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Intelligence Report

Soviet Expenditures for Research and Development

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
October 1969

INTELLIGENCE REPORT

Soviet Expenditures for Research and Development

Introduction

Military research and development (R&D) and military and civil space programs are pursued as highest priority undertakings in the USSR. The continuing drive to find and exploit technological breakthroughs in modern weaponry is a regular theme of Soviet scientific and military literature, and the aims and achievements of the Soviet space program have been given ample publicity.

Civil and industrial R&D has found it difficult to compete with such glamorous claimants for scarce

Note: This report was produced solely by CIA. It was prepared by the Office of Strategic Research and coordinated with the Offices of Current Intelligence, Economic Research, and Scientific Intelligence and the Foreign Missile and Space Analysis Center.

It updates certain aspects of SR IR 67-3, Rubles for Research: Trends in Soviet R&D Expenditures, November 1967. Revisions in the data in the earlier report result partly from the acquisition of new information on Soviet expenditures for science and partly from continuing improvements in ruble-to-dollar conversion rates for military research and development. The changes make the dollar valuation of Soviet R&D efforts more comparable to the expenditure series estimated for Soviet military procurement and deployment. The terms of reference and methodology described in Rubles for Research are unchanged.

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resources, but the Soviets are now giving increased attention to the role of nonmilitary R&D.

Estimates of expenditures by the USSR for military and civil R&D and space have intelligence utility in several ways. First, when combined with estimates of the costs of Soviet forces and deployed weapon systems they enable an estimate of total military related activity in the USSR. Second, they permit conclusions about Soviet acceptance of heavy burdens against future--and often uncertain--payoffs in the strategic and space arenas. Third, they indicate how much the Soviets have been willing to spend to improve their industrial and consumer sectors. Finally, they provide a measure of total Soviet resources devoted to R&D and space which can be compared with US data.

This report analyzes Soviet funding for both military and civil research and development and space; examines overall trends in the financial support given to military R&D, including military space, to civil R&D, and to civil space programs; and compares the Soviet effort with US levels and trends. Conclusions begin on page 12.

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The Evidence

The USSR annually publishes statistics on the science budget and total science expenditures including capital investment (except in 1968, for which investment has not yet been announced). Soviet statements imply that these published ruble expenditure data refer to outlays which correspond to US spending for both private and governmental research and development, including that financed by the Department of Defense, the National Aeronautics and Space Administration, and the Atomic Energy Commission. Despite uncertainties in the details of Soviet statistical categories--relating primarily to definitions and concepts of R&D compared with those used in the US--broad comparability in coverage is believed to exist between the two sets of data.

The Soviets do not publish a breakdown of their expenditures among military R&D (including military space activities), civil R&D, and the civil space program. Analysis of the detailed budgetary information that is available, however, has enabled a breakout of the Soviets' civil R&D effort from their classified R&D effort, which covers both military R&D and the entire space program.

To distinguish between military R&D and space expenditures, the Soviet military and civil space program--which can be clearly defined using a combination of intelligence information and published Soviet material--has been costed in dollars as if it were purchased in the US. When these figures are converted to rubles, they enable the derivation of an estimate of Soviet military R&D. A further distinction is made between civil and military space programs on the basis of US categories to derive a total for military R&D and military space.*

* *These numerical findings represent a special case among the military-economic estimates of the components of Soviet military expenditures in that they are based primarily on openly published Soviet financial data rather than on calculations of the expenditure implications of observed and estimated military programs.*

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As a general check on the validity of the estimate of military R&D expenditures derived from analyzing budget data and costing the civil space program, an independent effort has been made to estimate the R&D costs of individual weapon systems and then to sum these costs. When R&D expenditure data on known weapon systems are adjusted to include estimated R&D expenditures not allocable to specific weapon systems, the results for the period 1960-68 are close enough to the estimate of military R&D derived by the budget analysis approach to indicate that budget analysis yields generally valid results.

Gaps in information and problems of monetary comparability--the conversion of ruble expenditures to their US dollar equivalents*--continue to limit the precision of estimates of total funding levels for Soviet R&D. Although the level of actual expenditures may be higher or lower than calculated, the estimated trends in overall growth presented in this report are probably not markedly different from the actual trends as seen by Soviet leaders. In general, trends can be estimated more confidently than absolute levels of expenditure.

Trends in Total R&D and Space Expenditures

Total Soviet financial outlays for "science"--which is believed to include all civil and military research and development and space--provide a broad measure of trends in the resources the USSR is devoting to these endeavors.

** Ruble expenditure data are converted to dollars using ruble-to-dollar ratios that reflect a US efficiency level considerably above that of the USSR. Although this is in agreement with observations of qualified US engineers who have visited the USSR and also coincides with Soviet statements that US industry in general is about twice as efficient as its Soviet counterpart, additional research is needed to further refine these ratios to more accurately reflect varying efficiency levels in the different sectors of the Soviet economy.*

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Annual Soviet expenditures on R&D and space more than doubled between 1960 and 1968. (See table, page 6.) In 1960, the announced expenditures for science in current prices totaled 3.9 billion rubles, or the equivalent of about 7.6 billion dollars.* By 1968, these expenditures had increased to an estimated 9 billion rubles (equivalent to 17.4 billion dollars)--outlays for science exclusive of capital investment of 7.9 billion rubles announced by the Soviets plus an estimated 1.1 billion rubles for the investment category. Total US R&D and space expenditures increased from 13.7 billion dollars to 25.4 billion during the same period.

From 1960 through 1968, total Soviet spending for R&D increased at an average rate of 11 percent, with the highest annual percentage increase--16 percent--occurring in 1962 and the lowest--8 percent--in 1965. A planned increase of 13 percent has been announced for 1969, but recent price increases will probably limit the real increase to less than 10 percent.

The average annual rate of growth of Soviet expenditures of about 11 percent compares with about 8 percent for similar expenditures in the US. Even with this disparity in rates, however, the Soviets will not quickly close the absolute gap in expenditures. In the 1960-68 period, total US R&D and space expenditures amounted to 173 billion dollars, while Soviet expenditures amounted to the equivalent of 111 billion dollars, and in 1968 the US was still spending half again as much as the USSR.

Statistics on science expenditures are published only on an annual basis, and what little evidence of future funding trends exists consists of generalized statements by economists, scientific planners, and other Soviet officials. An example is the 7 June 1969 speech by party chief Brezhnev at the International Congress of Communist and Workers Parties committing the Soviet Union to an increase in the pace of its scientific activity. This statement

* Dollar values used in this report for Soviet expenditures are expressed in terms of constant 1966 US prices. Those for the US are in current prices.

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Soviet and US Expenditures
for Research and Development and Space
1960-68

	Billion 1966 Dollars							
	1960	1961	1962	1963	1964	1965	1966	1967
<u>Soviet Expenditures a/</u>	<u>7.6</u>	<u>8.7</u>	<u>10.1</u>	<u>11.3</u>	<u>12.4</u>	<u>13.4</u>	<u>14.6</u>	<u>16.0</u>
Civil R&D	2.2	2.3	2.6	2.8	2.9	3.1	3.4	3.7
Military R&D (including mili- tary space)	5.0	5.8	6.4	7.0	6.9	6.4	6.5	7.2
Civil space	0.4	0.6	1.0	1.6	2.7	3.8	4.7	5.2
	Billion Current Dollar							
<u>US Expenditures</u>	<u>13.7</u>	<u>14.5</u>	<u>15.8</u>	<u>17.5</u>	<u>19.4</u>	<u>20.6</u>	<u>22.4</u>	<u>24.0</u>
Civil R&D b/	6.7	6.0	6.3	6.6	6.0	7.1	8.1	9.2
Military R&D (including mili- tary space) c/	6.6	7.7	8.1	8.2	9.0	8.2	8.2	9.2
Civil space d/	0.4	0.8	1.4	2.7	4.4	5.3	6.1	5.6

Note: Because of rounding, components may not add to totals shown. US data are in fiscal year terms, Soviet in calendar year terms.

- a. Soviet ruble expenditures for "science" are announced and the size of the subcategories are derived from these and other sources. In 1968, the announced science expenditures excluded capital investment--about 10 percent of the total--which is estimated for 1968 only.
- b. US National Science Foundation data.
- c. Includes Department of Defense total expenditures for R&D, adjusted to conform to National Science Foundation definition and Atomic Energy Commission R&D for military purposes.
- d. Total of expenditures by National Aeronautics and Space Administration (including Communications Satellite Corporation, Department of Commerce, Department of the Interior, Atomic Energy Commission (civil space only), and National Science Foundation).

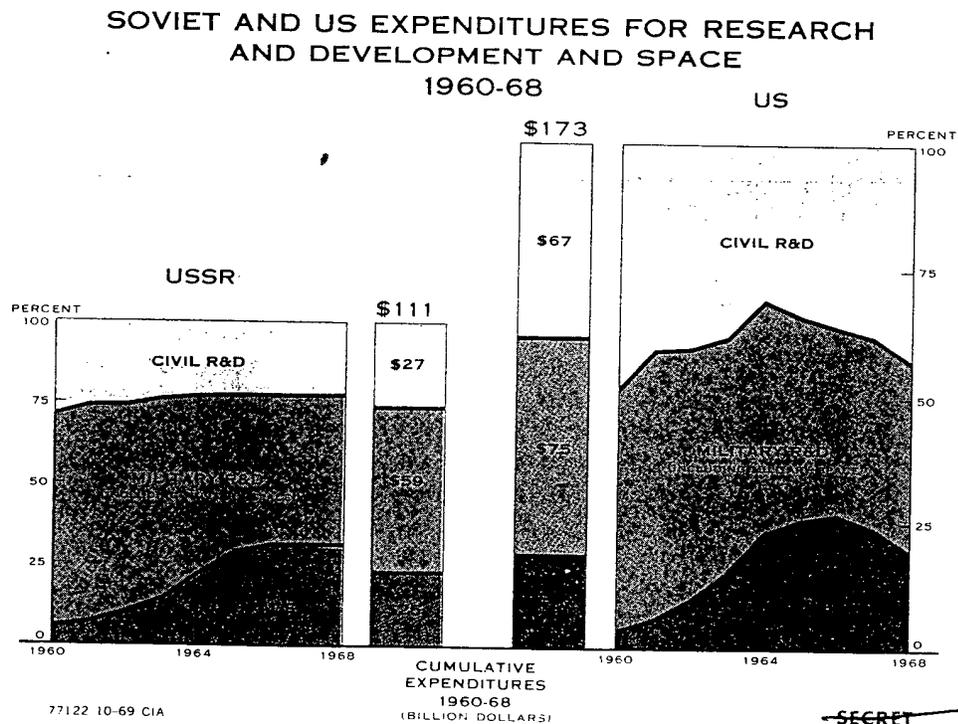
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implies a higher growth rate than the 9 to 10 percent real increase in expenditures experienced during the past few years (after the effects of recent price increases have been discounted).

Trends in Military R&D Expenditures

The largest share of total Soviet expenditures for science is estimated to have gone to military R&D including military space (hereafter referred to as military R&D). Military R&D received about two-thirds of total R&D expenditures in 1960, and although its share is declining it was still the largest category in 1968, when it accounted for almost half of the total. (See chart, below.)

During the past 9 years the USSR has spent the equivalent of nearly 60 billion dollars on the qualitative improvement of its arsenal of weapon



systems. Although all military missions have benefited from this effort, most of the resources have been channeled into upgrading the strategic attack and strategic defense forces.

Estimated military R&D expenditures have increased only slightly as a share of total estimated defense spending since 1960, growing from about one-sixth to a current share of about one-fifth.

The trend in military R&D spending over this period has not been smooth. Estimated expenditures rose rapidly during the early Sixties, with large amounts of money flowing into the development of third generation ICBMs, an IRBM, new fighter interceptors, and the ABM program. During 1963-66, military R&D expenditures apparently stabilized or declined slightly as R&D emphasis was shifted to the space effort and estimated expenditures on the Soviet civil space program increased rapidly. As increases in civil space spending began to slow down in the last three years, expenditures for military R&D again increased, reaching the equivalent of about 8 billion dollars in 1968. (See the table on page 6.)

The pace of activity for a number of weapon systems now under development--special trajectory ICBMs, multiple warheads, high performance aircraft, submarines, air defense and tactical air systems, ABMs, and reconnaissance satellites--suggests that military R&D spending will continue to grow. The need for improving the technological level of Soviet industry, much heralded in recent Soviet literature and highlighted by Brezhnev at the International Congress in Moscow in June 1969, will present serious competition for R&D funds, however, and may slow the rate of growth of military R&D in the future. Given the Soviets' strong defense motivations, however, and their uncertainties about the prospects for and nature of a strategic arms limitation agreement, the final balance between civil R&D and military R&D over the next several years has probably not yet been decided.

Soviet and US military R&D expenditures have shown a parallel pattern in recent years. Both felt the short run impact of large civil space expenditures in the mid-Sixties and both reflect steadily increasing military R&D expenditures over the longer term.

Trends in Civil Space Expenditures

Estimates of annual spending on civil space programs in the USSR, in US expenditure terms, reached the billion dollar mark in 1962. From then through 1965 the Soviet space effort was the most rapidly growing category of R&D spending.

In its initial phases, the Soviet space program had achieved economies in large part by using boosters developed for the Soviet missile program. After 1962 the increased weights of payloads for future programs forced the development of large boosters specifically designed for space applications. This, coupled with the advent of manned space flights, drove space spending up rapidly during the following 3 years. By 1965 estimated annual Soviet civil space expenditures had reached a level that would equal almost 4 billion dollars if the programs had been bought in the US.

Between 1965 and 1968 civil space spending continued to increase, but at a decreasing rate, as much of the developmental work on large space boosters and spacecraft for manned space flight neared completion. The 1968 expenditure level is estimated at the equivalent of about 5.4 billion dollars. Civil space programs currently under way and projected in intelligence estimates will probably hold expenditures for these purposes at or near this level for the next few years.

As in military R&D, US and Soviet civil space spending patterns are quite similar. In the US, expenditures by the National Aeronautics and Space Administration reached a peak in 1966, and although Soviet spending on programs of this same general type is still going up the Soviet rate of growth is rapidly declining. Estimated Soviet spending on civil space during 1960-68 totaled about 25 billion dollars compared with about 31 billion dollars for the US.

Trends in Civil R&D Expenditures

The largest part of the gap in spending between the US and the USSR has been in funds devoted to civil R&D, where Soviet spending is believed to have lagged that of the US by 40 billion dollars during the 1960-68 period.

This relative neglect of the depth and quality of civil R&D occurred in large part because of the heavy commitment of financial, personnel, and hardware resources by the USSR to advanced military weaponry and space systems. Although estimated expenditures for the civil R&D sector have increased steadily since 1960, they are still at a low level compared with those in the US. The equivalent of only about 4 billion dollars was spent in the USSR in 1968 on civil R&D compared with about 11 billion dollars for the US.

The low priority accorded civil R&D in the past not only contributed to the slow rate of economic growth and the small increase in productivity experienced in the USSR in recent years, but it has also probably made Soviet military programs more costly. The lack of a broad, adaptive industrial base has prevented the development of a balanced economy with depth in every sector to meet changing military demands.

Soviet authorities are now more aware than ever of the adverse effects the lack of civil R&D spending has had on economic progress, and efforts are currently under way to improve the situation. The Soviets have identified three approaches: First, an increase in the expenditure level for civil R&D is to take place during the next Five Year Plan (1971-75). Second, a change in emphasis from research to development is being called for. By Soviet admission, this will move the USSR closer to US practice, which the Soviets admit is more efficient. Third, improvements are planned for the overall administration of civil R&D efforts to eliminate bottlenecks and speed economic returns from R&D expenditures. Major changes are planned in every stage of the R&D process, from initial planning to final pricing of new products.

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Conclusions

Soviet financial outlays for "science"--believed to include spending for both military and civil R&D and space programs--will probably continue to be spurred to higher levels by ambitious military and space goals and concurrent efforts to find ways to reverse the declining trend in industrial productivity

Total "science" expenditures, which are announced by the Soviets, have grown since 1960 at an average annual rate of about 11 percent. The largest percentage increases were registered from 1960 through 1963 when expenditures increased by an average of 14 percent a year. Since then the average annual rate of growth in expenditures has been only about 9 percent and no individual year's growth has deviated from this average by more than 1 percent. Total expenditures are likely to continue to grow at about the same rate in the near future.

Estimated outlays for military R&D and military space, which grew rapidly during 1960-63 and then declined slightly through 1965, have shown signs of growth since then. Outlays for 1968 are estimated to be about 8 billion dollars.

Civil R&D programs have grown steadily since 1960, but the absolute level of expenditures estimated for civil R&D--about 4 billion dollars in 1968--is still far below that of military R&D. Increased emphasis will probably be placed on this sector in the future, and its relative share of total R&D expenditures will probably grow.

Estimated civil space program costs--which grew very rapidly in the early Sixties--began to level off after 1966, and will probably remain at about their present estimated level of 5.4 billion dollars during the next few years.

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The US devotes considerably more resources to military and civil R&D and space than the USSR. In 1968, in comparable cost terms, the totals of all three components of R&D--military R&D including military space, civil R&D, and civil space--reached about 25.4 billion dollars for the US and about 17.4 billion dollars for the USSR. The major disparity is in expenditures for civil and industrial R&D. Although investment in space facilities and in some of the larger space programs has passed through the more expensive stages in both countries and may slacken off in the future, the steady long-term growth in combined R&D and space spending in the USSR will probably continue.

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