9795

SECRET

CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
Office of Strategic Research

CONTRIBUTION TO NIE 11-2-69:
SOVIET NUCLEAR PROGRAMS

SUPPLEMENT

FORCE AND COST IMPLICATIONS OF SOVIET NUCLEAR WEAPONS PROGRAMS

Copy No. 68

May 1969

SECRET

RF

229125

WARNING

This document contains information affecting the national defense of the United States, within the meaning of Title 18, sections 793 and 794, of the US Code, as amended. Its transmission or revelation of its contents to or receipt by an unauthorized person is prohibited by law.

Contents

Annex

Tables

Charts

Force and Cost Implications of Soviet Nuclear Weapons Programs

Summary

Since 1960 the Soviet military has been allocating a large share--about one ruble out of every five--of its annual military procurement for the acquisition of nuclear bombs and missile warheads. Total outlays, including maintenance costs, for nuclear devices during these years have averaged almost 10 percent of the ruble valuation of Soviet defense and space expenditures.

The strategic attack forces have been the largest recipient of nuclear weapons resources. Recently, allocations to the strategic defense and general purpose forces have been increasing as Soviet tactical nuclear warfare doctrine has developed and as more air defense complexes have been equipped with nuclear warhead options.

Nuclear costs have not increased in proportion to the actual numbers of nuclear weapons being procured during recent years. This is because cheaper nuclear material has become available, the weight and size of the weapons have been reduced, and weapons maintenance costs have declined.

Note: The data in this supplement are financial expressions of physical inputs--exclusive of RDT&E (research, development, test, and evaluation)--to nuclear weapons programs estimated by the intelligence community. A more detailed explanation of the analysis is presented in the annex.

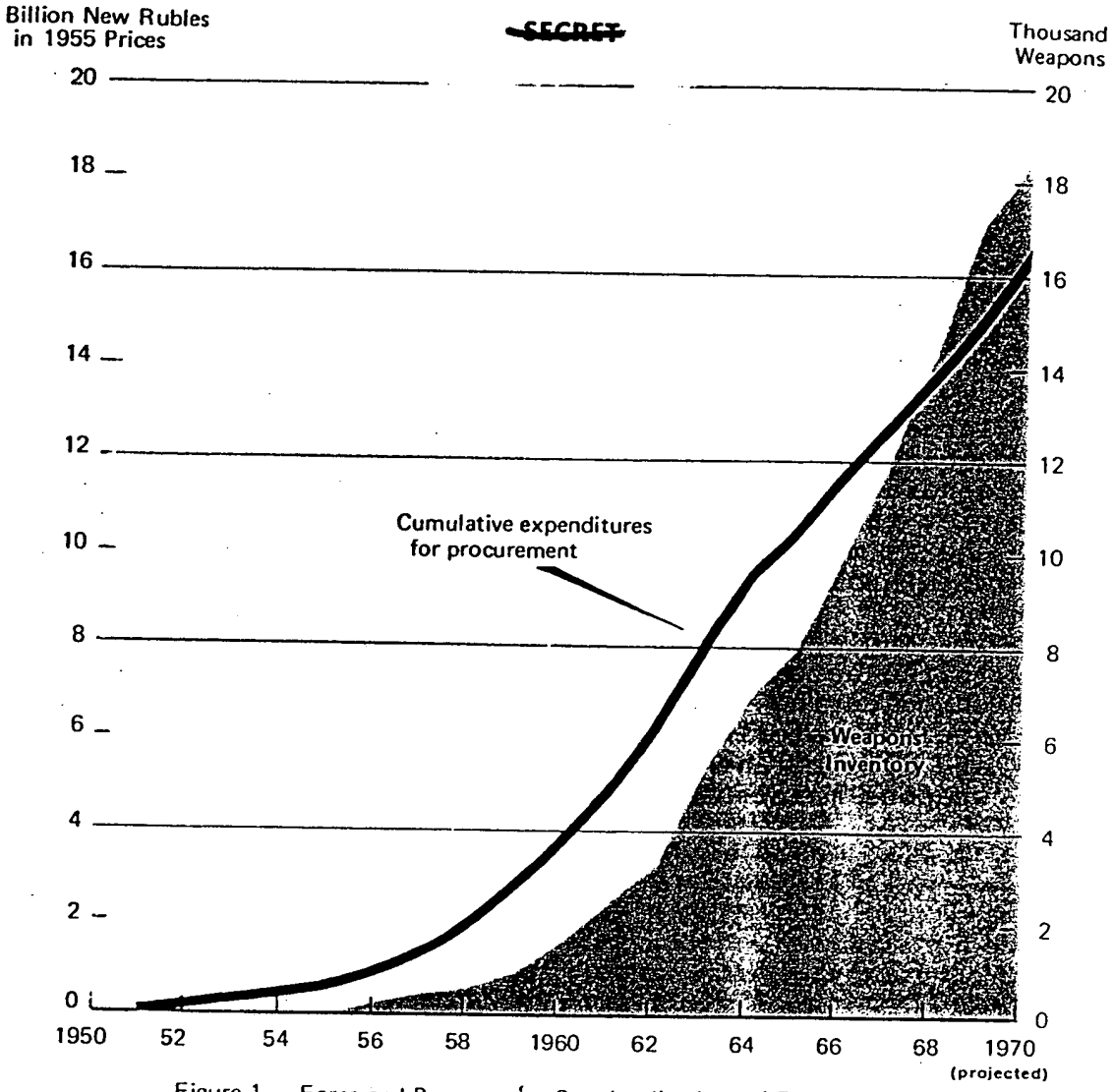

Figure 1. Force and Procurement Cost Implications of Estimated Soviet Nuclear Weapons Programs, 1950-70

95073 5-69 CIA

I. Total Nuclear Weapons Expenditures

In the period since the first nuclear bombs were assigned to the old TU-4 Bull bombers in the early 1950s, the Soviets have spent an estimated 15 billion rubles for the procurement of nuclear devices of all types (see Figure 1, opposite page). This would be equivalent to about $15 billion if these weapons were procured in the US.* An additional 1.8 billion rubles is estimated to have been spent for the maintenance of these weapons during their usable lifetime. In the same period the Soviets have spent an estimated 11 billion rubles for the procurement of naval ships and submarines of all types, 18 billion rubles for missile systems, and 28 billion rubles for aircraft.

In the early years of the Soviet nuclear weapons program, most expenditures were for research and development. Less than 5 percent of total 1950-55 defense procurement went to serial production of weapons, even though the primitive, low-yield fission devices of these early years were quite expensive on a unit basis when compared with modern nuclear weapons. It is estimated that in 1955 the Soviet stockpile consisted of no more than 100 to 200 of these devices.

In the mid-1950s, however, with the advent of the TU-16 Badger, TU-95 Bear, and M-4 Bison bombers, the Soviets began procuring large numbers of thermonuclear bombs and air-to-surface missile (ASM) warheads. By 1960 the share of total defense procurement expenditures going to nuclear weapons had grown to 20 percent, and it has remained at this proportion since.

The peak in Soviet nuclear weapons procurement came during the period 1962-64 as a result of the heavy requirements for nuclear weapons for the new

---

* *Because the current cost of US nuclear weapons procurement is to a large extent an understated accounting cost, no meaningful comparison can be made between US and Soviet nuclear weapons expenditures. The scope of nuclear weapons costs in this paper excludes all costs for research, development, and testing.*

Table 1

Estimated Soviet Expenditures for Procurement of Nuclear Weapons, Selected Years 1951-69

	Million Rubles						
	1951	1956	1961	1966	1967	1968	1969
Total procurement	75	275	1,150	925	1,075	1,125	1,150
Strategic attack	75	275	850	400	525	450	600
Strategic defense			50	125	225	325	250
Ground forces			225	300	250	275	225
Naval forces			25	100	75	75	75

SS-4 MRBM force, the continued growth of the nuclear weapons inventory for Long Range Aviation, and the rapid deployment of tactical nuclear weapons for the ground forces. Annual expenditures for nuclear weapons in this period averaged about 1.5 billion rubles.

Expenditures for nuclear weapons procurement decreased in 1965-66, even though the actual number of weapons being procured increased. The decline in outlays resulted from the tapering off of nuclear procurement for the strategic bomber forces with their large, expensive weapons, the near completion of the FROG tactical rocket deployment, and the declining unit costs of nuclear devices in general.

In 1967-68, with the advent of the SA-5 air defense system, the Y-class submarine, and new ICBMs and MR/IRBMs, nuclear weapons outlays again began to increase (see Table 1, opposite page). As these systems reach full deployment in the early 1970s, expenditures for nuclear weapons are expected to increase further, particularly if the Soviets decide to add an MRV or MIRV capability to their ICBMs.

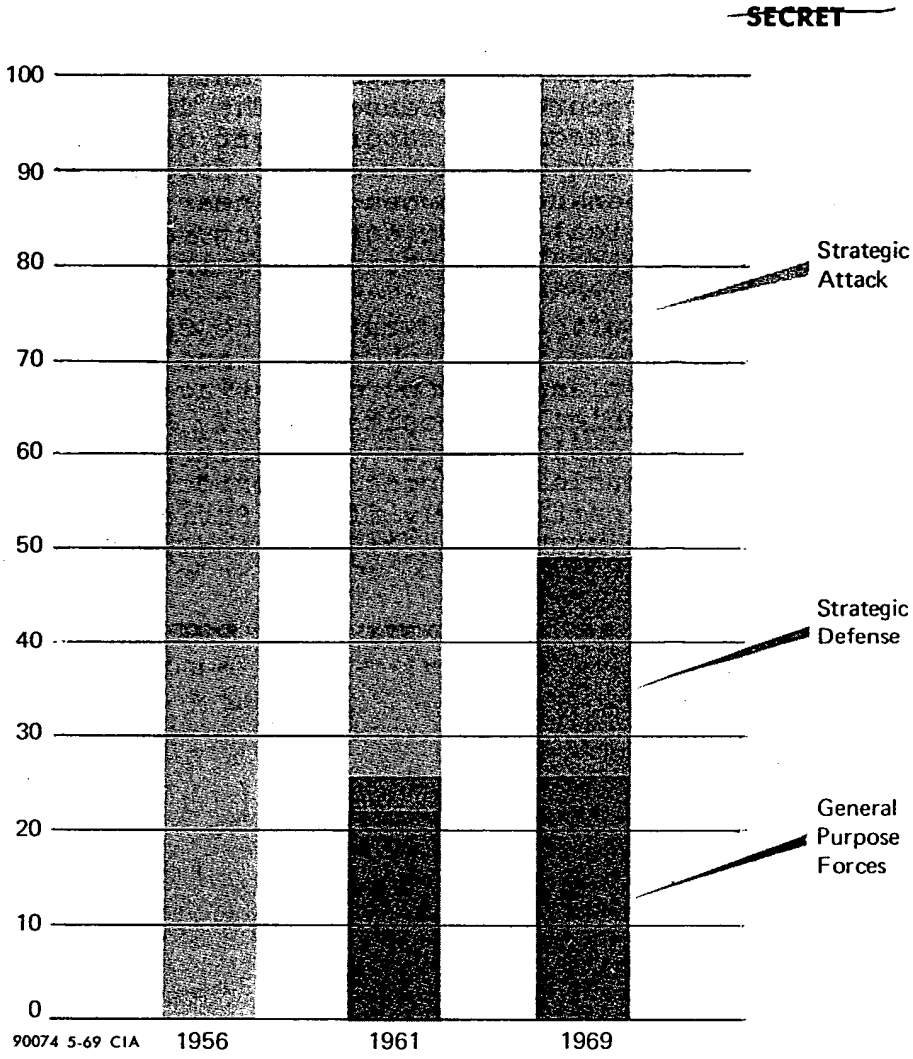

Figure 2. Percentage Distribution of Estimated Soviet Expenditures for Nuclear Weapons Procurement, by Mission, 1956, 1961, and 1969

II. Weapons Allocations

Of the 15 billion rubles estimated to have been spent by the Soviets for nuclear weapons procurement since 1950, over two-thirds has gone to the strategic attack forces. The general purpose forces have received about one-fourth, while the strategic defense mission has received less than 10 percent. The Soviet bomber forces probably received all of the nuclear weapons produced until 1957.

By 1960, as the size of nuclear weapons was reduced and the requirements of the strategic attack forces were somewhat satisfied, the Soviets began procuring nuclear weapons for their general purpose ground and naval forces. Increased allocations to the cruise missile submarine and surface ship forces, ground tactical missiles, and naval aviation units were largely responsible for the decline in the strategic attack share of total nuclear weapons procurement expenditures (see Figure 2, opposite page).

Since 1960, Soviet general purpose forces have probably received an average of about 390 million rubles worth of nuclear weapons per year. With this level of expenditures, the Soviets have added more than 700 new nuclear warheads or bombs per year to the nuclear inventory of the general purpose forces over the past decade.

The strategic defense forces are also estimated to have received their first nuclear capability during the early 1960s, when a small number of nuclear warheads were probably allocated to some of the SA-1 sites. Nuclear expenditures for strategic defense began increasing more sharply after 1965 as some SA-2 sites were given a nuclear capability and as the SA-5 system was deployed. As these two SAM programs, along with the postulated ABM programs, reach peak deployment during the 1970s, it is estimated that strategic defense nuclear expenditures will remain at a fairly steady 150 million to 200 million rubles per year.

On a system basis, the TU-16 Badger bomber force has been the single largest recipient of Soviet nuclear weapons. To date these aircraft have been allocated an estimated 3.3 billion rubles worth of bombs

and ASM warheads, or almost 25 percent of all nuclear weapons expenditures for all forces since 1950. This amount represents about one-third of all nuclear weapons procurement outlays for strategic attack forces in the 1950-68 period and is almost as much as was spent during those years for the total nuclear inventory of the general purpose ground and naval forces. (Table 2, below, shows the ranking of the 15 leading Soviet systems in terms of their estimated nuclear weapons costs.)

Table 2

Cumulative Soviet Expenditures for Nuclear Weapons Procurement Estimated Through 1970

Selected Delivery Systems

Rank	System	Procurement Period	Million Rubles
1	TU-16 Badger bomber	1954-70	3,500
2	SS-4 MRBM	1959-65	1,350
3	FROG-3, -4, and -7 tactical rockets	1959-70*	1,225
4	TU-95 Bear bomber	1956-70	1,215
5	SA-5 SAM	1966-70*	680
6	IL-28 Beagle bomber	1959-68	630
7	SS-11 ICBM	1965-70*	580
8	SS-7 ICBM	1961-65	570
9	SS-9 ICBM	1965-70*	520
10	M-4 Bison bomber	1958-68	515
11	TU-22 Blinder bomber	1961-70*	480
12	SS-1B and -1C tactical missiles	1959-68	440
13	Y-class submarine	1967-70*	410
14	SA-2 SAM	1965-69	380
15	TU-4 Bull bomber	1951-54	350

* *Although it is estimated that procurement of nuclear devices for these systems will continue beyond 1970, the costs shown are cumulative through 1970 only.*

III. Nuclear Weapons Maintenance Costs

The Soviets are estimated to have spent an average of 180 million rubles per year since 1960 to maintain their nuclear weapons stockpile. Although maintenance expenditures have increased, the rate of the increase has been less than the growth of the stockpile. From 1960 to 1969, the weapons stockpile increased ninefold--from 1,700 weapons to 17,000--but annual maintenance expenditures increased only threefold, mainly because of the change in composition of the stockpile.

In terms of weapon numbers, approximately 12,000 or 70 percent of the 17,000 weapons currently estimated to be in the stockpile are smaller fission devices used by the general purpose and strategic defense forces. These weapons are less expensive to maintain than the larger thermonuclear devices which composed the bulk of the Soviet nuclear weapons inventory a decade ago. While it probably cost the Soviets an average of 40,000 rubles to maintain one nuclear weapon in 1960, today it costs less than one-half that much because the weapons have become smaller and easier to maintain in the field.

In addition to the changes in nature of the weapons in the stockpile, the cost of producing the nuclear material used for maintenance replacement has also decreased considerably.

These two factors are expected to cause total nuclear weapons maintenance expenditures to level off at about 300 million rubles per year during the 1970s, despite the expected deployment of new delivery systems.

IV. The Declining Unit Costs of Nuclear Weapons Procurement

The unit procurement costs of Soviet nuclear weapons has probably dropped considerably over the past several years. As in the US, the Soviet production cost per kilogram of nuclear material is estimated to have declined, and the weapon fabrication costs per unit have tended to decrease as the Soviets produce more and more devices of similar design. This trend is most pronounced in the area of tactical nuclear weapons production, where large numbers of devices are being procured.

Annex

Estimating the Costs of Nuclear Weapons

The expenditure data contained in this contribution have been derived as a part of CIA's efforts to define and analyze the resources and costs which the Soviets devote to their total military forces and to critical segments of it. These data are financial expressions of physical inputs to the nuclear weapons programs estimated by the US intelligence community. All costs for research, development, and testing are excluded.

The costs of Soviet nuclear weapons are determined by applying nuclear weapons loading factors and characteristics to weapons programs contained in national intelligence estimates and projections. In this way the amounts of special nuclear material needed annually and the numbers of weapons of each type needed to satisfy the requirements of the estimated force levels are computed.

Some of the parameters required to cost the nuclear weapons programs are presented as ranges in the appropriate national intelligence issuances. For the purposes of this analysis, single-valued estimates, considered to be the most likely, were selected from these ranges. In most instances the resultant expenditures were very close to the midpoints of the ranges of NIPP-68 expenditure data. The expenditures presented herein are not expected to change significantly as Section IV (Nuclear Implications of Soviet Military Forces) of NIPP-69 becomes available.

Material and fabrication requirements are costed through a series of declining cost curves based on estimates of cumulative Soviet material production and weight-cost formulas drawn from US data. The resulting dollar costs are converted to rubles using a ruble-dollar ratio based on comparative analysis of US and Soviet nuclear materials and weapons production techniques.

The Soviet Union probably had a shortage of weapons-grade materials until quite recently. Its current nuclear weapons expenditures, therefore, probably include the cost of current materials production.

any comparison between estimated equivalent dollar figures for Soviet nuclear weapons and US budgets for nuclear weapons would be misleading.