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USSR: Estimating the Composition of the Defense Industry's Output

A Technical Intelligence Report

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USSR: Estimating the Composition of the Defense Industry's Output

A Technical Intelligence Report

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December 1989

USSR: Estimating the Composition of the Defense Industry's Output

Summary

*Information available
as of 31 October 1989
was used in this report.*

The Soviet defense industry—the world's largest producer of weapons—has long manufactured both consumer goods and capital equipment for the civilian economy. Until recently, the extent and total value of the defense industry's civil production has been a matter of secrecy. In March 1989, however, Soviet Premier Ryzhkov announced that the share of civil production in the defense industry's output was 40 percent. Furthermore, he promised that, as a result of the planned conversion of defense industry production capacity from weapons to civil products, the share of civil production would rise to 60 percent by 1995.

To verify Ryzhkov's claims and to assess Soviet capabilities to shift defense industry resources from military to civil goods, we have developed independent estimates of the share of civil production in defense industry for the period 1965-88. We did so by combining British academic estimates and official Soviet data on the defense industry's production of selected civil commodities with CIA estimates of Soviet industrial and weapons production.

From this analysis, we judge that Ryzhkov's claim that, in 1988, civil production represented 40 percent of Soviet defense industry's output is technically defensible, but misleading for three reasons. First, the defense industry's civil output share was artificially inflated in 1988, when a civilian machine-building ministry was disbanded and some 260 civil machine-building enterprises were resubordinated to the defense industry. Ryzhkov includes the output of these 260 enterprises in his 40-percent figure. Second, much "civil" output consists of high-quality capital equipment designed for weapons producers' requirements. Finally, the Soviets probably are classifying other dual-use producer durables procured by the military—such as transport aircraft produced for Military Transport Aviation—as civil products.

While we have been able to verify the technical accuracy of Ryzhkov's statement, we believe it will be difficult to continue to make valid comparisons between the past and future composition of the defense industry's output, even with the greatly increased release of data on civil production by the defense industry. The primary problem in using such data to track the process of conversion will be the defense industry's continually changing administrative structure. The March 1988 expansion of defense industry was only the first organizational change. In July 1989

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the Soviets announced mergers that combined four of the ministries in the defense complex into two. At the same time, however, the Ministry of Medium Machine Building, the Soviet nuclear weapons authority, was transferred from the defense industry to the Fuel and Energy Complex and three formerly civil organizations—the State Committee for Computer Technology and Information Science and the ministries of Civil Aviation and Communications—were added to the defense complex. The Soviets may, in fact, be able to increase the share of civil production in defense-industrial output to 60 percent, their stated target, not just by converting weapons production facilities to civil production, but also by continuing to resubordinate either civil factories to defense industry or defense production facilities to the civil sector.

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Scope Note

This report constructs historical estimates of the split between weapons and civil production in the Soviet defense industry. Its purpose is to test official claims of the current composition of output of defense industry, to put into perspective announced plans for major shifts from weapons to civil production by 1995, and to evaluate our ability to verify the occurrence of such shifts. It does not address Soviet capabilities to convert from military to civil production at any specific weapons production facility

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USSR: Estimating the Composition of the Defense Industry's Output

The Soviet Defense Industry: An Introduction

In Soviet usage, the terms "defense industry" or "defense complex" generally refer to all ministries and enterprises formally subordinate to the Military-Industrial Commission (VPK).¹ The Soviet defense industry—the world's largest producer of weapons—manufactures every major weapon system produced in the Soviet Union with the exception of some types of land arms. The Soviets do not consider those enterprises that produce land arms, but are subordinate to a civil ministry, to be part of the defense complex.

Until July 1989 the defense industry was made up of nine industrial ministries. At that time, however, Soviet Premier Ryzhkov announced mergers that combined four of the defense-industrial ministries into two, initially reducing the total number of ministries in the defense industry from nine to seven. At the same time, however, the administrative boundaries of the defense industry were altered. Though they produce no major weapon systems, the ministries of Civil Aviation and Communications were formally subordinated to the VPK, as was the State Committee for Computer Technology and Information Science. Moreover, the Ministry of Medium Machine Building, the nuclear weapons authority, was removed from defense industry and transferred to the Fuel and Energy Complex (see table 1).

While the reasons for this administrative reorganization are not yet clear, it is not unusual for the VPK to oversee the production of some civil goods. Indeed, the defense industry has never produced weapons exclusively. Since its inception it has also produced a

¹ Most government management of the defense industries is performed by the Council of Ministers' Military Industrial Commission, which coordinates and controls all military-related research, design, development, testing, and production activities, and serves as a primary orchestrator for defense-industrial acquisition and assimilation of foreign technologies. See DI Reference Aid SOV 86-10016 (Unclassified), September 1986, *The Soviet Weapons Industry: An Overview*, for an unclassified description of the Soviet weapons industry.

variety of civil goods, ranging from refrigerators, to radios and machine tools, to motorcycles. There are three historical reasons for production of specific civilian product lines, the first being necessity. As the Soviet Union's most technologically developed sector, the defense industry has often had to design and manufacture specialized producer durables, such as advanced numerically controlled machine tools for the aviation industry, simply because the civil machine-building sector has been unable to do so. Next, defense-industrial ministries have produced some civil goods because they are the most logical producers of those goods. For example, the Ministry of Aviation Industry remains the exclusive domestic producer of civil aircraft. Finally, defense industry has produced civil goods such as samovars as profitable sidelines—especially when these goods can be made from otherwise unusable materials left over from weapons production.

Civil production at some defense-industrial enterprises predates the revolution. Much of the defense industry's involvement in civil production since then, however, has been a deliberate result of leadership policies. Under Stalin, the defense industry was tasked to develop manufacturing technologies for civil production, but which could also be easily converted to military production during mobilization for war. Thus, the defense industry pioneered the domestic production of many types of technologically complex models of prewar machine tools.² Defense factories were also directed to use spare capacity to produce civilian products technologically related to their basic military products to maintain work force skill levels and facilitate surging weapons production in case of

² A comprehensive look at the defense industry's historical contributions is given in Julian Cooper's "The Civilian Production of the Soviet Defence Industry," *Technical Progress and Soviet Economic Development*, ed. Ronald Anis and Julian Cooper, (Oxford: Basil Blackwell, Ltd., 1986), pp. 31-50.

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Table 1
The Soviet Defense-Industrial Complex

Ministry or Committee	Defense Responsibilities	Impact of July 1989 Reorganization
Aviation (MAP)	Aircraft, spacecraft, ASW, and air-to-air, air-to-surface, and surface-to-air missiles	
Defense Industry (MOP)	Conventional ground force weapon systems: antitank guided, tactical surface-to-air, ASW, and some ballistic missiles	Acquired Machine Building (MM)
Machine Building (MM) ^a	Conventional ordnance munitions fuzing and solid propellants	Merged with MOP
Electronics Industry (MEP)	Electronic parts, components subassemblies, and computers	
General Machine Building (MOM)	Ballistic and cruise missiles, submarine fire-control systems, lasers, spacecraft, and space-launch vehicles	
Medium Machine Building (MSM)	Nuclear weapons and high-energy lasers	Moved to Fuel and Energy Complex
Radio Industry (MRP)	Radars, communications equipment, computers, guidance and control systems, and lasers	Acquired MPSS
Communications Equipment Industry (MPSS) ^a	Communications equipment, radar components, electronic warfare components, military computers, and facsimile equipment	Merged with MRP
Shipbuilding Industry (MSP)	Naval ships and weaponry, submarine detection systems, naval acoustic systems, and radars	
Civil Aviation	None known	Newly added
Communications	None known	Newly added
State Committee for Computer Technology and Information Science	None known	Newly added

^a Disbanded/merged.

mobilization. By the late 1930s the defense industry was producing textile machinery, tractors, turbines, railcars, excavators, and optical equipment.

Beginning in the 1950s, many defense industry enterprises initiated new lines of civil production. Although the leadership provided most of the impetus for this move, profitability was also a consideration. Khrushchev's campaign to pressure the defense industry to increase its contributions to the consumer was much publicized, and even Brezhnev, a staunch defender of parochial military interests, called for the defense industry to step up production of equipment for agriculture as well as for light, food-processing, and medical industries. Indeed, throughout Brezhnev's

regime—and the subsequent short tenures of Andropov and Chernenko—the defense industry's role in civilian production continued to grow: by the mid-1980s it was producing nearly all consumer electronics and most large household durables such as refrigerators and washing machines. In addition, many cars, trucks, motorcycles, and tractors were produced by the defense sector. The defense industry, through the Ministry of Medium Machine Building—the Soviet nuclear weapons authority—even produced radioactive isotopes and associated medical equipment for the Soviet Ministry of Health.

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Benefits to the Consumer

Because the defense industry traditionally has had priority access to industrial materials, skilled labor, and resources, the Soviet consumer has often benefited from defense production of civil goods. In cases where both civil and defense industries produce similar goods, the item produced by the defense industry tends to be of higher quality. Soviet consumers often look for goods having a post office box as a manufacturer's address—a sign that they were produced by the defense industry. The absolute quality of the defense industry's civil output has not always been high, however. The defense industry, for example, is the exclusive domestic manufacturer of Soviet color TVs, whose faulty construction has reportedly resulted in thousands of apartment fires in Moscow alone.

Such quality problems reflect the ambivalence that many defense enterprises have toward production of civil items. Despite being a profitable sideline in many instances, the defense industry's performance has been judged primarily on how well it meets targets for weapons production. These targets are set by the VPK and enforced by the Ministry of Defense's on-site military representative system. Before Gorbachev, any conflicts between weapons and civil production goals tended to be resolved in favor of weapons production. During the pre-Gorbachev period, leadership exhortations for the defense industry to better meet its obligations to the consumer were more in the nature of pleas to make better use of those resources left after military needs were satisfied, rather than any real changes in the priority Moscow placed on guns versus butter.

Claims and Promises

Despite the important role the defense industry plays in the civil economy, figures on nonweapons production have until recently been a closely held secret and a matter of some controversy. In 1971, Leonid Brezhnev claimed that 42 percent of the defense industry's production was civil in nature. Brezhnev's language was ambiguous, however, and we believe he was referring only to the civil production of one defense-industrial ministry—the Ministry of the Defense Industry—and not to that of the entire defense-industrial complex. This ministry primarily produces land

arms but also manufactures oil drilling equipment, refrigerators, machine tools, motor vehicles, and tractors. It is the defense-industrial ministry with the largest share of civil production.

Following Brezhnev's statement, no other official claims appeared until January 1989, when General Vitaliy Shabanov, the Soviet Deputy Minister of Defense for Armaments, claimed the share of civil production in the defense industry's output was 50 percent. This figure was repeated three days later by Academician Roald Sagdeyev. In March 1989, however, Soviet Premier Ryzhkov, speaking to members of the international press, put the share of defense industry's civil output at 40 percent.¹ He later promised that the share of civil production would rise to 46 percent by 1990 and 60 percent by 1995—in part reflecting the effort to convert weapons-producing facilities to civil tasks. Since March all other officials have used the 40-percent figure—even Shabanov, who explicitly cited Ryzhkov in a 9 May 1989 interview on Soviet television.

Estimating the Defense Industry Output, 1965-88

To test Ryzhkov's claim, we have developed estimates of the Soviet defense industry output during the period 1965-88 for three major product groups—producer durables, consumer durables, and defense hardware.² The composition of the defense industry's machinery output can, in turn, be determined after aggregating the output of the three product groups. The estimates themselves are developed from the

¹ In addition to the overall share, senior defense industry officials have announced civil production shares for some individual ministries. The former minister of the Ministry of the Defense Industry put its current share of civil output at 50 percent (*Pravda*, 14 March 1989, p. 2), and the ministers of the Aviation and Shipbuilding Industries claimed the current shares of civil production in their ministries were 35.8 percent and 42 percent, respectively (*Ekonomicheskaya gazeta*, No. 21, May 1989, p. 15).

² Producer durables are capital equipment such as machine tools, computers, and civil aircraft. Consumer durables include goods such as TVs, radios, samovars, and bicycles. Defense hardware includes land, air, and naval arms and defense electronics.

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CIA's commodity-based measure of industrial production, estimates by a British academic of the defense industry's civil commodity production during 1965-85, official Soviet data on the defense industry's civil commodity production in 1988, and CIA estimates of Soviet weapons production.

Producer Durables Production

The value of the defense industry's output of specific producer durables was calculated directly from CIA's estimates of civil aircraft and shipbuilding output; British estimates of the defense industry's production of tractors, railway cars, and machine tools;² and Soviet official data. For example, to obtain the value of the defense industry's computer output, the one available historical estimate of the defense industry's share of computer production in 1985, 0.90, is multiplied by the CIA's time series on the value of computer production in constant 1982 prices to obtain the value for 1985 and earlier years. Because the defense industry is the sole manufacturer of many advanced instruments, we estimate its share of instrument production as one-third, even though we do not have a historical source for this estimate. The summation of these calculations is shown in table 2. The details of these calculations are shown in appendix B.

The CIA's measure of Soviet industrial production includes a number of common end-use producer durables, such as trucks that are produced for the Soviet military, but it excludes those transport aircraft and helicopters that are produced for the Soviet military. There is often, however, no intrinsic difference between Military Transport Aviation (VTA) aircraft

² Professor Julian Cooper has estimated the defense industry's production shares for various producer and consumer durables for 1965-85. (See Julian Cooper's "The Scale of Output of Civilian Products by the Soviet Defence Industry," *Soviet Industry and Technology Series*, Discussion Paper No. 3, Table 1 [University of Birmingham: Centre for Russian and East European Studies, August 1988]. An abridged version of Cooper's Table 1 is provided in this report as appendix A1. Cooper's estimates are based on more than three decades of academic research into the Soviet defense complex. He has publicly identified over 100 plants subordinate to the defense sector. His plant subordination estimates are based on either explicit open-source identification, in some cases dating back to the 1920s; Soviet defense-related VEP plant visits reported in the Soviet press; or identification of a plant in Western secondary sources.

Table 2
Soviet Defense Industry Output of Selected
Producer Durables - (Constant 1982
Enterprise Wholesale Prices)

	Value of Output
1965	3,687
1970	5,952
1975	12,666
1980	13,251
1985	12,057
1988	11,357

³ We have little or no information on defense industry's production of miscellaneous producer durables such as plumbing equipment, and thus have not made any estimates of their value. Consequently, the totals shown for the value of producer durables output should be viewed as minimum figures.

and those produced for Aeroflot. Similarly, a transport helicopter can carry a slingload of either ammunition or oilfield equipment with equal facility. Claims that the VTA will carry 50,000 tons of civil cargo in 1989 suggest that the Soviets may consider dual-use transport aircraft and helicopters not as weapons, but as producer durables (see table 3).

Consumer Durables Production

Consumer durables production is estimated directly using published Soviet data on total production and prices, as well as Julian Cooper's estimates of the defense industry's share of production during the period 1965-85 for consumer durables, including automobiles, mopeds, motorcycles, bicycles, cameras, refrigerators, tape recorders, radios, vacuum cleaners, televisions, washing machines, and watches and clocks. The annual Soviet handbook of economic statistics, *Narudnoe khozyaystvo*, lists production quantities for each of these items. Enterprise wholesale prices for these items were taken from a price list published by the State Planning Commission of the

³ See Aleksey Izyumov, "Shortcomings in the Current Conversion Effort," *Literaturnaya gazeta*, 12 July 1989, p. 11.

Table 3 *Million 1982 rubles*
Soviet Defense Industry's Total Output of Selected Producer Durables, Final Demand in Established Prices

	Producer Durables at Enterprise Wholesale Prices	+ VTA Transport Aircraft and Helicopters at Established Prices	= Total Defense Producer Durables
1965	3,687	1,962	5,649
1970	5,952	2,936	8,888
1975	12,666	4,472	17,138
1980	13,251	4,490	17,741
1985	12,057	5,866	17,923
1988	11,357	7,825	19,182

Table 4 *Billion 1982 rubles*
Value of Soviet Defense Industry's Selected Consumer Durable Production

	Enterprise Wholesale Prices
1965	1,244
1970	2,078
1975	2,710
1980	3,264
1985	3,901
1988	5,044

RSFSR and converted to 1982 prices by using 1981-82 sector average conversion ratios. Using these data, the value of defense industry production of consumer durables is calculated directly as the sum of the 1982 price times the quantity produced for the 12 items listed above. The summation of these calculations is shown in table 4. The details of these calculations are provided in appendix C.

Weapons Production

The estimates of the total value of weapons production are taken directly from the CIA's assessment of the quantities produced of missiles, naval ships, combat aircraft, and other weapons valued in constant 1982 prices. Nearly all weapons are produced by the defense industry. However, roughly one-third of major land arms is produced at facilities such as Uralmash, which is subordinate to the Ministry of Heavy Machine Building—a civil ministry. Thus, the value of military hardware produced by the defense industry is calculated as a residual—total weapons production minus one-third of civil land arms. The summary of these calculations is shown in table 5.

¹Cited by Vladimir G. Treml, "Price Index for Soviet Machinery," Draft Working Paper, Duke University, September 1988.

Fitting the Pieces Together

Because producer durables, consumer durables, and weapons have been calculated in terms of shipments to final demand at enterprise-established prices,² relative shares can be calculated by aggregating the three components

The value of these three components of the defense industry's production of machinery for final demand and its composition in terms of final demand at established prices can now be calculated. As shown in table 6, we estimate that the share of weapons produced to meet final demand declined from 83 percent in 1965 to 71 percent a decade later and then

²Most of the consumer and producer durables listed in appendices B and C cannot be used as intermediate inputs. One exception, however, is computer equipment—some of which is probably used as an input to weapons or numerically controlled machine-tool production. The estimates of the defense industry's share of civil output developed subsequently in this paper will be slightly overstated to the extent that the defense industry uses computer equipment as material input in the production process. To some extent, this bias will be offset by the bias caused by our inability to estimate the value of the defense industry's production of producer durables such as plumbing supplies.

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Table 5 *Billions 1982 factor cost rubles*
Value of Soviet Defense Industry's Weapons Production

	Total Weapons Production *	1/3 of Civil Land Arms	Defense Industry Weapons Production
1965	33.3	0.7	32.5
1970	40.9	1.3	39.6
1975	48.9	1.3	47.6
1980	51.1	1.7	49.4
1982	48.9	1.8	47.1
1985	47.6	2.1	45.5
1988	53.2	2.3	50.9

* Weapons only. Excludes common-use producer durables such as military transport aircraft, transport helicopters, and naval auxiliaries.

to 68 percent in 1988. Conversely, the share of civil output manufactured to meet final demand nearly doubled during this period, from 17 percent in 1965 to more than 32 percent in 1988.

Moving From a Commodity to a Ministry Basis

The civil output share in the defense industry of 32.2 percent is not yet comparable to the 40-percent figure cited by Premier Ryzhkov. One reason is that our estimates were developed using commodity-based data, whereas the Soviets usually aggregate data on either an enterprise or a ministerial basis. When Soviet officials refer to the defense complex, they refer to all enterprises formally under the aegis of the VPK—whether the subordinate enterprise produces machinery or not. For example, the machine-building ministries—including the defense ministries—have subsidiary farms. Many machine-building ministries also have their own construction organizations. Lev D. Ryabev, the former Minister for Medium Machine Building, promised to deliver "turnkey projects" to the agroindustrial complex and would therefore probably include the value of any construction work involved in these projects as civil output.

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Table 6 *Millions 1982 rubles (except where noted)*
Production of the Defense Industry for Final Demand Established Prices *

	1965	1970	1975	1980	1985	1988
Producer durables	5,694 (14.3)	8,888 (17.6)	17,138 (25.4)	17,741 (25.2)	17,923 (26.6)	19,182 (25.5)
Consumer durables	1,244 (3.2)	2,078 (4.1)	2,710 (4.0)	3,264 (4.6)	3,901 (5.8)	5,044 (6.7)
Weapons	32,500 (82.5)	39,600 (88.3)	47,600 (70.6)	49,400 (70.2)	45,500 (67.6)	50,900 (67.8)
Total	39,393 (100)	50,566 (100)	67,448 (100)	70,405 (100)	67,324 (100)	75,126 (100)

* The percent of share structure is in parentheses.

We believe there are four basic differences between any recent ministry-based figures cited by the Soviet leadership and the commodity-based estimates of defense industry output derived above. Soviet official claims on civil output in the defense-industrial ministries reflect:

- The defense industry's 1 March 1988 absorption of enterprises formerly belonging to the now dissolved Ministry for Machine Building for Light and Food Processing Industries and Household Appliances (*Minlegpishchemash*).
- Nonmachinery civil output by machine-building enterprises subordinate to the defense ministries.
- Output of non-machine-building enterprises subordinate to the defense ministries.
- The probable use of gross output rather than deliveries to final demand.

To take account of these differences, we first adjusted our estimates of civil production in the defense industry to include production of machinery for food processing and light industry. Recent Soviet statistics on the composition of the defense industry's output include the production from 260 enterprises that were transferred to defense industry on 1 March 1988, when *Minlegpishchemash* was disbanded.⁶ The inclusion of the output of these resubordinated factories serves to artificially inflate the share of civil goods production in the total output of the defense industry.

Estimating the size of this effect is straightforward. The various issues of *Narodnoye khozyaystvo* provide data on the value of output of equipment for food processing and light industry. Recent Soviet statements and official statistics reveal that, before 1988, almost all of this equipment was produced in *Minlegpishchemash* or the defense industry. These production figures are shown in table 7.

Accounting for Nonmachinery Consumer Goods

The recently published Soviet consumer goods handbook, *Proizvodstvo tovarov narodnogo potrebleniya v SSSR*, provides 1988 data on consumer goods production for eight of the nine former defense-industrial ministries, excepting only the smallest—the historically secretive Ministry of Medium Machine Building. The handbook reveals that the defense industry produced 26,603 million rubles' worth of consumer goods—at retail prices. Much of this, though, represents consumer durables production that has already been counted (see appendix C). The additional consumer goods include such nonmachinery items as furniture, china, and badminton racquets and may represent over 5 billion rubles' worth of additional civil production when valued in enterprise wholesale

⁶ Igor Belousov, the head of the VPK, in a 10 February 1989 *Sovetskaya Rossiya* interview, almost certainly included the output of the resubordinated plants in his statement on the value of defense industry's production of equipment for the food-processing industry. He stated that the defense industry's production of such equipment was 865 million rubles in 1987 and over 1 billion rubles in 1988. Given that national production of such equipment was 867 million rubles in 1987 and that *Minlegpishchemash* was the major producer of such equipment, Belousov's share estimates must include the output of the resubordinated plants. Claimed defense industry production shares for refrigerators, washing machines, and vacuum cleaners show similar increments in 1988.

prices.⁷ Including the production of such goods in the defense industry's output further reduces the share of weapons production in total output. This effect, and the effect of including equipment for food processing and light industry and nonmachinery output, is shown in the following tabulation:

The value of the production of the defense industry for final demand in 1988, in million 1982 rubles, and the percentage share of the total in each category (in parentheses) can be broken down as follows:

	Producer Durables	Consumer Durables	Weapons	Total
Not including equipment for food processing and light industry	19,182	5,044	50,900	75,126
Including equipment for food processing and light industry	1,997	0	0	1,997
Including nonmachinery consumer goods	0	5,596	0	5,596
Expanded defense industry production totals	21,179 (25.6%)	10,640 (12.9%)	50,900 (61.5%)	82,719 (100%)

Factors Not Taken Into Account

Ideally, we would like to adjust the commodity coverage of the defense industry's output by including the output of subsidiary farms and the value of functions such as construction work performed by defense-industrial construction organizations. Unfortunately, no official data have been published on the size of these effects, although we believe their inclusion would slightly reduce the share of weapons production in total defense industry output.

⁷ Soviet retail prices are much higher than enterprise wholesale prices. The Soviet newspaper *Sovetskaya torgovlya* gave 1988 retail prices for many of the consumer durables in the sample (see appendix D). The ratio of retail prices to the estimated 1982 wholesale prices for the sample was 2.5. If this ratio is valid for all defense consumer goods production, the 1988 value of such production in 1982 wholesale prices is 26,600 divided by 2.5 or 10,640 million rubles. The additional production of nonmachinery consumer goods by defense industry in 1988 is thus total production minus consumer durables production, that is, 10,640 million rubles minus 5,044 million rubles (from table 6), or 5,596 million rubles.

Table 7
Production of Food Processing and
Light Industry

	Million rubles			
	1985	1986	1987	1988
Food-processing equipment	810	855	867 ^a	1,029
Light industry equipment	955	983	932	987 ^b
Total	1,765	1,838	1,799	2,016

^a The defense industry produced 865 of 867 million rubles' worth of this equipment, according to VPK Chairman Igor Belousov.

^b The defense industry produced 968.3 of the 987-million-ruble total for 1988, according to the recently released Statistical Handbook, *Proizvodstvo tovarov narodnogo potrebleniya v SSSR*, Moscow, 1989.

The last problem considered is the Soviet accounting practice of measuring output using a ministry's gross value of output (GVO), rather than its value-added or final sales. Gross value of output double-counts intermediate goods, and the degree of double-counting may differ between defense and civil production. Thus, the share of weapons production measured in terms of GVO could be different from the share of weapons production measured in terms of final sales. One source of bias might be that weapons, on average, are more complex than civil goods, and their manufacture requires more interfactory and interministerial shipments of industrial materials, which would increase the share of weapons output measured in terms of GVO.

The potential size of this bias seems small. For 1985 sufficient Soviet data are available to reconstruct a GVO-based share structure of the defense industry (see appendix E). The data suggest that, in 1985, the defense industry's share of civil output was about 30.9 to 31.3 percent on a GVO basis, while we estimate that the defense industry's share of civil output was 32.4 percent on a final-demand basis. Since the 1985 final-demand estimate, like estimates for all years other than 1988, excludes defense industry's pre-Minlepnishchemash production of equipment for the

light and food-processing industries and some consumer goods, it understates the share of civil goods—but only slightly. The closeness of the final-demand and GVO estimates thus suggests that any bias caused by the use of the GVO measure is approximately the same size as the small bias resulting from the incomplete coverage of the pre-1988 measures of final demand. Thus, Soviet use of GVO does not seem to cause any major bias in measuring civil shares of defense output.

Comparisons With Soviet Statements

As detailed at the beginning of this report, highly placed Soviet spokesmen claimed that, in 1988, Soviet defense factories produced a mix of 60 percent military hardware and 40 percent consumer goods. CIA's 1988 estimate, developed above, of the composition of output of the defense industry is that weapons represent 61.5 percent of defense industry's output in 1988—after including equipment for food processing and light industry and nonmachinery consumer goods, and classifying as civil goods both high-quality capital equipment used to produce weapons and the dual-use transport aircraft produced for Military Transport Aviation. Thus, it appears that the current share of weapons output in defense industry production claimed by Soviet officials is technically defensible.

Implications for Verification of Future Soviet Claims

The historical estimates developed above of the composition of output of the Soviet defense industry show a gradual but long-term increase in the share of civil goods in defense industry production. Soviet plans call for a sharp acceleration of this trend. Our ability to use Soviet official data to track the planned transformation of the defense industry will depend not only on the continued availability of data, but also on the extent of future administrative reorganizations of the defense-industrial complex.

The Soviets have recently greatly increased the release of data on civil production in the defense industry—providing aggregate production values of

civil goods and production of selected commodities (primarily consumer goods) both for the complex and individual ministries. We expect the Soviets will continue to release this type of information, in which case we should be able to verify whether their claims are valid.

Problems are more likely to arise in evaluating the defense industry's progress in meeting Gorbachev's conversion goals, given the continuing process of streamlining and merging the industrial bureaucracies. Last year's acquisition of *Minlegpishchemash* by the defense industry artificially inflated the share of civil output in defense industry production by several percentage points. The administrative reorganization in July 1989 muddied the waters further, but it appears likely that recent Soviet claims that half of the defense industry's current output is civil in nature include the value of goods and services provided by the Ministries of Civil Aviation and Communications in the defense industry's output.

It remains to be seen how the Soviets will define the boundaries of the defense industry in the future—they may, in fact, be able to go much of the way toward

fulfilling their target of raising the share of civil production in the defense complex to 60 percent merely by continuing to resubordinate civil factories to the defense industry or, as with nuclear weapons production, resubordinating defense-related production to the civil sector. The administrative changes Gorbachev has initiated for the defense industry will make it very difficult to continue to make valid comparisons between the past and future composition of the defense industry's output. This, in turn, means that, while we may still be able to use official Soviet economic data to verify future claims on the composition of the defense industry's output for a given year, we may not be able to use this data to determine whether changes in the composition of defense industry output result from administrative reorganization or from the actual conversion of weapons production lines to civil production.

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Appendix A

Defense Industry's Production Share
of Selected Commodities *

Product	1965	1970	1975	1980	1985	1988
Metal-cutting machine tools (MAP, MOP, MM, MOM, MSP, MRP) *	NA	(14) *	(14)	(14)	(13)	20
Including NC machines	NA	(42)	(36)	(30)	(26)	18
Tractors (MOP, MOM)	13	13	(14)	(15)	(15)	13
Irrigators (MSP) *	NA	NA	NA	9	12	NA
Railway freight cars (MOP)	NA	(33)	(30)	(27)	NA	NA
Tramcars (MOM)	72	55	65	60	NA	NA
Passenger cars (MOP)	NA	11	10	10	(12)	10
Motorcycles and scooters (MOP)	73	69	68	(64)	(63)	56
Bicycles (MM)	44	37	(39)	(42)	(40)	57
Mopeds and motorized cycles (MM)	23	21	21	21	NA	NA
Refrigerators (MOM, MAP, MM, MOP, MRP)	48	48	(48)	(48)	NA	98
Washing Machines (MAP, MM, MOP, MSP, MOM)	(41)	(38)	(32)	(27)	(27)	69
Vacuum cleaners (MAP, MOP, MSP)	49	(42)	(46)	(43)	NA	78
Television sets (MPSS, MRP, MOM, MEP)	100	100	100	100	100	100
Radios (MPSS, MRP, MEP, MSP, MM, MOM [?])	100	100	100	100	100	100
Tape recorders (MPSS, MRP, MEP, MM, MAP, MSP)	(95)	(95)	(95)	(95)	(95)	98
Video cassette recorders (MEP, MAP, MM, MSP)	100	100	100	100	100	100
Personal computers (MRP, MEP)	NA	NA	NA	NA	(90)	NA
Including home computers (MRP, MEP)	NA	NA	NA	NA	100	98
Clocks and watches (MM, MAP, MEP)	12	12	(11)	(11)	(19)	22
Cameras (MOP, MAP)	100	100	100	100	100	100
Furniture (value terms)	NA	NA	NA	2	2	3
Consumer goods (MAP, MSP, MOP, MEP, MPSS only [value terms])	NA	NA	14 *	17 *	21 *	23

Note: Appendix A is taken from table 1 in Julian Cooper, "The Scale of Output of Civilian Products by the Soviet Defence Industry," *Soviet Industry and Technology Series*, Discussion Paper No. 3, (University of Birmingham: Centre for Russian and East European Studies, August 1988). Data for 1988 were taken from the recently released statistical handbook, *Proizvodstvo i vyvoz narodnogo potrebleniya v SSSR*, Moscow 1989.

* The share of total Soviet output of civilian products from enterprises of the defense industry (percent of total output in physical unit terms, unless otherwise specified).

* Acronyms used in this appendix are explained in table 1.

- NA = not known

() = estimate

* Share of total deliveries to agriculture. Some irrigators are built at MOP enterprises, but the scale of production and deliveries is not known. The share shown refers to the shipbuilding industry alone.

* Data not available for MOM, MM, MRP, and MSM.

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Appendix B

Defense Industry's Output of Selected Producer Durables

	1965	1970	1975	1980	1985	1988
Kirov tractors^a						
Total output (thousands)	3.1	7.4	14.5	16.8	18.1	18.1
Defense industry output share (percent)	100	100	100	100	100	100
1982 price (rubles)	20,600					
Defense industry output (million rubles)	63.9	152.4	298.7	346.1	372.9	372.9
Southern Machine Building Plant tractors^a						
Total output (thousands)	19.2	23.9	23.9	25.9	26.1	26.1
Defense industry output share (percent)	100	100	100	100	100	100
1982 price (rubles)	4,400					
Defense industry output (million rubles)	84.5	105.1	105.1	113.9	114.9	114.9
Nizhny-Tagil mainline freight cars^b						
Total output (thousands)	19.2	19.2	23.1	18.9	15.4	15.4
Defense industry output share (percent)	100	100	100	100	100	100
1982 price (rubles)	6,600					
Defense industry output (million rubles)	126.7	126.7	152.5	124.7	101.6	101.6
Machine tools^c						
Total output (million rubles)	638	978	1,493	2,135	3,076	3,243
Defense industry output share (percent)	14	14	14	14	13	20
Defense industry output (million rubles)	89.3	136.9	209.0	298.9	399.9	648.6
Computers and computer equipment						
Total output (million rubles)	59	169	1,024	2,400	4,202	
Defense industry output share (percent)	90	90	90	90	90	(5,000) ^d
Defense industry output (million rubles)	53.1	152.1	921.6	2,160.9	3,781.8	5,000
Precision instruments						
Total output (million rubles)	607	1,140	2,049	3,521	4,531	5,400
Defense industry output share (percent)	33.3	33.3	33.3	33.3	33.3	33.3
Defense industry output (million rubles)	202.1	380.0	682.3	1,172.5	1,508.8	1,800.0
Civil shipbuilding						
Total output (million rubles)	484	511	656	512	420	446
Defense industry output share (percent)	100	100	100	100	100	100
Defense industry output (million rubles)	484	511	656	512	420	446

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Defense Industry's Output of Selected Producer Durables (continued)

	1965	1970	1975	1980	1985	1988
Civil aircraft						
Total output (million rubles)	2,583	4,388	9,641	8,523	5,357	2,873
Defense industry output share (percent)	100	100	100	100	100	100
Defense industry output (million rubles)	2,583	4,388	9,641	8,523	5,357	2,873
Total output of selected defense industry producer durables (million rubles)	3,687	5,952	12,666	13,251	12,057	11,357

^a See table 3 in Julian Cooper, "The Scale of Output of Civilian Products by the Soviet Defence Industry."

^b *Ibid.*, table 6.

^c *Ibid.*, table 2.

^d The Central Committee secretary for defense industry, Oleg Baklanov, claimed that, "every year, the defense complex produces computer equipment worth 5 billion rubles." Quoted by TASS International Service on 25 August 1989.

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Appendix C

Defense Industry's Output of Selected Consumer Durables

	1965	1970	1975	1980	1985	1988
Automobiles						
Total output (<i>thousands</i>)	201.2	344.2	1,201	1,327	1,332	1,416
Defense industry output share (percent)	0	11	10	10	12	10
1981 price	2,472					(130)
1982/1981 price ratio	1.062					
Defense industry output (<i>million rubles</i>)	0	99.4	315.3	348.4	419.6	341.3
*Motorcycles						
Total output (<i>thousands</i>)	711	833	1,029	1,090	1,148	1,068
Defense industry output share (percent)	73	69	68	64	63	56
1981 price	488.34					(601)
1982/1981 price ratio	1.062					
Defense industry output (<i>million rubles</i>)	269.2	298.1	362.9	361.8	375.1	311.7
Bicycles						
Total output (<i>thousands</i>)	3,873	4,442	5,007	5,452	5,362	5,637
Defense industry output share (percent)	44	37	39	42	40	56
1981 price	65.38					(3,176)
1982/1981 price ratio	1.062					
Defense industry output (<i>million rubles</i>)	118.3	114.1	135.6	159.0	148.9	22.5
Cameras						
Total output (<i>thousands</i>)	1,053	2,045	3,031	4,255	2,085	2,720
Defense industry output share (percent)	100	100	100	100	100	100
1981 price	51.94					(130)
1982/1981 price ratio	0.745					
Defense industry output (<i>million rubles</i>)	4.7	79.1	117.3	164.6	8.7	105.1
Tape recorders						
Total output (<i>thousands</i>)	453	1,192	2,525	3,045	4,665	5,543
Defense industry output share (percent)	95	95	95	95	95	98
1981 price	54.65					(5,406)
1982/1981 price ratio	0.745					
Defense industry output (<i>million rubles</i>)	17.5	46.1	97.7	117.8	18.4	22.1

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Defense Industry's Output of Selected Consumer Durables (continued)

	1965	1970	1975	1980	1985	1988
Color televisions						
Total output (thousands)	0	46	589	2,262	4,024	5,693
Defense industry output share (percent)	100	100	100	100	100	100
1981 price	388.22					
1982/1981 price ratio	0.745					
Defense industry output (million rubles)	0	13.3	17.4	654.2	1,163.8	1,646.6
Black and white televisions						
Total output (thousands)	3,655	6,636	6,371	5,266	5,347	3,935
Defense industry output share (percent)	100	100	100	100	100	100
1981 price	13.57					
1982/1981 price ratio	0.745					
Defense industry output (million rubles)	355.5	645.5	619.7	512.2	52.1	382.8
Radios						
Total output (thousands)	5,160	7,815	8,376	8,478	8,849	8,026
Defense industry output share (percent)	100	100	100	100	100	100
1981 price	47.82					
1982/1981 price ratio	0.745					
Defense industry output (million rubles)	183.8	278.4	298.4	302.0	315.3	285.9
Watches and clocks						
Total output (thousands)	30,570	40,200	55,100	66,700	67,200	73,500
Defense industry output share (percent)	12	12	11	14	19	22
1981 price	10					(16,000)
1982/1981 price ratio	0.745					
Defense industry output (million rubles)	27.3	35.9	45.2	69.6	95.1	119.2
Refrigerators						
Total output (thousands)	1,675	4,140	5,579	5,925	5,860	6,231
Defense industry output share (percent)	48	48	48	48	48	100
1981 price	150					(6,228)
1982/1981 price ratio	1.083					
Defense industry output (million rubles)	13.6	322.8	435.0	462.0	456.9	1,011.7

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Defense Industry's Output of Selected Consumer Durables (continued)

	1965	1970	1975	1980	1985	1988
Manual washing machines						
Total output (thousands)	2,847	4,344	2,425	2,851	3,830	4,612
Defense industry output share (percent)	41	38	32	27	27	69
1981 price	49.35					
1982/1981 price ratio	1.068					
Defense industry output (million rubles)	61.5	87.0	4.9	4.6	54.5	168.8
Automatic washing machines						
Total output (thousands)	585	899	861	975	1,238	1,491
Defense industry output share (percent)	41	38	32	27	27	69
1981 price	106.25					
1982/1981 price ratio	1.068					
Defense industry output (million rubles)	27.2	38.8	31.3	29.9	37.9	117.7
Vacuum cleaners						
Total output (thousands)	800	1,509	2,920	3,222	4,065	4,795
Defense industry output share (percent)	49	42	46	43	43	78 (3,722)
1981 price	28.38					
1982/1981 price ratio	1.068					
Defense industry output (million rubles)	11.9	19.2	4.7	42.0	53.0	112.8

Note: Consumer durable production is taken from *Narodnoe khozyaystvo*, various years. Prices in 1981 are taken from a Gosplan RSFSR handbook, cited by Vladimir B. Trenl, Price Index for Soviet Machinery, Draft Working Paper, Duke University, September 1988. Output values for 1988 represented as (...) are taken from *Proizvodstvo tovarov narodnogo potrebleniya v SSSR*, Moscow, 1990.

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Appendix D

Retail Prices of Selected
Consumer Goods, 1988

Item	Ruble Price
Automobiles	7,630.00*
Motorcycles	957.30
Bicycles	92.20
Cameras	76.00
Tapc recorders	318.90
Color TVs	694.20
Black and white TVs	232.70
Radios	118.20
Watches and clocks	26.90
Refrigerators	312.00
Washing machines	103.90
Vacuum cleaners	46.80

* 1987 retail price. Derived by dividing the value of auto sales through state retail stores and consumer cooperatives, 13,544 million rubles, by the number of automobiles sold in 1987, 1,775,000. Source for the value of sales is the 1987 *Narodnoye khozyaystvo*, p. 420. Source for the volume of sales is *Sotsial'naya razvitiye SSSR*, Goskomstat, Moscow, 1988. All other prices are taken from the May 1989 special edition Number 7 of *Sovetskaya trgovlya*, p. 3.

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Appendix E

An Alternative Estimate of the Defense Industry's Composition, 1985

It is possible to estimate the composition of the defense industry's output in 1985 using Soviet data and published GVO production figures. This results in an estimate of the share of the defense industry's civil production in 1985 that is nearly the same as the estimate based on final demand at enterprise-established prices. The GVO share estimate is developed by combining data from a number of separate Soviet statements. The estimate may be flawed if the Soviets cited below were not using some common basis for their statements

Gross Value of Machine-Building
Output, by Source and Type, 1985

Billion rubles

		Scenario I	Scenario II
	Total machine-building output	220.2	220.2 ^a
Minus	Output of machine-building enterprises subordinate to non-machine-building ministries	14.6	16.0 ^b
Equals	Output of defense industry and civil machine-building complex	205.6	204.2
Minus	Weapons output of defense industry	78.9	78.4 ^c
Minus	Output of the civil machine-building ministries	90.8	90.8 ^d
Equals	Residual—civil output of the defense industry	35.9	35.0

^a Machine building's 1985 gross value of output was 27.4 percent of 803.8 billion rubles. See *Narodnoye khozyaystvo v SSSR za 70 let*, pp. 126 and 132.

^b The productivity of workers in primary machine building is 3 to 3.3 times greater than the productivity of workers in secondary machine building (that is, enterprises subordinate to non-machine-building ministries) (A. P. Lyovin, *Intensifikatsiya i effektivnost' razvitiya mashinostroitel'nogo kompleksa SSSR*, Moscow, Izdatel'stvo "Nauka," 1986, p. 53). There are 16.38 million people employed in the machine-building sector, of whom 3.111 million are employed in secondary machine-building enterprises. (See *Trud*, 1988, and G. A. Dzhevadov, [ed.] *Mezhotraslevoye upravleniye proizvodstvom*, Moscow, Izdatel'stvo "Ekonomika," 1983, p. 48.) There are thus 13,269 million employees in primary machine building (includes the defense sector and the civil machine-building complex). A range of the value of output produced by secondary machine building can be calculated by solving for "X" in the following equations, where "X" is the gross value of output per million workers in secondary machine building:

$$13,269 \text{ times } 3.0 \text{ times } X + 3,111 \text{ times } X = 220.2;$$

$$\text{thus } X = 5.13; \text{ and } 3,111 \text{ times } X = 16.0$$

$$13,269 \text{ times } 3.3 \text{ times } X + 3,111 \text{ times } X = 220.2;$$

$$\text{thus } X = 4.70; \text{ and } 3,111 \text{ times } X = 14.6 \text{ (C)}$$

^c Politburo member Yegor Ligachev, in a speech to the 18 July CPSU Conference, revealed that "in 1985 military output accounted for almost 40 percent of production at defense plants and in the machine-building complex." (*Pravda*, 21 July 1989.) Forty percent of 204.9 billion rubles is 82.0 billion rubles and 40 percent of 206.2 billion rubles is 82.5 billion rubles. In table 4 it was assumed that, of the 47.6 billion rubles' worth of weapons produced in 1985, some 2.1 billion rubles' worth of land arms were produced by civil machine building. Assuming that this proportion remains the same on a GVO basis, the GVO of weapons produced by civil machine building is (2.1/47.6) times 82.0 to 82.5 or 3.6 billion rubles. Thus, the value of weapons produced by defense industry is 82.0 to 82.5 minus 3.6 or 78.4 to 78.9 billion rubles.

^d The respected Soviet economist, V. K. Fal'tsman, stated that the (civil) machine-building ministries produced 11.3 percent of industrial output in 1985, 803.8 times 0.113 = 90.8. See "Methodological Problems of Planning and Forecasting an Acceleration in the Development of Machine Building," in *Ekonomika i matematicheskiye metody*, July-August 1987, p. 579.

The residual must represent the value of civil production by the defense industry in 1985. The resulting share structure for defense industry in 1985 based on gross value of output is thus:

	Low		High	
	Rubles	Percent Share	Rubles	Percent Share
Civil	35.0	30.9	35.9	31.3
Weapons	78.4	69.1	78.9	68.7
Total	113.4	100.0	114.8	100.0

This 30.9- to 31.3-percent range for civil output using gross value of output as the measure of production is close to the 32.4-percent share for civil output using deliveries to final demand at established prices developed in table 6.

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Appendix F

Glossary

Enterprise wholesale prices	Enterprise-established wholesale prices are the prices at which goods are valued when they leave the factory. These prices do not include transportation costs or turnover tax—a selective and highly differentiated tax on specific commodities, principally consumer goods. These are not market-based prices—they generally are set administratively in Moscow and do not reflect either relative scarcities or preferences. Prices tend to be based on an estimate by the State Committee for Price's estimate of the long-run average price of producing a given item.
Final demand	Some goods (raw materials, parts, and components) are intermediate products only, but many other goods can be used either as intermediate inputs in a production process or as final goods. If a radio is sold to a consumer, the radio counts toward final demand; if the radio is sold to an automobile manufacturer who installs the radio in an automobile and sells the automobile to a consumer, the radio counts as an intermediate product and the radio-equipped automobile is counted as final demand.
Gross value of output	Gross value of output (GVO) is a measure of the value of economic transactions occurring during an accounting period—normally during a year. If there is a single large plant that makes both radios (\$10) and autos (\$90) and sells one auto with a radio to a consumer for \$100, the value of economic transactions is \$100. If, on the other hand, the large plant divests itself of the radio plant and now buys a radio from the radio plant, installs the radio in an auto, and sells the auto with a radio to a consumer for \$100, the value of economic transactions is now \$110; that is, a \$10 sale of the radio to the auto plant plus a \$100 sale of the auto with a radio to the consumer. In the latter case, GVO has increased by 10 percent because of changes in plant organization, but the real value of goods delivered to final demand remains unchanged.