. It failed for several reasons: the first was general disagreement about the most probable origin of a surprise attack. The Western countries conceived of a surprise attack via the polar areas from long-range missiles or manned aircraft carrying nuclear weapons—hence their insistence on an aerial inspection zone in the Arctic region. The Soviet Union found a danger of surprise attack in the "fact that in Europe and the Middle East there are concentrated in close proximity to each other the main armed forces of the countries which are parties to the North Atlantic Treaty, the Baghdad Pact and the Warsaw Treaty". Under these circumstances "the danger of an armed conflict beginning is especially great". Consequently, the Soviet Government favoured an agreement whereby Europe and the Middle East would be subjected to close observation and inspection. In other words, the Soviet Union was more interested in avoiding the outbreak of limited war, which might expand into a world war, than in speculating on the possibility of a massive nuclear surprise attack.

Secondly, the USSR was exceedingly concerned over the prospect of the Federal Republic of Germany getting nuclear weapons. Its last proposal reflected this concern as well as its willingness to compromise on other points in exchange for some assurances that West Germany would not become a nuclear power. However, the rigid policy of then West German Chancellor, Adenauer, who repeatedly requested the stationing of nuclear weap-

ons in the Federal Republic of Germany—an attitude which, because of strategic considerations, had also been adopted by NATO—meant that there was very little prospect for an agreement.⁶ Third, the German question in general played a significant role in the Western countries' attitude toward Soviet proposals. They refused to consent to any proposal for a European zone of inspection whose centre would be the demarcation line between the two military blocs, since in their opinion this would indirectly legalize the division of both Germany and Europe as a whole. In addition, they considered that the area west of the demarcation line would contain far more installations of strategic importance than an equal area east of the line. They reasoned that the vast area of the Soviet Union permitted defence in depth, which was not the case in Western Europe. Finally, if Central Europe was opened to aerial and ground-control-post inspection, this would in effect lead to the neutralization of that region. This was not acceptable to the Western countries either, for the same reason—the absence of an adequate depth of defence in Western Europe.

The question of aerial inspection against surprise attack has been to a great extent dropped from the discussions of separate arms-control measures. Development of space technology with reconnaissance satellites has provided a sufficient substitute for the earlier proposals for aerial inspection. But the problem of ground control posts has been raised again on several occasions as part of measures designed to reduce the danger of war by accident or miscalculation, or surprise attack, and as a confidence-building measure. [39]

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Section 3. Background to other disarmament questions

3A. Background to the sea-bed disarmament debate

3.A.1 Draft treaty on the prohibition of the emplacement of nuclear weapons and other weapons of mass destruction on the seabed and the ocean floor and in the subsoil thereof, submitted by the USSR and the USA to the Conference of the Committee on Disarmament on 1 September 1970

The States Parties to this Treaty,

Recognizing the common interest of mankind in the progress of the exploration and use of the seabed and the ocean floor for peaceful purposes,

Considering that the prevention of a nuclear arms race on the seabed and the ocean floor serves the interests of maintaining world peace, reduces international tensions, and strengthens friendly relations among States,

Convinced that this Treaty constitutes a step towards the exclusion of the seabed, the ocean floor and the subsoil thereof from the arms race,

Convinced that this Treaty constitutes a step towards a Treaty on general and complete disarmament under strict and effective international control, and determined to continue negotiations to this end,

Convinced that this Treaty will further the purposes and principles of the Charter of the United Nations, in a manner consistent with the principles of international law and without infringing the freedoms of the high seas,

Have agreed as follows:

Article I

1. The States Parties to this Treaty undertake not to emplant or emplace on the seabed and the ocean floor and in the subsoil thereof beyond the outer limit of a seabed zone as defined in Article II 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.
2. The undertakings of paragraph 1 of this Article shall also apply to the seabed zone referred to in the same paragraph, except that within such seabed

Source: CCD document, CCD/269/Rev. 3.

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zone, they shall not apply either to the coastal State or to the seabed beneath its territorial waters.

3. The States Parties to this Treaty undertake not to assist, encourage or induce any State to carry out activities referred to in paragraph 1 of this Article and not to participate in any other way in such actions.

Article II

For the purpose of this Treaty the outer limit of the seabed zone referred to in Article I shall be coterminous with the twelve-mile outer limit of the zone referred to in Part II of the Convention on the Territorial Sea and the Contiguous Zone, signed in Geneva on 29 April 1958 and shall be measured in accordance with the provisions of Part I, Section II, of this Convention and in accordance with international law.

Article III

1. In order to promote the objectives of and ensure compliance with the provisions of this Treaty, each State Party to the Treaty shall have the right to verify through observation the activities of other States Parties to the Treaty on the seabed and the ocean floor and in the subsoil thereof beyond the zone referred to in Article I, provided that observation does not interfere with such activities.

2. If after such observation reasonable doubts remain concerning the fulfilment of the obligations assumed under the Treaty, the State Party having such doubts and the State Party that is responsible for the activities giving rise to the doubts shall consult with a view to removing the doubts. If the doubts persist, the State Party having such doubts shall notify the other States Parties, and the Parties concerned shall co-operate on such further procedures for verification as may be agreed, including appropriate inspection of objects, structures, installations or other facilities that reasonably may be expected to be of a kind described in Article I. The Parties in the region of the activities, including any coastal State, and any other Party so requesting, shall be entitled to participate in such consultation and co-operation. After completion of the further procedures for verification, an appropriate report shall be circulated to other Parties by the Party that initiated such procedures.

3. If the State responsible for the activities giving rise to the reasonable doubts is not identifiable by observation of the object, structure, installation or other facility, the State Party having such doubts shall notify and make appropriate inquiries of States Parties in the region of the activities and of any other State Party. If it is ascertained through these inquiries that a particular State Party is responsible for the activities, that State Party shall con-

sult and co-operate with other Parties as provided in paragraph 2 of this Article. If the identity of the State responsible for the activities cannot be ascertained through these inquiries, then further verification procedures, including inspection, may be undertaken by the inquiring State Party, which shall invite the participation of the Parties in the region of the activities, including any coastal State, and of any other Party desiring to co-operate.

4. If consultation and co-operation pursuant to paragraphs 2 and 3 of this Article have not removed the doubts concerning the activities and there remains a serious question concerning fulfilment of the obligations assumed under this Treaty, a State Party may, in accordance with the provisions of the Charter of the United Nations, refer the matter to the Security Council, which may take action in accordance with the Charter.

5. Verification pursuant to this Article may be undertaken by any State Party using its own means, or with the full or partial assistance of any other State Party, or through appropriate international procedures within the framework of the United Nations and in accordance with its Charter.

6. Verification activities pursuant to this Treaty shall not interfere with activities of other States Parties and shall be conducted with due regard for rights recognized under international law including the freedoms of the high seas and the rights of coastal States with respect to the exploration and exploitation of their continental shelves.

Article IV

Nothing in this Treaty shall be interpreted as supporting or prejudicing the position of any State Party with respect to existing international conventions, including the 1958 Convention on the Territorial Sea and the Contiguous Zone, or with respect to rights or claims which such State Party may assert, or with respect to recognition or non-recognition of rights or claims asserted by any other State, related to waters off its coasts; including inter alia territorial seas and contiguous zones, or to the seabed and the ocean floor, including continental shelves.

Article V

The Parties to this Treaty undertake to continue negotiations in good faith concerning further measures in the field of disarmament for the prevention of an arms race on the seabed, the ocean floor, and the subsoil thereof.

Article VI

Any State Party may propose amendments to this Treaty. Amendments shall enter into force for each State Party accepting the amendments upon

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their acceptance by a majority of the States Parties to the Treaty and thereafter for each remaining State Party on the date of acceptance by it.

Article VII

Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be held in Geneva, Switzerland, in order to review the operation of this Treaty with a view to assuring that the purposes of the preamble and the provisions of the Treaty are being realized. Such review shall take into account any relevant technological developments. The review conference shall determine in accordance with the views of a majority of those Parties attending whether and when an additional review conference shall be convened.

Article VIII

Each State Party to this Treaty 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 the supreme interests of its country. It shall give notice of such withdrawal to all other States Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it considers to have jeopardized its supreme interests.

Article IX

The provisions of this Treaty shall in no way affect the obligations assumed by States Parties to the Treaty under international instruments establishing zones free from nuclear weapons.

Article X

1. This Treaty shall be open for signature to all States. Any State which does not sign the Treaty before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.
2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and of accession shall be deposited with the Governments of . . . which are hereby designated the Depositary Governments.
3. This Treaty shall enter into force after the deposit of instruments of ratification by twenty-two Governments, including the Governments designated as Depositary Governments of this Treaty.
4. For States whose instruments of ratification or accession are deposited after the entry into force of this Treaty it shall enter into force on the date of the deposit of their instruments of ratification or accession.

5. The Depositary Governments shall promptly inform the Governments of all signatory and acceding States of the date of each signature, of the date of deposit of each instrument of ratification or of accession, of the date of the entry into force of this Treaty, and of the receipt of other notices.

6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

Article XI

This Treaty, the Chinese, English, French, Russian and Spanish texts of which are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the States signatory and acceding thereto.

In witness whereof the undersigned, being duly authorized thereto, have signed this Treaty.

3A.2. Breadth of territorial seas and fishing jurisdictions claimed by selected countries¹

Country	Territorial sea	Fishing limit	Other
Albania	10 miles	12 miles	
Algeria	12 miles	12 miles	
Argentina		200 miles	Sovereignty is claimed over a 200-mile maritime zone but the law specifically provides that freedom of navigation of ships and aircraft in the zone is unaffected. Continental Shelf—including sovereignty over superjacent waters.
Australia	3 miles	12 miles	
Belgium	3 miles	12 miles ²	
Brazil	12 miles	12 miles	
Bulgaria	12 miles	12 miles	
Burma	12 miles	12 miles	
Cambodia	12 miles	12 miles	
Cameroun	18 miles	18 miles	
Canada	3 miles	12 miles	
Ceylon	6 miles	6 miles	Claims right to establish conservation zones within 100 nautical miles of the territorial sea.
Chile	3 miles	200 miles	
China, People's Rep. of	3 miles	3 miles	
China, Rep. of (Taiwan)	12 miles		
Colombia	12 miles	12 miles	
Congo, Dem. Rep. of (Kinshasa)	3 miles	3 miles	

¹ As of 1 January 1970.

² Parties to the European Fisheries Convention which provides for the right to establish 3-mile exclusive fishing zone seaward of 3-mile territorial sea plus additional 6-mile fishing zone restricted to the convention nations.

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3A.2. Continued

Country	Territorial sea	Fishing limit	Other
Costa Rica	3 miles		"Specialized competence" over living resources to 200 miles.
Cuba	3 miles	3 miles	
Cyprus	12 miles	12 miles	100-mile mineral exploration limit.
Dahomey	12 miles	12 miles	
Denmark	3 miles	12 miles ^a	Contiguous zone 6 miles beyond territorial sea for protection of health, fiscal, customs matters, and the conservation of fisheries and other natural resources of the sea.
Greenland		12 miles	
Faroe Islands		12 miles	
Dominican Republic	6 miles	12 miles	
Ecuador	200 miles	200 miles	
El Salvador	200 miles	200 miles	Undefined protective areas may be proclaimed seaward of territorial sea, and up to 100 miles seaward of territorial sea may be proclaimed fishing conservation zone.
Ethiopia	12 miles	12 miles	
Germany, Fed. Rep. of	3 miles	12 miles ^a	
Germany, Dem. Rep. of	3 miles		
Finland	4 miles	4 miles	
France	3 miles	12 miles	
Gabon	12 miles	12 miles	
Gambia	3 miles	3 miles	
Ghana	12 miles	12 miles	
Greece	6 miles	6 miles	
Guatemala	12 miles	12 miles	
Guinea	130 miles	130 miles	
Guyana	3 miles	3 miles	
Haiti	6 miles	6 miles	
Honduras	12 miles	12 miles	
Iceland	4 miles	12 miles	
India	12 miles	12 miles	
Indonesia	12 miles	12 miles	Plus right to establish 100 miles conservation zone. Archipelago concept baselines.
Iran	12 miles	12 miles	
Iraq	12 miles	12 miles	
Ireland	3 miles	12 miles ^a	
Israel	6 miles	6 miles	
Italy	6 miles	12 miles ^a	
Ivory Coast	6 miles	12 miles	
Jamaica	12 miles		
Japan	3 miles	3 miles	
Jordan	3 miles	3 miles	
Kenya	12 miles	12 miles	
Kuwait	12 miles	12 miles	
Lebanon		6 miles	
Liberia	12 miles	12 miles	
Libya	12 miles	12 miles	
Malagasy Republic	12 miles	12 miles	
Malaysia	12 miles	12 miles	
Maldiv Islands	3 miles	6 miles	
Malta	3 miles	3 miles	
Mauritania	12 miles	12 miles	
Mauritius	3 miles	3 miles	

3A.2. Continued

Country	Territorial sea	Fishing limit	Other
Mexico	12 miles	12 miles	
Morocco	3 miles	12 miles	Exception—6-mile fishing zone for Strait of Gibraltar.
Netherlands	3 miles	12 miles ^a	
New Zealand	3 miles	12 miles	
Nicaragua	3 miles	200 miles	Continental Shelf including sovereignty over superjacent waters.
Nigeria	12 miles	12 miles	
Norway	4 miles	12 miles	
Pakistan	12 miles	12 miles	Plus right to establish 100-mile conservation zones.
Panama	200 miles	200 miles	Continental Shelf including sovereignty over superjacent waters.
Peru	200 miles	200 miles	
Philippines			Archipelago concept baselines. Waters between these baselines and the limits described in the Treaty of Paris, 10 Dec. 1898, the United States-Spain Treaty of 7 Nov. 1900, and United States-United Kingdom Treaty of 2 Jan. 1930, are claimed as territorial sea.
Poland	3 miles	3 miles	
Portugal	No claims	12 miles ^a	
Romania	12 miles	12 miles	
Saudia Arabia	12 miles	12 miles	
Senegal	12 miles	18 miles	Fishing zone beyond 12 miles does not apply to those nations which are party to the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone.
Sierra Leone	12 miles	12 miles	
Singapore	3 miles	3 miles	
Somali Republic	12 miles	12 miles	
South Africa	6 miles	12 miles	
Spain	6 miles	12 miles ^a	
Sudan	12 miles	12 miles	
Sweden	4 miles	12 miles ^a	
Syria	12 miles	12 miles	Contiguous zone—an additional 6-mile area to control security, customs, hygiene, and financial matters.
Tanzania	12 miles	12 miles	
Thailand	12 miles	12 miles	
Togo	12 miles	12 miles	
Trinidad and Tobago	3 miles	3 miles	
Tunisia	6 miles	12 miles	Fisheries zone follows the 50-meter isobath at specified areas of the coast (maximum 65 miles).
Turkey	6 miles	12 miles	
Ukrainian SSR.	12 miles	12 miles	
USSR	12 miles	12 miles	
United Arab Republic	12 miles	12 miles	
United Kingdom	3 miles	12 miles	
Overseas areas	3 miles	3 miles	
United States of America	3 miles	12 miles	

3A.2. Continued.

Country	Territorial sea	Fishing limit	Other
Uruguay	12 miles	200 miles	Sovereignty is claimed over a 200-mile maritime zone but law specifically provides that the freedom of navigation of ships and aircraft beyond 12 miles is unaffected by the claim.
Venezuela	12 miles	12 miles	
Yemen	12 miles	12 miles	
Yugoslavia	10 miles	10 miles	

3A.3. Convention on the Territorial Sea and the Contiguous Zone of 29 April 1958

Part I. Territorial Sea

Section II. Limits of the Territorial Sea

Article 3

Except where otherwise provided in these articles, the normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State.

Article 4

1. In localities where the coast line is deeply indented and cut into, or if there is a fringe of islands along the coast in its immediate vicinity, the method of straight baselines joining appropriate points may be employed in drawing the baseline from which the breadth of the territorial sea is measured.

2. The drawing of such baselines must not depart to any appreciable extent from the general direction of the coast, and the sea areas lying within the lines must be sufficiently closely linked to the land domain to be subject to the régime of internal waters.

3. Baselines shall not be drawn to and from low-tide elevations, unless lighthouses or similar installations which are permanently above sea level have been built on them.

4. Where the method of straight baselines is applicable under the provisions of paragraph 1, account may be taken, in determining particular baselines, of economic interests peculiar to the region concerned, the reality and the importance of which are clearly evidenced by a long usage.

5. The system of straight baselines may not be applied by a State in such a manner as to cut off from the high seas the territorial sea of another State.

6. The coastal State must clearly indicate straight baselines on charts, to which due publicity must be given.

Article 5

1. Waters on the landward side of the baseline of the territorial sea form part of the internal waters of the State.

2. Where the establishment of a straight baseline in accordance with article IV has the effect of enclosing as internal waters areas which previously had been considered as part of the territorial sea or of the high seas, a right of innocent passage, as provided in articles 14 to 23, shall exist in those waters.

Article 6

The outer limit of the territorial sea is the line every point of which is at a distance from the nearest point of the baseline equal to the breadth of the territorial sea.

Article 7

1. This article relates only to bays the coasts of which belong to a single State.

2. For the purposes of these articles, a bay is a well-marked indentation whose penetration is in such proportion to the width of its mouth as to contain landlocked waters and constitute more than a mere curvature of the coast. An indentation shall not, however, be regarded as a bay unless its area is as large as, or larger than, that of the semi-circle whose diameter is a line drawn across the mouth of that indentation.

3. For the purpose of measurement, the area of an indentation is that lying between the low-water mark around the shore of the indentation and a line joining the low-water marks of its natural entrance points. Where, because of the presence of islands, an indentation has more than one mouth, the semi-circle shall be drawn on a line as long as the sum total of the lengths of the lines across the different mouths. Islands within an indentation shall be included as if they were part of the water areas of the indentation.

4. If the distance between the low-water marks of the natural entrance points of a bay does not exceed twenty-four miles, a closing line may be drawn between these two low-water marks, and the waters enclosed thereby shall be considered as internal waters.

5. Where the distance between the low-water marks of the natural entrance

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points of a bay exceeds twenty-four miles, a straight baseline of twenty-four miles shall be drawn within the bay in such a manner as to enclose the maximum area of water that is possible with a line of that length.

6. The foregoing provisions shall not apply to so-called "historic" bays, or in any case where the straight baseline system provided for in article 4 is applied.

Article 8

For the purpose of delimiting the territorial sea, the outermost permanent harbour works which form an integral part of the harbour system shall be regarded as forming part of the coast.

Article 9

Roadsteads which are normally used for the loading, unloading and anchoring of ships, and which would otherwise be situated wholly or partly outside the outer limit of the territorial sea, are included in the territorial sea. The coastal State must clearly demarcate such roadsteads and indicate them on charts together with their boundaries, to which due publicity must be given.

Article 10

1. An island is a naturally-formed area of land, surrounded by water, which is above water at high-tide.
2. The territorial sea of an island is measured in accordance with the provisions of these articles.

Article 11

1. A low-tide elevation is a naturally-formed area of land which is surrounded by and above water at low-tide but submerged at high-tide. Where a low-tide elevation is situated wholly or partly at a distance not exceeding the breadth of the territorial sea from the mainland or an island, the low-water line on that elevation may be used as the baseline for measuring the breadth of the territorial sea.
2. Where a low-tide elevation is wholly situated at a distance exceeding the breadth of the territorial sea from the mainland or an island, it has no territorial sea of its own.

Article 12

1. Where the coasts of two States are opposite or adjacent to each other, neither of the two States is entitled, failing agreement between them to the contrary, to extend its territorial sea beyond the median line every

point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of each of the two States is measured. The provisions of this paragraph shall not apply, however, where it is necessary by reason of historic title or other special circumstances to delimit the territorial seas of the two States in a way which is at variance with this provision.

2. The line of delimitation between the territorial seas of two States lying opposite to each other or adjacent to each other shall be marked on large-scale charts officially recognized by the coastal States.

Article 13

If a river flows directly into the sea, the baseline shall be a straight line across the mouth of the river between points on the low-tide line of its banks.

3A.4. List of signatures, ratifications, accessions and notifications of succession to the Convention on the Territorial Sea and the Contiguous Zone of 29 April 1958¹

State	Signature	Ratification, accession (a), notification of succession (b)
Afghanistan	30 October 1958	
Argentina	29 April 1958	
Australia	30 October 1958	14 May 1963
Austria	27 October 1958	
Bolivia	17 October 1958	
Bulgaria	31 October 1958	31 August 1962
Byelorussian SSR	30 October 1958	27 February 1961
Cambodia		18 March 1960 <i>a</i>
Canada	29 April 1958	
Ceylon	30 October 1958	
China, Rep. of (Taiwan)	29 April 1958	
Colombia	29 April 1958	
Costa Rica	29 April 1958	
Cuba	29 April 1958	
Czechoslovakia	30 October 1958	31 August 1961
Denmark	29 April 1958	26 September 1968
Dominican Republic	29 April 1958	11 August 1964
Finland	27 October 1958	16 February 1965
Ghana	29 April 1958	
Guatemala	29 April 1958	
Haiti	29 April 1958	29 March 1960
Holy See	30 April 1958	
Hungary	31 October 1958	6 December 1961
Iceland	29 April 1958	
Iran	28 May 1958	
Ireland	2 October 1958	
Israel	29 April 1958	6 September 1961
Italy		17 December 1964 <i>a</i>
Jamaica		8 October 1965 <i>b</i>

¹ As at 31 December 1969.

Source: UN document, ST/LEG/SER. D/3.

3A.4. Continued

State	Signature		Ratification, accession (a), notification of succession (b)	
Japan			10 June	1968 <i>a</i>
Kenya			20 June	1969 <i>a</i>
Liberia	27 May	1958		
Madagascar			31 July	1962 <i>a</i>
Malawi			3 November	1965 <i>a</i>
Malaysia			21 December	1960 <i>a</i>
Malta			19 May	1966 <i>b</i>
Mexico			2 August	1966 <i>a</i>
Nepal	29 April	1958		
Netherlands	31 October	1958	18 February	1966
New Zealand	29 October	1958		
Nigeria			26 June	1961 <i>b</i>
Pakistan	31 October	1958		
Panama	2 May	1958		
Portugal	28 October	1958	8 January	1963
Romania	31 October	1958	12 December	1961
Senegal			25 April	1961 <i>a</i>
Sierra Leone			13 March	1962 <i>b</i>
South Africa			9 April	1963 <i>a</i>
Switzerland	22 October	1958	18 May	1966
Thailand	29 April	1958	2 July	1968
Trinidad and Tobago			11 April	1966 <i>b</i>
Tunisia	30 October	1958		
Uganda			14 September	1964 <i>a</i>
Ukrainian SSR	30 October	1958	12 January	1961
Union of Soviet Socialist Republics	30 October	1958	22 November	1960
United Kingdom	9 September	1958	14 March	1960
United States of America	15 September	1958	12 April	1961
Uruguay	29 April	1958		
Venezuela	30 October	1958	15 August	1961
Yugoslavia	29 April	1958	28 January	1966

3A.5. List of signatures, ratifications, accessions and notifications of succession to the Convention on the Continental Shelf of 29 April 1958¹

State	Signature		Ratification, accession (a), notification of succession (b)	
Afghanistan	30 October	1958		
Albania			7 December	1964 <i>a</i>
Argentina	29 April	1958		
Australia	30 October	1958	14 May	1963
Bolivia	17 October	1958		
Bulgaria			31 August	1962 <i>a</i>
Byelorussian SSR	31 October	1958	27 February	1961
Cambodia			18 March	1960 <i>a</i>
Canada	29 April	1958		

¹ As at 31 December 1969.

Source: UN document, ST/LEG/SER. D/3.

3A.5. Continued

State	Signature		Ratification, accession (a), notification of succession (b)	
Ceylon	30 October	1958		
Chile	31 October	1958		
China, Rep. of (Taiwan)	29 April	1958		
Colombia	29 April	1958	8 January	1962
Costa Rica	29 April	1958		
Cuba	29 April	1958		
Czechoslovakia	31 October	1958	31 August	1961
Denmark	29 April	1958	12 June	1963
Dominican Republic	29 April	1958	11 August	1964
Ecuador	31 October	1958		
Federal Republic of Germany	30 October	1958		
Finland	27 October	1958	16 February	1965
France			14 June	1965 <i>a</i>
Ghana	29 April	1958		
Guatemala	29 April	1958	27 November	1961
Haiti	29 April	1958	29 March	1960
Iceland	29 April	1958		
Indonesia	8 May	1958		
Iran	28 May	1958		
Ireland	2 October	1958		
Israel	29 April	1958	6 September	1961
Jamaica			8 October	1965 <i>a</i>
Kenya			20 June	1969 <i>a</i>
Lebanon	29 May	1958		
Liberia	27 May	1958		
Madagascar			31 July	1962 <i>a</i>
Malawi			3 November	1965 <i>a</i>
Malaysia			21 December	1960 <i>a</i>
Malta			19 May	1966 <i>b</i>
Mexico			2 August	1966 <i>a</i>
Nepal	29 April	1958		
Netherlands	31 October	1958	18 February	1966
New Zealand	29 October	1958	18 January	1965
Pakistan	31 October	1958		
Panama	2 May	1958		
Peru	31 October	1958		
Poland	31 October	1958	29 June	1962
Portugal	28 October	1958	8 January	1963
Romania			12 December	1961 <i>a</i>
Senegal			25 April	1961 <i>a</i>
Sierra Leone			25 November	1966 <i>a</i>
South Africa			9 April	1963 <i>a</i>
Sweden			1 June	1966 <i>a</i>
Switzerland	22 October	1958	18 May	1966
Thailand	29 April	1958	2 July	1968
Trinidad and Tobago			11 July	1968 <i>a</i>
Tunisia	30 October	1958		
Uganda			14 September	1964 <i>a</i>
Ukrainian SSR	31 October	1958	12 January	1961
Union of Soviet Socialist Republics	31 October	1958	22 November	1960
United Kingdom	9 September	1958	11 May	1964
United States of America	15 September	1958	12 April	1961
Uruguay	29 April	1958		
Venezuela	30 October	1958	15 August	1961
Yugoslavia	29 April	1958	28 January	1966

3B. *Background to the negotiations on CBW*

3B.1. List of states which have signed, ratified, acceded or succeeded to the 1925 Geneva Protocol, as of 31 August 1970

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.

The Undersigned Plenipotentiaries, in the name of their respective Governments:

Whereas the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world; and

Whereas the prohibition of such use has been declared in Treaties to which the majority of Powers of the world are Parties; and

To the end that this prohibition shall be universally accepted as a part of International Law, binding alike the conscience and the practice of nations;

Declare:

That the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration.

The High Contracting Parties will exert every effort to induce other States to accede to the present Protocol. Such accession will be notified to the Government of the French Republic, and by the latter to all signatory and acceding Powers, and will take effect on the date of the notification by the Government of the French Republic.

The present Protocol, of which the French and English texts are both authentic, shall be ratified as soon as possible. It shall bear to-day's date.

The ratifications of the present Protocol shall be addressed to the Government of the French Republic, which will at once notify the deposit of such ratification to each of the signatory and acceding Powers.

The instruments of ratification of and accession to the present Protocol will remain deposited in the archives of the Government of the French Republic.

The present Protocol will come into force for each signatory Power as from the date of deposit of its ratification, and, from that moment, each Power will be bound as regards other Powers which have already deposited their ratifications. In witness whereof the Plenipotentiaries have signed the present Protocol.

Done at Geneva in a single copy, the seventeenth day of June, One Thousand Nine Hundred and Twenty-Five.

Number of parties to the Protocol

According to the information provided by the French Government, the depositary government, the number of parties to the Geneva Protocol as of 31 August

1970 was seventy-four. This figure is the sum of ratifications, accessions and notifications of succession. It should be recalled, however, that Estonia, Latvia and Lithuania no longer have independent status, while both the Federal Republic of Germany and the German Democratic Republic, as well as the People's Republic of China and the Republic of China (Taiwan) are bound by ratification or accession, respectively, on behalf of Germany and China. Thus the total number of actual parties to the Geneva Protocol is seventy-three.

On 19 August 1970, President Nixon, when submitting the Protocol for ratification to the US Senate, stated that the number of parties was eighty-five. Presumably this number includes certain states which are former non-self-governing territories and which have made general statements of continuity to the treaties and international obligations concluded by the power formerly responsible for their administration without, however, informing the French Government that the statement specifically applied to the Geneva Protocol. 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. This was conveyed in a letter from the French Embassy in Stockholm, dated 26 August 1970; the relevant part of the letter reads as follows: "le Gouvernement français estime qu'une déclaration générale de continuité formulée par un Etat ayant accédé à l'indépendance, ne saurait habiliter un gouvernement dépositaire d'une convention internationale à considérer cet Etat comme lié par la dite convention."

Some countries which have made general statements of continuity appear not to be aware of the position taken by the French Government on this question, and consider themselves bound by the Protocol although they have made no specific statement to this effect. For example, the Minister of Foreign Affairs of Upper Volta, in a letter dated 14 May 1970, stated that the Geneva Protocol was made applicable to Upper Volta by the ratification of France in 1926, and that in his view no process of ratification was now necessary.

However, it would appear from the statement of the French Government, as well as from the practice of countries such as Rwanda, Gambia and Niger, that, whereas no further act of ratification is necessary for former colonial territories, it is necessary, if such a country is to be considered a party, for it to notify the French Government officially that it considers itself bound by the Protocol.

A. LIST OF SIGNATORIES AND RATIFICATIONS

Signatory	Deposit of ratification
Austria	9 May 1928
Belgium	4 Dec. 1928 ⁷
Brazil	28 Aug. 1970
British Empire ²	9 April 1930 ⁸
Bulgaria	7 March 1934 ⁹
Canada	6 May 1930 ¹⁰
Chile	2 July 1935 ¹¹
Czechoslovakia	16 Aug. 1938 ¹²
Denmark	5 May 1930
Egypt	6 Dec. 1928

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El Salvador	
Estonia	28 Aug. 1931 ¹³
Ethiopia	20 Sept. 1935 ¹⁴
Finland	26 June 1929
France	10 May 1926 ¹⁵
Germany ⁴	25 April 1929
Greece	30 May 1931
India	9 April 1930 ¹⁶
Italy	3 April 1928
Japan	21 May 1970
Latvia	3 June 1931
Lithuania	15 June 1933
Luxembourg	1 Sept. 1936
Netherlands ⁵	31 Oct. 1930 ¹⁷
Nicaragua	
Norway	27 July 1932
Poland	4 Feb. 1929
Portugal	1 July 1930 ¹⁸
Romania	23 Aug. 1929 ¹⁹
Serbs, Croats and Slovenes, Kingdom of the (Yugoslavia)	12 April 1929 ³
Siam (Thailand)	6 June 1931
Spain	22 Aug. 1929 ²⁰
Sweden	25 April 1930
Switzerland	12 July 1932
Turkey	5 Oct. 1929
USA	
Uruguay	
Venezuela	8 Feb. 1928

B. LIST OF ACCESSIONS AND SUCCESSIONS

Country	Notification by the French Government
Argentina	12 May 1969
Australia	24 May 1930 ²⁵
Central African Republic	31 July 1970
Ceylon	20 Jan. 1954
China ²¹	24 Aug. 1929 ²⁶
Cuba	24 June 1966
Cyprus	12 Dec. 1966. ³⁷
Gambia	16 Nov. 1966 ³⁶
Ghana	3 May 1967
Holy See	18 Oct. 1966
Hungary	11 Oct. 1952
Iceland	2 Nov. 1967
Iraq	8 Sept. 1931 ²⁷
Irish Free State (Ireland)	29 Aug. 1930 ²⁸
Israel	20 Feb. 1969 ²⁹

Ivory Coast	27 July 1970
Jamaica	28 July 1970 ¹
Kenya	6 July 1970
Lebanon	17 April 1969
Liberia	17 June 1927
Malagasy Republic	2 Aug. 1967
Maldives	6 Jan. 1967 ³⁸
Mexico	28 May 1932
Monaco	6 Jan. 1967
Mongolia	6 Dec. 1968 ³⁰
Nepal	9 May 1969
New Zealand	24 May 1930 ³¹
Niger	19 April 1967 ³⁹
Nigeria	15 Oct. 1968 ³²
Pakistan ²³	9 June 1960
Paraguay	22 Oct. 1933 ²²
Persia (Iran)	5 Nov. 1929
Rwanda	25 June 1964 ⁶
Sierra Leone	20 March 1967
South Africa	24 May 1930 ³³
Syria	17 Dec. 1968 ³⁴
Tanganyika ²⁴	22 April 1963
Tunisia	12 July 1967
Uganda	24 May 1965
USSR	15 April 1928 ³⁵

Postscript. On 14 September 1970, the French Government notified the accession of Malawi, and on 16 September the accession of Ecuador. Thus, the total number of actual parties to the Protocol, by mid-September 1970, is seventy-five.

¹ 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 United Kingdom in 1930.

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".

³ 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.

⁴ 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.

⁵ Including Netherlands Indies, Surinam and Curaçao.

⁶ 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.

⁷ (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.

⁸ (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.

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⁹ 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.

¹⁰ (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.

¹¹ (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.

¹² 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.

¹³ (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.

¹⁴ 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.

¹⁵ (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.

¹⁶ (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.

¹⁷ 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.

¹⁸ (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.

¹⁹ (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.

²⁰ Declares as compulsory *ipso facto* and without special agreement in relation to any other Member or State accepting and executing 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, June 17, 1925.

²¹ 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.

²² 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.

²³ On 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.

²⁴ The United Republic of Tanganyika and Zanzibar informed the UN Secretary-General that all international agreements formerly in force between either country and other States would continue to be in force for the Republic of Tanzania.

²⁵ 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.

²⁶ The People's Republic of China considers itself bound by the Protocol on condition of reciprocity.

²⁷ 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 they shall not be bound by the Protocol towards any State at enmity with them whose armed forces, or the forces of whose allies, do not respect the dispositions of the Protocol.

²⁸ 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.

²⁹ 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.

³⁰ 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 this State.

³¹ Same reservations as Australia. (See footnote 25.)

³² 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.

³³ Same reservation as Australia. (See footnote 25.)

³⁴ 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.

³⁵ (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.

³⁶ In a declaration of 11 October 1966, Gambia confirmed its participation in the Protocol which had been made applicable to it by Great Britain.

³⁷ 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.

³⁸ In a declaration of 19 December 1966, Maldives confirmed its adherence to the Protocol.

³⁹ In a letter of 18 March 1967, Niger declared that it was bound by the adherence of France to the Protocol.

3B.2. United Nations resolution 2603 A(XXIV) on the question of chemical and bacteriological (biological) weapons

The General Assembly,

Considering that chemical and biological methods of warfare have always been viewed with horror and been justly condemned by the international community,

Considering that these methods of warfare are inherently reprehensible, because their effects are often uncontrollable and unpredictable and may be injurious without distinction to combatants and non-combatants and because any use would entail a serious risk of escalation,

Recalling that successive international instruments have prohibited or sought to prevent the use of such methods of warfare,

Noting specifically in this regard:

(a) That the majority of States then in existence adhered to 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,

(b) That since then further States have become Parties to that Protocol,

(c) That yet other States have declared that they will abide by its principles and objectives,

(d) That these principles and objectives have commanded broad respect in the practice of States,

(e) That the General Assembly, without any dissenting vote, has called for the strict observance by all States of the principles and objectives of the Geneva Protocol,

Recognizing therefore, in the light of all the above circumstances, that the Geneva Protocol embodies the generally recognized rules of international law prohibiting the use in international armed conflicts of all biological and chemical methods of warfare, regardless of any technical developments,

Mindful of the report of the Group of Experts, appointed by the Secretary-General under General Assembly resolution 2454 A (XXIII) of 20 December 1968, on chemical and bacteriological (biological) weapons and the effects of their possible use,

Considering that this report and the foreword to it by the Secretary-General add further urgency for an affirmation of these rules and for dispelling, for the future, any uncertainty as to their scope and, by such affirmation, assure the effectiveness of the rules and enable all States to demonstrate their determination to comply with them,

Declares as contrary to the generally recognized rules of international law, as embodied in 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, the use in international armed conflicts of:

(a) 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;

(b) Any biological agents of warfare—living organisms, whatever their nature, or infective material derived from them—which are intended to cause disease or death in man, animals or plants, and which depend for their effects on their ability to multiply in the person, animal or plant attacked.

Recorded vote

In favour: Afghanistan, Algeria, Argentina, Brazil, Bulgaria, Burma, Burundi, Byelorussia, Cameroon, Central African Republic, Ceylon, Chad, Colombia, Congo (Brazzaville), Congo (Democratic Republic of), Costa Rica, Cuba, Cyprus, Czechoslovakia, Dahomey, Dominican Republic, Ecuador, Equatorial Guinea, Ethiopia, Finland, Gabon, Ghana, Guatemala, Guinea, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Ireland, Ivory Coast, Jamaica, Jordan, Kenya, Kuwait, Lebanon, Lesotho, Libya, Maldives, Mali, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Nepal, Niger, Nigeria, Pakistan, Panama, Peru, Poland, Romania, Rwanda, Saudi Arabia, Senegal, Somalia, Southern Yemen, Spain, Sudan, Sweden, Syria, Togo, Trinidad and Tobago, Uganda, Ukraine, USSR, United Arab Republic, United Republic of Tanzania, Upper Volta, Yemen, Yugoslavia.
Against: Australia, Portugal, United States.

Abstaining: Austria, Belgium, Bolivia, Canada, Chile, China, Denmark, El Salvador, France, Greece, Iceland, Israel, Italy, Japan, Laos, Liberia, Luxembourg, Madagascar, Malawi, Malaysia, Netherlands, New Zealand, Nicaragua, Norway, Paraguay, Philippines, Sierra Leone, Singapore, South Africa, Swaziland, Thailand, Tunisia, Turkey, United Kingdom, Uruguay, Venezuela.

Absent: Albania, Barbados, Botswana, Cambodia,¹ Gambia, Malta, Zambia.
Source: GAOR—Twenty-fourth Session. Supplement No. 29 (A/7629).

¹ Later announced that it would have voted in favour.

3B.3. Revised UK draft convention for the prohibition of biological methods of warfare and accompanying draft Security Council resolution,² of 18 August 1970

The States concluding this Convention, hereinafter referred to as the “Parties to the Convention”,

Recalling that many States have become Parties to 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,

Recognizing the contribution that the said Protocol has already made, and continues to make, to mitigating the horrors of war,

Recalling further United Nations General Assembly Resolutions 2162B (XXI) of 5 December 1966, and 2454A (XXIII) of 20 December 1968, which called for strict observance by all States of the principles and objectives of the Geneva Protocol and invited all States to accede to it,

Believing that chemical and biological discoveries should be used only for the betterment of human life,

Recognizing nevertheless that the development of scientific knowledge throughout the world will increase the risk of eventual use of biological methods of warfare,

Convinced that such use would be repugnant to the conscience of mankind and that no effort should be spared to minimize this risk,

Desiring therefore to reinforce the Geneva Protocol by the conclusion of a Convention making special provision in this field,

Declaring their belief that, in particular, provision should be made for the prohibition of recourse to biological methods of warfare in any circumstances.

Have agreed as follows:

ARTICLE I

Each of the Parties to the Convention undertakes, insofar as it may not already be committed in that respect under Treaties or other instruments in force prohibiting the use of chemical and biological methods of warfare, never in any circumstances, by making use for hostile purposes of microbial or other biological agents or toxins causing death, damage or disease to man, other animals, or crops, to engage in biological methods of warfare.

² Disarmament Committee document. CCD/225/Rev.2.

ARTICLE II

Each of the Parties to the Convention undertakes:

- (a) not to produce or otherwise acquire, or assist in or permit the production or acquisition of:
 - (i) microbial or other biological agents or toxins of types and in quantities that have no justification for prophylactic or other peaceful purposes;
 - (ii) ancillary equipment or vectors the purpose of which is to facilitate the use of such agents or toxins for hostile purposes;
- (b) not to conduct, assist or permit research aimed at production of the kind prohibited in sub-paragraph (a) of this Article; and
- (c) to destroy, or divert to peaceful purposes, within three months after the Convention comes into force for that Party, any stocks in its possession of such agents or toxins or ancillary equipment or vectors as have been produced or otherwise acquired for hostile purposes.

ARTICLE III

1. Any Party to the Convention which believes that biological methods of warfare have been used against it may lodge a complaint with the Secretary-General of the United Nations, submitting all evidence at its disposal in support of the complaint, and request that the complaint be investigated and that a report on the result of the investigation be submitted to the Security Council.

2. Any Party to the Convention which believes that another Party is in breach of any of its undertakings under Articles I and II of the Convention, but which is not entitled to lodge a complaint under Paragraph 1 of this Article, may lodge a complaint with the Security Council, submitting all evidence at its disposal, and request that the complaint be investigated.

3. Each of the Parties to the Convention undertakes to co-operate fully with the Secretary-General and his authorized representatives in any investigation he may carry out, as a result of a complaint, in accordance with Security Council Resolution No . . .

ARTICLE IV

Each of the Parties to the Convention affirms its intention to provide or support appropriate assistance, in accordance with the United Nations Charter, to any Party to the Convention, if the Security Council concludes that biological methods of warfare have been used against that Party.

ARTICLE V

Each of the Parties to the Convention undertakes to pursue negotiations in good faith on effective measures to strengthen the existing constraints on chemical methods of warfare.

ARTICLE VI

Nothing contained in the present Convention shall be construed as in any way limiting or derogating from obligations assumed by any State under 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.

ARTICLE VII

[Provisions for amendments.]

ARTICLE VIII

[Provisions for Signature, Ratification, Entry into Force, etc.]

ARTICLE IX

1. This Convention shall be of unlimited duration.

2. Each Party shall in exercising its national sovereignty have the right to withdraw from the Convention, if it decides that extraordinary events, related to the subject matter of this Convention, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Convention and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.

ARTICLE X

[Provisions on languages of texts, etc.]

Revised draft Security Council resolution

The Security Council,

Welcoming the desire of a large number of States to subscribe to the Convention for the Prohibition of Biological Methods of Warfare, and thereby undertake never to engage in such methods of warfare; to prohibit the production and research aimed at the production of biological weapons; and to destroy, or divert to peaceful purposes, such weapons as may already be in their possession,

Noting that under Article III of the Convention, Parties will have the right to lodge complaints and to request that the complaints be investigated,

Recognizing the need, if confidence in the Convention is to be established, for appropriate arrangements to be made in advance for the investigation of any such complaints, and the particular need for urgency in the investigation of complaints of the use of biological methods of warfare,

Noting further the declared intention of Parties to the Convention to provide or support appropriate assistance, in accordance with the Charter, to any other Party to the Convention, if the Security Council concludes that biological methods of warfare have been used against that Party,

Reaffirming in particular the inherent right, recognized under Article 51 of the Charter, of individual and collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security.

1. Requests the Secretary-General

(a) to take such measures as will enable him

(i) to investigate without delay any complaints lodged with him in accordance with Article III.1 of the Convention;

(ii) if so requested by the Security Council, to investigate any complaint made in accordance with Article III.2 of the Convention; and

(b) to report to the Security Council on the result of any such investigation.

2. Declares its readiness to give urgent consideration

(a) to any complaint that may be lodged with it under Article III. 2 of the Convention; and

(b) to any report that the Secretary-General may submit in accordance with operative paragraph 1 of this Resolution on the result of his investigation of a complaint; and if it concludes that the complaint is well-founded, to consider urgently what action it should take or recommend in accordance with the Charter.

3. Calls upon Member States and upon Specialized Agencies of the United Nations to co-operate as appropriate with the Secretary-General for the fulfilment of the purposes of this Resolution.

**3B.4. Draft convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons.³
Submitted by Bulgaria, Byelorussian SSR, Czechoslovakia, Hungary, Mongolia, Poland, Romania, Ukrainian SSR, and the USSR, on 19 September 1969.**

The States Parties to this Convention,

Convinced of the immense importance and urgent necessity of eliminating from the arsenals of States such dangerous weapons of mass destruction as chemical and bacteriological (biological) weapons,

³ UN document. A/7655.

Other disarmament questions

Guided by the desire to facilitate progress in the achievement of the objectives of general and complete disarmament,

Desiring to contribute to the strengthening of confidence between peoples and the general improvement of the international atmosphere,

Believing that scientific discoveries in the field of chemistry and bacteriology (biology) must in the interests of all mankind be used solely for peaceful purposes,

Recognizing the important significance of 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, an instrument which embodies generally recognized rules of international law,

Reaffirming their adherence to the purposes and principles of that Protocol and calling upon all States to comply strictly with them,

Recalling General Assembly resolutions 1262B (XXI) and 2454A (XXIII) which condemned all actions contrary to the Geneva Protocol of 17 June 1925,

Noting the conclusions contained in the report submitted to the United Nations General Assembly and the Disarmament Committee on the grave consequences for mankind that might result from the use of chemical and bacteriological (biological) weapons,

Expressing their desire to contribute to the implementation of the Purposes and Principles of the Charter of the United Nations,

Have agreed as follows:

ARTICLE 1

Each State Party to this Convention undertakes not to develop, produce, stockpile or otherwise acquire chemical and bacteriological (biological) weapons.

ARTICLE 2

Each State Party to this Convention undertakes to destroy within a period of . . .—observing all the necessary precautions—or to divert to peaceful uses all previously accumulated chemical and bacteriological (biological) weapons in its possession.

ARTICLE 3

Each State Party to the Convention undertakes not to assist, encourage or induce any particular State, group of States or international organizations to develop, produce or otherwise acquire and stockpile chemical and bacteriological (biological) weapons.

ARTICLE 4

Each State Party to the Convention shall be internationally responsible for compliance with its provisions by legal and physical persons exercising their activities in its territory, and also by its legal and physical persons outside its territory.

ARTICLE 5

Each State Party to the Convention undertakes to take as soon as possible, in accordance with its constitutional procedures, the necessary legislative and administrative measures to prohibit the development, production and stock-piling of chemical and bacteriological (biological) weapons and to destroy such weapons.

ARTICLE 6

The States Parties to the Convention undertake to consult one another and to co-operate in solving any problems which may arise in the application of the provisions of this Convention.

ARTICLE 7

1. This Convention shall be open for signature by all States. Any State which does not sign the Convention before it enters 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 States which have signed it. The instruments of ratification and instruments of accession shall be deposited with the Governments of . . . which are hereby designated the depositary Governments.

3. This Convention shall enter into force after the deposit of the . . . instrument of ratification by a Government, including the instruments of ratification of the Governments of States which are permanent members of the United Nations Security Council and of other Governments designated as depositaries of the Convention.

4. For States whose instruments of ratification or accession are deposited after the Convention enters into force, the Convention shall enter into force on the date on which their instruments of ratification or accession are deposited.

5. The depositary Governments shall promptly inform all States which have signed and acceded to this Convention of the date of each signature, the date on which each instrument of ratification or accession is deposited and the date on which the Convention enters into force, and shall transmit other notifications to them.

6. This Convention shall be registered by the depositary Governments in accordance with Article 102 of the Charter of the United Nations.

ARTICLE 8

This Convention, of which the Russian, English, French, Spanish and Chinese texts are equally authentic, shall be deposited in the archives of the depositary Governments. Duly certified copies of the Convention shall be transmitted by the depositary Governments to the Governments of States which have signed the Convention and acceded to it.

In witness whereof, the undersigned, duly authorized thereto, have signed this Convention.

Done in . . . copies at . . ., this . . . day of . . .

Working paper submitted on 14 April 1970 by Hungary, Mongolia and Poland in connection with the draft convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons⁴

I

A new article is to be included in the text of the Convention reading:
"1. Each State Party to this Convention which finds that actions of any other State Party constitute a breach of the obligations assumed under articles 1 and 2 of the Convention, may lodge a complaint with the Security Council of the United Nations. Such a complaint should include all possible evidence confirming its validity as well as a request for its consideration by the Security Council. The Security Council shall inform the States Parties to this Convention of the result of the investigation.

2. Each State Party to this Convention undertakes to co-operate in carrying out any investigations which the Security Council may undertake on the basis of the complaint received by the Council."

II

Draft Security Council Resolution

"The Security Council,

Highly appreciating the desire of a large number of States to subscribe to the Convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons,

⁴ Disarmament Committee document. CCD/285/Corr.1.

Bearing in mind that under article . . . of the Convention the States Parties shall have the right to lodge complaints with the Security Council together with a request for their consideration by the Council,

Recognizing the need for appropriate measures with a view to ensuring the observance of the obligations contained in the Convention,

Taking into consideration the desire of the States Parties to co-operate with the Security Council with a view to ensuring the strict observance of the obligations contained in the Convention,

1. *Declares* its readiness:

— to give urgent consideration to any complaints lodged under article . . . of the Convention,

— to take all necessary measures for the investigation of a complaint,

— to inform the States Parties to the Convention of the result of the investigation;

2. *Calls upon* all States Parties to the Convention to co-operate with a view to implementing the provisions of this resolution.”

3C. Chronology of major disarmament efforts: September 1969 to September 1970¹

1969

2 September The General Conference of the Agency for the Prohibition of Nuclear Weapons in Latin America is inaugurated in Mexico City.

15 September The UN Secretary-General, in the introduction to the annual report on the work of the organization, calls on the USSR and the USA to stop work on the development of new offensive and defensive strategic systems, pending progress in the Strategic Arms Limitation Talks; also proposes to dedicate the 1970s as a Disarmament Decade and establish a programme for dealing with all aspects of arms control and disarmament.

19 September A group of nine socialist countries, including the USSR, submits to the UN General Assembly a draft convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons.

¹ A chronology from 1945 to August 1969, can be found in the *SIPRI Yearbook 1968/69* pages 280–318.

Sources: Mainly UN and CCD documents, communiqués of relevant international meetings, and official government pronouncements. A list of UN resolutions concerning disarmament is presented on pages 472 to 485.

Other disarmament questions

7 October USA and USSR submit to the Disarmament Conference a joint draft 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.

30 October USA and USSR submit a revised joint draft of the sea-bed treaty.

31 October the Foreign Ministers of the Warsaw Treaty countries, meeting in Prague, call for an all-European conference in the first half of 1970. The proposed agenda includes the ensuring of European security and renunciation of the use of force or threat of its use in the mutual relations among states in Europe; as well as expansion of trade, economic, scientific and technical relations.

17 November Strategic Arms Limitation Talks (SALT) between the USSR and the USA open in Helsinki.

24 November The US President announces his Government's renunciation of the use of lethal biological agents and weapons and all other methods of biological warfare, as well as disposal of existing stocks of biological weapons; reaffirms the US renunciation of the first use of lethal chemical weapons and extends the renunciation to the first use of incapacitating chemicals; says that the 1925 Geneva Protocol will be submitted to the Senate for its advice and consent to ratification.

28 November A World Health Organization group of consultants submits to the UN Secretary-General a report on "Health Aspects of Chemical and Biological Weapons".

28 November The Federal Republic of Germany signs the Treaty on the Non-Proliferation of Nuclear Weapons.

16 December UN General Assembly appeals to the governments of the USSR and USA to agree on a moratorium on further testing and deployment of new offensive and defensive strategic nuclear-weapon systems; declares the decade of the 1970s a Disarmament Decade; calls upon CCD to continue its work on a draft treaty prohibiting the emplacement of nuclear and other weapons of mass destruction on the sea-bed; declares as contrary to the generally recognized rules of international law the use in international armed conflicts of any chemical agents of warfare and any biological agents of warfare; invites all states which have not yet done so to accede to or ratify the Geneva Protocol in the course of 1970; requests the UN Secretary-

General to conduct an enquiry in connection with the creation of a world-wide exchange of seismological data to facilitate the achievement of a comprehensive test ban.

22 December The USSR and the USA conclude five weeks of a preliminary exchange of views on strategic arms limitation.

1970

2 February The British Secretary of State for Foreign and Commonwealth Affairs states his Government's view that CS and other such gases not significantly harmful to man in other than wholly exceptional circumstances are regarded as being outside the scope of the 1925 Geneva Protocol.

3 February Japan signs the Treaty on the Non-Proliferation of Nuclear Weapons.

12 February The Netherlands Minister of Foreign Affairs, in a parliamentary debate, declares his willingness to co-operate in seeking agreement to abolish for the future the use of herbicides and defoliants in warfare.

12–17 February With a view towards implementing Article V of the Non-Proliferation Treaty, nuclear experts from the USA and the USSR hold talks in Moscow on ways to share their knowledge of peaceful atomic explosions. The discussions are the second round of an exchange of views that began in Vienna in April 1969.

14 February The USA announces the decision to renounce offensive preparations for and the use of toxins as a method of warfare, and to destroy all existing toxin weapons and all stocks of toxins which are not required for a research programme for defensive purposes.

18 February UN Secretary-General, in a speech before the CCD in Geneva, draws attention to the possible military applications of the gas centrifuge method of producing enriched uranium.

5 March The Treaty on the Non-Proliferation of Nuclear Weapons enters into force upon the deposit of the instruments of ratification by the USSR and the USA.

5 March Romania urges the CCD to consider the prohibition of the use of force, non-intervention in the internal affairs of other states, renunciation of the holding of military maneuvers on foreign territory, and adoption of measures designed to eliminate foreign military bases.

24 March Canada announces in the CCD that it does not possess and does not intend to develop, produce, acquire, stockpile or use biological weapons (or toxins); that it does not possess and does not intend to develop, produce, acquire, stockpile or use chemical weapons unless these should be used against it or its allies; tear gas and other crowd and riot control agents are not included in this commitment.

14 April Hungary, Mongolia and Poland submit to the CCD a working paper suggesting the inclusion in the draft convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons, of a new article by which the parties would be entitled to lodge complaints with the UN Security Council.

16 April The Strategic Arms Limitation Talks reconvene in Vienna.

23 April A third version of the joint US-Soviet draft treaty on the sea-bed is submitted to the CCD. It incorporates a number of suggestions made by different delegations.

29 April The Swedish Government, in a foreign policy message to parliament, declares that Sweden does not possess, and does not intend to manufacture, any biological or chemical means of warfare.

21 May Japan ratifies the 1925 Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases and of Bacteriological Methods of Warfare.

22 May At the conference on "The Politics of Disarmament" the UN Secretary-General suggests that the United Nations assemble and provide information along the lines of the Armaments Yearbook published by the League of Nations; proposes that a comprehensive study be undertaken of the economic and social consequences of the armaments race and of massive military budgets.

27 May The Foreign Ministers of NATO, meeting in Rome, invite talks on mutual and balanced force reductions in Europe, with special reference to Central Europe.

29 June The Foreign Ministers of the Warsaw Treaty countries, meeting in Budapest, express their belief that a study of the question of reducing foreign armed forces on the territory of European states would serve the interests of détente and security in Europe. In addition to the agenda items suggested at the Prague meeting (31 October 1969), a further proposal for the agenda of the all-European conference is the creation of a body to deal with questions of security and co-operation in Europe.

30 June The USA, in a working paper submitted to the CCD, proposes to include toxins in the UK draft convention for the prohibition of biological methods of warfare.

12 August The USSR and the Federal Republic of Germany sign a treaty committing the two nations to renounce force and to respect the inviolability of the existing borders in Europe.

14 August The USA and the USSR conclude the Vienna phase of their Strategic Arms Limitation Talks (SALT), stating that the talks made it possible to increase the degree of mutual understanding on a number of aspects of the matters discussed.

19 August The US President submits the 1925 Geneva Protocol to the Senate for advice and consent to ratification.

26 August The US Senate rejects an amendment to the military procurement bill providing that no funds authorized under the bill should be used to procure, maintain or use herbicides.

1 September A fourth version of the joint US-Soviet draft treaty on the sea-bed is submitted to the CCD.

3 September The CCD submits a report to the UN General Assembly on its deliberations, and expresses the hope that the sea-bed draft treaty would be commended by the General Assembly and opened for signature at an early date.

3D. List of states which have signed or ratified the arms regulation treaties

The list includes signatures and ratification up to 31 August 1970.

Antarctic Treaty Antarctic Treaty. Signed at Washington on 1 December 1959. Came into force on 23 June 1961. (*United Nations Treaty Series*, Vol. 402, 1961, page 72.)

Partial Test Ban Treaty Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water. Signed at Moscow, on 5 August 1963, and subsequently at London, Moscow and Washington. Came into force on 10 October 1963. (*United Nations Treaty Series*, Vol. 480, 1963, page 43.)

	Antarctic Treaty		Partial Test Ban Treaty	
	Signed	Ratification deposited	Signed	Ratification deposited
Afghanistan			8 Aug. 1963 ⁸ 9 Aug. 1963 ⁴	12 Mar. 1964 ¹¹ 13 Mar. 1964 ¹³ 23 Mar. 1964 ¹²
Albania				
Algeria			14 Aug. 1963 ⁸ 19 Aug. 1963 ⁴	
Argentina	1 Dec. 1959	23 June 1961	8 Aug. 1963 ⁵ 9 Aug. 1963 ⁷	
Australia	1 Dec. 1959	23 June 1961	8 Aug. 1963 ⁶	12 Nov. 1963 ¹⁴
Austria			11 Sept. 1963 ⁹ 12 Sept. 1963 ³	17 July 1964 ¹⁴
Barbados				
Belgium	1 Dec. 1959	26 July 1960	8 Aug. 1963 ⁶	1 Mar. 1966 ¹⁴
Bolivia			8 Aug. 1963 ⁵ 21 Aug. 1963 ³ 20 Sept. 1963 ⁴	4 Aug. 1965 ¹³ 25 Jan. 1966 ¹¹
Botswana				5 Jan. 1968 ¹⁹ 14 Feb. 1968 ¹⁸ 4 Mar. 1968 ²⁰
Brazil			8 Aug. 1963 ⁸ 9 Aug. 1963 ⁴	15 Dec. 1964 ¹³ 15 Jan. 1965 ¹³ 4 Mar. 1965 ¹¹
Bulgaria			8 Aug. 1963 ⁶	13 Nov. 1963 ¹³ 21 Nov. 1963 ¹² 2 Dec. 1963 ¹¹
Burma			14 Aug. 1963 ⁶	15 Nov. 1963 ¹⁴
Burundi			4 Oct. 1963 ⁵	
Byelorussian SSR			8 Oct. 1963 ⁴	16 Dec. 1963 ^{12,27}
Cambodia				
Cameroon			27 Aug. 1963 ⁵ 6 Sept. 1963 ³	
Canada			8 Aug. 1963 ⁶	28 Jan. 1964 ¹⁴

Outer Space Treaty Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. Signed at London, Moscow and Washington on 27 January 1967. Came into force on 10 October 1967.

Latin American Nuclear-Free Zone Treaty Treaty for the Prohibition of Nuclear Weapons in Latin America, with Additional Protocols I and II (Treaty of Tlatelolco). Signed at Mexico City on 14 February 1967. (See page 218.)

Non-Proliferation Treaty Treaty on the Non-Proliferation of Nuclear Weapons. Signed at London, Moscow and Washington on 1 July 1968. Came into force on 5 March 1970.

Outer Space Treaty		Latin American Nuclear-Free Zone Treaty		Non-Proliferation Treaty	
Signed	Ratification deposited	Signed	Ratification deposited	Signed	Ratification deposited
27 Jan. 1967 ⁵ 30 Jan. 1967 ⁴				1 July 1968 ⁶	4 Feb. 1970 ¹³ 5 Feb. 1970 ¹² 5 Mar. 1970 ¹¹
27 Jan. 1967 ⁵ 18 Apr. 1967 ⁴	26 Mar. 1969 ¹⁷	27 Sept. 1967 ³⁷			
27 Jan. 1967 ⁵	10 Oct. 1967 ¹⁴			27 Feb. 1970 ⁸	
20 Feb. 1967 ⁶	26 Feb. 1968 ¹⁴			1 July 1968 ⁶	27 June 1969 ¹⁶
	12 Sept. 1968 ²⁴	18 Oct. 1968	25 Apr. 1969 ³⁹	1 July 1968 ⁵	
27 Jan. 1967 ⁷ 2 Feb. 1967 ⁵				20 Aug. 1968 ⁶	
27 Jan. 1967 ⁵		14 Feb. 1967	18 Feb. 1969 ³⁹	1 July 1968 ⁵	26 May 1970 ¹³
27 Jan. 1967 ⁵				1 July 1968 ⁵	28 Apr. 1969 ¹¹
30 Jan. 1967 ⁴ 2 Feb. 1967 ⁸	5 Mar. 1969 ^{14, 34}	9 May 1967 ³⁸	29 Jan. 1968 ³⁸		
27 Jan. 1967 ⁶	28 Mar. 1967 ¹² 11 Apr. 1967 ¹³ 19 Apr. 1967 ¹¹			1 July 1968 ⁶	5 Sept. 1969 ¹³ 18 Sept. 1969 ¹² 3 Nov. 1969 ¹¹
22 May 1967 ⁶	18 Mar. 1970 ¹⁴				
27 Jan. 1967 ⁵					
10 Feb. 1967 ⁴	31 Oct. 1967 ^{12, 27}				
27 Jan. 1967 ⁵				17 July 1968 ⁵ 18 July 1968 ⁴	8 Jan. 1969 ¹³
27 Jan. 1967 ⁶	10 Oct. 1967 ¹⁴			23 July 1968 ⁸ 29 July 1968 ⁴	8 Jan. 1969 ¹⁴

Other disarmament questions

	Antarctic Treaty		Partial Test Ban Treaty	
	Signed	Ratification deposited	Signed	Ratification deposited
Central African Rep.				22 Dec. 1964 ²⁴ 24 Aug. 1965 ²² 25 Sept. 1965 ²³
Ceylon			22 Aug. 1963 ⁸ 23 Aug. 1963 ⁴	5 Feb. 1964 ¹³ 12 Feb. 1964 ¹² 13 Feb. 1964 ¹¹
Chad			26 Aug. 1963 ⁵	1 Mar. 1965 ¹³
Chile	1 Dec. 1959	23 June 1961	8 Aug. 1963 ⁵ 9 Aug. 1963 ⁷	6 Oct. 1965 ¹¹
China, People's Republic of*				
Colombia			16 Aug. 1963 ⁹ 20 Aug. 1963 ³	
Congo, Republic of (Brazzaville)				
Congo, Dem. Rep. of (Kinshasa)			9 Aug. 1963 ⁸ 12 Aug. 1963 ⁴	28 Oct. 1965 ¹³
Costa Rica			9 Aug. 1963 ³ 13 Aug. 1963 ⁵ 23 Aug. 1963 ⁴	10 July 1967 ¹³
Cuba				
Cyprus			8 Aug. 1963 ⁶	15 Apr. 1965 ¹¹ 21 Apr. 1965 ¹² 7 May 1965 ¹³
Czechoslovakia		14 June 1962 ¹	8 Aug. 1963 ⁶	14 Oct. 1963 ¹⁵ 17 Oct. 1963 ¹³
Dahomey			27 Aug. 1963 ⁵ 3 Sept. 1963 ³ 9 Oct. 1963 ⁴	15 Dec. 1964 ¹³ 23 Dec. 1964 ¹² 22 Apr. 1965 ¹¹
Denmark		20 May 1965 ¹	9 Aug. 1963 ⁶	15 Jan. 1964 ¹⁴
Dominican Republic			16 Sept. 1963 ⁵ 17 Sept. 1963 ³ 19 Sept. 1963 ⁴	3 June 1964 ¹² 18 June 1964 ¹¹ 22 July 1964 ¹³
Ecuador			27 Sept. 1963 ⁵ 1 Oct. 1963 ⁷	6 May 1964 ¹³ 8 May 1964 ¹¹ 13 Nov. 1964 ¹²
El Salvador			21 Aug. 1963 ⁵ 22 Aug. 1963 ³ 23 Aug. 1963 ⁴	3 Dec. 1964 ¹³ 7 Dec. 1964 ¹¹ 9 Feb. 1965 ¹²
Equatorial Guinea				
Ethiopia			9 Aug. 1963 ⁸ 19 Sept. 1963 ⁴	
Finland			8 Aug. 1963 ⁶	9 Jan. 1964 ¹⁴
France	1 Dec. 1959	16 Sept. 1960		
Gabon			10 Sept. 1963 ⁵	20 Feb. 1964 ¹³ 4 Mar. 1964 ¹¹ 9 Mar. 1964 ¹²

Outer Space Treaty		Latin American Nuclear-Free Zone Treaty		Non-Proliferation Treaty	
Signed	Ratification deposited	Signed	Ratification deposited	Signed	Ratification deposited
27 Jan. 1967 ⁵					
10 Mar. 1967 ³				1 July 1968 ⁶	
				1 July 1968 ⁴	
27 Jan. 1967 ⁵		14 Feb. 1967			
3 Feb. 1967 ³					
20 Feb. 1967 ⁴					
27 Jan. 1967 ⁵		14 Feb. 1967		1 July 1968 ⁵	
27 Jan. 1967 ⁵				22 July 1968 ⁵	
29 Apr. 1967 ⁴				26 July 1968 ⁴	
4 May 1967 ³				17 Sept. 1968 ³	
		14 Feb. 1967	25 Aug. 1969 ³⁹	1 July 1968 ⁵	3 Mar. 1970 ¹³
27 Jan. 1967 ⁵				1 July 1968 ⁶	10 Feb. 1970 ¹³
15 Feb. 1967 ⁴					16 Feb. 1970 ¹³
16 Feb. 1967 ³					5 Mar. 1970 ¹¹
27 Jan. 1967 ⁶	11 May 1967 ¹¹ 18 May 1967 ¹² 22 May 1967 ¹³			1 July 1968 ⁶	22 July 1969 ¹⁴
				1 July 1968 ⁵	
27 Jan. 1967 ⁶	10 Oct. 1967 ¹⁴			1 July 1968 ⁶	3 Jan. 1969 ¹⁴
27 Jan. 1967 ³	21 Nov. 1968 ¹³	28 July 1967	14 June 1968 ³⁹	1 July 1968 ⁵	
27 Jan. 1967 ⁵	7 Mar. 1969 ¹³	14 Feb. 1967	11 Feb. 1969 ³⁹	9 July 1968 ⁵	7 Mar. 1969 ¹³
16 May 1967 ³					
7 June 1967 ⁴					
27 Jan. 1967 ⁵	15 Jan. 1969 ¹³	14 Feb. 1967	22 Apr. 1968 ³⁹	1 July 1968 ⁵	
27 Jan. 1967 ⁶				5 Sept. 1968 ⁶	5 Feb. 1970 ¹²
10 Feb. 1967 ⁴					5 Mar. 1970 ¹⁶
27 Jan. 1967 ⁶	12 July 1967 ¹⁴			1 July 1968 ⁶	5 Feb. 1969 ¹⁴
25 Sept. 1967 ⁶					

Other disarmament questions

	Antarctic Treaty		Partial Test Ban Treaty	
	Signed	Ratification deposited	Signed	Ratification deposited
Gambia				27 Apr. 1965 ²¹ 6 May 1965 ¹⁸
German Dem. Rep.*			8 Aug. 1963 ⁴	30 Dec. 1963 ^{12,28}
Germany, Fed. Rep. of*			19 Aug. 1963 ⁶	1 Dec. 1964 ^{16,29}
Ghana			8 Aug. 1963 ⁴ 9 Aug. 1963 ⁵ 4 Sept. 1963 ³	27 Nov. 1963 ¹¹ 9 Jan. 1964 ¹³ 31 May 1965 ¹²
Greece			8 Aug. 1963 ⁵ 9 Aug. 1963 ⁷	18 Dec. 1963 ¹⁴
Guatemala			23 Sept. 1963 ⁵	6 Jan. 1964 ^{18,30}
Guinea				
Guyana				
Haiti			9 Oct. 1963 ⁵	
Honduras			8 Aug. 1963 ⁵ 15 Aug. 1963 ³ 16 Aug. 1963 ⁴	2 Oct. 1964 ¹³ 2 Dec. 1964 ¹¹
Hungary			8 Aug. 1963 ⁶	21 Oct. 1963 ¹¹ 22 Oct. 1963 ¹³ 23 Oct. 1963 ¹²
Iceland			12 Aug. 1963 ⁶	29 April 1964 ¹⁴
India			8 Aug. 1963 ⁶	10 Oct. 1963 ¹¹ 14 Oct. 1963 ¹² 18 Oct. 1963 ¹³
Indonesia			23 Aug. 1963 ⁶	20 Jan. 1964 ¹² 27 Jan. 1964 ¹³ 8 May 1964 ¹¹
Iran			8 Aug. 1963 ⁶	5 May 1964 ¹⁴
Iraq			13 Aug. 1963 ⁶	30 Nov. 1964 ¹¹ 1 Dec. 1964 ¹³ 3 Dec. 1964 ¹²
Ireland			8 Aug. 1963 ⁸ 9 Aug. 1963 ⁴	18 Dec. 1963 ¹⁶ 20 Dec. 1963 ¹²
Israel			8 Aug. 1963 ⁶	15 Jan. 1964 ¹⁶ 28 Jan. 1964 ¹²
Italy			8 Aug. 1963 ⁶	10 Dec. 1964 ¹⁴
Ivory Coast			5 Sept. 1963 ⁵	5 Feb. 1965 ¹³
Jamaica			13 Aug. 1963 ⁶	
Japan	1 Dec. 1959	4 Aug. 1960	14 Aug. 1963 ⁶	15 June 1964 ¹⁴
Jordan			12 Aug. 1963 ⁸ 19 Aug. 1963 ⁴	29 May 1964 ¹¹ 7 July 1964 ¹² 10 July 1964 ¹³
Kenya				10 June 1965 ²² 11 June 1965 ²⁴ 30 June 1965 ²³

Outer Space Treaty		Latin American Nuclear-Free Zone Treaty		Non-Proliferation Treaty	
Signed	Ratification deposited	Signed	Ratification deposited	Signed	Ratification deposited
2 June 1967 ³				4 Sept. 1968 ³ 20 Sept. 1968 ⁵ 24 Sept. 1968 ⁴	
27 Jan. 1967 ⁴	2 Feb. 1967 ^{12, 28}			1 July 1968 ⁴	31 Oct. 1969 ¹²
27 Jan. 1967 ⁶				28 Nov. 1969 ⁸	
27 Jan. 1967 ⁵ 15 Feb. 1967 ⁴ 3 Mar. 1967 ³				1 July 1968 ⁹ 24 July 1968 ³	4 May 1970 ¹¹ 5 May 1970 ¹³ 11 May 1970 ¹²
27 Jan. 1967 ⁵				1 July 1968 ⁹	11 Mar. 1970 ¹³
		14 Feb. 1967		26 July 1968 ⁵	
3 Feb. 1967 ⁵					
27 Jan. 1967 ⁵		14 Feb. 1967	23 May 1969 ³⁹	1 July 1968 ⁵	2 June 1970 ¹³
27 Jan. 1967 ⁵		14 Feb. 1967	23 Sept. 1968 ³⁹	1 July 1968 ⁵	
27 Jan. 1967 ⁶	26 June 1967 ¹⁴			1 July 1968 ⁶	27 May 1969 ¹⁴
27 Jan. 1967 ⁶	5 Feb. 1968 ¹⁴			1 July 1968 ⁶	18 July 1969 ¹⁴
3 Mar. 1967 ⁶					
27 Jan. 1967 ⁵ 30 Jan. 1967 ⁴ 14 Feb. 1967 ³				2 Mar. 1970 ⁸	
27 Jan. 1967				1 July 1968 ⁶	2 Feb. 1970 ¹³ 10 Feb. 1970 ¹² 5 Mar. 1970 ¹¹
27 Jan. 1967 ⁸ 9 Mar. 1967 ⁴	4 Dec. 1968 ¹² 23 Sept. 1969 ¹¹			1 July 1968 ⁴	29 Oct. 1969 ¹²
27 Jan. 1967 ⁸	17 July 1968 ¹³ 19 July 1968 ¹¹			1 July 1968 ⁹ 4 July 1968 ⁹	1 July 1968 ¹⁷ 4 July 1968 ¹¹
27 Jan. 1967 ⁶					
27 Jan. 1967 ⁶				28 Jan. 1969 ⁶	
				1 July 1968 ⁵	
29 June 1967 ⁶		26 Oct. 1967	26 July 1969 ³⁹	14 Apr. 1969 ⁶	5 Mar. 1970 ¹⁴
27 Jan. 1967 ⁶	10 Oct. 1967 ¹⁴			3 Feb. 1970 ⁶	
2 Feb. 1967 ⁵				10 July 1968 ⁵	11 Feb. 1970 ¹⁸ 11 June 1970 ¹⁵
				1 July 1968 ⁵	11 June 1970 ¹²

Other disarmament questions

	Antarctic Treaty		Partial Test Ban Treaty	
	Signed	Ratification deposited	Signed	Ratification deposited
Korea, P. Dem. Rep. of*				
Korea, Rep. of*			30 Aug. 1963 ⁸	24 July 1964 ^{16,31}
Kuwait			20 Aug. 1963 ⁶	20 May 1965 ^{13,32} 21 May 1965 ¹¹ 17 June 1965 ¹²
Laos			12 Aug. 1963 ⁶	10 Feb. 1965 ¹¹ 12 Feb. 1965 ¹³ 7 Apr. 1965 ¹²
Lebanon			12 Aug. 1963 ⁵ 13 Aug. 1963 ⁷	14 May 1965 ¹³ 20 May 1965 ¹¹ 4 June 1965 ¹²
Lesotho				
Liberia			8 Aug. 1963 ⁵ 16 Aug. 1963 ³ 27 Aug. 1963 ⁴	19 May 1964 ¹³ 22 May 1964 ¹¹ 16 June 1964 ¹²
Libya			9 Aug. 1963 ³ 16 Aug. 1963 ⁹	15 July 1968 ¹¹
Luxembourg			13 Aug. 1963 ³ 3 Sept. 1963 ⁵ 13 Sept. 1963 ⁴	10 Feb. 1965 ¹⁴
Madagascar			23 Sept. 1963 ⁵	15 Mar. 1965 ¹³
Malawi				26 Nov. 1964 ²¹ 7 Jan. 1965 ¹⁸
Malaysia			8 Aug. 1963 ⁵ 12 Aug. 1963 ³ 21 Aug. 1963 ⁴	15 July 1964 ¹² 16 July 1964 ¹⁶
Maldivé Islands				
Mali			23 Aug. 1963 ⁶	
Malta				25 Nov. 1964 ²¹ 1 Dec. 1964 ¹⁸
Mauritania			13 Sept. 1963 ⁵ 17 Sept. 1963 ³ 8 Oct. 1963 ⁴	6 Apr. 1964 ¹³ 15 Apr. 1964 ¹¹ 28 Apr. 1964 ¹²
Mauritius				30 Apr. 1969 ²¹ 12 May 1969 ¹⁸
Mexico			8 Aug. 1963 ⁶	27 Dec. 1963 ¹⁴
Monaco*				
Mongolia			8 Aug. 1963 ⁷	1 Nov. 1963 ¹² 7 Nov. 1963 ¹¹
Morocco			27 Aug. 1963 ⁹ 30 Aug. 1963 ³	1 Feb. 1966 ¹¹ 18 Feb. 1966 ¹² 21 Feb. 1966 ¹³
Nepal			26 Aug. 1963 ⁷ 30 Aug. 1963 ⁵	7 Oct. 1964 ¹⁴

Outer Space Treaty		Latin American Nuclear-Free Zone Treaty		Non-Proliferation Treaty	
Signed	Ratification deposited	Signed	Ratification deposited	Signed	Ratification deposited
27 Jan. 1967 ^{5, 31}	13 Oct. 1967 ¹³			1 July 1968 ^{5, 31}	
				15 Aug. 1968 ⁹	
				22 Aug. 1968 ³	
27 Jan. 1967 ⁸ 2 Feb. 1967 ⁴				1 July 1968 ⁶	20 Feb. 1970 ¹² 5 Mar. 1970 ¹⁶
23 Feb. 1967 ⁶	31 Mar. 1969 ¹⁵ 30 June 1969 ¹³			1 July 1968 ⁶	15 July 1970 ¹⁵
27 Jan. 1967 ⁵				9 July 1968 ⁵	20 May 1970 ¹³
				1 July 1968 ⁵	5 Mar. 1970 ¹³
	3 July 1968 ²⁴			18 July 1968 ³	
				19 July 1968 ⁵	
				23 July 1968 ⁴	
27 Jan. 1967 ⁹ 31 Jan. 1967 ³				14 Aug. 1968 ⁶	
	22 Aug. 1968 ^{24, 35}			22 Aug. 1968 ⁵	
20 Feb. 1967 ⁵ 21 Feb. 1967 ³ 3 May 1967 ⁴				1 July 1968 ⁶	5 Mar. 1970 ¹⁴
				11 Sept. 1968 ⁵	7 Apr. 1970 ¹³
	11 June 1968 ²³			14 July 1969 ⁵	10 Feb. 1970 ¹²
				15 July 1969 ⁴	5 Mar. 1970 ¹³
				17 Apr. 1969 ⁵	6 Feb. 1970 ¹³
	7 Apr. 1969 ²⁰ 21 Apr. 1969 ¹⁸ 13 May 1969 ¹⁹			1 July 1968 ⁵	8 Apr. 1969 ¹³ 14 Apr. 1969 ¹¹ 25 Apr. 1969 ¹²
27 Jan. 1967 ⁶	31 Jan. 1968 ¹⁴	14 Feb. 1967 ⁴³	27 Sept. 1967 ³⁹	26 July 1968 ⁶	21 Jan. 1969 ¹⁴
27 Jan. 1967 ⁴	10 Oct. 1967 ¹²			1 July 1968 ⁴	14 May 1969 ¹²
	22 Dec. 1967 ²⁵			1 July 1968 ⁶	
3 Feb. 1967 ⁹ 6 Feb. 1967 ³	10 Oct. 1967 ¹¹ 16 Oct. 1967 ¹² 22 Nov. 1967 ¹³			1 July 1968 ⁶	5 Jan. 1970 ¹³ 9 Jan. 1970 ¹² 3 Feb. 1970 ¹¹

Other disarmament questions

	Antarctic Treaty		Partial Test Ban Treaty	
	Signed	Ratification deposited	Signed	Ratification deposited
Netherlands		1 Mar. 1967 ^{1,2}	9 Aug. 1963 ⁶	14 Sept. 1964 ^{2, 14}
New Zealand	1 Dec. 1959	1 Nov. 1960	8 Aug. 1963 ⁶	10 Oct. 1963 ¹⁶ 21 Oct. 1963 ¹²
Nicaragua			13 Aug. 1963 ⁸ 16 Aug. 1963 ⁴	26 Jan. 1965 ¹¹ 26 Feb. 1965 ¹⁷
Niger			24 Sept. 1963 ⁸	3 July 1964 ¹² 6 July 1964 ¹¹ 9 July 1964 ¹³
Nigeria			30 Aug. 1963 ⁴ 2 Sept. 1963 ³ 4 Sept. 1963 ⁵	17 Feb. 1963 ¹¹ 25 Feb. 1967 ¹² 28 Feb. 1967 ¹³
Norway	1 Dec. 1959	24 Aug. 1960	9 Aug. 1963 ⁶	21 Nov. 1963 ¹⁴
Pakistan			14 Aug. 1963 ⁶	
Panama			20 Sept. 1963 ⁵	24 Feb. 1966 ¹³
Paraguay			15 Aug. 1963 ⁸ 21 Aug. 1963 ⁴	
Peru			23 Aug. 1963 ⁶	20 July 1964 ¹³ 4 Aug. 1964 ¹¹ 21 Aug. 1964 ¹²
Philippines			8 Aug. 1963 ⁸ 14 Aug. 1963 ⁴	10 Nov. 1965 ¹¹ 15 Nov. 1965 ¹³ 8 Feb. 1966 ¹²
Poland		8 June 1961 ¹	8 Aug. 1963 ⁶	14 Oct. 1963 ¹⁴
Portugal			9 Oct. 1963 ⁸	
Romania			8 Aug. 1963 ⁶	12 Dec. 1963 ¹⁴
Rwanda				22 Oct. 1963 ²² 16 Dec. 1963 ²⁸ 27 Dec. 1963 ²⁴
San Marino			17 Sept. 1963 ⁵ 20 Sept. 1963 ³ 24 Sept. 1963 ⁴	3 July 1964 ¹¹ 9 July 1964 ¹³ 27 Nov. 1964 ¹²
Saudi Arabia				
Senegal			20 Sept. 1963 ⁵ 23 Sept. 1963 ³ 9 Oct. 1963 ⁴	6 May 1964 ¹¹ 12 May 1964 ¹² 2 June 1964 ¹³
Sierra Leone			4 Sept. 1963 ³ 9 Sept. 1963 ⁴ 11 Sept. 1963 ⁵	21 Feb. 1964 ¹¹ 4 Mar. 1964 ¹³ 29 Apr. 1964 ¹²
Singapore				12 July 1968 ²¹ 23 July 1968 ¹⁸
Somalia			19 Aug. 1963 ⁹	
South Africa	1 Dec. 1959	21 June 1960		10 Oct. 1963 ²⁶
Southern Yemen				
Spain			13 Aug. 1963 ⁵ 14 Aug. 1963 ³	17 Dec. 1964 ¹⁶
Sudan			9 Aug. 1963 ⁶	4 Mar. 1966 ¹⁶ 28 Mar. 1966 ¹²

Outer Space Treaty		Latin American Nuclear-Free Zone Treaty		Non-Proliferation Treaty	
Signed	Ratification deposited	Signed	Ratification deposited	Signed	Ratification deposited
10 Feb. 1967 ⁶	10 Oct. 1969 ¹⁴	15 Mar. 1968 ^{2,40}		20 Aug. 1968 ⁶	
27 Jan. 1967 ⁶	31 May 1968 ¹⁴			1 July 1968 ⁶	10 Sept. 1969 ¹⁴
27 Jan. 1967 ⁵ 13 Feb. 1967 ⁸		15 Feb. 1967	25 Oct. 1968 ³⁹	1 July 1968 ⁸	
1 Feb. 1967 ⁵	17 Apr. 1967 ¹¹ 3 May 1967 ¹³				
	14 Nov. 1967 ²²			1 July 1968 ⁶	27 Sept. 1968 ¹¹ 7 Oct. 1968 ¹³ 14 Oct. 1968 ¹²
3 Feb. 1967 ⁶	1 July 1969 ¹⁴			1 July 1968 ⁶	5 Feb. 1969 ¹⁴
12 Sept. 1967 ⁶	8 Apr. 1968 ¹⁴				
27 Jan. 1967 ⁵		14 Feb. 1967		1 July 1968 ⁵	
		26 Apr. 1967	19 Mar. 1969 ³⁹	1 July 1968 ⁵	4 Feb. 1970 ¹³ 5 Mar. 1970 ¹¹
30 June 1967 ⁵		14 Feb. 1967	4 Mar. 1969 ³⁹	1 July 1968 ⁵	3 Mar. 1970 ¹⁴
27 Jan. 1967 ⁸ 29 April 1967 ⁴				1 July 1968 ⁵ 18 July 1968 ⁴	
27 Jan. 1967 ⁶	30 Jan. 1968 ¹⁴			1 July 1968 ⁶	12 June 1969 ¹⁴
27 Jan. 1967 ⁶	9 Apr. 1968 ¹⁴			1 July 1968 ⁶	4 Feb. 1970 ¹⁴
27 Jan. 1967 ⁵					
21 Apr. 1967 ⁵ 24 Apr. 1967 ³ 6 June 1967 ⁴	29 Oct. 1968 ¹³ 21 Nov. 1968 ¹² 3 Feb. 1969 ¹¹			1 July 1968 ⁵ 29 July 1968 ³ 21 Nov. 1968 ⁴	10 Aug. 1970 ¹¹
				1 July 1968 ⁹ 26 July 1968 ³	
27 Jan. 1967 ⁷ 16 May 1967 ⁵	13 July 1967 ¹² 14 July 1967 ¹³ 25 Oct. 1967 ¹¹				
				5 Feb. 1970 ⁸	
2 Feb. 1967 ⁵				1 July 1968 ⁶	5 Mar. 1970 ¹¹
1 Mar. 1967 ⁵	30 Sept. 1968 ¹³ 8 Oct. 1968 ¹¹				
				14 Nov. 1968 ⁴	
	27 Nov. 1968 ²² 7 Dec. 1968 ²⁴				
				24 Dec. 1968 ⁴	

Other disarmament questions

	Antarctic Treaty		Partial Test Ban Treaty	
	Signed	Ratification deposited	Signed	Ratification deposited
Swaziland				29 May 1969 ²⁶ 3 June 1969 ²³
Sweden			12 Aug. 1963 ⁶	9 Dec. 1963 ¹⁴
Switzerland*			26 Aug. 1963 ⁶	16 Jan. 1964 ¹⁴
Syrian Arab Republic			13 Aug. 1963 ⁶	1 June 1964 ¹⁴
Taiwan			23 Aug. 1963 ⁵	18 May 1964 ¹³
Tanzania, Un. Rep. of			16 Sept. 1963 ³ 18 Sept. 1963 ⁵ 20 Sept. 1963 ⁴	6 Feb. 1964 ¹⁸
Thailand			8 Aug. 1963 ⁶	15 Nov. 1963 ¹¹ 21 Nov. 1963 ¹² 29 Nov. 1963 ¹³
Togo			18 Sept. 1963 ⁵	7 Dec. 1964 ¹³
Trinidad and Tobago			12 Aug. 1963 ⁸ 13 Aug. 1963 ⁴	14 July 1964 ¹³ 16 July 1964 ¹¹ 6 Aug. 1964 ¹²
Tunisia			8 Aug. 1963 ⁵ 12 Aug. 1963 ³ 13 Aug. 1963 ⁴	26 May 1965 ¹⁵ 3 June 1965 ¹³
Turkey			9 Aug. 1963 ⁶	8 July 1965 ¹⁴
Uganda			29 Aug. 1963 ⁸	24 Mar. 1964 ¹¹ 2 Apr. 1964 ¹³
Ukrainian SSR			8 Oct. 1963 ⁴	30 Dec. 1963 ^{12, 27}
USSR	1 Dec. 1959	2 Nov. 1960	5 Aug. 1963 ¹⁰	10 Oct. 1963 ¹⁰
United Arab Republic			8 Aug. 1963 ⁶	10 Jan. 1964 ^{14, 33}
United Kingdom	1 Dec. 1959	31 May 1960	5 Aug. 1963 ¹⁰	10 Oct. 1963 ¹⁰
United States	1 Dec. 1959	18 Aug. 1960	5 Aug. 1963 ¹⁰	10 Oct. 1963 ¹⁰
Upper Volta			30 Aug. 1963 ⁵	
Uruguay			12 Aug. 1963 ⁵ 27 Sept. 1963 ⁷	25 Feb. 1969 ¹¹
Venezuela			16 Aug. 1963 ⁹ 20 Aug. 1963 ⁹	22 Feb. 1965 ¹² 3 Mar. 1965 ¹¹ 29 Mar. 1965 ¹³
Viet-Nam, Dem. Rep. of*				
Viet-Nam, Rep. of*			1 Oct. 1963 ⁵	
Western Samoa			5 Sept. 1963 ³ 6 Sept. 1963 ⁹	15 Jan. 1965 ¹³ 19 Jan. 1965 ¹¹ 8 Feb. 1965 ¹²
Yemen			13 Aug. 1963 ⁴ 6 Sept. 1963 ⁵	
Yugoslavia			8 Aug. 1963 ⁶	15 Jan. 1964 ¹¹ 31 Jan. 1964 ¹² 3 Apr. 1964 ¹³
Zambia				11 Jan. 1965 ²¹ 8 Feb. 1965 ¹⁸

Outer Space Treaty		Latin American Nuclear-Free Zone Treaty		Non-Proliferation Treaty	
Signed	Ratification deposited	Signed	Ratification deposited	Signed	Ratification deposited
				24 June 1969 ³	11 Dec. 1969 ¹¹ 16 Dec. 1969 ¹⁸ 12 Jan. 1970 ¹⁸
27 Jan. 1967 ⁶	11 Oct. 1967 ¹⁴			19 Aug. 1968 ⁶	9 Jan. 1970 ¹⁴
27 Jan. 1967 ⁵ 30 Jan. 1967 ⁴	18 Dec. 1969 ¹⁴			27 Nov. 1969 ⁸	
	14 Nov. 1968 ²⁸			1 July 1968 ⁴	24 Sept. 1969 ¹²
27 Jan. 1967 ⁵				1 July 1968 ⁵	27 Jan. 1970 ¹⁸
27 Jan. 1967 ⁶	5 Sept. 1968 ¹¹ 9 Sept. 1968 ¹² 10 Sept. 1968 ¹³				
27 Jan. 1967 ⁵				1 July 1968 ⁵	26 Feb. 1970 ¹⁸
24 July 1968 ³ 17 Aug. 1967 ⁴ 28 Sept. 1967 ⁵		27 June 1967		20 Aug. 1968 ⁵ 22 Aug. 1968 ⁸	
27 Jan. 1967 ⁸ 15 Feb. 1967 ⁴	28 Mar. 1968 ¹¹ 4 Apr. 1968 ¹² 17 Apr. 1968 ¹³			1 July 1968 ⁶	26 Feb. 1970 ¹⁴
27 Jan. 1967 ⁶	27 Mar. 1968 ¹⁴ 24 Apr. 1968 ²⁴			28 Jan. 1969 ⁶	
10 Feb. 1967 ⁴	31 Oct. 1967 ^{12, 27}				
27 Jan. 1967 ⁶	10 Oct. 1967 ¹⁴			1 July 1968 ⁶	5 Mar. 1970 ¹⁴
27 Jan. 1967 ⁹	10 Oct. 1967 ¹³ 23 Jan. 1968 ¹²			1 July 1968 ⁷	
27 Jan. 1967 ⁶	10 Oct. 1967 ^{14, 36}	20 Dec. 1967 ⁴²	11 Dec. 1969 ⁴⁸	1 July 1968 ⁶	27 Nov. 1968 ¹⁶ 29 Nov. 1968 ¹²
27 Jan. 1967 ⁶ 3 Mar. 1967 ⁵	10 Oct. 1967 ¹⁴ 18 June 1968 ¹³	1 April 1968 ⁴¹		1 July 1968 ⁶ 25 Nov. 1968 ⁵ 11 Aug. 1969 ⁴	5 Mar. 1970 ¹⁴ 3 Mar. 1970 ¹⁸
27 Jan. 1967 ⁵ 30 Jan. 1967 ⁴		14 Feb. 1967	20 Aug. 1968 ³⁹	1 July 1968 ⁵	
27 Jan. 1967 ⁵	3 Mar. 1970 ¹³	14 Feb. 1967	23 Mar. 1970	1 July 1968 ⁵	
27 Jan. 1967 ⁵				1 July 1968 ⁵	
				23 Sept. 1968 ⁴	
27 Jan. 1967 ⁶				10 July 1968 ⁶	4 Mar. 1970 ¹⁸ 5 Mar. 1970 ¹⁵

* Non-member of the United Nations.

1. The date of accession.
2. Including Surinam and Netherlands Antilles.
3. Signed at London.
4. Signed at Moscow.
5. Signed at Washington.
6. Signed at London, Moscow and Washington.
7. Signed at London and Moscow.
8. Signed at London and Washington.
9. Signed at Moscow and Washington.
10. Original Party.
11. Instrument of ratification deposited at London.
12. Instrument of ratification deposited at Moscow.
13. Instrument of ratification deposited at Washington.
14. Instrument of ratification deposited at London, Moscow and Washington.
15. Instrument of ratification deposited at London and Moscow.
16. Instrument of ratification deposited at London and Washington.
17. Instrument of ratification deposited at Moscow and Washington.
18. Notification of succession deposited at London.
19. Notification of succession deposited at Moscow.
20. Notification of succession deposited at Washington.
21. Notification of succession deposited at Moscow and Washington.
22. Instrument of accession deposited at London.
23. Instrument of accession deposited at Moscow.
24. Instrument of accession deposited at Washington.
25. Instrument of accession deposited at London, Moscow and Washington.
26. Instrument of accession deposited at London and Washington.
27. With the reference to the signature and deposit of ratification by the Byelorussian SSR and the Ukrainian SSR, the Government of USA considers those two constituent republics as already covered by the signature and deposit of ratification of the treaty by the USSR.
28. With the reference to the signature and deposit of ratification by the Government of German Democratic Republic, the Government of USA issued the following statement: "Inasmuch as the Government of the United States of America does not recognize the 'German Democratic Republic' as a State or as an entity possessing national sovereignty, it does not accept notice of signature in behalf thereof. Bearing in mind, however, the purpose of the treaty, the Government of the United States of America notes that the East German regime has signified its intention with respect to the matters dealt with in the treaty." This view was reaffirmed by the Government of the United States in connection with deposit of ratification by the German Democratic Republic.
29. The instrument of ratification contains the following declaration: "The aforementioned Treaty is also applicable in Land Berlin with effect from the date on which it enters into force in Federal Republic of Germany, taking into account the rights and responsibilities of the Allied authorities and the powers they retain in the fields of disarmament and demilitarisation."

30. The instrument of ratification contains the following statement designated as a "reservation": "The signing, approval, ratification and application by the Government of Guatemala . . . does not imply that the Republic of Guatemala accords recognition as a legal government to any regime which it does not at present recognize. Nor does it imply the establishment or restoration of diplomatic relations with those countries with which such relations are not at present maintained."
31. Both in connection with the ratification of the Partial Test Ban Treaty and in connection with the signature of the Non-Proliferation Treaty, the following statement was attached: "... the ratification (the signing) by the Government of Korea of the said Treaty does not in any way mean or imply the recognition of any territory or regime which has not been recognized by the Republic of Korea as a State or Government."
32. The note transmitting the instrument of ratification contains the following statement: "... The Government of the State of Kuwait takes the view that its signature and ratification of the said 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."
33. The note transmitting the instrument of ratification contains the following statement: "... The ratification by the Government of the United Arab Republic of this Treaty does not mean or imply any recognition of Israel or any Treaty Relations with Israel."
34. The note transmitting the instrument of ratification contains the following statement: "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."
35. The instrument of accession contains the following statement: "The Government of the Malagasy Republic understands that the provisions of Article 10 may in no way affect the principle of the national sovereignty of the State, which shall retain its freedom of decision with respect to the 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."
36. In regard to the Outer Space Treaty the instrument of ratification states that it is also ratified in respect of "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." In regard to the Non-Proliferation Treaty the same statement is made, except that the Kingdom of Swaziland is omitted.

In connection with the ratification of both treaties the following declaration is made: "... 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 depository 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."

37. In connection with the signing the Government of Argentina stated: "The Government of the Republic of Argentina in conformity with the Article 28, first paragraph, wants to express its satisfaction with the inclusion of clauses which preserve the right of pacific development of nuclear energy and, among these, Article 18, which recognizes the right of the parties concerned to carry out, by their own means or in association with third parties, peaceful nuclear explosions, including explosions for which it might be necessary to use devices similar to those used in nuclear weapons. The Government of the Republic of Argentina understands that these clauses guarantee that nuclear energy can be used, as a necessary part of the process of development in Latin America, and in consequence, represent a fundamental prior condition for an acceptable equilibrium of mutual responsibilities and obligations of nuclear and non-nuclear powers in matters of proliferation. When signing the Treaty the Government of the Republic of Argentina expressly states its agreement with the interpretative resolution, designated as Resolution 20 (Four) of the Preparatory Commission for the Denuclearization of Latin America."
38. In connection with the signing the Government of Brazil stated: "... In the judgement of the Brazilian Government the Article 18 above mentioned gives the signatory Nations the right to carry out by their own means or in association with third parties, nuclear explosions for peaceful purposes, including those which presuppose devices similar to those used in military armaments." The note transmitting the instrument of ratification contains the following statement: "The Government of Brazil when ratifying the Treaty declares that it is not making use of the dispensation to which it is entitled in accordance with paragraph 2 of Article 28. The Government of Brazil also reiterates the terms of its Note on the interpretation of Article 18 of the Treaty, that was deposited on the day of signing..."
39. Treaty is in force through a declaration in accordance with paragraph 2 of the Article 28.
40. Only the Additional Protocol I, which applies to all the extra-continental and continental states which are de jure or de facto internationally responsible for the territories which lie within the limits of the geographical zone established in the Treaty, i.e. France, the Netherlands, United Kingdom and United States.

In connection with the signing the Government of the Netherlands stated: "No provision of the Protocol shall be interpreted as prejudicing the position of the Kingdom 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."

"No provision of the Protocol shall be interpreted as implying that, with respect to the

carrying-out of nuclear explosions for peaceful purposes on the territory of Surinam and the Netherland Antilles, other rules apply than those operative for the Parties to the Treaty."

41. Only additional Protocol II, which applies to the powers possessing nuclear weapons, i.e. China P.R., France, United Kingdom, United States and USSR.

In connection with the signing the Government of the United States stated inter alia that: "I... As regards the undertaking in Article 3 of the Protocol II not to use or threaten to use nuclear weapons against the Contracting Parties, the United States would have to consider that an armed attack by a Contracting Party, in which it was assisted by a nuclear-weapons State, would be incompatible with the Contracting Party's corresponding obligations under Article 1 of the Treaty."

"II. The United States wishes to point out again the fact that the technology of making nuclear explosive devices for peaceful purposes is distinguishable from the technology of making nuclear weapons... Therefore we understand the definition contained in Article 5 of the Treaty as necessarily encompassing all nuclear explosive devices. It is our understanding that Articles 1 and 5 restrict accordingly the activities of the Contracting Parties under paragraph 1 of Article 18..."

42. Only additional Protocols I and II.

In connection with the signing the Government of the United Kingdom stated inter alia that: "... (b) Article 18 of the Treaty, when read in conjunction with Articles 1 and 5 thereof, would not permit the Contracting Parties to the Treaty 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: ... (d) the Government of the United Kingdom would, in the event of any act of aggression by a Contracting Party to the Treaty in which that Party was supported by a nuclear-weapons State, be free to reconsider the extent to which they could be regarded as committed by the provisions of Additional Protocol II..."

43. In connection with the signing the Government of Mexico stated it understood: "1. That, in view of Article VII of the Treaty, none of the provisions of the Treaty shall be interpreted as affecting in any way the rights and obligations of Mexico as a State Party to the Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty), ...; and 2. That, at present time, any nuclear explosive device may be 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. Nevertheless, if technological progress should change that situation, it would be necessary to amend the pertinent provisions of the Treaty, in accordance with the procedure established therein."

3E.1. *List of United Nations resolutions on disarmament and related matters, 1969^a*

1. General Assembly resolutions

Resolution no.	Subject	Date of adoption	Voting results	
2496 (XXIV)	Effects of atomic radiation Requests the Scientific Committee to continue its work, including its co-ordinating activities, to increase knowledge of levels and effects of atomic radiation from all sources.	28 October 1969	Adopted unanimously	
2574 (XXIV)	Question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind.	15 December 1969		
	<i>Resolution A</i> Requests the Secretary-General to ascertain the views of Member States on the desirability of convening a conference on the law of the sea to review the régimes of the high seas, the continental shelf, the territorial sea and the contiguous zone, fishing and conservation of the living resources of the high seas in order to arrive at a clear, precise and internationally accepted definition of the area of the sea-bed and ocean floor which lies beyond national jurisdiction, in the light of the international régime to be established for that area.		In favour	65
			Against	12 (USSR)
			Abstentions	30 (France, UK, USA)
	<i>Resolution B</i> Invites the Committee on the Peaceful Uses of the Sea-bed and the Ocean Floor beyond the Limits of National Jurisdiction, to consider further the questions entrusted to it under resolution 2467 (XXIII) (which instructs it, <i>inter alia</i> , to study the legal principles and norms which would promote international co-operation in exploration and use of the sea-bed and ocean floor and subsoil thereof; to study ways and means of promoting exploitation of this area; to examine proposed measures of co-operation to prevent marine pollution; and to study the reservation exclusively for peaceful purposes of the sea-bed and ocean floor) with a view to formulating recommendations on these questions; requests the Committee to expedite its work of preparing a comprehensive and balanced statement of these principles and to submit a draft declaration to the General Assembly at its twenty-fifth session, and further requests the Committee to formulate recommendations regarding the economic and technical conditions and the rules for the exploitation of the resources of this area.		In favour	109 (France, UK, USA, USSR)
			Against	0
			Abstentions	1

Resolution C

Requests the Secretary-General to prepare a study on various types of international machinery, particularly a study covering in depth the status, structure, functions and powers of an international machinery, having jurisdiction over the peaceful uses of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction, including the power to regulate, co-ordinate, supervise and control all activities relating to the exploration and exploitation of their resources for the benefit of mankind as a whole, irrespective of the geographical location of the States, taking into account the special interests and needs of the developing countries, whether land-locked or coastal.

In favour	100	(France, UK, USA)
Against	0	
Abstentions	11	(USSR)

Resolution D

Declares that, pending the establishment of an international régime, including appropriate international machinery,
a) States and persons, physical or juridical, are bound to refrain from all activities of exploitation of the resources of the area of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction;
b) No claim to any part of that area or its resources shall be recognized.

In favour	62	
Against	28	(France, UK, USA, USSR)
Abstentions	28	

2600 (XXIV) **International co-operation in the peaceful uses of outer space**
Inter alia invites Member States with experience in the field of remote earth resources surveying to make such experience available to other Member States which do not have such experience and encourage them to become familiar with this field; invites Member States to join in exploring the various aspects involved in the analysis of data obtained through earth resources surveying; and requests the Committee on the Peaceful Uses of Outer Space to continue its studies with regard to the possibilities of further international co-operation in connection with the development and use of remote earth resources survey techniques.

16 December 1969	In favour	105	(France, UK, USA)
	Against	9	(USSR)
	Abstentions	3	

2601 (XXIV) **International co-operation in the peaceful uses of outer space**
Resolution A
Inter alia endorses the recommendations and decisions in the report of the Committee on the Peaceful Uses of Outer Space; requests the Committee to continue to study questions relative to the definition of outer space and utilization of outer space and celestial bodies; and requests the specialized agencies and International Atomic Energy Agency (IAEA) to examine the particular problems which arise or may arise from the use of outer space in the fields within their competence and report thereon to the Committee.

16 December 1969	Adopted unanimously
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3E.1. Continued

Resolution no.	Subject	Date of adoption	Voting results	
	<i>Resolution B</i> <i>Inter alia</i> expressed deep dissatisfaction that efforts to complete a draft convention on liability for damage caused by objects launched into outer space have not been successful and urges the Committee on the Peaceful Uses of Outer Space to complete the draft convention in time for final consideration by the General Assembly in its twenty-fifth session.		Adopted unanimously	
2602 (XXIV)	Question of general and complete disarmament <i>Resolution A</i> Noting with satisfaction that the Governments of the USSR and the USA initiated bilateral negotiations on the limitation of offensive and defensive strategic nuclear-weapon systems, appeals to these Governments to agree, as an urgent preliminary measure, on a moratorium on further testing and deployment of new offensive and defensive strategic nuclear-weapon systems.	16 December 1969	In favour	82
			Against	0
			Abstentions	37 (France, UK, USA, USSR)
	<i>Resolution B</i> Endorses the agreement reached by the USSR and the USA on enlarging the composition of the Eighteen-Nation Committee on Disarmament thereafter called the Conference of the Committee on Disarmament (CCD).		In favour	113 (UK, USA, USSR)
			Against	0
			Abstentions	6 (France)
	<i>Resolution C</i> Invites the CCD to consider, without prejudice to existing priorities, effective methods of control against the use of radiological methods of warfare conducted independently of nuclear explosions; and recommends that the CCD consider, in the context of nuclear arms control negotiations, the need for effective methods of control of nuclear weapons that maximize radioactive effects.		In favour	79
			Against	0
			Abstentions	37 (France, UK, USA, USSR)
	<i>Resolution D</i> Concerned at the possible military applications of laser technology, recommends that the CCD give consideration, without prejudice to existing priorities, to the implications of this problem.		In favour	72
			Against	0
			Abstentions	44 (France, UK, USA, USSR)
	<i>Resolution E</i> <i>Inter alia</i> declares the decade of the 1970s as a Disarmament Decade; calls on Governments to intensify their efforts for effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament and the elimination of other weapons of mass		In favour	104 (UK, USA)
			Against	0
			Abstentions	13 (France, USSR)

destruction, and for a treaty on general and complete disarmament under strict and effective international control; requests the CCD, while continuing negotiations to reach the widest possible agreement on collateral measures, to work out a comprehensive programme, dealing with cessation of the arms race and general and complete disarmament, under effective international control, which could provide the Conference with a guideline to chart the course of its further work and its negotiations; and recommends that consideration be given to channelling a substantial part of the resources freed by measures in the field of disarmament to promote the economic development, in particular the scientific and technological progress, of developing countries.

Resolution F

Convinced that the conclusion of a 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 would constitute a step towards the exclusion of this area from the arms race, calls upon the CCD to take into account all proposals and suggestions that have been made at this session of the General Assembly, and to continue its work on this subject.

In favour	116	(UK, USA, USSR)
Against	0	
Abstentions	4	(France)

2603 (XXIV) **Question of chemical and bacteriological (biological) weapons**

16 December 1969

Resolution A

Declares as contrary to the generally recognized rules of international law, as embodied in the Geneva Protocol of 17 June 1925, the use in international armed conflicts of any chemical agents of warfare—chemical substances, whether gaseous, liquid or solid—and any biological agents of warfare—living organisms, whatever their nature, or infective material derived from them.

In favour	80	(USSR)
Against	3	(USA)
Abstentions	36	(France, UK)

Resolution B

I—Reaffirms its resolution 2162 B (XXI)^a of 5 December 1966 and calls for strict observance by all States of the principles and objectives of the Geneva Protocol of 17 June 1925 and invites all States which have not yet done so to accede to or ratify the Geneva Protocol in 1970.

In favour	120	(France, UK, USA, USSR)
Against	0	
Abstentions	1	

II—*Inter alia* recommends the report of the Secretary-General on chemical and bacteriological (biological) weapons and the effects of their possible use to the CCD as a basis for its further consideration of the elimination of these weapons.

III—Requests the CCD to give urgent consideration to reaching agreement on the prohibitions and other measures referred to in the draft Convention on the Prohibition of the Development, Production and Stockpiling of Chemical and Bacteriological (Biological) Weapons and on the Destruction of such Weapons, submitted to the General Assembly by the delegations of the USSR and other socialist countries, and in the

3E.1. Continued

Resolution no.	Subject	Date of adoption	Voting results		
	draft Convention on the Prohibition of Biological Methods of Warfare, submitted by the UK to the CCD; further requests the CCD to present a report on progress on all aspects of the problem of the elimination of chemical and bacteriological (biological) weapons to the General Assembly at its twenty-fifth session.				
2604 (XXIV)	Urgent need for suspension of nuclear and thermonuclear tests <i>Resolution A</i> Requests the Secretary-General to transmit to the Governments of the Member States or of the specialized agencies, or of the IAEA or Parties to the Statute of the International Court of Justice, a request for provision of certain information: a list of all seismic stations from which the Government concerned would be prepared to supply records on the basis of guaranteed availability and to provide data about each station, in particular the coordinates and the instrumentation. This is in the context of the creation of a world-wide exchange of seismological data which would facilitate the solution of the problem of verifying a comprehensive test ban.	16 December 1969	In favour	99	(UK, USA)
			Against	7	(USSR)
			Abstentions	13	(France)
	<i>Resolution B</i> Urges all States which have not done so to adhere without further delay to the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water; calls upon all nuclear-weapon States to suspend nuclear weapon tests in all environments; and requests the CCD to continue, as a matter of urgency, its deliberations on a treaty banning underground nuclear weapon tests.		In favour	114	(UK, USA, USSR)
			Against	1	
			Abstentions	4	(France)
2605 (XXIV)	Conference of Non-Nuclear-Weapon States <i>Resolution A</i> <i>Inter alia</i> , invites the specialized agencies, the IAEA and other international bodies concerned to report to the Secretary-General on further action taken by them concerning the recommendations contained in the resolutions of the Conference of Non-Nuclear-Weapon States, which were transmitted to them by the Secretary-General in pursuance of resolution 2456 A (XXIII) ² ; requests the Secretary-General to submit a progress report, based on the information supplied by those concerned and to place on the provisional agenda of the twenty-fifth session the question of implementation of the results of the Conference of Non-Nuclear-Weapon States.	16 December 1969	In favour	110	(France, UK, USA)
			Against	0	
			Abstentions	10	(USSR)

Resolution B

Invites the IAEA to submit to the Secretary-General a report on its studies and activities in the field of peaceful nuclear explosions; requests the Secretary-General to include in the agenda of the General Assembly at its twenty-fifth session an item entitled "Establishment within the framework of the International Atomic Energy Agency of an international service for nuclear explosions for peaceful purposes under appropriate international control".

In favour	80	(France, UK, USA)
Against	1	
Abstentions	37	(USSR)

¹ A list of the resolutions adopted at the 1967 and 1968 sessions can be found in the *SIPRI Yearbook of World Armaments and Disarmament, 1968/69*. A list of the resolutions adopted at previous sessions can be found in *The United Nations and Disarmament, 1945-1965*, United Nations, New York, 1967.

² This resolution is explained in the *SIPRI Yearbook, 1968/69*, pages 337-40.

Sources:

Resolutions: GAOR—Twenty-fourth Session. Supplement No. 29 (A/7629).

Voting results: Aktstycken utgivna av Kungl. Utrikesdepartementet, Ny serie 1 : A :19, Stockholm, 1970.

3E.2. *List of United Nations resolutions on conflicts, 1969–70*¹**1. Security Council resolutions**

Resolution no.	Subject	Date of adoption
I. Cyprus		
266 (1969)	Extends once more the stationing in Cyprus of the UN Peace-keeping Force, for a further period ending on 15 December 1969.	10 June 1969
274 (1969)	Extends once more the stationing in Cyprus of the UN Peace-keeping Force, for a further period ending on 15 June 1970.	11 December 1969
280 (1970)	Extends once more the stationing in Cyprus of the UN Peace-keeping Force, for a further period ending 15 December 1970.	9 June 1970
II. Middle East		
265 (1969)	Reaffirms its resolutions 248 (1968) and 256 (1968), and condemns the recent premeditated air attacks launched by Israel on Jordanian villages and populated areas in flagrant violation of the UN Charter and the cease-fire resolution.	1 April 1969
267 (1969)	Confirms that all legislative and administrative measures and actions by Israel which purport to alter the status of Jerusalem including expropriation of land and properties thereon are invalid and cannot change that status; urgently calls upon Israel to rescind forthwith all measures taken to alter the status of the City of Jerusalem, and in future to refrain from all action likely to have such an effect.	3 July 1969
270 (1969)	Condemns the premeditated air attack by Israel on villages in southern Lebanon in violation of its obligations under the Charter and Security Council resolutions.	26 August 1969
271 (1969)	Recognizes that any act of destruction or profanation of the Holy Places, religious buildings and sites in Jerusalem or any encouragement of, or connivance at, any such act may seriously endanger international peace and security; determines that the execrable act of desecration and profanation of the Holy Al Aqsa Mosque emphasizes the immediate necessity of Israel desisting from acting in violation of Security Council and General Assembly resolutions and rescinding forthwith all measures and actions taken by it designed to alter the status of Jerusalem; calls upon Israel scrupulously to observe the provisions of the Geneva Conventions and international law governing military occupation and to refrain from causing any hindrance to the discharge of the established functions of the Supreme Muslim Council of Jerusalem; and condemns	15 September 1969

the failure of Israel to comply with the aforementioned resolutions and calls upon it to implement the provisions of these resolutions.

- 279 (1970) Demands the immediate withdrawal of all Israeli armed forces from Lebanese territory. 12 May 1970
- 280 (1970) Condemns Israel for its premeditated military action in violation of the obligations under the Charter; declares that such armed attacks can no longer be tolerated and repeats its solemn warning to Israel that the Security Council will consider taking adequate and effective steps or measures in accordance with the Articles of the Charter to implement its resolutions; and deplores the loss of life and damage to property inflicted as a result of violations of resolutions of the Security Council. 19 May 1970

III. Portugal

- 268 (1969) Strongly censures the Portuguese attacks on Lote village in the Eastern province of Zambia; calls upon Portugal to desist forthwith from violating the territorial integrity and from carrying out unprovoked raids against Zambia; demands the immediate release and reparation of all civilians kidnapped by Portuguese military forces; and further demands from Portugal the return of all property unlawfully taken from Zambian territory. 28 July 1969
- 273 (1969) Strongly condemns the Portuguese authorities for the shelling of the village of Samine and again calls upon Portugal to desist forthwith from violating the sovereignty and territorial integrity of Senegal. 9 December 1969
- 275 (1969) Deeply deplores the loss of life and heavy damage to several Guinean villages inflicted by the Portuguese military authorities; calls upon Portugal to desist forthwith from violating the sovereignty and integrity of the Republic of Guinea; further calls upon the Portuguese authorities in Guinea (Bissau) to immediately release the Guinean civilian plane and motor barge captured together with their occupants. 22 December 1969

IV. South Africa

- 264 (1969) Reaffirming the inalienable right of the people of Namibia to freedom and independence in accordance with the provisions to the General Assembly resolution 1514 (XV), considers that the continued presence of South Africa in Namibia is illegal and contrary to the principles of the Charter and the previous decisions of the United Nations; calls upon the Government of South Africa to immediately withdraw its administration from the territory; declares that the actions of the Government of South Africa designed to destroy the national unity and territorial integrity of Namibia through the establishment of Bantustans are contrary to the provisions of the UN Charter; declares that the

3E.2. Continued

no.	Subject	Date adoption
269 (1969)	Government of South Africa has no right to enact the "South West Africa Affairs Bill"; condemns the refusal of South Africa to comply with pertinent General Assembly resolutions; and invites all States to exert their influence in order to obtain compliance by the Government of South Africa with the provisions of the present resolution.	12 August 1969
276 (1970)	<i>Inter alia</i> strongly condemns the refusal of the Government of South Africa to comply with General Assembly and Security Council resolutions pertaining to Namibia; declares that the continued presence of the South African authorities in Namibia is illegal and that consequently all acts taken by the Government of South Africa on behalf of or concerning Namibia after the termination of the mandate are illegal and invalid; decides to establish an ad hoc sub-committee of the Council to study, in consultation with the Secretary-General, ways and means by which the relevant resolutions can be effectively implemented in accordance with the appropriate provisions of the Charter, in the light of the flagrant refusal of South Africa to withdraw from Namibia, and to submit its recommendations by 30 April 1970.	30 January 1970

V. Southern Rhodesia

277 (1970)	Condemns the illegal proclamation of republican status of the Territory by the illegal régime in Southern Rhodesia; decides that Member States shall refrain from recognizing this illegal régime or from rendering any	18 March 1970
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assistance to it; reaffirms the primary responsibility of the Government of the United Kingdom for enabling the people of Zimbabwe to exercise their right to self-determination and independence, and urges that Government to discharge fully its responsibility; decides that Member States shall: (a) immediately sever all diplomatic, consular, trade, military and other relations that they may have with the illegal régime in Southern Rhodesia, and terminate any representation that they may maintain in the Territory; and (b) immediately interrupt and existing means of transportation to and from Southern Rhodesia; requests Member States to take all possible further action under Article 41 of the Charter to deal with the situation in Southern Rhodesia, not excluding any of the measures provided in that Article; calls upon Member States, and in particular those with primary responsibility under the Charter for the maintenance of international peace and security, to assist effectively in the implementation of the measures called for in the present resolution; decides that the Committee of the Security Council established by resolution 253 (1968), shall be *inter alia* entrusted with the responsibility to study ways and means by which Member States could carry out more effectively the decisions of the Security Council regarding sanctions against the illegal régime of Southern Rhodesia and to make recommendations to the Security Council.

2. General Assembly resolutions

Resolution no.	Subject	Date of adoption	Voting results	
I. Korea				
2516 (XXIV)	<p>Question of Korea</p> <p><i>Inter alia</i> reaffirms that the objectives of the UN in Korea are to bring about the establishment of a unified, independent and democratic Korea under a representative form of government; expresses the belief that arrangements should be made to achieve these objectives through genuinely free elections held in accordance with the relevant resolutions of the General Assembly; requests the UN Commission for the Unification and Rehabilitation of Korea to pursue these and other efforts to achieve the objectives of the UN in Korea, and to continue to carry out the tasks previously assigned to it by the General Assembly. It also notes that the UN forces which were sent to Korea have in a greater part already been withdrawn, that the sole objective of these forces at present in Korea is to preserve the peace and security of the area, and that the Governments concerned are prepared to withdraw their remaining forces whenever such action is requested by the Republic of Korea or whenever the conditions for a lasting settlement formulated by the General Assembly have been fulfilled.</p>	25 November 1969	In favour 70 Against 26 Abstentions 21	(<i>France, UK, USA</i>) (<i>USSR</i>)
II. Middle East				
2535 (XXIV)	<p>United Nations Relief and Works Agency for Palestine Refugees in the Near East</p> <p><i>Resolution A</i></p> <p>Notes with deep regret that repatriation or compensation of the refugees as provided for in paragraph 11 of General Assembly resolution 194 (III) has not been effected, that no substantial progress has been made in the programme endorsed in paragraph 2 of resolution 513 (VI) for the reintegration of refugees either by repatriation or resettlement and that, therefore, the situation of the refugees continues to be a matter of serious concern; also notes with regret that the UN Conciliation Commission for Palestine was unable to find means for achieving progress in the implementation of paragraph 11 of General Assembly resolution 194 (III), and requests the Commission to exert continued efforts towards the implementation thereof; and calls upon all Governments as a matter of urgency to make the most generous efforts to meet the anticipated needs of the UN Relief and Works Agency for Palestine Refugees in the Near East.</p>	10 December 1969	In favour 110 Against 0 Abstentions 1	(<i>Arab States, France, UK, USA, USSR</i>) (<i>Israel</i>)

Resolution B

Inter alia draws the attention of the Security Council to the grave situation resulting from Israeli policies and practices in the occupied territories and Israel's refusal to implement Security Council and General Assembly resolutions.

In favour	48	(Arab States, USSR)
Against	2	(Israel, USA)
Abstentions	47	(France, UK)

Resolution C

Endorses the efforts of the Commissioner-General of the UN Relief and Works Agency for Palestine Refugees in the Near East to continue to provide humanitarian assistance, on an emergency basis and as a temporary measure, to other persons in the area who are at present displaced and in serious need of assistance as a result of the June 1967 hostilities, and strongly appeals to all Governments and to organizations and individuals to contribute generously for the above purposes to the UN Relief and Works Agency for Palestine Refugees in the Near East and to the other non-governmental organizations concerned.

In favour	108	(Arab States, Israel, UK, USA, USSR)
Against	0	
Abstentions	3	

III. Namibia

2498 (XXIV) **Question of Namibia**
Reaffirms the inalienable right of the people of Namibia to self-determination and independence, and condemns the Government of South Africa for its refusal to withdraw its administration from Namibia.

31 October 1969	In favour	95	(USA, USSR)
	Against	2	(Portugal, South Africa)
	Abstentions	6	(France, UK)

2517 (XXIV) **Question of Namibia**
Inter alia condemns the Government of South Africa for its persistent refusal to withdraw its administration from the Territory and for its policies and actions designed to destroy the national unity and territorial integrity of Namibia; and calls upon all States to co-operate with the UN Council for Namibia in carrying out the tasks entrusted to it.

1 December 1969	In favour	92	(USSR)
	Against	2	(Portugal, South Africa)
	Abstentions	19	(France, UK, USA)

IV. Peace-keeping operations

2576 (XXIV) **Comprehensive review of the whole question of peace-keeping operations in all their aspects**
Requests the Special Committee on Peace-keeping Operations to continue its work and to submit to the General Assembly at its twenty-fifth session a comprehensive report on the UN military observers established or authorized by the Security Council for observation purposes pursuant to Council resolutions, as well as a progress report on such work as the Special Committee may be able to undertake on any other models of peace-keeping operations.

15 December 1969	In favour	109	(France, UK, USA, USSR)
	Against	1	
	Abstentions	1	

3E.2. Continued

Resolution no.	Subject	Date of adoption	Voting results			
V. Southern Africa						
2547 (XXIV)	Measures for effectively combating racial discrimination, the policies of apartheid and segregation in southern Africa	11 December 1969	In favour	87	(USSR)	
	<i>Resolution A</i>		Against	1	(Portugal)	
	Determined to promote immediate and urgent action with a view to restoring the human rights and fundamental freedoms of the oppressed peoples of southern Africa, <i>inter alia</i> reaffirms its recognition of the legitimacy of the struggle by the opponents of the <i>apartheid</i> , of racial discrimination and of Portuguese colonialism in southern Africa; strongly censures the Government of South Africa for its illegal occupation of Namibia, a territory under the direct responsibility of the UN; calls upon the Government of the United Kingdom, the Administering Authority, to reconsider its deplorable refusal to intervene in Southern Rhodesia by force and restore the human and fundamental freedoms of the peoples of Zimbabwe, as well as to ensure the application of the relevant Geneva Conventions of 1949 to the situation prevailing in Southern Rhodesia; calls upon the Governments of Portugal and South Africa to observe the terms of the Geneva Conventions relative to the Treatment of Prisoners of War and relative to the Protection of Civilian Persons in Time of War.		Abstentions	23	(France, UK, USA)	
	<i>Resolution B</i>	15 December 1969	In favour	86	(USSR)	
	<i>Inter alia</i> condemns the racist Government of South Africa for its perpetuation and further intensification of the inhuman policy of <i>apartheid</i> in complete and flagrant violation of the Charter of the UN and the Universal Declaration of Human Rights and for its continuous affront and insult to the human conscience; calls upon the Government of the United Kingdom, the Administering Power in Southern Rhodesia, to repeal the illegal legislation referred to in a part of paragraph 529 of the Special Rapporteur's report and enacted by the racist and illegal régime of Southern Rhodesia; deplores the refusal of the Government of the United Kingdom to suppress the racist and illegal minority régime in Southern Rhodesia and thus to restore the fundamental human rights of the people of Zimbabwe; calls upon all those Governments which still maintain diplomatic, commercial, military, cultural and other relations with the racist Governments of South Africa and Southern Rhodesia, to terminate such relations immediately in accordance with the relevant resolutions of the General Assembly and the Security Council.			Against	2	(Portugal, South Africa)
				Abstentions	21	(France, UK, USA)

2508 (XXIV) Question of Southern Rhodesia

Inter alia reaffirms the inalienable right of the people of Zimbabwe to freedom and independence and the legitimacy of their struggle to attain that right in conformity with the provisions of General Assembly resolution 1514 (XV); declares illegal all measures taken by the racist minority régime to deprive the people of Zimbabwe of their legitimate rights and to entrench its policies of *apartheid* in Southern Rhodesia; condemns the failure and refusal of the Government of the United Kingdom as the Administrative Power to take effective measures to bring down the racist minority régime in Southern Rhodesia and to transfer power to the people of Zimbabwe; condemns further the intervention of South African armed forces in Southern Rhodesia, which constitutes an act of aggression against the people and the territorial integrity of Zimbabwe; condemns the policies of the Governments of South Africa and Portugal and other Governments which continue to have political, economic, military and other relations with the illegal racist minority régime in Southern Rhodesia in contravention with the relevant resolutions of the UN; calls upon the Government of the United Kingdom, in fulfillment of its responsibility as the Administering Power, to take effective measures, including the use of force, to put an immediate end to the illegal racist minority régime in Southern Rhodesia and to transfer all powers to the people of Zimbabwe on the basis of majority rule; reaffirms its conviction that the sanctions will not put an end to the illegal racist minority régime in Southern Rhodesia unless they are comprehensive, mandatory, effectively supervised, enforced and complied with, particularly by South Africa and Portugal; further draws the attention of the Security Council to the urgent necessity of applying the following measures envisaged under Chapter VII of the Charter: (a) The scope of the sanctions against the illegal racist minority régime should be widened to include all the measures laid down in Article 41 of the Charter; (b) Sanctions should be imposed on South Africa and Portugal, the Governments of which have blatantly refused to carry out the mandatory decisions of the Security Council.

21 November 1969

In favour	83	(USSR)
Against	7	(South Africa, UK, USA)
Abstentions	20	(France)

¹ A list of the resolutions adopted by the Security Council during 1967 and 1968 as well as resolutions taken by the General Assembly sessions of 1967 and 1968 can be found in the *SIPRI Yearbook 1968/69*.

Sources:

Resolutions: SCOR—Resolutions and decisions taken by the Security Council 1969.

—Resolutions and decisions taken by the Security Council 1970.

GAOR—Twenty-fourth Session. Supplement No. 29 (A/7629).

Voting results: Aktstycken utgivna av Kungl. Utrikesdepartementet, Ny serie 1 : A : 19, Stockholm 1970.

Glossary

Advanced Manned Strategic Aircraft (AMSA) US bomber, proposed to replace the B-52.

Anti-ballistic missile (ABM) Surface-to-air missile intended to intercept and destroy incoming ballistic missiles.

Assured destruction capability Ability to inflict a very high-level of damage on an adversary's population and industry.

Ballistic missiles Missile which follows a ballistic trajectory— that is, the trajectory of something that is thrown.

B-52 Large US intercontinental subsonic bomber, carrying conventional and nuclear weapons.

CEP (circular probable error) A measure of the accuracy of a missile: the radius of the circle within which half of any group of incoming warheads are expected to land.

Counterforce capability Ability to destroy opponent's strategic offensive forces.

First-strike capability Ability to destroy sufficient of the opponent's offensive weapons to prevent a successful counter-attack.

Fractional orbital bombardment system (FOBS) Method of delivering nuclear weapons from low altitude orbital trajectories. The orbital trajectory is fractional—that is, it does not complete a circuit of the earth.

Galosh NATO code-name for Soviet anti-ballistic missile.

Guidance system The system which moves a weapon in a desired direction; control may be exercised by an automatic regulating device or by a component which reacts to outside signals.

Hardening The protecting of military facilities to make them resistant to the blast of a nuclear weapon. Hardened missile launch sites consist of underground silos with protective covering.

Hard-point defence Defensive system for protecting a hardened site from nuclear attack.

Initial operating capacity (IOC) Date on which a weapon or weapon system becomes operational.

Intercontinental ballistic missile (ICBM) Missile with a range between 5 500 and 8 000 nautical miles.

Intermediate range ballistic missile (IRBM) Missile with a range between 2 000 and 4 000 nautical miles.

Kiloton The explosive power of 1 000 tons of TNT.

Megaton The explosive power of 1 000 000 tons of TNT.

Minuteman Class of solid fueled ICBMs. Two versions of this missile have been deployed, Minuteman I and II. The third version—Minuteman III—will carry MIRVs, and is now coming into operation..

Multiple individually-targetable re-entry vehicle (MIRV) System which can carry in one missile several warheads which can be individually delivered on separate targets. MIRVs will be incorporated in Minuteman III and Poseidon missiles.

Multiple re-entry vehicles (MRV) System which can carry several warheads in one missile: these warheads, however, cannot be individually targeted.

Medium-range ballistic missile (MRBM) Missile with a range of approximately 1 500 nautical miles.

Penetration aids Devices aboard missiles and aircraft which aid passage through enemy defence systems. These aids may include decoys, chaff, and electronic jammers to interfere with radar.

Polaris US nuclear-powered submarine, capable of launching 16 missiles; the term is also used to describe the missiles.

Poseidon United States missile which, it is planned, will replace most Polaris missiles in the next five years. It will carry MIRVs.

Re-entry vehicle Portion of a missile or space craft which is designed to survive the frictional heat of entering the earth's atmosphere from space.

Second-strike capability Ability to retaliate and destroy a large proportion of an adversary's industry and population, after the adversary had first launched a nuclear attack.

Silo A missile shelter including a vertical hole in the ground with facilities either for launching the missile directly or for lifting it to a launch position.

Spartan Missile which is part of the United States anti-ballistic missile system: designed for intercepting incoming missiles outside the atmosphere.

Glossary

Sprint Missile which is part of the United States anti-ballistic missile system: designed for intercepting incoming missiles after reentry into the atmosphere.

SS-9, SS-11 and SS-13 United States designation of certain Soviet intercontinental ballistic missiles.

Titan United States liquid-fueled ICBM with a warhead of several megatons.

Warhead Section of a missile which contains the explosive charge (either conventional or nuclear).

Weapon system A combat instrument, including both the weapon (such as missile or bomber) and its related equipment and support service and facilities.

Résumé

Voici la seconde édition de l'*Annuaire de l'Institut International de Recherche sur la Paix, de Stockholm*. Son propos reste le même : donner une vue synoptique des armements et des dépenses militaires en différents points du monde ainsi que des progrès accomplis, le cas échéant, dans leur limitation ou leur réduction. Les conceptions sous-jacentes restent également les mêmes : la conviction que le monde consacre une quantité excessive de ses ressources aux préparatifs du massacre mutuel, et qu'il y aurait tout avantage à réduire cette quantité. Il ne s'agit pas d'une vue simpliste selon laquelle les armes sont la seule, voire la principale cause de guerre, mais de la conviction que toute compétition engagée en vue d'acquérir et de mettre au point de nouvelles armes constitue un facteur d'exacerbation des relations internationales qui engendre suspicions et tensions, menaces et contre-menaces.

Ce volume commence par une analyse des tendances qu'accusent les dépenses militaires mondiales. Il aborde ensuite le sujet du commerce des armes avec les pays du tiers-monde, commerce qui constitue la principale voie de diffusion mondiale du matériel de guerre classique technologiquement avancé. Il se concentre ensuite sur quatre domaines : la course aux armements nucléaires et les pourparlers sur la limitation des armements stratégiques; les niveaux des effectifs et des armements en Europe, et les pourparlers possibles sur la limitation des armements et les réductions de forces qui pourraient s'associer à une conférence sur la sécurité européenne; la militarisation des océans et la dénucléarisation des fonds marins; enfin les pourparlers en cours sur l'interdiction des armes chimiques et biologiques. Dans le chapitre sur les fonds océaniques, entre autres, le livre s'efforce d'allier à la documentation sur les armes et les développements militaires des discussions sur les projets de désarmement. On a généralement tendance à traiter ces deux sujets — analyse des armements et analyse du désarmement — dans des publications distinctes; ils devraient être traités comme les deux volets d'une même question.

Il convient de répéter la mise en garde générale de l'an dernier. La documentation de base sur le développement des armes est, dans une proportion écrasante, d'origine américaine. Il n'y a pour ainsi dire rien à ce sujet dans la littérature disponible en Union Soviétique, ce qui pourrait donner l'impres-

sion que seuls les États-Unis font avancer la technologie des armes nouvelles — conclusion évidemment erronée. Il est exact que les États-Unis se trouvent à l'avant-garde de cette technologie et qu'ils publient des documents à son sujet; il est donc inévitable que l'évolution américaine soit celle qui retient le plus l'attention. On est en droit de supposer que d'autres pays les suivent dans cette voie.

Les dépenses militaires mondiales

Les dépenses militaires mondiales en valeurs constantes (c'est-à-dire après déduction de l'effet de l'inflation) n'ont pas augmenté en 1969. Et cela, après trois ans pendant lesquels elles avaient augmenté de 30 pour cent. En 1970, il semble certain qu'elles vont connaître un dégonflement, peut-être de l'ordre de 2 pour cent. Les chiffres du budget des États-Unis indiquent une baisse sensible des dépenses militaires, et ceux de l'Union Soviétique un léger accroissement. En 1968 et 1969, le monde a consacré quelque 7 pour cent du total de ses produits nationaux aux usages militaires. Cette année, ce chiffre devrait s'abaisser quelque peu.

Aux États-Unis, les dépenses afférant au Vietnam constituent le facteur le plus important d'augmentation ou de diminution. L'an dernier, la question se posa de savoir si, à mesure que les dépenses militaires pour le Vietnam s'allégeaient, d'autres dépenses pour les forces stratégiques ou la recherche et le développement s'alourdiraient d'autant. Cette substitution n'a pas eu lieu jusqu'ici. Cependant, un grand nombre de nouveaux programmes militaires se trouvent à un stade de développement initial, et la seconde étape de la réduction des dépenses pour le Vietnam se fait toujours attendre. Les autres pays de l'OTAN n'ont pas connu d'augmentation de leurs dépenses militaires depuis quelques années. Quant à l'Union Soviétique, ses dépenses militaires ont progressé de plus de 35 pour cent entre 1965 et 1969 — plus vite que celles des États-Unis, en valeurs constantes. Et les dépenses des autres pays du Pacte de Varsovie — d'après les chiffres de leurs budgets — ont progressé encore plus vite.

Les dépenses militaires des pays sous-développés ne constituent qu'une partie négligeable du total mondial. Mais elles se sont élevées à une cadence plus vive que dans les pays industriels. La cause en réside dans le très rapide accroissement des dépenses au Moyen-Orient. Abstraction faite de ces dernières, les taux d'accroissement des deux zones, développée et sous-développée, sont à peu près équivalents.

Le commerce d'armes avec les pays sous-développés

Les livraisons identifiées d'armes « majeures » — navires, avions, blindés et missiles — vers les pays sous-développés ont atteint en 1969 un total de 1,5 milliards de dollars (aux prix de 1968). Soit moins que pour 1967, année de pointe, mais encore en troisième place parmi les chiffres de l'après-guerre.

La tendance profonde de l'évolution de ces fournitures d'armes est probablement toujours ascendante. La politique des États-Unis, telle qu'elle a été définie à Guam sous le terme de « doctrine Nixon » — et selon laquelle dans la plupart des cas un pays menacé devrait lui-même assumer la responsabilité primaire de sa défense — va vraisemblablement entraîner un accroissement des fournitures militaires aux nations clientes. En 1969, les livraisons d'armes US aux pays d'Extrême-Orient — en particulier Taiwan et la Corée du Sud — ont été plus importantes que pour n'importe quelle année depuis 1955. Les livraisons effectuées en 1969 par l'Union Soviétique ont probablement été plus faibles qu'au cours des deux années précédentes. Le gros du rééquipement des forces de la RAU était terminé avant le début de l'année et les livraisons de missiles anti-aériens au Vietnam du Nord ont accusé un fléchissement. L'Inde a été l'autre grand destinataire des armes soviétiques en 1969. D'autres livraisons soviétiques ont été dirigées sur le Yémen du Sud, le Pakistan, le Soudan, la Mauritanie, le Nigéria et la Libye.

La Grande-Bretagne a livré en 1969 une assez grande quantité d'équipements militaires aux pays pétroliers du Moyen-Orient; là, mais aussi ailleurs, elle a réussi à placer de nombreux Hawker Hunters remis à neuf. Elle a également reçu de substantielles commandes navales des pays de l'Amérique latine. Quant aux ventes d'armes majeures françaises, bien qu'elles aient baissé en 1969 par suite de l'embargo sur les armes à destination d'Israël, elles semblent cette année en voie de connaître une reprise. L'Afrique du Nord (Libye, Algérie), l'Amérique latine et la Grèce ont passé d'importantes commandes en France.

Le Moyen-Orient continue à absorber la plus grande partie des importations d'armes majeures du tiers-monde. Il ne s'agit pas uniquement des livraisons aux belligérants du conflit israëlo-arabe; l'Arabie Séoudite, l'Iran et les États du Golfe Persique ont fait de gros achats. Les livraisons aux pays de l'Extrême-Orient ont été très nombreuses l'an dernier. Les pays de l'Amérique latine continuent à s'adresser plutôt à l'Europe qu'aux États-Unis pour leurs achats d'armements technologiquement avancés; l'an dernier, ils ont passé d'importantes commandes de navires, en particulier de sous-marins.

Le contexte des pourparlers sur la limitation des armes stratégiques

Ce chapitre présente une confrontation des armes nucléaires des USA et de l'URSS. Il évite la classification en armes « stratégiques » et « tactiques » et fait l'évaluation de toutes les armes nucléaires qui se font face à l'Est comme à l'Ouest, distinguant entre celles qui sont capables d'atteindre une partie quelconque du pays de l'adversaire principal, les régions frontalières de ce pays ou simplement le territoire de ses alliés.

Pendant les années cinquante et au début des années soixante, les États-Unis avançaient très vite dans le domaine de l'armement nucléaire. Vers 1966, l'Union Soviétique commença à les rattraper dans le secteur des fusées intercontinentales à base terrestre; mais elle possède encore bien moins de bombardiers, et ne fait que commencer à déployer une force de sous-marins à missiles balistiques du type Polaris. Depuis 1964, le missile soviétique dont il est beaucoup question — désigné à l'Ouest par SS-9 — est apparu au rythme d'environ 50 par an. Il y a quelque incertitude quant au nombre des nouveaux silos actuellement mis en chantier. Le chapitre contient une analyse détaillée et la reconstruction des estimations US quant au nombre de SS-9.

Les US poursuivent très rapidement la mise en place de têtes nucléaires à charges multiples pour missiles et le développement de nouveaux vecteurs nucléaires « stand-off » pour bombardiers, programme conçu pour leur donner d'ici à 1975 quelque 10 000 têtes nucléaires pour armes à long rayon d'action. Ils accélèrent également la mise au point d'un nouveau bombardier à long rayon d'action et les phases initiales d'un nouveau sous-marin à missiles balistiques. Les projets soviétiques à long terme ne sont pas connus. L'un des mobiles qui explique, des deux côtés, l'adoption de ces projets est la crainte — certainement professée du côté US et fort probablement entretenue également du côté soviétique — que l'ennemi potentiel cherche à se doter d'une capacité de première frappe. C'est une crainte qui semble dénuée de fondement.

L'équilibre de la terreur n'est pas fragile : des modifications même substantielles du nombre de têtes nucléaires possédées par l'une ou l'autre des puissances n'altéreraient pas sérieusement la stabilité de cet équilibre. Il existe par conséquent un large éventail d'accords possibles sur les quantités dont chacune des parties se dote, qui permettrait à l'une et à l'autre de disposer d'une capacité de seconde frappe sans leur donner de capacité de première frappe — ce qui est apparemment la condition de la stabilité.

La sécurité européenne et le désarmement

Il est possible que, sous une forme ou une autre, un dialogue puisse s'engager entre les puissances de l'OTAN et celles du Pacte de Varsovie sur telle ou telle forme de désarmement ou de réglementation des armements en Europe. (Ce chapitre ne traite que les aspects du désarmement des questions relatives à la sécurité européenne.) On relève une certaine convergence entre les propositions de l'OTAN et celles des pays liés par le Pacte de Varsovie.

Si un tel dialogue devait avoir lieu, il semble probable qu'il aborderait d'abord la question des forces armées et des armements de la région centrale, soit l'Allemagne de l'Ouest et le Benelux d'un côté et l'Allemagne de l'Est, la Pologne, la Tchécoslovaquie et peut-être la Hongrie, de l'autre. Il n'y a pas de ligne de démarcation évidente entre des pourparlers sur les forces dans les zones mentionnées plus haut et des pourparlers sur l'ensemble des forces armées et armements de toutes les puissances de l'OTAN et du Pacte de Varsovie, où qu'elles soient déployées.

Le chapitre étudie en détail les estimations des forces en présence. Le point de vue militaire qui prévaut à l'Ouest est que les forces conventionnelles de l'OTAN sont de beaucoup inférieures, et que si les pays du Pacte de Varsovie lançaient une attaque conventionnelle, celle-ci pourrait être contenue dix jour au plus. Cette conception est mise en doute, et le chapitre expose différents arguments sur la manière de compter les divisions ou le nombre des troupes, sur les possibilités de renforts, sur ce que signifie la supériorité en chars des pays du Pacte de Varsovie, sur les mérites relatifs des diverses forces aériennes en Europe, etc.

Etant convaincues qu'elles sont en état d'infériorité sur le plan conventionnel, les puissances de l'OTAN ont fait savoir que si une guerre conventionnelle survenait, elles seraient prêtes, à un certain stade, à faire un premier usage « à l'essai » de l'arme nucléaire. Le chapitre récapitule la politique actuelle de l'OTAN sur l'emploi des armes nucléaires et expose quelques-unes des critiques qu'elle soulève.

Ces discussions sur les armes et les troupes, en tant que contexte de base de toute négociation sur le désarmement, suscitent différents points de vue. Etant donné qu'une force offensive doit être nettement supérieure à la force défensive pour avoir quelque chance de réussir, il n'est pas nécessaire pour assurer la sécurité de conclure un accord de parité exacte. Il y a eu dans le passé un grand nombre de plans sur la réduction des forces qui pourraient être réexaminés, en particulier des projets élaborés par l'Union

Soviétique ou d'autres pays est-européens qui furent rejetés par les puissances occidentales dès lors qu'ils insistaient pour que la réunification de l'Allemagne fût le préalable de tout accord. Il existe également un certain nombre de projets connexes — ceux par exemple prévoyant des postes d'observation au sol ou la limitation des manoeuvres — qui pourraient être repris. En outre, il devrait être possible au moins de réduire la quantité énorme d'armes nucléaires stockées en Europe, en particulier du côté ouest.

La militarisation des fonds marins; le traité sur la dénucléarisation des fonds marins

Ce chapitre expose en les juxtaposant des éléments de documentation sur les armements et le désarmement. Les océans ont été choisis pour deux raisons : premièrement, il s'agit d'une zone où la technologie militaire connaît une expansion rapide, et deuxièmement, il existe un projet de traité en cours d'examen qui proscriit des fonds marins les armes de destruction massive.

Le chapitre commence par la discussion des facteurs qui ont conduit à la militarisation des océans et spécialement des avantages qu'ils procurent en fait de camouflage; il aborde également les inconvénients, tel le problème des communications. Il examine ensuite en particulier la guerre anti-sous-marine : moyens de détection, systèmes d'armes utilisés dans le processus de détection et moyens d'attaque.

La section suivante traite les technologies nouvelles et les développements nouveaux relatifs au fond des océans. Pour ce qui est des technologies nouvelles elle conclut que pour les opérations sur le socle continental, la technologie existe déjà, et que des opérations se situant jusqu'à une profondeur de 6 000 mètres — ce qui comprend virtuellement toute l'étendue des océans — seront possibles vers l'an 2000.

Des systèmes mobiles d'engins sous-marins avancés sont en cours de développement rapide. Des submersibles à évolution libre opèrent déjà à des profondeurs de 2 000 mètres, et la génération suivante de sous-marins militaires, si elle voit le jour, sera probablement capable d'en faire autant et pourra être entièrement desservie à partir d'installations sous-marines. Les installations reposant sur les fonds sont principalement constituées à l'heure actuelle par des systèmes de détection de sous-marins. Il se pourrait que plus tard des stations immergées équipées de personnel deviennent opérationnelles. Quant aux installations de missiles fixés sur le fond des mers, elles ne furent pas sérieusement envisagées, même avant que les lits

des mers ne devinssent un élément des discussions sur le désarmement en 1967.

Les fonds marins font l'objet d'un projet de traité. Le chapitre présente un compte rendu détaillé des négociations sur ce traité jusqu'au mois de septembre 1970. Il y a eu à l'origine une proposition soviétique pour un traité excluant tout usage des fonds marins à des fins militaires. Les États-Unis firent une contre-proposition de traité qui empêcherait que ce milieu ne servît à la mise en place d'armes de destruction massive. A la suite de concessions majeures faites par l'Union Soviétique, le projet commun mis au point, et qui était en gros celui des États-Unis, se limitait aux armes de destruction massive. Les changements opérés de la première à la quatrième version du projet de traité n'ont pas changé son essence.

La signification de ce projet de traité est de peu d'envergure. Elle se rapporte à quelque chose qui n'existe pas et qui, même en l'absence de ce traité, avait peu de chances de se réaliser. Dans sa forme actuelle, le projet ne fera pas grand'chose pour limiter les utilisations militaires des fonds marins, encore moins celles des mers et des océans en général. Le traité suppose que les fonds marins constituent une aire qui peut être traitée séparément du reste des océans, ce qui est erroné.

Les armes chimiques et biologiques

En 1969 et 1970, le débat sur les armes chimiques et biologiques a été plus animé qu'à aucun autre moment depuis la seconde guerre mondiale. Le chapitre traite d'abord la pression exercée pour amener une adhésion universelle au Protocole de Genève de 1925. Cette pression s'exerça surtout à l'encontre des États-Unis, la seule grande puissance qui ne soit pas encore partie au Protocole.

Le 25 novembre 1969, le Président des États-Unis déclara qu'il soumettrait le Protocole au Sénat. Dans la même déclaration, il renonçait à l'emploi des agents biologiques létifères et précisait que dans ce domaine la recherche biologique resterait confinée aux mesures défensives, les stocks existants d'armes biologiques allant être détruits. Il fut précisé par la suite que cette renonciation comprenait les toxines. Le Président renonçait également à utiliser en premier les armes chimiques létifères ou provoquant une incapacité, tout en faisant valoir qu'elles n'incluaient pas les substances chimiques de harcèlement telles que les gaz lacrymogènes et les défoliants. Le Protocole a été soumis au Sénat en vue de ratification le 19 août 1970. Le chapitre expose les arguments selon lesquels, oui ou non, le droit international

interdit l'emploi des gaz lacrymogènes et des substances chimiques défoliantes.

Aussi bien la Conférence de Genève sur le désarmement que les Nations Unies ont largement discuté la question de savoir s'il convenait de traiter les armes chimiques et biologiques séparément ou conjointement. Le chapitre rend compte de l'ensemble des arguments avancés dans un sens ou dans l'autre. Il résume les débats relatifs au projet de convention britannique sur les armes biologiques ainsi que ceux du projet de convention des neuf États socialistes prévoyant l'interdiction des armes tant chimiques que biologiques.

Le chapitre arrive à la conclusion que les perspectives d'accord sur une convention interdisant la production et le stockage des armes tant chimiques que biologiques ne sont pas bonnes : les États-Unis ont déclaré que le fait d'insister sur un accord unique couvrant à la fois les armes biologiques et les armes chimiques équivaldrait à accepter l'arrêt de tout progrès réel pendant longtemps. D'un autre côté, un traité proscrivant uniquement les armes biologiques n'aurait pas beaucoup plus de valeur que des renonciations unilatérales si celles-ci pouvaient être obtenues de la part de toutes les grandes puissances.

Une autre possibilité serait celle d'un traité qui interdirait les armes biologiques et assurerait l'arrêt de la production et le non-transfert de pays à pays au moins des plus létifères des agents chimiques qui se prêtent uniquement aux opérations de guerre. Ceci constituerait une étape sur la voie d'une prohibition totale.

Autres mesures de désarmement

Aucun progrès notable n'a été fait sur les autres fronts du désarmement. Le traité de non-prolifération nucléaire est entré en vigueur le 5 mars 1970. Cependant, un certain nombre d'États possédant une technologie nucléaire avancée — Israël, l'Afrique du Sud, l'Inde, le Pakistan, le Brésil et l'Argentine — n'ont pas signé ce traité. Pour d'autres États, le problème est actuellement d'élaborer des procédures de contrôle pour empêcher que des matières fissiles ne soient détournées de leurs utilisations civiles en faveur d'usages militaires. Au plus tard en mars 1972, c'est-à-dire deux ans après l'entrée en vigueur du traité, les premiers accords « de sauvegarde » doivent être prêts à être appliqués. Un comité de l'AIEA a mis au point un modèle d'accord de ce genre.

Peu de progrès ont été accomplis vers une cessation des explosions nucléaires sous-terraines. L'Assemblée Générale a demandé au Secrétaire

Général de se renseigner auprès des nations membres pour savoir si elles étaient disposées à coopérer en matière d'échange de données sismiques et, dans l'affirmative, à rendre compte de la nature de leur équipement; l'objet de cette démarche était de faciliter un accord sur le contrôle d'un traité interdisant tout explosion. A la demande des Nations Unies, la Conférence sur le désarmement de Genève a accepté de considérer les aspects militaires de la technologie radiologique et du laser. Enfin, l'Assemblée Générale a déclaré la décennie de 1970 Décennie internationale du Désarmement, des efforts étant faits pour élaborer un programme de désarmement à longue échéance.

Article spécial

Un article spécial est consacré à la zone latino-américaine non-nucléarisée. C'est la première et la seule zone de ce genre dans des territoires habités du monde. L'article décrit les négociations qui ont abouti au traité établissant cette zone, ainsi que la nature et les fonctions de l'organisme chargé de veiller à son application. La rédaction en a été assurée par le Dr. Alfonso García Robles, qui fut président de la Commission préparatoire ayant mis au point le traité.

Documentation

Ce volume offre un ensemble détaillé de chiffres de dépenses militaires couvrant une période de vingt ans, aux prix courants et en valeurs constantes. En outre, il fournit des estimations, relatives à cette année, de la valeur des livraisons militaires gratuites accordées par les puissances occidentales. Il est en effet utile à certains points de vue de considérer les montants totaux consacrés aux usages militaires dans les pays bénéficiaires, qu'ils proviennent des ressources propres de ces pays ou des livraisons gratuites, ce que rend possible la présentation des séries de chiffres de ces livraisons militaires.

Les États-Unis ont publié récemment des estimations concernant la tendance à la hausse des dépenses soviétiques en matière de recherches et développements militaires. Un passage de *l'Annuaire* analyse la documentation scientifique américaine qui y est consacrée et constate qu'il est impossible de tirer des conclusions valables sur le niveau et l'évolution de ces dépenses à partir des données publiées.

L'Annuaire présente ensuite des évaluations sur les stocks mondiaux de navires de combat pour les années 1950, 1955, 1960, 1965 et 1968. Ce sont les premiers d'une série de tableaux sur les stocks d'armes mondiaux. Les tableaux font apparaître le déclin du nombre des grands bâtiments et l'augmentation de celui de moindre tonnage. Il est fait usage d'un système d'évaluation pour une estimation uniforme concernant les principaux pays et zones et pour le monde dans son ensemble. Ces calculs permettent de conclure que le stock mondial de navires de combat s'accroît à la cadence annuelle de 5 à 6 pour cent en valeur constante. Ce taux d'augmentation est à peu près le même pour les pays développés que pour les pays sous-développés. Toutefois, pour ces derniers, il s'agit surtout d'une augmentation quantitative, alors que pour les pays développés elle est plutôt qualitative. Une autre comparaison montre que le stock des navires de combat de l'OTAN est à peu près le double de celui des pays membres du Pacte de Varsovie. Si on ajoutait à ces calculs la valeur des bases navales, la différence entre les deux blocs serait encore plus grande.

Les valeurs estimées du commerce des armes majeures avec les pays du tiers-monde sont mises à jour pour 1969. De même, un répertoire commercial de toutes les grandes transactions identifiées d'armes avec les pays du tiers-monde est donné pour 1969 ainsi qu'un répertoire provisoire pour la première moitié de 1970.

Dans le contexte des pourparlers SALT *l'Annuaire* rend compte en détail des déclarations officielles faites par les États-Unis sur le déploiement du missile soviétique appelé SS-9 et les sous-marins soviétiques du type Polaris. Il donne un aperçu des stocks mondiaux d'armes nucléaires qui témoigne de l'énorme quantité de puissance létifère, équivalant probablement à quelque 30 tonnes de T.N.T. par habitant du globe, dont disposent actuellement les deux super-grands. Les chiffres des explosions d'armes nucléaires sont mis à jour : 1970 montre tous les signes d'une année record, avec un grand nombre d'essais atomiques américains. Au cours des dix-huit derniers mois, neuf ou dix explosions américaines souterraines ont eu lieu, libérant des substances radio-actives dans l'atmosphère. La France a procédé à une série d'essais atmosphériques.

Pour d'éventuelles discussions sur le désarmement en Europe, il existe toute une série de propositions faites dans le passé, propositions de réduction ou de dégagement des forces, de mesures propres à prévenir les attaques-surprise, de création de zones dénucléarisées. Cet historique montre comment ces propositions ont eu tendance à échouer en raison de leur liaison complexe au problème de la réunification de l'Allemagne.

Des documents de référence sont également présentés pour le traité sur

la dénucléarisation des fonds marins — assortis d'un tableau montrant l'extension des revendications en matière d'eaux territoriales d'un certain nombre de pays; ainsi que pour les discussions sur le désarmement dans le domaine des armes chimiques et biologiques. Est également présentée une chronologie des principales contributions à l'œuvre de désarmement au cours des derniers douze mois. La liste des signataires des traités relatifs au désarmement est mise à jour jusqu'à fin août 1970. D'autres listes, avec résumés, énoncent les résolutions des Nations Unies relatives au désarmement et aux conflits internationaux.

Kurzfassung

Die zweite Ausgabe des *SIPRI-Jahrbuches* liegt Ihnen hiermit vor. Das Ziel ist das gleiche geblieben: es sollte eine umfassende Übersicht über die Rüstung und Militärausgaben der Welt und, falls ein solcher erreicht wurde, auch über den Fortschritt bei ihrer Begrenzung oder Verringerung gegeben werden. Auch die Grundgedanken des Buches sind die gleichen geblieben: der Glaube, dass die Welt eine viel zu grosse Menge ihrer Mittel für die Vorbereitung eines Massakers unter einander aufwendet, und dass diese Menge zum Wohle aller verringert werden könnte. Darin liegt nun nicht etwa die simple Ansicht, dass die Rüstung die einzige oder auch die Hauptursache eines Krieges ist; darin liegt der Glaube, dass der Rüstungswettlauf und der Wettbewerb bei der Entwicklung neuer Waffen ein Faktor ist, der die internationalen Beziehungen zuspitzt, weil er Argwohn und Spannung, Drohung und Gegendrohung hervorruft.

Das Buch beginnt mit einer Untersuchung der Entwicklungstendenzen in den militärischen Ausgaben der Welt. Dann wird der Waffenhandel mit den Ländern der dritten Welt diskutiert, dem Hauptweg der Ausbreitung hochentwickelter konventioneller Waffen über die ganze Welt. Dann konzentriert sich das Buch auf vier Gebiete: den Kernwaffenwettlauf und die Unterhandlungen über die Einschränkung der strategischen Waffen; die Truppen- und Waffenzahl in Europa sowie die eventuellen Gespräche über die Rüstungseinschränkung und die Reduktion der Streitkräfte, die die Initiativen zu einer europäischen Sicherheitskonferenz begleiten könnten; die Militarisierung der Ozeantiefe und die Beseitigung von Atomwaffen vom Meeresgrund; schliesslich die gegenwärtigen Diskussionen über das Verbot der chemischen und biologischen Kriegsführung. In dem Kapitel über die Ozeantiefe und an anderer Stelle wird der Versuch gemacht, den Stoff über die Waffen und die militärische Entwicklung mit der Diskussion der Abrüstungsvorschläge zu vereinbaren. Diese beiden Themen: die Analyse der Waffen und die Analyse der Abrüstung — werden gewöhnlich in gesonderten Publikationen behandelt, sollten aber als Teile des gleichen Problems betrachtet werden.

Es gibt einen allgemeinen Vorbehalt, der schon voriges Jahr gemacht wurde und heute wiederholt werden muss. Der überwiegende Teil des Materials über die Entwicklung der Waffen ist amerikanisch. In der allgemein

zugänglichen Literatur der Sowjetunion gibt es keinerlei Angaben. Dadurch könnte der Eindruck entstehen, dass es ausschliesslich die Vereinigten Staaten sind, die die technische Entwicklung neuer Waffen fortführen, was natürlich den Tatsachen nicht entspricht. Nur stehen die Vereinigten Staaten bei dieser technischen Entwicklung an führender Stelle und veröffentlichen Material darüber. Dadurch wird es unvermeidlich, dass der Entwicklung in den USA die meiste Aufmerksamkeit geschenkt wird. Doch kann man mit vollem Recht annehmen, dass sich andere Nationen in der gleichen Richtung bewegen.

Militärausgaben der Welt

Die Militärausgaben der Welt sind 1969 in ihrem Realwert — also nach Subtraktion des Inflationseffektes — nicht gestiegen. Dies geschah nach drei Jahren, in denen sie um 30 Prozent in die Höhe gegangen waren. Für 1970 ist mit Sicherheit ein Absinken vorauszusehen, und zwar um vielleicht etwa 2 Prozent. Die Militärausgaben der Vereinigten Staaten wurden bedeutend niedriger als früher angesetzt, im Staatshaushalt der Sowjetunion sind sie um ein wenig höher geplant. 1968 und 1969 hatte die Welt etwa 7 Prozent ihrer Produktion für militärische Zwecke verwandt. Diese Zahl dürfte in diesem Jahr etwas sinken.

In den Vereinigten Staaten wird Anstieg und Absinken der Ausgaben vor allem durch die Ausgaben in Vietnam verursacht. Im vergangenen Jahr erhob sich die Frage, ob nach dem Absinken der militärischen Ausgaben in Vietnam nun an deren Stelle andere Ausgaben für strategische Streitkräfte oder Forschung und Entwicklung in die Höhe gehen würden. Bisher ist das nicht eingetreten. Immerhin gibt es eine grosse Zahl neuer militärischer Pläne in frühen Entwicklungsstadien, und die zweite Hälfte der Ausgabenbeschränkung für Vietnam liegt noch vor uns. Die anderen NATO-Länder haben seit mehreren Jahren keinen Anstieg ihrer Militärausgaben zu verzeichnen gehabt. Die Militärausgaben der Sowjetunion sind von 1965–1969 in ihrem Realwert um mehr als 35 Prozent gestiegen, die der anderen Warschauer Paktstaaten — ihren Staatshaushalten zufolge — noch rascher.

Die Militärausgaben der Entwicklungsländer machen einen ganz geringen Prozentsatz der Gesamtausgaben der Welt aus. Trotzdem sind sie rascher gestiegen als in den Industrieländern. Das wird ausschliesslich durch den sehr raschen Ausgabenanstieg im Nahen Osten verursacht. Klammert man diesen aus den Berechnungen aus, dann ist die Entwicklungsrate in den Entwicklungs- und den Industrieländern ungefähr die gleiche.

Waffenhandel mit den Entwicklungsländern

Die identifizierten Lieferungen Grossgerätes — Schiffe, Flugzeuge, Panzer und Raketen — in die Entwicklungsländer machten 1969 insgesamt etwa 1 1/2 Milliarde US-Dollar (Preise von 1968) aus. Das lag unter der Zahl für das Spitzenjahr 1967 und war die dritthöchste Zahl der Nachkriegszeit.

Die grundlegende Tendenz dieser Waffenlieferungen ist wahrscheinlich immer noch steigend. Die Politik der Vereinigten Staaten im Zeichen der in Guam formulierten „Nixon-Doktrin“, dass eine bedrohte Nation in den meisten Fällen selbst die Hauptverantwortung für ihre eigene Verteidigung übernehmen solle, wird wahrscheinlich einen Anstieg der Militärlieferungen nach Kundenstaaten nach sich ziehen. 1969 waren die Waffenlieferungen der USA nach den Ländern des Fernen Ostens — insbesondere Taiwan und Südkorea — höher als in irgendeinem Jahr seit der Mitte der fünfziger Jahre. Die Lieferungen aus der Sowjetunion waren wahrscheinlich niedriger als in den beiden Jahren davor. Die Hauptmenge der Neuausrüstung für die Streitkräfte der Vereinigten Arabischen Republik war vor Neujahr geliefert worden, und die Lieferungen der Flugabwehrraketen für Nord-Vietnam sind zurückgegangen. Indien war 1969 ein weiteres grosses Bestimmungsland sowjetischer Waffenlieferungen. Andere sowjetische Waffenlieferungen gingen nach Südjemen, Pakistan, dem Sudan, Mauritien, Nigeria and Libyen.

Grossbritannien lieferte 1969 ansehnliche Mengen militärischer Ausrüstung nach den an Erdöl reichen Staaten des Nahen und Mittleren Ostens; mit Erfolg verkauft es hier und an andere Länder renovierte Hawker-Hunter-Jagdflugzeuge. Auch erhielt es grosse Aufträge für den Flottenaufbau in Südamerika. Die wichtigsten französischen Waffenverkäufe gingen 1969 wegen des Waffenembargos für Israel zurück; doch dürften die Verkäufe in diesem Jahr wieder steigen. Ansehnliche Aufträge gingen aus Nordafrika (Libyen, Algerien), Südamerika und Griechenland ein.

Immer noch geht der grösste Teil aller Lieferungen Grossgerätes für die dritte Welt nach dem Nahen Osten. Es sind das nicht nur die Lieferungen für die kriegführenden Staaten im arabisch-israelischen Krieg, auch Saudi-Arabien, der Iran und die Staaten am Persischen Golf haben grosse Einkäufe getätigt. Die Lieferungen nach den Ländern des Fernen Ostens waren im letzten Jahr sehr gross. Die lateinamerikanischen Staaten wenden sich auch weiterhin eher an Europa als die Vereinigten Staaten, um hochentwickelte Waffen zu kaufen: im vergangenen Jahr gaben sie grosse Aufträge auf Kriegsschiffe, vor allem Unterseeboote.

Der Hintergrund der Gespräche über die Begrenzung der strategischen Waffen

Dieses Kapitel bringt einen Vergleich der Kernwaffen, mit denen die USA und die UdSSR einander gegenüberstehen. Die Klassifizierung „strategisch“ und „taktisch“ wird vermieden, statt dessen werden alle Kernwaffen geschätzt, die nach Osten oder Westen gerichtet sind, und eingeteilt, je nachdem sie irgend einen Teil des Landes des Hauptgegners, dessen Randgebiete oder nur das Territorium seiner Alliierten zu treffen imstande sind.

Die Vereinigten Staaten haben in den fünfziger und zu Beginn der sechziger Jahre ihr Kernwaffenarsenal sehr rasch entwickelt. Etwa ab 1966 begann die Sowjetunion, in bezug auf die interkontinentalen Raketen mit Festlandrampen den Abstand aufzuholen, doch besitzt sie immer noch viel weniger Bomber und steht am Anfang der Entwicklung von U-Booten mit ballistischen Raketen vom Typ Polaris. Seit 1964 sind ungefähr 50 der neuesten sowjetischen Raketen, die im Westen als SS-9 bezeichnet werden, pro Jahr hinzugekommen. Wieviele neue Abschussbasen für sie gegenwärtig geschaffen werden, ist nicht ganz sicher. Das Kapitel analysiert und rekonstruiert die amerikanischen Schätzungen der Anzahl von SS-9 Raketen.

Die USA installiert sehr rasch multiple Sprengköpfe für Raketen und entwickelt neue „Voraus (Stand-off)“-Raketen für Bomber, ein Programm, das bis 1975 etwa 10 000 Sprengköpfe allein für Langstreckenwaffen ergeben soll. Sie arbeiten auch intensiv an einem neuen Langstreckenbomber und den frühen Entwicklungsstadien eines neuen U-Bootes für ballistische Raketen. Die Zukunftspläne der Sowjetunion sind unbekannt. Eines der Grundmotive der Zukunftspläne auf beiden Seiten ist die Furcht — auf amerikanischer Seite offen zugegeben, aber wahrscheinlich auch auf sowjetischer Seite vorhanden — dass der potentielle Feind die Kapazität aufzubauen versucht, um als erster zuschlagen zu können. Diese Furcht erscheint unglaubwürdig.

Das Gleichgewicht der Angst ist nicht empfindlich: selbst ziemlich wesentliche Veränderungen in der Zahl der Sprengköpfe auf einer der beiden Seiten würde das Gleichgewicht der Kräfte nicht effektiv verändern. Es gibt auf beiden Seiten daher viele Möglichkeiten zu Vereinbarungen über die Zahlen, die beiden Seiten die Gegenschlagkapazität belassen, aber jeder von ihnen das Angriffspotential nehmen würde: darin liegt ganz deutlich die Voraussetzung der Stabilität.

Europäische Sicherheit und Abrüstung

Es ist möglich, dass zwischen den NATO-Ländern und den Warschauer Paktstaaten ein gewisser Dialog über irgendeine Form der Abrüstung oder der Waffenregulierung in Europa beginnt. (Dieses Kapitel beschäftigt sich nur mit dem Abrüstungsaspekt der Probleme der europäischen Sicherheit). Zwischen den Vorschlägen der NATO und des Warschauer Paktes besteht eine gewisse Übereinstimmung.

Falls ein solcher Dialog zustande kommen sollte, dann ist es wahrscheinlich, dass er mit den Streitkräften und Waffen in Zentraleuropa beginnen würde, also Westdeutschland und den Benelux-Ländern auf der einen, Ostdeutschland, Polen, der Tschechoslowakei und vielleicht auch Ungarn auf der anderen Seite. Es gibt keinen deutlichen Grenzpunkt zwischen den Diskussionen über die Streitkräfte in diesem Gebiet und den Diskussionen über alle Streitkräfte und Waffen aller NATO-Länder und Warschauer Paktstaaten, wo sie sich auch befinden.

Das Kapitel bespricht ausführlich die Schätzungen der Streitkräfte beider Seiten und deren Bewertung. Die im Westen vorwiegend zum Ausdruck gebrachte militärische Meinung ist, dass die konventionellen Streitkräfte der NATO stark unterlegen sind und dass ein Angriff mit konventionellen Waffen, falls ihn der Warschauer Pakt starten würde, für höchstens zehn Tage aufgehalten werden könnte. Diese Ansicht ist in Frage gestellt worden; und das Kapitel stellt die verschiedenen Argumente gegen einander, soll man die Divisionen oder soll man die Anzahl der Soldaten zählen, welche Möglichkeiten der Verstärkungen existieren, wie bedeutend ist die Überlegenheit des Warschauer Paktes an Panzern, welches sind die relativen Vorzüge der einzelnen Luftwaffen in Europa usw.

Da die NATO-Länder an ihre Unterlegenheit an konventionellen Streitkräften glauben, haben sie angedeutet, dass sie im Falle eines konventionellen Krieges an einem gewissen Punkt bereit wären, als „Stichprobe“ als erste eine Kernwaffe einzusetzen. Das Kapitel gibt eine kurze Übersicht über die gegenwärtige NATO-Politik zum Einsatz von Kernwaffen und zählt auch einige der kritischen Stimmen darüber auf.

Aus diesen Diskussionen über Waffen und Streitkräfte erheben sich verschiedene Punkte, die einen Hintergrund für Abrüstungsdiskussionen überhaupt ergeben. Da eine Angriffskraft, wenn sie die Chance eines Erfolges haben soll, einer Defensivkraft immer deutlich überlegen sein muss, braucht aus Sicherheitsgründen kein Abkommen über genaue Parität der Kräfte getroffen zu werden. Es gibt viele frühere Pläne für Reduktionen der Streitkräfte, die noch einmal neu geprüft werden könnten, hauptsächlich Vor-

schläge der Sowjetunion und anderer osteuropäischer Länder, die die Westmächte abgelehnt hatten, als sie noch auf der Wiedervereinigung Deutschlands als der Vorbedingung jeglicher Abkommen bestanden. Es gibt auch eine Reihe von Teilvorschlägen — z. B. über Beobachtungsposten zu Lande oder die Begrenzung der Manöver — die wieder ausgegraben werden könnten. Schliesslich sollte es möglich sein, die Riesenzahl der in Europa, vor allem auf der Seite des Westens gestapelten Kernwaffen zumindest zu reduzieren.

Die Militarisierung der Ozeantiefe: der Vertrag über den Meeresgrund

In diesem Kapitel wird Material über Rüstungen und Abrüstungen nebeneinander gestellt. Die Ozeantiefe ist aus zwei Gründen ausgewählt worden: erstens entwickelt sich die Kriegstechnik auf diesem Gebiet sehr rasch, und zweitens wird ein Vertragsentwurf in Betracht gezogen, der die Massenvernichtungswaffen vom Meeresgrund verbannt.

Das Kapitel diskutiert zu Beginn die Faktoren, die zur Militarisierung der Ozeantiefe geführt haben, vor allem die Vorteile, die der Ozean für die Heimlichhaltung bietet; es zieht auch die Nachteile in Betracht, z. B. das Problem der Nachrichtentechnik. Dann befasst es sich insbesondere mit der U-Boot-Bekämpfung, den Mitteln der Entdeckung, den beim Entdeckungsprozess eingesetzten Waffensystemen und den Mitteln des Angriffs.

Der nächste Abschnitt beschäftigt sich mit neuen Techniken und neuen Entwicklungen auf dem Meeresgrund. Es zieht aus den neuen Techniken die Schlussfolgerung, dass Operationen an den Kontinentalsockeln technisch heute schon möglich sind und dass im Jahre 2000 Operationen bis zu einer Tiefe von etwa 6 000 Meter, was eigentlich den gesamten Ozean umfasst, möglich sein werden.

Hochentwickelte bewegliche Unterwassersysteme werden sehr rasch entwickelt. Freischwimmende Unterwasserfahrzeuge arbeiten bereits in einer Tiefe von über 2 000 Meter; und die nächste Generation militärischer U-Boote dürfte, falls sie entwickelt wird, die gleichen Fähigkeiten besitzen sowie ausschliesslich von Unterwassereinrichtungen aus versorgt werden können. Die Installationen auf dem Meeresgrund bestehen gegenwärtig hauptsächlich aus Kontrollstationen zur U-Bootbekämpfung; später dürften auch bemannte Unterwasserstationen eingesetzt werden. Feste Unterwasser-Raketenstartanlagen auf dem Meeresgrund sind nie ernsthaft überlegt worden, auch nicht vor 1967, als der Meeresgrund zu einem Thema der Abrüstungsgespräche wurde.

Der Meeresgrund bildet das Thema eines Vertragsentwurfs, und das Kapitel bringt eine umfassende Übersicht der Verhandlungen über diesen Vertrag bis September 1970. Ursprünglich hatte ein sowjetischer Vorschlag vorgelegen, die Benutzung des Meeresgrundes für militärische Zwecke überhaupt zu verbieten. Die Vereinigten Staaten machten daraufhin den Gegenvorschlag eines Abkommens, das die Installation von Massenvernichtungswaffen auf dem Meeresgrund verhindern sollte. Infolge grosser Zugeständnisse der Sowjetunion wurde dann ein gemeinsamer Vertragsentwurf vorgelegt, der im Grunde dem amerikanischen Vorschlag entsprach und sich auf Massenvernichtungswaffen beschränkte. Die Änderungen in den Entwürfen zwischen der ersten und vierten Fassung haben das Wesen des Inhalts nicht verändert.

Die Bedeutung dieses Vertragsentwurfes ist nicht sehr gross. Er besteht lediglich darin, dass er etwas ächtet, was es nicht gibt und wahrscheinlich auch ohne das Abkommen nie entwickelt worden wäre. In seiner gegenwärtigen Form wird der Vertrag nicht sehr dazu beitragen, die militärische Benutzung des Meeresgrundes zu beschränken und noch weniger diejenige der Ozeantiefe. Der Vertrag setzt voraus, dass man Meeresgrund und Meerestiefe gesondert behandeln kann, das kann man aber nicht.

Chemische und biologische Kriegsführung

1969 und 1970 war die Debatte über die chemische und biologische Kriegsführung reger als zu jedem anderen Zeitpunkt seit dem zweiten Weltkrieg. Das Kapitel diskutiert zuerst den Druck, der ausgeübt wurde, um eine allgemeine Unterzeichnung des Genfer Protokolls von 1925 zu erreichen. Dieser richtete sich hauptsächlich gegen die Vereinigten Staaten, die einzige Grossmacht, die dem Protokoll noch nicht beigetreten war.

Am 25. November 1969 erklärte der Präsident der Vereinigten Staaten, er werde das Protokoll dem Senat unterbreiten. In der gleichen Erklärung verzichtete er auf die Anwendung todbringender biologischer Mittel und sagte, die biologische Forschung auf diesem Gebiet würde auf Defensivmassnahmen beschränkt werden und die vorhandenen Vorräte bakteriologischer Waffen sollten beseitigt werden. Später wurde erläutert, dass in diesem Verzicht auch Toxine enthalten waren. Der Präsident verzichtete ebenfalls darauf, als erster todbringende und ausser Gefecht setzende chemische Waffen anzuwenden, doch wurde deutlich gemacht, dass dies störende Chemikalien wie Tränengas und Mittel gegen Pflanzenwuchs nicht umfasste. Das Protokoll wurde dem Senat am 19. August 1970 zur Ratifizierung unterbreitet. Das Kapitel referiert alle Argumente beider Seiten darüber, ob

Tränengas und chemische Mittel gegen Pflanzenwuchs durch das Völkerrecht geächtet werden oder nicht.

Sowohl die Abrüstungskonferenz in Genf als auch die Vereinten Nationen haben ausführlich darüber diskutiert, ob chemische und biologische Waffen getrennt oder gemeinsam behandelt werden sollten. Das Kapitel gibt eine Übersicht über die auf beiden Seiten vorgebrachten Argumente. Es referiert die Diskussion über den britischen Vertragsentwurf über biologische Waffen und den Vertragsentwurf der neun sozialistischen Länder über das Verbot sowohl der chemischen als auch biologischen Waffen.

Das Kapitel kommt zu dem Schluss, dass die Perspektiven des Abschlusses einer Konvention über das Verbot der Produktion und Lagerung sowohl chemischer als auch biologischer Waffen nicht gut sind: die Vereinigten Staaten erklärten, wenn man auf einer einzigen Konvention über sowohl biologische als auch chemische Waffen bestehe, dann würde das den bewussten Verzicht auf jeglichen konkreten Fortschritt für eine sehr lange Zeit bedeuten. Andererseits würde ein Vertrag, der lediglich die biologischen Waffen ächte, nicht viel mehr Wert haben als der einseitige Verzicht aller Grossmächte auf die Anwendung dieser Waffen.

Eine andere Möglichkeit ist ein Vertrag, der die biologischen Waffen ächtet und die Einstellung der Produktion zumindest der todbringenden chemischen Kampfmittel, die nur im Krieg angewendet werden können, sowie deren Verlagerung von einem Land zum anderen vorsehen würde. Das wäre ein vorbereitender Schritt zu einem totalen Verbot.

Andere Abrüstungsmassnahmen

An anderen Fronten der Abrüstung wurde kein nennenswerter Fortschritt erzielt. Der Nichtproliferationsvertrag trat am 5. März 1970 in Kraft. Doch haben eine Reihe von Staaten mit fortgeschrittener Atomtechnik — Israel, Südafrika, Indien, Pakistan, Brasilien und Argentinien — den Vertrag nicht unterzeichnet. Für die anderen Staaten besteht das Problem nun darin, die Kontrollprozeduren auszuarbeiten, um die Überführung von Spaltmaterial von friedlichen zu militärischen Zwecken zu verhindern. Spätestens im März 1972, zwei Jahre nach dem Inkrafttreten des Vertrages müssen die ersten Sicherheitsverträge fertig sein und angewandt werden können. Ein Komitee der Internationalen Atomagentur hat dafür einen Modellvertrag entworfen.

Nur ein geringer Fortschritt wurde bei der Einstellung der unterirdischen Kernwaffenversuche erzielt. Die Vollversammlung der Vereinten Nationen

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beauftragte den Generalsekretär, die Mitgliedsstaaten zu befragen, ob sie zu einem Austausch ihrer seismologischen Angaben bereit sind, und falls ja, auch zu Angaben über die in ihrem Besitz befindlichen Einrichtungen; damit sollte ein Einverständnis über die Prüfung eines umfassenden Vertrags zur Ächtung der Kernwaffenversuche erleichtert werden. Im Auftrag der Vereinten Nationen erklärte sich die Genfer Abrüstungskonferenz bereit, die militärischen Aspekte der radiologischen und Lasertechnik zu untersuchen. Schliesslich erklärte die Vollversammlung der Vereinten Nationen die siebziger Jahre zum Jahrzehnt der Abrüstung, und man bemüht sich, ein langfristiges Abrüstungsprogramm auszuarbeiten.

Spezialartikel

Das *Jahrbuch* enthält einen Spezialartikel über die atomwaffenfreie Zone in Lateinamerika. Es ist die erste und bisher einzige solche Zone in bewohnten Weltgegenden. Der Artikel schildert die Verhandlungen, die zu dem Vertrag führten, sowie die Natur und die Funktionen der ihn überwachenden Körperschaft. Der Artikel ist geschrieben von Dr. Alfonso Garcia Robles, der der Vorsitzende der Vorbereitenden Kommission, die den Vertrag entwarf, gewesen ist.

Quellenmaterial

Das Buch enthält eine vollständige Aufstellung der Militärausgaben für die letzten zwanzig Jahre in sowohl laufenden als auch festen Preisen. Ausserdem gibt es Schätzungen für den Wert der in diesem Jahr bewilligten Militärhilfe der Westmächte. Es ist aus manchen Gründen sinnvoller, die Summe, die in den Empfängerländern für militärische Zwecke verwandt wird, sei es aus den Eigenmitteln des Landes, sei es aus der bewilligten Militärhilfe, insgesamt in Betracht zu ziehen. Das wird möglich mit Hilfe der Angaben über die bewilligte Militärhilfe.

Einige unlängst in den Vereinigten Staaten veröffentlichte offizielle Schätzungen lassen auf einen ansteigenden Trend der sowjetischen Ausgaben für militärische Forschung und Entwicklung schliessen. In einem Abschnitt des *Jahrbuches* wird das betreffende Unterlagenmaterial untersucht; daraus ergibt sich, dass von veröffentlichten Angaben aus keine Schlüsse in Bezug auf die Höhe und die Entwicklung dieser Ausgaben gezogen werden können.

Das *Jahrbuch* bringt Schätzungen des Gesamtbestandes der Welt an Kriegsschiffen für fünf einzelne Jahre: 1950, 1955, 1960, 1965 und 1968.

Diese sind die ersten mehrerer Serien über den Waffenvorrat der Welt. Die Tabellen zeigen das Absinken der Zahl schwerer und den Anstieg der Zahl kleinerer Kriegsschiffe. Es wird ein Bewertungssystem angewandt, um mit einer einzigen Schätzung den Bestand der wichtigsten Länder und Weltgegenden sowie der Welt als ganzer zu finden. Aus der Berechnung geht hervor, dass der Weltvorrat an Kriegsschiffen jährlich in festen Preisen schätzungsweise um 5–6 Prozent wächst. Diese Wachstumsrate ist in den Industrieländern und den Entwicklungsländern ungefähr die gleiche. Immerhin handelt es sich in den Entwicklungsländern hauptsächlich um einen Anstieg der Zahl; in den Industrieländern dagegen entsteht dieser Anstieg nicht so sehr aus der zahlenmässigen Erhöhung als vielmehr einer Besserung der Produkte. Der Vergleich liegt nahe, dass der Bestand der NATO an Kriegsschiffen ungefähr doppelt so gross ist wie der des Warschauer Paktes. Wird der Wert der Marinestützpunkte in diese Berechnung eingeführt, so wird der Unterschied zwischen den beiden Blöcken noch grösser.

Die Schätzungen des Wertes des Handels mit Grossgeräten mit Ländern der dritten Welt sind für 1969 aktualisiert worden, und das Buch enthält ein Register des Waffenhandels für alle identifizierten grösseren Geschäfte mit Ländern der dritten Welt für 1969 sowie ein provisorisches Register für die erste Hälfte 1970.

Als Hintergrund zu SALT bringt das *Jahrbuch* eine genaue Analyse der offiziellen Erklärungen der USA über die mit SS-9 bezeichnete sowjetische Rakete und das sowjetische U-Boot vom Polaris-Typ. Es bringt auch einen knappen Bericht über die Weltvorräte an Kernwaffen, aus dem die riesige Menge an todbringenden Waffen hervorgeht, die heute in den Arsenalen der beiden Grossmächte gehortet werden und wahrscheinlich etwa 30 Tonnen TNT pro Kopf der Weltbevölkerung ausmachen. Die Zahlen für die Kernwaffenversuche wurden aktualisiert: alles deutet daraufhin, dass das Jahr 1970 ein sehr ausgiebiges Jahr werden wird, da eine grosse Anzahl amerikanischer Versuche durchgeführt wird. In den letzten 18 Monaten haben neun oder zehn unterirdische USA-Versuche radioaktives Material in die Atmosphäre strömen lassen. Frankreich hat eine Reihe von Versuchen in der Atmosphäre durchgeführt.

Als Material zu eventuellen Diskussionen über eine Abrüstung in Europa bringt das *Jahrbuch* die volle Aufzählung der früheren Abrüstungsvorschläge, Vorschläge für Beschränkung oder Rückziehung der Streitkräfte sowie die Schaffung atomwaffenfreier Zonen. Diese Geschichte zeigt, wie die früheren Vorschläge wegen ihrer komplizierten Beziehung zum Problem der Wiedervereinigung Deutschlands zum Scheitern verurteilt waren.

Auch zu dem Abschnitt zum Abkommen über den Merresgrund wird Material veröffentlicht, einschliesslich einer Tabelle über den Anspruch aus-

Kurzfassung

gewählter Länder an die Ausdehnung der territorialen Gewässer; weiter auch Material zu den Abrüstungsgesprächen auf dem Gebiet der chemischen und biologischen Kriegsführung. Weiter findet der Leser eine chronologische Zusammenstellung der wichtigeren Abrüstungsinitiativen während der letzten zwölf Monate. Die Liste der Unterzeichner von Abrüstungsverträgen ist bis Ende August 1970 vervollständigt worden. Weiter gibt es Aufstellungen und Kurzfassungen über Resolutionen der Vereinten Nationen in Abrüstungsfragen und über Konflikte.

Резюме

Предлагаемое издание является вторым выпуском Ежегодника Стокгольмского Международного Института по Исследованию Проблем Мира (SIPRI Yearbook). Цель книги осталась прежней: дать читателю по возможности полный обзор вооружений и военных затрат во всем мире, а также достигнутого прогресса — если такой имеется — в их ограничении или сокращении. Не изменились и основные предпосылки, а именно: уверенность в том, что чрезмерное количество ресурсов выделяется во всем мире на подготовку к взаимному уничтожению и что эти ресурсы можно было бы с успехом сократить. Из этого не следует, что вооружение является единственной или даже основной причиной войны — это был бы слишком упрощенный подход; но мы убеждены в том, что соревнование в приобретении оружия и создании новых боевых средств обостряет международные отношения, вызывает недоверие, напряженность, и создает угрозу.

Книга начинается с анализа тенденций мировых военных расходов. Затем обсуждается состояние торговли оружием со странами третьего мира; эта торговля является основным путем распространения в мире сложных видов неядерного оружия. Затем детально рассматриваются четыре основные проблемы: гонка ядерных вооружений и переговоры об ограничении стратегического оружия; численность войск и боевых средств в Европе и возможные переговоры об ограничении вооружений и сокращении вооруженных сил, которые могли бы сопровождать меры, направленные на созыв конференции по европейской безопасности; милитаризация океанов и запрещение размещения ядерного оружия на дне морей; ведущиеся переговоры о запрещении химического и биологического оружия. Как в главе относящейся к недрам океана, так и в других разделах книги, материалы касающиеся боевых средств и военных мероприятий, обсуждаются совместно с предположениями о разоружении. Существует тенденция трактовать анализ боевых средств и анализ проблемы разоружения в отдельных публикациях, тогда как на самом деле они являются частями одной и той же проблемы.

В этом году, как и в прошлом, необходимо сделать следующую оговорку. Обширный материал, касающийся развития в области вооружений позаимствован в основном из американских источников. В открытой

литературе Советского Союза эта тема почти не затрагивается. Это может создать впечатление, что одни только Соединенные Штаты работают над развитием новой боевой техники — что, конечно, не соответствует действительности. Однако справедливо отметить, что Соединенные Штаты занимают передовую позицию в военной технологии и публикуют соответствующую информацию. Это объясняет, что столько внимания уделяется развитию американского оружия. Можно, однако, смело предполагать, что и другие страны идут в том же направлении.

Мировые военные расходы

Мировые военные расходы, в реальном исчислении (то-есть за вычетом эффекта инфляции), не повысились в 1969 году, тогда как за три предыдущих года они возросли на 30 процентов. Имеется повод думать, что в 1970 году они понизятся, быть может, примерно на 2 процента. Бюджетные ассигнования на военные расходы должны значительно понизиться в Соединенных Штатах и незначительно повыситься в Советском Союзе. В 1968 и 1969 гг. мир в совокупности выделял на военные цели примерно 7 процентов от производимого продукта. В этом году эта цифра должна немного понизиться.

В Соединенных Штатах эти повышения и понижения объясняются в основном расходами на войну во Вьетнаме. В прошлом году задавался следующий вопрос: по мере снижения военных расходов во Вьетнаме, не займут ли их место и не станут ли повышаться расходы на стратегические силы или на исследования и развитие новых видов оружия. До сих пор этого не произошло. Однако, имеется целый ряд новых военных проектов, находящихся на ранних этапах развития, а вторая часть сокращений расходов во Вьетнаме еще не начала выполняться. В других странах-членах НАТО уже в течение последних нескольких лет не обнаруживалось никаких повышений в военных расходах. Военные расходы Советского Союза, в реальном исчислении, возросли более чем на 35 процентов с 1965 по 1969 гг. — то-есть быстрее, чем в Соединенных Штатах. Расходы других стран-участников Варшавского договора повышались еще быстрее, согласно цифровым данным их бюджетов.

Военные расходы в слаборазвитых странах составляют очень небольшую долю мировых расходов. Однако они повышались быстрее, чем в развитых странах. Это повышение всецело объясняется очень быстрым увеличением расходов на Ближнем Востоке. Если учитывать этот фактор, то темпы роста в обеих категориях стран — как развитых, так и развивающихся — будут примерно одинаковы.

Торговля оружием со слаборазвитыми странами

В 1969 году констатированные поставки основных видов боевых средств (суда, самолеты, танки и ракеты) в развивающиеся страны составляли сумму в примерно 1 1/2 миллиарда амер. долл. (по ценам 1969 г.). Хотя эта цифра не достигает рекордной 1967 г., она все же занимает третье место за весь послевоенный период.

Поставки таких видов оружия имеют все еще тенденцию к росту. Позиция, занимаемая Соединенными Штатами, в соответствии с доктриной Никсона, провозглашенной на о-ве Гуам, согласно которой в большинстве случаев находящаяся под угрозой страна должна нести главную ответственность за свою оборону, приведет по всей вероятности к повышению военных поставок странам-покупателям. В 1969 году поставки оружия из США в страны Дальнего Востока — в частности на о-в Тайвань и в Южную Корею — превышали поставки предыдущих лет, начиная с середины пятидесятых годов. Поставки из Советского Союза в 1969 г. вероятно уменьшились по сравнению с двумя предыдущими годами. Основная часть поставок на перевооружение войск Объединенной Арабской Республики была выполнена до начала года, и, кроме того, уменьшились поставки зенитных ракет в Северный Вьетнам. Индия была другим крупным получателем оружия из Советского Союза в 1969 г. Другие советские поставки направлялись в Южный Йемен, Пакистан, Судан, Мавританию, Нигерию и Ливию.

Великобритания в 1969 году поставляла значительную долю военного оборудования в богатые нефтью страны Ближнего Востока; как этим, так и другим странам она успешно продает отремонтированные самолеты типа Hawker Hunter. Кроме того, ею были получены крупные заказы в связи с развитием военно-морских сил в странах Латинской Америки. Продажа Францией основных видов оружия понизилась в 1969 году в результате эмбарго на поставки оружия Израилю, но в текущем году поставки по всей вероятности увеличатся. Крупные новые заказы поступили из стран Северной Африки (Ливия, Алжир), Латинской Америки и Греции.

В импорте основных видов оружия развивающимися странами, доля стран Ближнего Востока все еще является самой значительной, причем этот импорт состоит не только из поставок оружия участникам арабо-израильской войны; большие количества закупаются Саудовской Аравией, Ираном и государствами Персидского залива. Очень высокого уровня достигли в прошлом году поставки в страны Дальнего Востока. Латиноамериканские страны, закупающие сложные виды оружия, продолжают обращаться чаще к Европе, чем к Соединенным Штатам; в

прошлом году они разместили крупные заказы на военно-морские суда, в частности на подводные лодки.

Переговоры об ограничении стратегического оружия

В этой главе проводится сравнение ядерных вооружений США и СССР. Рассматриваемое оружие не разделяется на стратегическое и тактическое; дается оценка всех видов ядерного оружия как на Востоке, так и на Западе, с разделением их по способности нанести удар по любой части страны главного противника, по пограничным ее районам или только по территории ее союзников.

В 1950-х и в начале 1960-х гг. развитие ядерного оружия в Соединенных Штатах шло очень быстрыми темпами. Примерно с 1966 г. Советский Союз стал догонять США по количеству наземных межконтинентальных ракет; тем не менее он все еще располагает значительно меньшим количеством бомбардировщиков и только теперь приступил к выпуску подводных лодок-носителей баллистических ракет, типа Поларис. Советская ракета, о которой так много говорилось в прессе и которая известна на Западе под названием SS-9, выпускается с 1964 г. в количестве примерно 50 ракет в год. Нет точных данных о количестве новых стартовых площадок, строящихся для этих ракет в настоящее время. В главе содержится детальный анализ данных США о численности ракет SS-9.

Соединенные Штаты ускоренными темпами работают над ракетами с многочисленными ядерными боеголовками и разрабатывают для бомбардировщиков новую ракету типа воздух-земля; в результате такой программы, к 1975 г. у Соединенных Штатов будет насчитываться уже около 10 000 ядерных боеголовок только для оружия дальнего действия. Быстро также ведется в США работа над новым типом бомбардировщика дальнего действия и над начальными этапами выпуска нового типа подводной лодки, вооруженной баллистическими ракетами. Перспективные планы Советского Союза не известны. Одной из движущих сил, на которой основываются долгосрочные планы обеих сторон, является опасение — несомненно признаваемое в Соединенных Штатах и, по всей вероятности, испытываемое также в Советском Союзе — что потенциальный противник добивается способности нанесения первого удара. Такое опасение представляется не обоснованным.

Равновесие страха не так легко нарушить. Весьма даже значительные изменения в количествах боеголовок той или другой стороны не в состоянии существенным образом нарушить равновесие сил. Поэтому возможен ряд соглашений о количествах, которыми могли бы располагать обе стороны и которые обеспечили бы обеим сторонам способность

нанесения второго удара — но не первого — что очевидно являлось бы условием устойчивости.

Европейская безопасность и разоружение

Возможно, что державы-члены НАТО и державы-участники Варшавского договора установят диалог о той или иной форме разоружения или регулирования вооружений в Европе. (В данной главе рассматривается только аспект разоружения общей проблемы Европейской безопасности.) В предложениях стран НАТО и стран Варшавского договора наблюдается известное сближение взглядов.

Если будет установлен такой диалог, то он по всей вероятности начнется с вопроса о вооруженных силах и вооружениях в центральном районе Европы — то-есть в Западной Германии и странах Бенилюкса с одной стороны, в Восточной Германии, Польше, Чехословакии и быть может Венгрии — с другой. Нельзя провести четкого разграничения между дискуссией о вооруженных силах, находящихся в этих районах, и дискуссией о всех войсках и оружии всех держав — сторон НАТО и Варшавского договора — где бы они ни были размещены.

В главе подробно обсуждаются примерная численность сил обеих сторон и их оценка. В военных кругах Запада преобладает мнение, что обычные вооруженные силы стран НАТО являются гораздо слабее и что они не выдержали бы более 10 дней в случае нападения на них такими же обычными силами стран Варшавского договора. Такое мнение оспаривается. В данной главе приводятся различные аргументы по вопросам таким как: следует ли вести подсчет дивизий или численности войск, какие возможности существуют в отношении подкреплений, какое значение имеет превосходство в танках стран Варшавского договора, каковы относительные достоинства различных военно-воздушных сил в Европе и т. п.

Основываясь на уверенности в том, что их обычные военные силы и вооружения являются более слабыми, державы-члены НАТО заявили, что, в случае развязки войны обычными силами, они будут в известный момент готовы к первому «пробному» применению ядерного оружия. В главе излагается вкратце позиция, занимаемая в настоящее время НАТО в отношении применения ядерного оружия, как и некоторые критические замечания.

В связи с дискуссией о вооружениях и вооруженных силах возникает ряд вопросов, касающихся дискуссии по разоружению. Тот факт, что нападающий, для обеспечения шанса на успех, должен иметь явный перевес в силах перед обороняющимся, не означает, что в целях без-

опасности, необходимо придти к соглашению о точном паритете сил. В прошлом выдвигалось много проектов о сокращении сил, которые можно было бы повторно рассмотреть; в основном это были предложения, которые выдвигались Советским Союзом и другими восточно-европейскими странами, и которые отклонялись западными державами, настаивавшими в то время на объединении Германии как предпосылке к любому соглашению. Выдвигалось также в свое время ряд других проектов, таких, например, как создание наземных наблюдательных постов или ограничение военных маневров, которые также можно было бы вытаскивать из-под спуда. Кроме того, несомненно существует возможность хотя бы сокращения огромных запасов ядерного оружия, хранящегося в Европе, особенно в западных странах.

Милитаризация океанов – Договор о дне морей

В этой главе сопоставляются материалы, относящиеся к вооружениям, и к разоружению. Проблема милитаризации океанов обсуждается потому что в этой области военная технология развивается очень быстро, а также потому что в настоящее время обсуждается проект договора о запрещении размещения оружия массового уничтожения на дне морей.

Глава начинается с рассмотрения факторов, ведущих к милитаризации океана, в частности преимуществ, которые предоставляются океаном для укрытия от наблюдений; рассматриваются также недостатки, такие, например, как трудности обеспечения связи. Особо рассматривается вопрос борьбы с подводными лодками: средства обнаружения, системы оружия, используемые в процессе обнаружения, и средства нападения.

В следующем разделе рассматриваются новые виды технологии и усовершенствования, достигнутые в области использования дна океана. Уже существует технология для операций на континентальном шельфе, а операции на глубине 6 000 метров — что распространяется почти на весь океан — окажутся возможными к 2000 г.

Современнейшие подвижные подводные устройства осваиваются быстрыми темпами. Свободно передвигающиеся под водой установки оперируют уже на глубине более 2000 метров. По всей вероятности следующее «поколение» военных подводных лодок, если оно будет создано, будет оперировать на той же глубине и обслуживание будет вестись полностью с подводных установок. Нынешние установки на дне являются главным образом системами обнаружения подводных лодок, но в будущем могут быть введены в действие подводные базы с личным составом. Вопрос стационарных ракетных установок на морском дне никогда серьезно не рассматривался, даже до 1967 года, то-есть до того как морское дно стало предметом переговоров о разоружении.

Морское дно является предметом проекта договора. В главе содержится обширный отчет о переговорах вплоть до сентября 1970 года. Первоначальное предложение о заключении договора о запрещении использования дна морей для любых военных целей было внесено Советским Союзом. Соединенные Штаты, со своей стороны, выдвинули контрпредложение, представив проект договора о запрещении использования этой среды для размещения оружия массового уничтожения. В результате значительных уступок со стороны Советского Союза был представлен совместный советско-американский проект договора, в основном соответствующий предложению Соединенных Штатов, то-есть ограничивающийся оружием массового уничтожения. Поправки, внесенные в проект договора между выпусками его первого и четвертого вариантов, не изменили его сути.

Значение этого проекта договора небольшое. Оно сводится к тому, что налагается запрет на то что не существует, и что вряд ли когда-либо существовало бы, даже без наличия договора. В теперешней его форме он в незначительной степени поможет делу ограничения использования дна морей в военных целях, не говоря уже о морях и океанах в целом. Договор предполагает, что дно является областью, которую можно рассматривать в отрыве от вопроса милитаризации океанов; на самом деле это не так.

Химическое и биологическое оружие

В 1969 и 1970 гг. прения по вопросу о химическом и биологическом оружии были более оживленными, чем в какое-либо другое время после второй мировой войны. В главе описываются усилия, имеющие целью обеспечить всеобщее присоединение к Женевскому протоколу 1925 года. В основном призывы были обращены в адрес Соединенных Штатов — единственной великой державы, еще не являющейся стороной Протокола.

25 ноября 1969 г. президент Соединенных Штатов Америки заявил, что он представит Протокол на рассмотрение Сената с целью его ратификации. В этом же выступлении он заявил об отказе от применения смертоносных биологических средств и указал, что биологические исследования в этой области будут ограничены оборонительными мерами и что существующие запасы бактериологического оружия будут ликвидированы. Позднее было уточнено, что этот отказ распространяется и на токсины. Кроме того, президент заявил, что США не будут первыми применять смертоносное или приводящее к потере боеспособности химическое оружие. Однако, этот отказ не распространяется на изнуряющие химические средства такие как слезоточивый газ или средства, уничто-

жающие растительность. 19 августа 1970 г. Женевский Протокол был представлен сенату США для ратификации. В главе излагаются аргументы и контраргументы относительно того, запрещается ли международным правом применение слезоточивого газа и средств уничтожающих растительность.

Как на Женевской конференции по разоружению, так и в Организации Объединенных Наций, широко обсуждался вопрос о том, следует ли трактовать совместно или отдельно химические и биологические виды оружия. В главе приводятся аргументы, выдвинутые в пользу того или другого варианта. Резюмируется дискуссия по британскому проекту конвенции о биологическом оружии и по проекту конвенции, представленному девятью социалистическими странами, о запрещении как химического, так и биологического оружия.

Указывается, что перспективы заключения конвенции, запрещающей производство и накопление запасов как химического, так и биологического оружия, не благоприятны: Соединенные Штаты заявили, что настаивать на заключение единого соглашения, охватывающего как биологическое, так и химическое оружие, равносильно признанию, что никакого прогресса не будет в течение длительного периода времени. С другой стороны, договор, запрещающий одно лишь биологическое оружие, не имел бы большего значения, чем односторонние заявления об отказе от этого оружия, если таковые были бы сделаны всеми крупными державами.

Другой возможностью явился бы договор о запрещении биологического оружия, в котором однако предусматривалось бы также прекращение производства и запрещение передачи другим странам хотя бы наиболее смертоносных химических средств, используемых только в военных целях. Эта мера явилась бы промежуточным этапом на пути к полному запрещению химического оружия.

Прочие меры по разоружению

Никакого заметного прогресса не было достигнуто в других областях разоружения. Договор о нераспространении ядерного оружия вступил в силу 5 марта 1970 года. Однако ряд стран, располагающих современной атомной технологией, а именно Израиль, Южная Африка, Индия, Пакистан, Бразилия и Аргентина, не подписали этого договора. Что касается других государств, то перед ними возникает проблема разработки мер контроля по предотвращению использования расщепляющих материалов в военных целях. Первые соглашения о гарантиях должны вступить в силу не позднее марта 1972 года — то-есть два года спустя после вступления в силу договора. Один из комитетов Международного

агентства по атомной энергии разработал проект соответствующего типового соглашения.

Незначительный прогресс отмечен в области прекращения подземных ядерных испытаний. Генеральная Ассамблея ООН поручила Генеральному секретарю обратиться к государствам-членам с запросом об их готовности сотрудничать в обмене сейсмическими данными и, в утвердительном случае, сообщить, каким оборудованием они располагают; такая информация могла бы способствовать достижению договоренности о контроле за выполнением положений договора о прекращении всех ядерных испытаний. По просьбе Организации Объединенных Наций, конференция по разоружению в Женеве обсудила военные аспекты радиологической технологии и технологии лазера. Генеральная Ассамблея ООН объявила десятилетие 1970-х годов Десятилетием Разоружения и в настоящее время принимаются меры для разработки долгосрочной программы разоружения.

Специальная статья

В *Ежегоднике* содержится специальная статья об объявлении Латинской Америки зоной, свободной от ядерного оружия. Это первая и единственная такого рода зона установленная на населенных территориях мира. В статье описываются переговоры, предшествовавшие заключению договора о создании безъядерной зоны, а также характер и функции органа, следящего за его выполнением. Статья написана г-ном Альфонсо Гарсия Роблес, бывшим председателем подготовительной комиссии, разработавшей проект договора.

Справочный материал

Приводится целый ряд цифровых данных о военных расходах за двадцатилетний период времени, исчисленных в текущих и постоянных ценах. Кроме того, даются оценочные данные о стоимости военной помощи, которая предоставляется безвозмездно западными державами. В некоторых случаях более целесообразно рассматривать общие суммы предназначаемые на военные цели, как за счет собственных средств страны, так и за счет получаемой безвозмездной помощи из-за границы. Статистические данные о предоставляемой безвозмездной помощи позволяют такой анализ.

Из опубликованных в последнее время в Соединенных Штатах официальных оценочных данных, вытекает, что советские расходы на исследования в военной области увеличиваются. В одном из разделов книги обсуждаются американские материалы анализирующие эти рас-

ходы; в заключении констатируется, что на основании опубликованных информации невозможно дать правильную оценку советских расходов на исследование, или их тенденций — к росту или сокращению.

В *Ежегоднике* дается оценка наличия военных судов в мире за 1950, 1955, 1960, 1965 и 1968 годы. Из статистических таблиц явствует, что численность крупных судов понизилась, а численность мелких — повысилась. Используется система учета, которая дает возможность единой оценки, как по главным странам и районам так и для всего мира в целом. Подсчеты показывают, что наличие военных судов в мире, выраженное в постоянных ценах, возрастает примерно на 5–6 процентов в год. Эти темпы роста более или менее одинаковы как для развитых так и для развивающихся стран, но в развивающихся странах рост проявляется в повышении численности, тогда как в развитых странах он происходит за счет повышения качества судов. Составление данных позволяет прийти к выводу, что запасы военных судов стран НАТО превышают примерно вдвое запасы стран Варшавского договора. Если к расчетам добавить стоимость военно-морских баз, разница между обоими блоками еще увеличится.

Оценка стоимости торговли основными видами оружия с развивающимися странами пополнена данными за 1969 год. Имеется также реестр торговли оружием с указанием всех констатированных основных торговых операций со странами третьего мира за 1969 год и предварительный реестр за первое полугодие 1970 г.

В качестве исходного материала для дискуссии об ограничении стратегического оружия (SALT), в *Ежегоднике* приводится детальный анализ официальных заявлений Соединенных Штатов относительно размещения советских ракет, именуемых SS-9, и советских подводных лодок типа Поларис. Дается краткий обзор мировых запасов ядерного оружия, из которого явствует, что в настоящее время в арсеналах обеих великих держав хранятся такие запасы уничтожающей силы, что на каждого человека в мире приходится примерно 30 тонн эквивалента TNT. Данные об испытаниях ядерного оружия пополнены последними цифрами: 1970 год следует повидимому считать годом с очень большим числом испытаний, причем много испытаний было проведено Соединенными Штатами. В ходе 9 или 10 подземных испытаний, проведенных США за последние 18 месяцев, радиоактивные материалы попали в атмосферу. Франция провела ряд испытаний в атмосфере.

В качестве исходного материала для возможной дискуссии о разоружении в Европе дается полный отчет о предложениях, которые вносились в прошлом: предложения о сокращении вооруженных сил или их отводе, о предотвращении внезапного нападения, о создании зон свободных от

ядерного оружия. Эти предложения терпели неудачу поскольку их решение связывалось с проблемой объединения Германии.

Справочный материал представлен к разделу о договоре, касающемся дна морей; приводится таблица с указанием ширины территориальных вод ряда стран. Приложен также материал к разделу, посвященному химическому и биологическому оружию. Дается перечень в хронологическом порядке основных событий в области разоружения за истекшие 12 месяцев. Перечень стран, подписавших договоры касающиеся разоружения, пополнен последними данными и доведен до конца августа 1970 года. Дается список и содержание резолюций Организации Объединенных Наций, относящихся к вопросам разоружения и к конфликтам.

Sumario

Esta es la segunda edición del *Anuario del Instituto Internacional de Estocolmo para la Investigación de la Paz* (SIPRI). El propósito de dicho *Anuario* es el de suministrar una guía sinóptica de los armamentos del mundo, así como de los gastos militares, indicando si se ha hecho algún progreso para reducirlos o por lo menos para limitarlos. Los valores fundamentales son siempre los mismos, la creencia de que el mundo está consagrando una cantidad excesiva de recursos para preparar una matanza mutua, y que ésta cantidad podría con ventaja ser reducida. Esto no quiere simplemente expresar que los armamentos sean la única, o la principal causa de la guerra; quiere decir solamente que la carrera armamentista y el desarrollo de nuevas armas es un factor irritante en las relaciones internacionales, el cual crea sospechas y tensiones, amenazas y contra amenazas.

El *Anuario* comienza examinando el curso de los gastos militares del mundo. Después, pasa a discutir el comercio de armas con los países del tercer mundo — la ruta principal por la cual se propagan las armas convencionales sofisticadas alrededor del mundo. Se concentra luego en cuatro campos: la carrera de las armas nucleares y las negociaciones para la limitación de las armas estratégicas nucleares; la cuantía de las tropas y armamentos en Europa y las posibles negociaciones para limitar armamentos y reducir fuerzas, las cuales podrían asociarse con una conferencia de seguridad europea; la militarización del océano profundo y la denuclearización del fondo del mar; y las presentes discusiones para la prohibición de las armas químicas y biológicas. En el capítulo sobre el océano profundo, así como en otras partes, el *Anuario* trata de unificar el material referente a los nuevos desarrollos militares y técnicos con los proyectos de desarme. Estos dos temas, el análisis de los armamentos y el análisis del desarme tienden a ser discutidos en publicaciones separadas aún cuando se les debería considerar como dos aspectos de un mismo tema.

La advertencia del año pasado debe ser repetida de nuevo. La gran parte del material sobre el desarrollo de nuevas armas es estadounidense. La literatura soviética no ofrece prácticamente dato alguno a este respecto. Esto podría dar la impresión de que sólo los Estados Unidos están desarrollando nuevas armas, lo cual es naturalmente falso. Simplemente quiere decir que los Estados Unidos están a la vanguardia en la técnica armamentista y que publican información al respecto. Esto hace inevitable que se preste más atención al desarrollo de la tecnología estadounidense,

pero debe suponerse que también otras naciones se mueven en la misma dirección.

Gastos militares mundiales

Los gastos militares del mundo, en términos reales (es decir, descontando el efecto de la inflación) no han aumentado en 1969. En los tres años previos, dichos gastos habían aumentado en un 30 por ciento. En 1970, parece que disminuyen en un 2 por ciento. Los gastos militares de los Estados Unidos serán, según lo presupuestado, significativamente más bajos, mientras que los de la Unión Soviética aumentarán, aunque en cantidad muy limitada. Durante 1968 y 1969 el mundo estaba consagrando un 7 por ciento de su producción total para usos militares. Este año, dicha cifra debería disminuir ligeramente.

La guerra de Vietnam es la responsable por la mayor parte del aumento y la disminución de los gastos en el presupuesto militar de los Estados Unidos. El año pasado se presentó la cuestión de que al disminuir los gastos de la guerra de Vietnam, otros gastos, dedicados a fuerzas estratégicas o investigaciones y desarrollo de nuevas técnicas militares, reemplazarían dicha partida. Hasta ahora esto no ha sucedido. Sin embargo las nuevos proyectos en prueba de desarrollo son cuantiosos y la segunda fase de la reducción de los gastos de la guerra de Vietnam no ha comenzado aún. Los gastos militares de las otras naciones de la OTAN no han aumentado en los últimos años. Los gastos militares de la Unión Soviética aumentaron en más de un 35 por ciento entre 1965 y 1969 —en términos reales, más rápido aún que en los Estados Unidos— y de acuerdo con los presupuestos de los otros países del Pacto de Varsovia, los gastos militares de dichos países aumentaron aún en mayor grado.

Los gastos militares de los países subdesarrollados forman sólo una pequeña parte del total mundial. Esta cifra ha ido aumentando, sin embargo con más rapidez que en los países desarrollados. Esto se debe enteramente a los gastos del Medio Oriente. Si las figuras de esta región se excluyen, la proporción del aumento para las dos áreas —de países en desarrollo y países desarrollados— es más o menos la misma.

El comercio de armas con los países subdesarrollados

Las ventas identificadas de armas pesadas —naves, aviones, tanques y proyectiles (missiles)— a los países subdesarrollados llegaron a sumar unos US

\$1 1/2 billiones (a precios de 1968). Esta suma fué menor a la de 1967, que fué al año más elevado, pero fué la tercera en el período de post guerra.

La tendencia fundamental en las ventas de armas es probablemente ascendiente. La política estadounidense, bajo la "doctrina Nixon" anunciada en la isla de Guam, por la cual en la mayoría de los casos un país amenazado debería asumir por si solo la responsabilidad su propia defensa, probablemente exigirá un aumento de suministros de materiales bélicos a los países clientes. En 1969, los envíos de armas estadounidenses a los países del Lejano Oriente, especialmente a Taiwan y Corea del Sur, fueron los más elevados desde mediados de la década de 1950. Las cantidades de armas suministradas por la Unión Soviética durante el año de 1969 fueron menores que durante los dos años anteriores. El reabastecimiento de las fuerzas armadas de la República Arabe Unida se efectuó antes del comienzo de este año, y los envíos de proyectiles (missiles) anti-aéreos a Vietnam del Norte han disminuído. Los otros suministros de armas soviéticas han sido dirigidos al Yemen del Sur, Pakistán, Sudan, Mauritania, Nigeria y Libia.

El Reino Unido vendió en 1969 cantidades considerables de equipos militares a los países del Medio Oriente ricos en petróleo; allí como también en otras partes, el Reino Unido vendió con gran éxito aviones Hawker Hunter retocados. Las órdenes por equipos navales provenientes de la América Latina son también de considerable cuantía. Las ventas de armamentos franceses declinaron en 1969 por razón del embargo de las armas vendidas a Israel, pero el monto de dichas ventas parece estar aumentado este año con motivo de las órdenes provenientes del Norte de Africa (Libia y Argelia), América Latina y Grecia.

Los países del Medio Oriente son los mayores compradores de armamentos pesados en el tercer mundo. Pero no se trata tan sólo de los países beligerantes que participan en la guerra Arabe-Israelita. Arabia Saudita, Irán y los estados del Golfo Persa están comprando elevadas cantidades. Los países de América Latina continúan haciendo sus compras de armas sofisticadas más en Europa que en los Estados Unidos: dichos países hicieron grandes pedidos de naves, en especial de submarinos durante el año pasado.

Antecedentes a las negociaciones para la limitación de las armas estratégicas nucleares

Este capítulo presenta una comparación de las armas nucleares con las cuales los Estados Unidos y la Unión Soviética se enfrentan. Aquí se evita

la clasificación de “estratégico” y “táctico”, se dan cálculos aproximados de todas las armas nucleares con las cuales se enfrentan el Este y el Oeste, distinguiéndolas según éstas sean capaces de atacar al país enemigo, las fronteras de éste, o solamente los territorios de sus aliados.

Durante la década de 1950 y a comienzos de la década de 1960, los Estados Unidos estaban a la vanguardia en la superioridad de las armas nucleares. Alrededor de 1966, la Unión Soviética comenzó a darle alcance en el número de proyectiles intercontinentales de tierra, sin embargo, la Unión Soviética tiene un número bastante reducido de aviones bombarderos y solamente hasta ahora está comenzando a desplegar submarinos con proyectiles (missiles) balísticos del tipo Polaris. El proyectil soviético tan mencionado en la prensa del mundo, conocido en el occidente con el nombre de SS-9 se está produciendo a una velocidad de 50 proyectiles por año desde 1964. Se desconoce el número de nuevos sitios de lanzamiento. Un análisis detallado y una reconstrucción de los cálculos aproximados de los Estados Unidos sobre el número de proyectiles SS-9 se presenta también en este capítulo.

Los Estados Unidos están muy adelantados en la instalación de ojivas nucleares múltiples en los proyectiles y están, también, desarrollando proyectiles stand-off para aviones bombarderos. Dicho programa está concebido para producir unas 10 000 ojivas nucleares para las armas de largo alcance ya para 1975. También se están apresurando con un nuevo tipo de bombardero de largo alcance y están desarrollando un nuevo tipo de submarino con proyectiles balísticos. Los planes futuros de la Unión Soviética se desconocen. Uno de los motivos poderosos detrás de los planes futuros, es el miedo, ciertamente profesado por los Estados Unidos y probablemente mantenido por la Unión Soviética, o sea, el miedo por la capacidad que posea el enemigo de atacar primero (first strike capability). Este miedo parece imaginario.

El balance del terror no es precario: cambios cuantitativos en los números de las ojivas nucleares de los proyectiles en una parte o en la otra, no alterarían de manera efectiva el balance del poder. Hay en consecuencia un amplio margen para posibles acuerdos numéricos lo cual dejaría a ambas partes en condiciones de responder al ataque (second strike capability), sin capacitarlos para atacar primero. Esto sería una condición aparente para el mantenimiento de la estabilidad.

La seguridad europea y el desarme

Es muy posible que alguna forma de discusiones entre los poderes de la OTAN y del Pacto de Varsovia puedan establecerse sobre la regulación de

armamentos y el desarme en Europa. (Este capítulo se refiere solamente a los aspectos del desarme en conexión con las cuestiones de la seguridad europea). Cierta convergencia en las propuestas de la OTAN y de los países del Pacto de Varsovia se ha podido notar en los últimos tiempos.

En el caso de que tales negociaciones tengan lugar, lo más probable es que comiencen con las fuerzas militares y los armamentos en la región central de Europa, es decir, Alemania Occidental, Bélgica, Holanda y Luxemburgo por una parte, y Alemania Oriental, Polonia, Checoslovaquia y quizás Hungría por la otra. No existe un límite preciso en las discusiones sobre las fuerzas en esas áreas y las discusiones sobre todas las fuerzas y los armamentos de los países de la OTAN y del Pacto de Varsovia, donde quiera que estén desplegados.

Este capítulo analiza y evalúa extensamente los cálculos de las fuerzas de ambos bloques. La opinión que prevalece, expresada por los militares del Occidente, es la de que las fuerzas convencionales de la OTAN son inferiores, y que si los países del Pacto de Varsovia lanzaran un ataque convencional este no podría ser contenido por más de 10 días. Este punto de vista es puesto en juicio, y se presentan varios argumentos como el recuento de divisiones, el recuento de tropas, posibilidades de refuerzos, el significado que tiene la superioridad numérica de los tanques de los países del Pacto de Varsovia, los méritos relativos de las distintas fuerzas aéreas, etc.

Debido a la creencia de su inferioridad en las fuerzas convencionales, los poderes de la OTAN han señalado que en caso de que hubiera una guerra convencional, estos estarían preparados para usar primeros, como "muestra", un arma nuclear. El capítulo sumaria luego la política contemporánea de la OTAN sobre el uso de las armas nucleares y presenta algunas críticas a ésta.

Las discusiones sobre la cantidad de tropas y armamentos como un precedente para negociaciones de desarme suscita numerosos puntos de vista. Como una fuerza ofensiva tiene necesidad de una poderosa superioridad, con relación a una fuerza defensiva para triunfar, un acuerdo de paridad exacta en las fuerzas, no es necesario para la seguridad. Hay un vasto número de planes para la reducción de fuerzas, formulados en el pasado, que deberían ser reexaminados, especialmente los proyectos presentados por la Unión Soviética y otros países de la Europa Oriental. Dichos planes fueron rechazados por los países de occidente, los cuales insistían en que la reunificación, de Alemania era una condición previa para cualquier clase de acuerdo. También hay otras propuestas complementarias a las propuestas mencionadas como por ejemplo, la limitación de las maniobras militares, los puestos terrestres de observación, etc., que podrían sacarse

a luz para ser examinadas de nuevo. Aún más, debería ser posible, al menos, reducir la inmensa cantidad de armas nucleares que existen en Europa, especialmente en el sector occidental.

La militarización del océano profundo; el tratado para la prohibición del emplazamiento de armas de destrucción en masa en el fondo del mar

En este capítulo se presentan juxtapuestos, material sobre armamentos y desarme. El océano profundo se escogió por dos razones: primero, ésta es la esfera en la cual la técnica militar se está expandiendo con mucha rapidez y segundo, un proyecto sobre un acuerdo para la prohibición del emplazamiento en el fondo del mar, de armas de destrucción en masa, está siendo considerado.

Dicho capítulo comienza presentando los distintos factores que conducen a la militarización del océano profundo, particularmente las ventajas que el océano brinda para el encubrimiento de material bélico. Se consideran también, las desventajas, como por ejemplo, el problema de comunicaciones. Después, se pasa a considerar en particular la guerra anti-submarina: los medios de detección, los armamentos empleados en la detección, los medios de ataque.

En la sección inmediata se presentan las nuevas técnicas y desarrollos del océano profundo; además se mencionan las técnicas ya existentes para operar en las plataformas continentales y la posibilidad de operar ya en el año 2 000 a profundidades de unos 6 000 metros, lo cual comprendería virtualmente todo el océano.

Los sistemas móviles submarinos están siendo desarrollados con gran velocidad. Los sumergibles de navegación libre están operando a una profundidad de más de 2 000 metros, y la próxima generación de los submarinos militares, si dichos submarinos completan su desarrollo, podrían llegar a lo mismo y podrían ser mantenidos por un sistema de servicio submarino. Las instalaciones del fondo del mar consisten por el momento en sistemas de detección para la guerra anti-submarina: se presume que en el futuro lleguen a operar estaciones de servicio tripuladas. Las instalaciones fijas de proyectiles en el fondo del océano no han sido consideradas con seriedad, aun antes de que el fondo del mar se convirtiera en un tema del desarme en 1967.

El fondo del océano es el sujeto de debate y este capítulo presenta un recuento extenso de las negociaciones que sobre dicho sujeto se

han venido efectuando hasta septiembre de 1970. Una propuesta presentada originalmente por la Unión Soviética, preveía la prohibición total del fondo del mar para fines militares. Los Estados Unidos presentaron a su vez una contra propuesta para prohibir el emplazamiento de armas de destrucción en masa en el fondo del océano. La Unión Soviética hizo grandes concesiones y finalmente un proyecto de tratado conjunto fué presentado. Este proyecto contenía realmente la propuesta original de los Estados Unidos, es decir, sólo la prohibición de las armas de destrucción en masa. Los cambios hechos a dicho proyecto de tratado entre su primera y cuarta versiones no cambian su esencia.

El significado de dicho proyecto de tratado no tiene mayor envergadura. A lo sumo viene a ser la prohibición de algo que todavía no existe y que aún, sin dicho tratado, hay pocas probabilidades de que exista. En su forma actual, el proyecto no hace mayor cosa para limitar los usos militares del fondo del mar y menos aún los del océano profundo en general. Este tratado asume, que el fondo del mar es un área que podría ser tratada por separado del problema de la militarización del océano profundo. Este punto de vista es incorrecto.

Las armas químicas y biológicas

Durante 1969 y 1970 el problema de la prohibición de las armas químicas y biológicas ha sido objeto de intenso debate. Este capítulo discute primero la presión ejercida por diferentes órganos y organizaciones internacionales para lograr una adhesión universal al Protocolo de Ginebra de 1925. Esta presión está dirigida en primer lugar hacia los Estados Unidos, los cuales son la única potencia mundial que aún no es miembro de dicho Protocolo.

El 25 de Noviembre de 1969 el Presidente de los Estados Unidos declaró que él iba a remitir el Protocolo para su ratificación por el Senado. En esta misma declaración él anunció que se renunciaba al uso de agentes biológicos letales, precisando que en este campo las investigaciones se limitarían a medidas defensivas y que las existencias de armas bacteriológicas se destruirían. A continuación se precisó que ésta renuncia comprendía también las toxinas. El Presidente anunció igualmente que se renunciaba al ataque inicial con armas químicas letales e incapacitantes, pero se recalcó que esta renuncia no incluiría materias químicas irritantes como gases lagrimógenos y pesticidas. El Protocolo fué remitido al Senado de los Estados Unidos el 19 de agosto de 1970. A continuación se presentan las opiniones en pro y en contra de la prohibición de gases lagrimógenos y pesticidas por ley internacional.

Las cuestiones de prohibir el desarrollo, la producción y el almacenamiento de armas destinadas a la guerra química y bacteriológica han sido tema de amplio debate tanto en las Naciones Unidas como en la Conferencia de Desarme de Ginebra. No se ha llegado a un acuerdo sobre si estas cuestiones deberían ser tratadas en común o por separado. Se presenta también en extenso recuento de las opiniones expresadas por las dos partes. Se resume la propuesta presentada por el Reino Unido sobre una convención para la prohibición de las armas biológicas, así como el proyecto presentado por los nueve países socialistas sobre una convención para la prohibición conjunta de las armas químicas y biológicas.

El capítulo concluye que los prospectos para una convención para la prohibición de la producción y almacenamiento de armas químicas y biológicas, no son muy prometedores. Los Estados Unidos han declarado, que el insistir en un sólo convenio que cubra al mismo tiempo las armas químicas y biológicas, significaría aceptar que no habría avances concretos en mucho tiempo. Por otra parte, un tratado prohibiendo solamente las armas biológicas no tendría más valor que el de una renuncia unilateral, si ésta fuera posible de obtener de todas las potencias mundiales.

Otra posibilidad sería un tratado que prohibiera las armas biológicas y también suspendiera la producción y prohibiera el traspaso a otras naciones de por lo menos, los agentes químicos más letales, que podrían ser usados sólo en la guerra. Este sería un paso intermedio hacia una prohibición total de las armas químicas.

Otras medidas de desarme

En los otros frentes del desarme no se obtuvieron resultados notables. El Tratado para la prohibición de la proliferación de las armas nucleares, entró en vigencia el 5 de marzo de 1970. Sin embargo, un gran número de naciones con una técnica nuclear avanzada —Israel, Africa del Sur, India, Pakistán, Brasil y Argentina— no han firmado dicho tratado. Para otras naciones el problema actual es el de operar las medidas de control para prevenir que el material fisionable no pase de usos civiles a usos militares. A más tardar en marzo de 1972, o sea dos años después de que el Tratado entrara en vigencia los primeros acuerdos sobre salvaguardias deberán estar listos para su aplicación. Un comité de la Agencia Internacional de Energía Atómica ha redactado un modelo de un acuerdo de esta naturaleza.

El progreso en la cesación de las pruebas atómicas subterráneas ha sido de menor cuantía. La Asamblea General de las Naciones Unidas pidió

al Secretario General que éste averiguara si las naciones miembros estaban deseosas de colaborar en un intercambio de datos sísmicos y en caso positivo, dar un informe sobre el equipo que dichas naciones utilizaban. Esta medida tenía por objeto facilitar un acuerdo para un tratado que prohíba las explosiones nucleares. A demanda de las Naciones Unidas, la Conferencia de Desarme de Ginebra consideró los aspectos militares de la técnica de la radiología y de los rayos laser. Finalmente, la Asamblea General de las Naciones Unidas declaró la década de 1970 como la década del desarme, y planes para un programa de desarme a largo plazo están siendo elaborados.

Un artículo especial

El *Anuario* presenta también un artículo especial sobre el tratado para la proscripción de las armas nucleares en la América Latina. Esta es la primera y única zona poblada del mundo libre de armas nucleares. Dicho artículo describe las negociaciones previas a la preparación del Tratado y la naturaleza y funciones del organismo que supervisa dicho tratado. Este fué elaborado por el Dr. Alfonso García Robles, quien fué el Presidente de la Comisión Preparatoria que redactó dicho tratado.

Material de referencia

El *Anuario* presenta series completas de los gastos militares por un período de 20 años, a precios corrientes y a precios constantes. Además, este año, se presentan cálculos estimados de la ayuda militar otorgada por los países occidentales. En algunos casos es más útil considerar el monto total consagrado a fines militares en los países receptores —incluyendo la suma proveniente de sus propios recursos y la suma de la ayuda militar gratuita. Las series de ayuda militar gratuita facilitan este análisis.

Cálculos oficiales estadounidenses recientemente publicados, muestran un aumento en los gastos militares destinados a la investigación y al desarrollo en la Unión Soviética. Una corta sección del *Anuario*, examina un número de estudios estadounidenses sobre dichos gastos y se concluye que es imposible hacer cálculos fidedignos sobre el nivel o la tendencia de estos gastos, basándose en los datos publicados.

El *Anuario* presenta evaluaciones de las existencias de naves de guerra en el mundo hacia los años 1950, 1955, 1960, 1965 y 1968. Esta es la primera de las series de las tablas de las existencias de armamentos del

mundo. Las tablas muestran la disminución numérica de las naves pesadas y un aumento en aquellas de menor tonelaje. Un sistema de calculaciones se emplea para hacer evaluaciones uniformes para los principales países, áreas y el total mundial. Esta calculación sugiere que las existencias de las naves de guerra del mundo están aumentando a una proporción de 5-6 por ciento al año, a precios constantes. Esta proporción es igual para los países desarrollados y subdesarrollados. Sin embargo, el aumento en los países subdesarrollados es sobre todo numérico, mientras que aquel de los países desarrollados es debido al mejoramiento cualitativo de las naves. La comparación sugiere que las existencias de naves de guerra de la OTAN son casi el doble de las los países del Pacto de Varsovia. Si el valor de las bases navales se agregara a estas cifras, la diferencia sería aún mayor.

Los valores estimados del comercio de armas con los países del tercer mundo se ponen al día para 1969. También se incluye el Registro del Comercio de Armas, con las mayores transacciones que han podido ser identificadas y confirmadas en 1969, así como un Registro provisional que cubre la primera mitad de 1970.

En el contexto de las negociaciones para la limitación de las armas estratégicas nucleares, el *Anuario* da un análisis detallado de las declaraciones de los Estados Unidos acerca del despliegue del proyectil soviético designado con el nombre de SS-9 y el submarino soviético del tipo Polaris. Se provee un resumen de las existencias mundiales de armas nucleares indicando la increíble cantidad de poder letal, el cual equivaldría aproximadamente a unas 30 toneladas de TNT por cada habitante de la tierra, almacenado ahora en los arsenales de los dos poderes mundiales. Las figuras para las pruebas atómicas se han puesto también al día. El año 1970 parece ser de gran actividad en dicho aspecto, especialmente por parte de los Estados Unidos. Nueve o diez de las pruebas atómicas subterráneas efectuadas por los Estados Unidos en los últimos 18 meses, han emitido material radioactivo a la atmósfera. Francia ha conducido una serie de pruebas atómicas atmosféricas.

En el contexto de las posibles discusiones del desarme europeo, se presenta un resumen de las propuestas hechas en el pasado —propuestas para la reducción de fuerzas y el “disengagement”, para prevenir un ataque de sorpresa, así como para el establecimiento de zonas libres de armas nucleares. Esta reseña indica como las propuestas pasadas tuvieron tendencia a fracasar debido a su intrincada relación con el problema de la reunificación de Alemania.

También se presentan materiales de referencia sobre el tratado para la prohibición de las armas de destrucción en masa en el fondo del mar —con una tabla que muestra la extensión de las aguas territoriales de

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ciertas naciones; las discusiones sobre la prohibición las armas químicas y biológicas. Se incluye igualmente una cronología con los mayores acontecimientos en el campo del desarme durante los 12 últimos meses; las listas de los signatarios de los tratados relativos al desarme puestas al día 31 de Agosto de 1970. Las listas de las resoluciones tomadas por las Naciones Unidas en materia de desarme y conflictos se presentan en un sumario.

Errata

SIPRI Yearbook 1968/69

Page 48. Chart 1.11. The spread of supersonic aircraft among third world countries. New Zealand should be excluded from the chart.

Page 58, line 15. For "A-48 Skyhawks" read "A-4B Skyhawks".

Page 66. Saudi Arabia and the Yemen, line 4. For "In October 1968, the British sent to Saudi Arabia" read "In October 1966, the British sent to Saudi Arabia".

Page 263, line 11. For "in the Arctic (14, 17)" read "in the Arctic (16, 17)".

Page 277, under Cargo-light helicopters. For "5A 330 Puma" read "SA 330 Puma".

Page 362, line 30. The book by Istvan Kende, *Nyolcvannyolc Haboru 1945-67* should be translated as *88 Wars* and not as *Neo-colonialism*.

Page 377. The Mongolian/Chinese border was incorrectly reported as being a passive border dispute. According to an official Mongolian source, the border conflict between the Mongolian People's Republic and the Chinese People's Republic was settled by an agreement on 26 December 1962.

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