WORKING PAPER

Information Cutoff Date: 31 January 1979

Estimating Soviet Spending for Military Hardware From Machinebuilding and Metalworking Statistics

June 1979

Office of Strategic Research
Central Intelligence Agency

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From Machinebuilding and Metalworking Statistics

Preface

The subject of this paper is the estimation of Soviet spending for military hardware (missiles, aircraft, radar, tanks, etc.) from statistics on the output of the machinebuilding and metalworking (MBMW) industries. 25X1

The Soviet Union limits disclosure of its defense spending to the publication of a single entry for "defense" in the annual state budget. The scope of this entry is not defined and it significantly understates total defense expenditures. Western analysts, therefore, must estimate Soviet defense spending to analyze trends in Soviet resource allocation and to assess the impact of defense programs upon the Soviet economy. 25X1

CIA estimates Soviet spending for defense primarily by "direct costing", first identifying the activities that make up the annual defense effort, then estimating the costs of each. To check the results of the direct costing method, however, analysts inside and outside CIA have attempted to estimate selected categories of Soviet defense spending by calculating unidentified residuals in the USSR's national accounts. The residuals that can be calculated from MBMW output statistics have been the ones most often used. But before the MBMW residuals can be compared with direct costing estimates, the limitations of the MBMW data must be understood. This working paper describes the available data and the results which their analysis yields. Then it compares the MBMW residuals with direct costing estimates of Soviet spending for military hardware. 25X1

A summary of the paper's conclusion is to be found on pages v-x. A more detailed discussion of the method, the data, and the results begin on page 1. A comparison of the MBMW residuals with direct costing estimates is presented in an annex which begins on page 47. 25X1

This working paper was prepared in the Military-Economic Analysis Center of the Office of Strategic Research. Comments and queries regarding this paper are welcome. 25X1
25X1

-i-

SECRET

Contents

25X1

SECRET

Annex

List of Tables

iii

SECRET

Estimating Soviet Spending for Military Hardware
From Machinebuilding and Metalworking Statistics

Summary

Soviet military hardware producers belong to the MBMW
industries, and Soviet statistics on total MBMW output
apparently include the value of military hardware products.
Thus, the value of Soviet military hardware should be
obtainable as a residual of MBMW output after subtracting
the value of non-defense production (Table I). But the
unavailability of complete, compatible, and clearly defined
time series of the required MBMW statistics complicates the
estimating process and greatly reduces the reliability and
usefulness of its results.   25X1

        To illustrate the current state of the estimating art,
this paper calculates three time series of MBMW residuals
for 1966-75. Each includes annual best estimates and
estimated lower and upper limits within which the "true"
residuals might fall (Tables II & III). The first series
(Series A) is calculated from "official" Soviet statistics
on MBMW output in "establishment"* terms and in July 1, 1967
producers' prices. The second series (Series B)--which
includes residuals only for the years 1966 and 1972--is
calculated from Western estimates of MBMW output in
"commodity"** terms and in current producers' prices.
(These estimates are taken from Western reconstructions of
the Soviet input-output tables for 1966 and 1972). The
third series (Series C) is calculated from the author's own
estimates of MBMW output in "establishment" terms and in
current producers' prices. These estimates are based on
published Soviet reports of MBMW labor costs, their share of
MBMW production outlays, and MBMW profits.   25X1

        The necessity of presenting these separate and often
quite different series illustrates a basic problem of the
available MBMW data and in current Western understanding of
them. The differences among the annual residuals in each
series reflect the differences among the alternative MBMW
GVO statistics from which they are calculated. All the

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* Establishment MBMW statistics report the value of the
output of all MBMW establishments, including the value of
non-MBMW products.

** Commodity MBMW statistics report the value of all MBMW
output, including that of non-MBMW establishments.

-v-

SECRET

Table I

Flow Chart for Calculating the Value of Soviet Military Hardware As a Residual in MBMW Output

A. MBMW GVO (Gross Value of Output)   X

B. Less Intermediate Use Output   X

C. Equals MBMW Produced for Final Use   X

D. Less Exports   X

E. Plus Imports   X

F. Less Investment $\triangle \cup C - R \& D$ X

G. Less Public and Private Consumption   X

H. Less Capital Repair   X

I. Equals MBMW Residual--An Estimate of the Value
    of Military Hardware   X

Table II
Best MBMW Residuals, 1966-75 (billions of rubles, producers' prices)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Series A Residuals 7/1/67 prices "establishment" statistics	3.1	3.9	5.8	8.1	9.2	10.3	12.3	15.0	16.3	20.3
As Share of GVO	5.7%	6.4%	8.4%	10.6%	10.8%	10.9%	11.7%	12.7%	12.4%	13.8%
Index (1966 = 100)	100	126	187	261	297	332	397	484	526	655
Series B Residuals current prices "commodity" statistics	7.0						16.3			
As Share of GVO	11.5%						15.0%			
Index (1966 = 100)	100						233			
Series C Residuals current prices "establishment" statistics	5.6	7.0	9.5	11.6	13.1	12.6	14.0	12.8	13.5	16.4
As Share of GVO	9.5%	10.6%	12.8%	14.3%	14.6%	13.2%	13.4%	11.8%	11.3%	12.5%
Index (1966 = 100)	100	125	170	207	234	225	250	229	241	293

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vii

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alternative GVO statistics may represent valid measures of MBMW output in Soviet terms. But while the alternative GVO statistics are known to be expressed in different prices and to reflect different ways of classifying output, published information on Soviet prices and output classifications does not explain the differences among them. Because of the paucity of data on non-defense MBMW production, substantially the same estimates of the value of non-defense production (or in the case of intermediate use products the same estimates of their share of GVO)* are incorporated in the calculation of all three residual series. As a consequence of this, the unexplained differences among the alternative sets of MBMW GVO statistics are passed on to the MBMW residuals.

25X1

Another major weakness of the MBMW residuals is that their composition is extremely uncertain. They almost certainly include the value of missiles, combat aircraft, naval ships, artillery, tanks, and all MBMW output of uniquely military use.** They probably do not include the value of MBMW purchased for consumption by military schools, hospitals, the Ministry of Defense's central administrative offices, or institutes engaged in military RDT&E (this probably is accounted for as "public consumption" which is subtracted in its entirety from MBMW GVO in the residual calculations). But it is uncertain whether the residuals include the value of all military hardware prototypes used for RDT&E (this may not be included in MBMW GVO), common-use durables such as trucks and construction equipment purchased by the military, or capital repair of military equipment. (At least some of these military uses of MBMW may be included in the estimates of MBMW investment goods, and capital repair.) Also the residuals may include the value of miscellaneous output not classified with any of the categories of MBMW subtracted from GVO in the residual calculations, and the "establishment" residuals may include the value of some non-MBMW products.

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* Published Soviet reports on the value of intermediate use MBMW products (subassemblies, spare parts, and other inventory items required in current production) pertain only to its share of MBMW GVO.

** This may include military hardware exports, the value of which would not be included in defense spending as defined in US budgetary accounts.

-viii-

Table III
Estimated Lower and Upper Limits of MBMW Residuals, 1966-75
(billions of rubles, producers" prices)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Series A 7/1/67 prices "establishment" statistics	-0.9- 6.8	-0.2- 8.0	1.4- 10.1	2.5- 13.4	3.9- 14.4	4.2- 16.2	5.7- 19.0	7.4- 22.5	7.1- 24.9	10.2- 30.1
Series B current prices "commodity" statistics	3.0- 10.9						9.7- 22.8			
Series C current prices "establishment" statistics	1.7- 9.4	2.8- 11.1	5.1- 13.9	6.0- 16.8	7.8- 18.2	6.6- 18.3	7.4- 20.4	5.6- 20.0	4.9- 21.7	6.7- 25.6

ix
SECRET

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Yet another problem with the residuals is that the average annual rates of growth which they imply are implausibly high: about 23 percent in Series A of Table II, about 15 percent in Series B, and almost 13 percent in Series C. Even the "low growth" residuals in Series C grow at an average of about 23 percent a year during 1967-70. Much of the growth in all series probably reflects the distortions introduced into the residual calculations by the mixing of data that differ in price and scope. But in the absence of homogeneous data on MBMW GVO and its non-defense components, such mixing is almost inevitable, and the "homogenizing" adjustments attempted may not accomplish their task. The high growth rates in the 1966-68 period also may be due in part to the military hardware price increases believed to have accompanied the 1967 reform of Soviet prices. The overpricing of new products may also account for some of the growth in all three residual series. But the Soviet MBMW producers' price index, which is based on a fixed sample of goods which may not include military products, cannot be used to deflate the residual series.

25X1

A final problem with the MBMW residuals is that often there is a wide margin for error in the estimated values of the categories of MBMW which are subtracted from MBMW GVO in the estimating process. Errors in estimating these values can have considerable impact on the MBMW residuals, and Table III attempts to depict the impact which such errors might have. Likely lower and upper limits were estimated for the values of intermediate use MBMW, MBMW exports, investment goods net of imports, public and private consumption, and capital repair. These estimates then were combined to calculate minimum and maximum estimates of the MBMW residuals. It is most unlikely and, in instances where negative residuals result, impossible that the true residuals would lie at either of the extremes presented in Table III. Still, Table III does give some sense of the range within which the "true" residual could lie, and the range is very wide.

25X1

Because of this and the other problems described, analysis of MBMW statistics is a very rough and uncertain means of estimating the value of Soviet military hardware output. All the problems involved, moreover, are problems of long standing and their solution is not in sight.

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-x-

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Estimating Soviet Spending for Military Hardware
From Machinebuilding and Metalworking Statistics

Discussion

Evidence for the Inclusion of Soviet Military
Hardware in MBMW Statistics

Western analysts have believed for some time that
Soviet statistics on the aggregate value of MBMW output
include the value of military hardware products. The
inspiration of this belief is the Soviet economic
classification system, which assigns military hardware
producers to the MBMW industries.(1)* The behavior of the
Soviet index of MBMW output for 1940-46 reinforces the
belief. (It rose by 29 points during 1940-45 and fell by
about one-third during 1945-46, apparently reflecting the
wartime growth and post-war reduction of military hardware
production)(2)   So, too, do many published analyses of
MBMW data from the 1950s, 1960s, and 1970s.(3)   25X1

The evidence for the inclusion of military hardware in
MBMW data is not conclusive, but it is very persuasive.
Still, to say that the value of Soviet military hardware is
included in MBMW statistics and to say that its value can be
isolated are two different things entirely.   25X1

Method and Data

In concept, estimating the value of Soviet military
hardware from MBMW data is a simple process of assembling a
series of annual MBMW GVO statistics and subtracting all
non-defense production to calculate residuals. Presumably,
the residuals will include all MBMW produced for the
military plus any miscellaneous output not identifiable as a
non-defense use. In practice, however, the estimating
process is complicated by serious data problems.
Calculation of MBMW residuals requires complete and
homogeneous series of statistics on GVO, intermediate use,
exports, imports, investment goods, public and private
consumption, and capital repair. But there are major gaps
and anomalies in the available data and limitations in
Western understanding of them.   25X1

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*Serially numbered source references begin on page 43.

-1-

SECRET

Alternative Sets of Data on MBMW GVO

The Soviet economic yearbooks which are the major
sources of industrial statistics do not report MBMW GVO in
ruble terms.(4) Instead, they include an index of MBMW
output (Row A, Table 1). (This index was calculated from
data in the prices of July 1, 1955 for 1955 through 1967,
and in the prices of July 1, 1967 for 1967 through 1975)(5)
Occasionally, however, Soviet publications report MBMW GVO
statistics for a given year or years. Prior to 1972,
multiplying these statistics by the MBMW index was the only
means of generating a time series on MBMW GVO. But in 1972
Gosplan published a book on the Ninth Five-Year Plan which
reported MBMW GVO for 1970-75 in July 1, 1967 producers'
prices (Row B). Subsequently, the Soviet economic yearbooks
for 1972-75 reported MBMW GVO as a share of total industrial
GVO in July 1, 1967 producers' prices. These reports pertain
to 1960, 1965 and 1970-75. Used in conjunction with other
published statistics, they yield an MBMW GVO series (Row C)
in which the values are very close to those which Gosplan
reported and consistent with the published Soviet index of
MBMW output.

A number of published Soviet sources also report MBMW
GVO statistics which are close to those reported by Gosplan
in 1972 or to those calculated from the information reported
in the economic yearbooks. One Soviet economist has reported
MBMW output values for 1960 (26.5 billion rubles) and 1973
(116 billion rubles) (6) that are approximately the same as
the reported and calculated values for those years in Rows B
and C. Another Soviet economist has cited figures identical
to the Gosplan reported data for 1970 and 1975, but may have
taken the information from the 1972 Gosplan work.(7) On the
other hand, for years in which GVO is reported in both
prices, the values in July 1, 1967 prices cannot be
converted into the earlier reported values in July 1, 1955
prices via published information on the relationship of the
prices in which they are expressed.(8) Also, yet another
Soviet economist has given higher MBMW output values for
1965, 1970, and 1975 (51 billion rubles, 88 billion rubles,
and 148 billion rubles).(9) In 1971 Premier Kosygin also
mentioned a GVO figure of 88 billion rubles for 1970.(10)
But there was no indication of the prices in which these
various figures were expressed.

As is often the case with Soviet data, the yearbook and
Gosplan-reported MBMW GVO statistics are not easily
reconciled with other published figures. Still, their
consistency with the MBMW index and their appearance in
authoritative sources mark them as the "official" figures.

-2-

Table 1
Estimated and Reported MBMW GVO, 1960-75
(billions of rubles, producers' prices)

	1960	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A. *Index*	32	57	64	72	81	90	100	111	124	139	155	173
B. 7/1/67 prices							84.8	93.3	104.2	116.1	129.8	145.7
Index							100	110	123	137	153	172
C. 7/1/67 prices	27.0	48.6					85.1	95.1	105.9	117.9	132.4	147.1
Index	32	57					100	112	124	139	156	173
D. 7/1/67 prices			54.3	61.1	68.7	76.3	84.8	94.1	105.2	117.9	131.4	146.7
E. Current prices			61.1						108.5			
F. Current prices			58.7	66.2	74.5	81.1	89.8	95.4	104.2	108.8	119.7	131.0

Sources:
A. *Narodnoye khozyaystvo SSSR v 1975 godu. Statisticheskiy yezhegodnik* (hereafter *Nar. khoz.*) (Moscow, 1976), pp. 255-56; *Nar. khoz. 1970* (Moscow, 1971), p. 204.
B. USSR, Gosplan, *Gosudarstvennyy pyatiletniy plan razvitiya narodnogo khozyaystva SSSR na 1971-1975 gody* (Moscow, 1972), pp. 346-47.
C. Appendix A, Table A-I, Row E.
D. The MBMW GVO for 1970 in Row B (84.8) is multiplied by the index of MBMW GVO in Row A.
E. V. Treml, D. Gallik, and B. Kostinsky, "1966 Ex Post Input-Output Tables for the USSR: A Survey," in V. Treml (ed.) *Studies in Soviet Input-Output Analysis* (New York, 1977), p. 49; Foreign Demographic Analysis Division (FDAD), US Dept. of Commerce, "The Reconstructed Soviet Input-Output Table for 1972 in Producers' Prices", unpublished tables, 8 Dec. 1977.
F. Appendix A, Table A-V, Row I (rounded to one decimal point).

Neither the 1972 Gosplan book nor the economic yearbooks of the Central Statistical Administration have reported MBMW GVO for 1966-69. But the values for these and other years can be estimated by multiplying the 84.8 billion rubles reported by Gosplan for 1970 by the index of annual MBMW output (Row D).

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The "official" MBMW GVO statistics for 1966 and 1972, however, are lower than Western estimates of MBMW GVO in the latest reconstructions of the 1966 and 1972 Soviet input-output tables (Row E). In the recently published reconstructed table for 1966, MBMW GVO in 1966 producers' prices is 61.1 billion rubles, compared to the "official" figure of 54.3 billion rubles in July 1, 1967 producers' prices. In an as yet unpublished reconstruction of the table for 1972 MBMW GVO in 1972 producers' prices is 108.5 billion rubles, compared to the "official" figure of 105.2 billion rubles in July 1, 1967 producers' prices (compare Rows D and E of Table 1).

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Part of the difference between the "official" figures and the estimates in the reconstructed input-output tables may be a matter of the prices in which they are expressed. The "official" statistics, as noted above, are in July 1, 1967 producers' prices. The estimates from the reconstructed input-output tables are in the current prices of 1966 and 1972. The Soviet producers' price index for MBMW, however, fails to explain the quantitative differences between the two sets of data. In fact, the index indicates that MBMW prices were constant during 1966-67 and decreased 10 percent by 1972.(11) If the reconstructed input-output table estimates of MBMW GVO were converted to 1967 prices via this index, the 1966 estimate would still be 61.1 billion rubles but the 1972 estimate would increase to 120.6 billion rubles.

25X1

Part of the difference between the "official" statistics and the estimates in the reconstructed input-output tables also may be a matter of different measures of output. The "official" figures, like MBMW GVO data reported before 1972, are probably "establishment" statistics, which report the total output of all MBMW

almost certainly are establishment statistics

-4-

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establishments, including non-MBMW output.* The reconstructed input-output table data are "commodity" statistics which report total MBMW output, including that of non-MBMW establishments. But the information which published Soviet sources provide on the size of difference between "commodity" and "establishment" MBMW GVO does not satisfactorily explain the differences between the reconstructed input-output table estimates and the "official" Soviet figures. In 1959 the reported ratio of "commodity" to "establishment" MBMW GVO was 0.92.(12) Published Soviet data suggest that for the USSR as a whole it ranged from 0.92 to about 0.95 during 1966-75 (13), and in the Belorussian SSR the ratio was about 0.96 in both 1970 and 1975. (14) (In a "private communication" to W.T. Lee, a former Soviet economist reported that the ratio was 0.88 in 1966 (15), but this is contradicted by the data just mentioned). But for both 1966 and 1972 the "commodity" to "establishment" ratio implicit in a comparison of the reconstructed input-output table estimates of MBMW GVO and the "official" MBMW GVO statistics is much higher--1.125 for 1966 and 1.031 or 1.146 in 1972 depending on whether or not the Soviet producers' price index is used to convert the estimate from the reconstructed input-output table to 1967 prices.

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Neither the Soviet producers' price index nor the published information on the difference between "commodity" and "establishment" output, therefore, sufficiently explains the differences between Western estimates of MBMW GVO in the reconstructed input-output tables for 1966 and 1972 and the

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*In his 1977 work W.T. Lee makes an interesting "circumstantial" case for the hypothesis that the MBMW GVO data reported by Gosplan and the post-1972 handbook MBMW data are "commodity" statistics. Lee's argument is based on the virtual equivalence of the MBMW GVO for 1966 calculated from the reports of Gosplan and the economic handbooks (54.3 billion rubles) and the estimate of MBMW GVO in an early reconstruction) of the 1966 Soviet input-output table (54.9 billion rubles) (The Estimation of Soviet Defense Expenditures, 1955-75. An Unconventional Approach (New York, 1977), pp. 163-66). Now that the estimate of MBMW GVO in the reconstructed input-output table for 1966 has been revised to 61.1 billion rubles Lee's case is weakened considerably. In the absence of evidence to the contrary and in the light of past Soviet practice, the MBMW GVO statistics reported since 1972 can be assumed to be "establishment" data.

-5-

"official" Soviet statistics for these years. The Western
estimates may not be final. The estimate for 1966 is a
recent revision of earlier published estimates and the
estimate for 1972 is, as yet, unpublished and still subject
to change.

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Still, the estimates of MBMW GVO in the reconstructed
Soviet input-output tables are well-substantiated. Despite
their puzzling differences from the "official" Soviet
statistics on MBMW GVO, they may represent valid measures of
MBMW output. Nor are these estimates alone in differing
from the "official" figures in ways that have yet to be
explained. Estimates of MBMW GVO also can be derived from
labor costs, their share in production outlays and reported
profits. These estimates (Row F of Table 1), which represent
output in "establishment" terms, are in current prices.
According to the Soviet producers' price index, MBMW prices
were constant during 1966-68 and decreased thereafter. But
during 1966-75 the estimates based on labor cost are higher
than the "official" MBMW GVO figures for every year until
1972. (In both 1966 and 1972 they are approximately 4
percent lower than the estimates of MBMW GVO in Western
reconstructions of the Soviet input-output tables.)

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The estimates based on labor costs must be regarded as
approximations, for as explained in the note to Tables A-II
through A-V,* their calculation requires some assumptions as
to the share of bonus payments from profit in reported MBMW
wages. But even when the uncertainties involved are taken
into account, the estimates based on labor cost differ
significantly from the "official" statistics on MBMW GVO.
Marshalled alongside the estimates from the reconstructed
input-output tables, the estimates based on labor costs are
at least sufficient to suggest that the "official" figures
are not the only word on MBMW GVO. As a result, there is
great uncertainty as to the appropriate series of MBMW GVO
statistics with which to begin the calculation of a residual
representing the value of Soviet military hardware. The
determination of the appropriate set of GVO statistics,
moreover, cannot be divorced from the estimation of the
value of the largest claimant of MBMW output--intermediate
use.

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*See Appendix A, pp. 29-34.

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Table 2
Estimated Shares of Intermediate Use Output in MBMW GVO, 1966-75

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Best Estimate										
A. All Intermediate Use	.415[1]	.422[3]	.428[3]	.435[3]	.442	.450[3]	.457[2]	.464[4]	.472[4]	.479[4]
Low Estimate										
B. All Intermediate Use	.405	.412	.418	.425	.431	.439	.446	.453	.461	.468
High Estimate										
C. All Intermediate Use	.425	.432	.438	.445	.453	.461	.468	.475	.483	.490

Sources:
A. 1. Calculated from data in V. Treml, D. Gallik, and B. Kostinsky, "1966 Ex Post Input-Output Tables for the USSR: A Survey," in V. Treml (ed.) Studies in Soviet Input-Output Analysis (New York, 1977), pp. 31-49.
2. Calculated from data in FDAD, U.S. Dept. of Commerce, "The Reconstructed Soviet Input-Output Table for 1972 in Producers' Prices," unpublished tables, 8 Dec. 1977.
3. Interpolated
4. Extrapolated

B. Allows for an error of -.01 in the estimate for 1966 and for the same degree of error in the estimates for other years.

C. Allows for an error of +.01 in the estimate for 1966 and for the same degree of error in the estimates for other years.

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Intermediate Use

Intermediate use MBMW output consists of subassemblies, spare parts and other inventory items required for current production. Determining its value is of critical importance to the calculation of a military residual, for intermediate use is the largest claimant of MBMW output. But there are few reports of its value in Soviet sources, and the available reports refer to the <u>share</u> of intermediate use in MBMW GVO. If these reported <u>shares</u> are multiplied by the different series of MBMW GVO <u>statistics</u> presented in Table 1, the resulting estimates of the value of intermediate use display the same relative differences as the GVO series. 25X1

Further problems arise because some of the Soviet reports on the share of intermediate use or its components in MBMW GVO appear to be mutually contradictory (16) and pertain to only a few particular years. Extrapolation or interpolation of the shares for other years, therefore, is an error prone process. Because of the large size of intermediate use, a small percentage error in estimating its annual share of GVO may result in an error that is large relative to the military hardware residual. Also, and more importantly, the reported shares apparently are calculated from input-output table data, especially the All-Union input-output tables for 1966 and 1972. As a result, they are not necessarily applicable to MBMW GVO statistics that differ in price and scope. 25X1

The estimates in Table 2 are presented subject to the qualifications just discussed. In Row A the shares of intermediate use in MBMW GVO during 1966-75 are estimated by interpolation or extrapolation from the estimated shares in the reconstructed input-output tables for 1966 and 1972. To reflect at least some of the uncertainty involved, Rows B and C allow for an <u>absolute</u> error of .01 on either side of the estimate for 1966 and for the <u>same</u> <u>degree</u> of error in the estimates for other years. 25X1

Final Uses of MBMW

Because intermediate use is reported only as a share of MBMW GVO, the estimates of its value display the same unexplained relative differences as the alternative sets of MBMW GVO statistics. So too do the estimates of final use MBMW--the difference between GVO and intermediate use. Another problem with the estimates of final use MBMW is their treatment of the value of military hardware prototypes used for RDT&E. Military prototypes may account for a significant part of Soviet spending for defense. Yet, it is

-8-

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uncertain whether the value of all military prototypes is included in the statistics on MBMW GVO.(17) As a result, it is also uncertain whether they are included in the estimates of final use output. ⬚   25X1

There are similar problems as to the scope of the data on the non-defense claimants of final use output. These are compounded by the unavailability of complete and homogeneous time series of statistics on the various claimants. ⬚   25X1

Exports and Imports

Soviet economic yearbooks regularly report the value of MBMW exports and imports, but they do so in foreign trade prices (Rows A-1 and B-1 of Table 3). Such prices may differ substantially from domestic Soviet prices. Yet, while overall foreign to domestic price conversion coeffiecients for all imports and exports can be calculated from data occasionally reported in Soviet publications, published Soviet sources say very little about the conversion coefficients for MBMW products. ⬚   25X1

In their work on foreign trade pricing in the 1966 Soviet input-output table, Kostinsky and Treml calculated a ratio of domestic to foreign trade MBMW prices of 0.71 from data reported by I.D Belkin.(18) Belkin's data pertained to imports, but Kostinsky and Treml recommended using a conversion ratio of 0.71 for imports and exports both. Lee, however, makes a plausible argument that the coefficients should be higher, and that the coefficients for imports and exports should differ as well.(19) Both of his points are well taken. But the limitations in our understanding of the subject are such that it is difficult to determine whether the conversion coefficients for MBMW exports should be higher than those for imports or vice versa. ⬚   25X1

The estimates in Table 3 reflect the range of possibilities suggested by the findings of Kostinsky and Treml, and the objections raised by Lee. Conversion coefficients of 0.71 are used to convert both imports and exports from foreign trade to domestic prices (Rows A-2 and B-2). Higher coefficients are used as well. Those for imports (Rows B-3 and B-4), however, are higher than those for exports (Rows A-3 and A-4) on the grounds that this is true of the overall conversion coefficients for all imports and exports calculated from data reported in published Soviet sources. (20) ⬚   25X1

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Table 3

Estimated Domestic Value of Soviet MBMW Exports and Imports, 1966-75
(billions of rubles)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Exports										
1.	Foreign Trade Prices	1.654	1.832	2.072	2.361	2.480	2.705	3.006	3.448	4.000	4.493
2.	(A1 x 0.71)	1.174	1.301	1.471	1.676	1.761	1.921	2.134	2.448	2.840	3.190
3.	(A1 x 0.85)	1.406	1.557	1.761	2.007	2.108	2.299	2.555	2.931	3.400	3.819
4.	(A1 x 1.00)	1.654	1.832	2.072	2.361	2.480	2.705	3.006	3.448	4.000	4.493
B.	Imports										
1.	Foreign Trade Prices	2.308	2.625	3.127	3.486	3.753	3.817	4.609	5.337	6.100	9.040
2.	(B1 x 0.71)	1.639	1.864	2.220	2.475	2.665	2.710	3.272	3.789	4.331	6.418
3.	(B1 x 1.00)	2.308	2.625	3.127	3.486	3.753	3.817	4.609	5.337	6.100	9.040
4.	(B1 x 1.25)	2.885	3.281	3.909	4.358	4.691	4.771	5.761	6.671	7.625	11.300

Sources:
A1 and B1 - Nar. khoz. 1968, pp. 657-58; Nar. khoz. 1969, pp. 652-53; Nar. khoz. 1972, pp. 739-40; Nar. khoz. 1973, pp. 790-92; Nar. khoz. 1975, pp. 753-56.

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-10-

The estimates are open to criticism for making no allowance for change over time, and for not capturing the full range of possible conversion coefficients. Both are valid criticisms, but the questions they involve cannot be answered satisfactorily given the available evidence. Consequently, the conversion of MBMW exports and imports from foreign trade to domestic prices involves much uncertainty. The uncertainty is an obstacle to the calculation of a good residual estimate of the value of Soviet military hardware throughout 1966-75, but is an even greater barrier in the later years. During the 1970s Soviet foreign trade in MBMW grew very rapidly, with imports growing much more rapidly than MBMW GVO. In 1975, depending on the conversion coefficients used in Table 3, the value of net imports of MBMW could range between 1.9 and 8.1 billion rubles. (Net imports are 4.5 billion rubles in foreign trade prices).   25X1

A final complicating factor is that, while the Soviets export and import military hardware, they apparently do not include the value of all such hardware in their reported data on MBMW foreign trade. Moreover, they may not include any military hardware except for some communications equipment in the MBMW foreign trade statistics. (There are residuals in Soviet MBMW import and export statistics when non-defense related products are subtracted from them. At least for some years, however, the residuals have been concluded to consist of communications equipment.) (21) In any event there is uncertainty involved. The uncertainty as to what the MBMW foreign trade statistics include results in uncertainty as to what is subtracted from MBMW GVO and what remains in the MBMW residuals.   25X1

Investment

Soviet sources regularly report the value of most of the MBMW output used for investment. But these data--the equipment, tool, and inventory component of capital investment--may not be reported in the year in which the MBMW investment goods are produced. Also they are expressed in prices that include transportation and handling charges, neither of which are included in the producers' prices in which other MBMW output is expressed. Finally, they exclude the value of changes in the stocks of uninstalled equipment and equipment for existing (as opposed to newly constructed) state institutions, hospitals, schools, and pre-schools.   25X1

-11-

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There is wide, but not universal agreement among
Western analysts that the statistics on the annual value of
MBMW investment goods are not reported on a production year
basis. The estimates in Table 4 reflect the different
positions which analysts have adopted on this question. The
best estimate corrects the equipment, tool, and inventory
data for an assumed six month lag between production and
reporting as investment (22) (Row B). The low estimate
assumes there is no lag at all (Row A) (23), and the high
estimate assumes there is a lag of one full year (Row C).
(24)

25X1

There is also disagreement about the share of
transportation charges and of non-MBMW products such as
furniture in the reported values of equipment, tool, and
inventory. Both, however, must be removed to make the data
compatible with producers' price data on MBMW output. The
best estimate (Row E) is that transportation charges and
non-MBMW products account for 12 percent of the value of
equipment, tool, and inventory.(25) The low estimate is
that they account for 9 percent, and the high estimate is 15
percent.

25X1

These estimates are in July 1, 1967 producers' prices.
(The unadjusted data from which they are estimated are
expressed in 1969 estimate prices, which reportedly reflect
the July 1, 1967 prices of machinery and equipment).(26) If
they are to be subtracted from MBMW GVO in current
producers' prices, a price adjustment is necessary. The
re-calculation of the equipment, tool, and inventory
component of investment in January 1, 1973 prices published
in the most recent Soviet economic yearbook provides at
least a rough basis for such an adjustment.

25X1

In 1973 the reported value of equipment, tool, and
inventory investment in January 1, 1973 prices (29.9 billion
rubles) was approximately 96 percent of its value in July 1,
1967 prices (31.1 billion rubles). This implies an average
annual decrease in prices of about 0.6 percent during
1968-73. Row G presents the price index which reflects this
average annual rate of decrease (1966 prices are assumed to
equal 1967 prices and the 1968-73 rate of decrease is
extrapolated through 1975. Rows H-J report the results of
multiplying the July 1, 1967 price estimates in Rows D-F by
this index of current prices.

25X1

Next it is necessary to account for the values of
annual changes in the stocks of uninstalled equipment and of
equipment produced for existing state institutions, schools,
hospitals, and pre-schools. The former never were included

-12-

Estimated Value of Annual MBMW Output Included in Reported Capital Investment, 1966-1975
(Billions of Rubles)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
A. Equipment, Tool, and Inventory (7/1/67 purchasers' prices)	18.5[1]	19.9[1]	21.5[1]	22.5[1]	25.3[1]	26.6[1]	28.8[1]	31.1[1]	34.1[1]	38.5[1]	42.2[2]
B. Row A corrected for a six-month lag	19.2	20.7	22.0	23.9	26.0	27.7	30.0	32.6	36.3	40.4	
C. Row A corrected for a one-year lag	19.9	21.5	22.5	25.3	26.6	28.8	31.1	34.1	38.5	42.2	
D. Row A x 0.85 (estimated 7/1/67 producers' prices)	15.7	16.9	18.3	19.1	21.5	22.6	24.5	26.4	29.0	32.7	
E. Row B x 0.88 (estimated 7/1/67 producers' prices)	16.9	18.2	19.4	21.0	22.9	24.4	26.4	28.7	31.9	35.6	
F. Row C x 0.91 (estimated 7/1/67 producers' prices)	18.1	19.6	20.5	23.0	24.2	26.2	28.3	31.0	35.0	38.4	
G. Estimated Index of current prices	1.00	1.00	.994	.988	.982	.976	.970	.964	.958	.953	
H. Row D x Row G (estimated current producers' prices)	15.7	16.9	18.2	18.9	21.1	22.1	23.8	25.4	27.8	31.2	
I. Row E x Row G (estimated current producers' prices)	16.9	18.2	19.3	20.7	22.5	23.8	25.6	27.7	30.6	33.9	
J. Row F x Row G (estimated current producers' prices)	18.1	19.6	20.4	22.7	23.8	25.6	27.5	29.9	33.5	36.6	

Sources:
A. 1. Nar.khoz. 1975, p. 503.
   2. Nar.khoz. za 60 let, p. 433. This source reports the value of equipment tool and inventory in 1/1/73 prices (40.7 billion rubles). In Row A this figure is converted to 7/1/67 prices by multiplying the reported value by an implicit ratio of 7/1/67 prices to 1/1/73 prices. The ratio was calculated by dividing the value of equipment, tool, and inventory for 1975 reported in Nar.khoz.1975 (38.5 billion rubles) by the value reported for 1975 in Nar.khoz. za 60 let, (37.1 billion rubles).
B. Each year's value in Row A is added to the following year's and the sum is divided by 2.
C. Each year's value in Row A is assumed to represent the previous year's production.
D. An estimate of the 7/1/67 producers' price value of equipment, tool, and inventory net of non-MBMW products.
E. An estimate of the 7/1/67 producers' price value of equipment, tool, and inventory net of non-MBMW products.
F. An estimate of the 7/1/67 producers' price value of equipment, tool, and inventory net of non-MBMW products.
G. This reflects a rate of deflation of 0.6% per year from 1967 to 1975 with 1966 prices assumed to equal 1967 prices. The deflation rate is implicit in a comparison of the value of equipment, tool, and inventory for 1973 in 7/1/67 prices (31.1 billion rubles per Nar.khoz. 1975) with the same year's value in 1/1/73 prices (29.9 billion rubles per Nar.khoz. za 60 let.
H. Calculations as indicated.
I. Calculations as indicated.
J. Calculations as indicated.

Table 5

Reported Values of Stocks of Uninstalled Equipment and Estimated Values of Annual Changes in These Stocks
(billions of rubles, stock values as of Jan. 1 of given year)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Stock Values	3.3[1]	3.5[1]		5.0[2]		4.9[3]			5.2[3]	6.3[4]
B.	Estimated Annual Change	0.2	0.75	0.75	-0.05	-0.05	0.1	0.1	0.1	0.55	0.55

Sources:
A1. A. Vozyakov, "Povyshat' effektivnost' kapital'nogo stroyitel'stva," Finansy SSSR, No. 8 (Aug. 1967), p. 7.
2. S. Butler, "The Soviet Capital Investment Program" in Joint Economic Committee, U.S. Congress, Economic Performance and the Military Burden in the Soviet Union (Washington, D.C. 1970), p. 46.
3. M.S. Zotov, "Vyshe uroven' raboty uchrezhdeniy stroybanka," Finansy SSSR, No. 6 (June 1974), p. 46.
4. V.A. Spektor,"Povysheniye effektivnosti snabzheniya stroyitel'stva," Ekonomika stroitel'stva No. 1 (1977), p. 71. This source reports the value of stocks "in 1975". It is assumed that he is referring to Dec. 31, 1975-Jan. 1, 1976.

B. Each stock value in A is subtracted from that which follows and the result is divided by the number of years between the dates to which the reports apply.

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Table 6
Calculated and Estimated Values of Equipment for Investment in Existing State Institutions, Schools, Hospitals, Kindergartens, and Nurseries 1960-75
(billions of rubles, 1955 estimate prices)

Year	A State and Cooperative Investment as Reported in the 1964 Handbook	B State and Cooperative Investment as Reported in the 1965 Handbook	C Difference Between A and B	D Estimated Values
1960	30.8	30.0	0.8	--
1961	32.7	31.9	0.8	--
1962	34.8	34.0	0.8	--
1963	37.0	36.1	0.9	--
1964	40.4	39.4	1.0	1.0
1965	--	--	--	1.0
1966	--	--	--	1.1
1967	--	--	--	1.1
1968	--	--	--	1.2
1969	--	--	--	1.2
1970	--	--	--	1.3
1971	--	--	--	1.3
1972	--	--	--	1.4
1973	--	--	--	1.4
1974	--	--	--	1.5
1975	--	--	--	

Sources:
A. *Nar. khoz. 1964*, p. 511.
B. *Nar. khoz. 1965*, p. 528.
C. Calculated from A and B.
D. Extrapolated from C.

SECRET

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in reported equipment, tool and inventory data. The latter were included prior to 1965 but have not been included since. 25X1

Table 5 lists the stock values of uninstalled equipment that Soviet sources have reported for the period 1966-1975 (Row A) and then calculates the values of the annual changes in these stocks (Row B). In some cases there is no problem with the calculations, but when stock values for successive years are not available, the annual changes are interpolated from the values for non-successive years. This is a likely source of error. Also these data are in current prices and differ from constant price investment data. But because of the small size of the figures involved, price adjustments would be negated when the estimates are rounded to a single decimal place. Table 5, therefore, makes no adjustment for the difference between current and constant prices. 25X1

The Soviet economic yearbooks for all years up to 1964 included the value of equipment for existing state institutions, hospitals, schools, and pre-schools in the reported investment data. The yearbooks for 1965 and subsequent years have not included the value of such equipment. For 1960-64 the values can be calculated by subtracting the 1965 yearbook's investment data for those years from the same years' investment data in the 1964 yearbook (Column C of Table 6). But for other years the statistics required for such calculations are not available and the values must be extrapolated (Column D). Moreover, the calculated and estimated values are in 1955 estimate prices, and so are not compatible with data expressed in different prices. Again, however, the small size of the statistics involved and the fact that they should be rounded to a single decimal place militate against price adjustments. 25X1

A final point to be noted is that MBMW investment data may include the value of common-use durables such as trucks and construction equipment purchased by the military.(27) (Common use durables, moreover, could include such things as transport aircraft and auxiliary ships.) But the inclusion of such goods in the investment data is uncertain. So too, therefore, is their inclusion in the military hardware residuals. 25X1

Public and Private Consumption

The value of MBMW output produced for public and private consumption in 1959-63 is reported--in purchasers' prices--in the 1964 Soviet economic yearbook.(28) For other

-16-

SECRET

Table 7

Estimated Annual Values of MBMW Goods Used for Public and Private Consumption, 1966-75

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Current Producers' Prices	4.8^1						7.9^2			
B.	*Index of Consumer Durables (constant prices)*	*100*	*109*	*122*	*133*	*149*	*169*	*194*	*210*	*227*	*248*
C.	Best Estimate (1967 producers' prices)	4.8	5.2	5.9	6.4	7.2	8.1	9.3	10.1	10.9	11.9
D.	Best Estimate (current Producers' prices)	4.8	5.1	5.6	5.9	6.5	7.1	7.9	8.4	8.8	9.4
E.	Low & High Range (1967 producers' prices)	4.3- 5.3	4.7- 5.7	5.3- 6.5	5.8- 7.0	6.5- 7.9	7.3- 8.9	8.4- 10.2	9.1- 11.1	9.8- 12.0	10.7- 13.1
F.	Low & High Range (current producers' prices)	4.3- 5.3	4.6- 5.6	5.0- 6.2	5.3- 6.5	5.9- 7.1	6.4- 7.8	7.1- 8.7	7.6- 9.2	7.9- 9.7	8.4- 10.4

Sources:
A.1. *Treml, Gallik, and Kostinsky, "1966 Ex Post Input-Output Tables for the USSR," pp. 47-49.*
   2. *FDAD, "The Reconstructed Soviet Input-Output Table for 1972 in Producers' Prices," unpublished tables, 8 Dec. 1977.*
B. *Gertrude E. Schroeder and Barbara S. Severin, "Soviet Consumption and Income Policies in Perspective," in Joint Economic Committee, U.S. Congress Soviet Economy in a New Perspective (Washington, D.C., Oct. 1976), p. 646.*
C. *The 1966 value in A is assumed to be in 1967 prices and the values for other years are estimated by multiplying this value by the index reported in B.*
D. *The 1966-75 values in C are deflated by assuming that the average annual rate of inflation of comparable prices relative to current prices was that implicit in a comparison of the 1972 values in A and C (with 1966 = 100).*
E. *Plus or minus 10 percent of the estimates in C.*
F. *Plus or minus 10 percent of the estimates in D.*

years, however, Soviet yearbooks do not report such information and the value of MBMW consumer goods must be estimated. Good estimates can be made for some years, but it is difficult to compile a complete and homogeneous time series.

25X1

Row A of Table 7 presents the estimates of the value of MBMW consumer goods from the reconstructed Soviet input-output tables for 1966 and 1972 in current producers' prices. Row B presents an index of Soviet consumer durables output in constant prices published by two Western analysts. Rows C and D combine the estimates for 1966 and 1972 and the index of consumer durables output to generate two time series of consumer durables output: one in July 1, 1967 prices (Row C) and one in current prices (Row D). The calculation of these two series, however, entails some heroic assumptions: 1) that the 1966 price estimate in Row A is equal to the value of public and private consumption in July 1, 1967 prices. 2) that the scope of the estimate for 1966 is the same as that of the consumer durables index in Row B, and 3) that the difference between the estimates for 1972 in Rows A and C (7.9 and 9.3 billion rubles) reflects the difference between current and constant prices.

25X1

Admittedly each of these assumptions is questionable. The prices of MBMW consumer goods could well have changed during 1966-67. The scope of the estimate for 1966 and that of the index may be quite different. Even if the difference between the two estimates for 1972 (7.9 billion rubles and 9.3 billion rubles) were solely the result of price changes the rate of change is unlikely to have been constant over time. To reflect the error involved, therefore, Table 7 allows for a range of plus or minus 10 percent in both the constant and current price estimates (Rows E and F).

25X1

There is, however, yet another problem with these estimates. It is possible that the estimates of public consumption include some military purchases, specifically those for the current use of military schools, hospitals, the administration of the MOD, and institutes engaged in military RDT&E. That all or part of such purchases are included in public consumption is uncertain. But it is generally accepted among Western analysts that Soviet budgetary outlays for health, education, administration, and science include outlays for military activities in these fields.(29) There are equal grounds for believing that reported consumption by education, health, administration and science--all "public" consumers of MBMW--include consumption by military education, health, administration, and science institutions. At least in a relative sense,

-18-

SECRET

there is more reason to believe that military purchases are included in public consumption than in investment, foreign trade or the other claimants of MBMW output.   25X1

Capital Repair

Capital repair of machinery and equipment is the last of the uses of MBMW to be subtracted from MBMW GVO in the calculation of military hardware residuals. Soviet yearbooks include an index of repair calculated from data in constant prices. But this reports the output of specialized repair establishments rather than of all repair of machinery and equipment. Moreover, the index may include categories of repair which already have been accounted for in the estimates of the uses of MBMW output presented on previous pages. (Current repair of machinery and equipment is classified as intermediate use, and the value of MBMW used for public consumption includes the value of some repair.) As a result this index is of little use for our calculations.   25X1

Good estimates of the value of capital repair are presented in the Western reconstructions of the Soviet input-output tables for 1966 and 1972 (Row A of Table 8). But these estimates may not be comparable. This is suggested by the fact that capital repair amounts to about 82 percent of repair GVO in the 1966 table (30), but only to about 64 percent in the 1972 table.(31) It is extremely unlikely that this sharp decline in capital repair's share of repair GVO reflects an actual difference between the 1966-72 growth of capital repair and the growth of repair as a whole. A more likely explanation is that some types of output classified as capital repair in 1966 were classified differently in 1972.   25X1

Given the apparent difference in scope between the estimates of the value of capital repair for 1966 and 1972, using them to estimate the values for other years is likely to lead to error. But there is little else that can be done. In Row B the 1966 and 1972 estimates of the value of capital repair are taken from the reconstructed Soviet input-output tables for those years, the estimated values for 1967-71 are interpolated, and the estimated values for 1973-75 are extrapolated. In recognition of the uncertainties involved, Rows C and D allow for a range of 10 percent on either side of the estimates in Row B.   25X1

These estimates are in current prices and are "commodity" statistics. As such they should not be combined with constant price "establishment" data in residual

Table 8
Estimated Values of Capital Repair, 1966-75
(billions of rubles, producers' prices)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Curent Prices	6.7[1]						9.7[2]			
B.	Best Estimate	6.7	7.1	7.6	8.0	8.6	9.1	9.7	10.3	11.0	11.7
C.	Low Estimate	6.0	6.4	6.8	7.2	7.7	8.2	8.7	9.3	9.9	10.5
D.	High Estimate	7.4	7.8	8.4	8.8	9.5	10.0	10.7	11.3	12.1	12.9

Sources:

A.1. As in Table 7, note A-1
  2. As in Table 7, note A-2

B. Interpolated (1967-71) and extrapolated (1973-75)

C. B x .9

D. B x 1.1

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calculations without adjusting for the differences in price or scope. But in the absence of a price index or "commodity/establishment" ratio for capital repair, any adjustments would be arbitrary and so no adjustment is attempted. 25X1

A final problem is that the estimated values of capital repair may include military purchases.(32) But the share of such purchases in the estimates is unknown. 25X1

The Residuals

The data problems described above do not allow for the calculation of a single time series of credible point estimates of the value of Soviet military hardware for 1966-75 from MBMW statistics. Rather they require the calculation of a number of separate series in which the annual estimates entail a wide range of uncertainty. 25X1

Table 9 presents "best estimate" MBMW residuals calculated from the three alternative sets of MBMW GVO statistics discussed in this report: the "official" Soviet statistics (in July 1, 1967 prices and "establishment" terms), the estimates of MBMW output from the reconstructed Soviet input-output tables for 1966 and 1972 (in current prices and "commodity" terms), and the estimates based on labor costs, their share in production outlays, and reported profits (in current prices and "establishment" terms). 25X1

The necessity of presenting these separate and often quite different series of MBMW residuals illustrates a basic problem with estimating the value of Soviet military hardware output from MBMW statistics. The alternative MBMW GVO statistics from which the residuals are calculated may all represent valid measures of MBMW output. But while the alternative GVO statistics are known to be expressed in different prices and to reflect different ways of classifying output, published information or Soviet prices and output classifications does not explain the differences among them. Because of the paucity of data on non-defense MBMW production, the same estimates of MBMW exports, imports, capital repair, and the same estimates of the share of intermediate use in MBMW GVO are incorporated in the calculation of all three residual series. The estimates of the value of investment goods and consumer durables are based on the same raw data. Because of adjustments for the difference between current and constant prices, different estimates of their value are incorporated in the calculation of the Series A residuals on the one hand and the Series B and C residuals on the other. But these differences are

-21-

SECRET

Table 9
Best MIMW Residuals, 1966-75
(billions of rubles, producers' prices)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Series A 7/1/67 prices "establishment" statistics	3.1	3.9	5.8	8.1	9.2	10.3	12.3	15.0	16.3	20.3
	Index (1966 = 100)	*100*	*126*	*187*	*261*	*297*	*332*	*397*	*484*	*526*	*655*
B.	Series B current prices "commodity" statistics	7.0						16.3			
	Index (1966 = 100)	*100*						*233*			
C.	Series C current prices "establishment" statistics	5.6	7.0	9.5	11.6	13.1	12.6	14.0	12.8	13.5	16.4
	Index (1966 = 100)	*100*	*125*	*170*	*207*	*234*	*225*	*250*	*229*	*241*	*293*

Sources

A. *Appendix B, Table B-I, Row I.*

B. *Appendix B, Table B-IV, Row I.*

C. *Appendix B, Table B-V, Row I.*

SECRET

small relative to the differences among the alternative MBMW
GVO statistics. The unexplained differences among these GVO
statistics, therefore, are passed on to the MBMW residuals.
There are, moreover, other reported MBMW GVO statistics (see
p. 2 of this report) which also differ in an unexplained way
from those used in calculating these residuals. In 1966,
for instance, one might as well use MBMW GVO statistics in
July 1, 1955 prices as in July 1, 1967 prices. Were this to
be done, there would be yet another 1966 residual that would
differ in an unexplained way from those presented in this
paper.

25X1

   Another major weakness of all the estimates is that
their composition is extremely uncertain. They almost
certainly include the value of missiles, artillery, combat
aircraft, naval ships, and all MBMW output of uniquely
military use.* But they may or may not include the value of
all military hardware prototypes used for RDT&E, common-use
durables such as trucks and construction equipment (and
possibly even transport aircraft and auxiliary ships), and
capital repair of military equipment. They probably do not
include the value of MBMW output produced for consumption by
military schools, hospitals, the administration of the MOD,
and institutes engaged in military RDT&E. (All of these are
likely to be included in public consumption.) They almost
certainly include the value of miscellaneous output not
classified with any of the categories of MBMW which were
subtracted from GVO in the residual calculations. The
"establishment" MBMW GVO statistics include some non-MBMW
output. But because of the uncertainty of the "commodity" to
"establishment" ratio, it is also uncertain whether non-MBMW
output remains in the "establishment" residuals.

25X1

   Yet another problem with the estimates in Table 9 is
that in all three series the average annual rate of growth
is implausibly high: about 23 percent in series A, about 15
percent in series B, and almost 13 percent in series C.
Even the low growth series, moreover, grows at about 23
percent a year during 1967-70. These high rates of growth
probably arise primarily from the distortions introduced by
the mixing of data that differ in price or scope and
illustrate that it is unrealistic to expect accurate point
estimates of the value of Soviet military hardware from
analysis of MBMW data. To some extent, however, the high

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* This may include hardware exports, the value of which
would not be included in defense spending as defined in US
budgetary accounts.

-23-

SECRET

Table 10

Lower and Upper Limits of MBMW Residuals, 1966-75
(billions of rubles, producers' prices)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Series A 7/1/67 prices "establishment" statistics	-0.9- 6.8	-0.2- 8.0	1.4- 10.1	2.5- 13.4	3.9- 14.4	4.2- 16.2	5.7- 19.0	7.4- 22.5	7.1- 24.9	10.2- 30.1
B.	Series B current prices "commodity" statistics	3.0- 10.9						9.7- 22.8			
C.	Series C current prices "establishment" statistics	1.7- 9.4	2.8- 11.1	5.1- 13.9	6.0- 16.8	7.8- 18.2	6.6- 18.3	7.4 20.4	5.6- 20.0	4.9- 21.7	6.7- 25.6

Sources:

A. Appendix B, Tables B-II and B-III, Row I.

B. Appendix B, Table B-IV, Row I.

C. Appendix B, Tables B-VI and VIII, Row I.

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rates of growth may reflect the impact of the 1967 price reform on the cost of military hardware(33) and the inflation widely believed to be characteristic of Soviet industrial output series. But the much criticized MBMW producers' price index, (34) which is based on a fixed sample of goods that may not include military products, cannot be used to deflate the residual series.   25X1

The margin for error in the annual estimates in each series is yet another problem. The estimates in Table 10 are presented to give some sense of this. These estimates were calculated from the same sets of MBMW GVO statistics as the estimates in Table 9. However, instead of the best estimates of non-defense MBMW production, the low and high estimates were used. These were combined so as first to minimize and then to maximize the annual residuals in each series. It is extremely unlikely and, in instances where negative values result, impossible that the "true" residuals in any of the series would lie at either of the estimated extremes. Still the width of the range between the lower and upper limits does convey some impression of the margin for error involved in the annual estimates.   25X1

Because of the many data problems involved, analysis of MBMW data is at present a rough and uncertain means of estimating the value of Soviet military hardware. The problems discussed in this report, moreover, are those encountered in the analysis of historical data. If estimates of the value of military hardware were made on the basis of planned future changes in output, the problems and obstacles encountered would be greater.*   25X1

If analysis of MBMW data is to yield more credible estimates of the value of Soviet military hardware, our understanding of Soviet MBMW statistics must be improved. Better understanding of the differences among the reported and estimated MBMW GVO statistics and of the scope of the statistics on non-defense MBMW uses is the most pressing need. But there is also insufficient knowledge of the

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* For 1979-80, for instance, MBMW GVO in 1/1/75 prices can be estimated from planned growth figures. But there is insufficient data on MBMW employment, wages, profits and incentive funds to estimate GVO in current prices for these years (or for 1976-78). Moreover, except for investment goods, for which planned growth figures in 1/1/73 prices are available, the value of the civilian components of MBMW GVO would be more difficult to estimate than for earlier years.

-25-

relationship of foreign trade to domestic prices, the value of MBMW consumer goods and capital repair, and the behavior of Soviet prices. All of these are long-standing problems, and their solution is not in sight. But until these problems are solved, MBMW residual estimates of the value of Soviet military hardware output will remain imprecise, uncertain and ill-defined.

25X1

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Appendix A

Calculation of GVO

Table A-I

Estimated MBMW GVO, 1960-75 (billions of 1967 rubles, producers' prices)

		1960	1965	1970	1971	1972	1973	1974	1975
A.	Index of Industrial GVO	44	66	100	108	115	123	133	143
B.	Industrial GVO			370					
C.	Industrial GVO	162.8	244.2	370	399.6	425.5	455.1	492.1	529.1
D.	MBMW GVO As a Share of Industrial GVO (percent)	16.6%	19.9%	23.0%	23.8%	24.9%	25.9%	26.9%	27.8%
E.	MBMW GVO	27.0	48.6	85.1	95.1	105.9	117.9	132.4	147.1

Sources:
A. Nar. khoz. 1975 (Moscow, 1976), p. 190.
B. According to a Gosplan-published book, the Ninth Five-Year Plan called for industry's GVO to increase by 174 billion rubles which would represent a 47 percent increase over GVO in 1970 (USSR, Gosplan, Gosudarstvennyi pyatiletniy plan razvitiya narodnogo khozyaystva SSSR na 1971-1975 gody (Moscow, 1972), p. 94.) Thus, industrial GVO in 1970 was 370 billion rubles.
C. The value in B is extrapolated to other years via the index in A.
D. Nar. khoz. 1972 (Moscow, 1973), p. 166; Nar. khoz. 1975, p. 197.
E. Row D x Row C.

SECRET

Note on Tables A-II through A-V

An often-used method of estimating the GVO of a given branch of Soviet industry is to:
1. multiply the branch's reported wage fund* by one plus the estimated rate of social insurance contributions.
2. divide the result by the reported share of labor and social insurance costs in total production outlays, and
3. add reported profits to the quotient.(1)

For the years after 1966, however, this method must be modified to yield accurate estimates. Since 1967 Soviet statistics on average wages and wage funds have included bonus payments from the material incentive fund, the source of which is profit.(2)** But bonuses paid from profit are not included in production costs.(3) To estimate GVO from labor costs and profit, therefore, one should:
1. multiply the branch's reported wage fund by one plus the estimated rate of social insurance contributions (the enterprise makes social insurance contributions on most bonuses as well as on regular wages).(4)
2. deduct payments from the material incentive fund derived from profits.
3. divide the result by the reported share of wages and social insurance costs in total production outlays.
4. add reported profits to the quotient.

In Table A-II this method is used to estimate industrial GVO for 1966-75, and the results are compared with the industrial GVO statistics reported in published Soviet sources. Estimated GVO never differs from reported GVO by more than 1.4 percent, and for eight of the ten years in question the estimated values lie within 1 percent of the reported values. In Table A-III, in contrast, industrial GVO is estimated by a similar method but without deducting

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*Soviet sources use the term "wage fund" in both a narrow and a broad sense, the former excluding bonuses paid from profit, the latter including such bonuses. In this note the term is used in its broad sense.

**I am indebted to Professor Treml of Duke University for calling this to my attention.

SECRET

the payments from the material incentive fund. Over time the estimated values grow steadily greater than the reported values. By 1975 the estimated value is 8 percent greater tha the reported value.

The method used in Table A-II, therefore, would appear to be a better method of estimating GVO from labor costs and profits than the method used in Table A-III. But because Soviet published sources do not report the annual value of payments from the material incentive fund of individual branches of industry, the value of these payments must be estimated to calculate MBMW GVO. In Table A-IV this is done by assuming that the ratio of MBMW material incentive payments from profits to total reported MBMW wages is the same as the ratio of all industrial material incentive payments to total reported industrial wages. But Soviet published sources indicate that the ratio of material incentive payments to total wages varies from branch to branch.(5) The calculated values of payments from the MBMW material incentive fund, therefore, must be recognized as estimates which may be in error.

1. This is the method used in W.T. Lee, <u>The Estimation of Soviet Defense Expenditures, 1955-75. An Unconventional Approach</u>, (New York, 1977), pp. 217-225.
2. N.A. Ivanov and G.I. Mechkovskiy (eds.) <u>Ekonomika truda</u> (Moscow, 1976), p.344.
3. <u>Ibid.</u>
4. V.I. Terebilov (ed.) <u>Kommentariy k zakonodatel'stvu o trude</u> (Moscow, 1976), p. 724.
5. Yu. Artemov, "Ekonomicheskiye granitsy fonda material'nogo pooshchreniya," <u>Voprosy ekonomiki</u>, 8 (1975), 37-38.

Table A-II
Estimated and Reported Industrial GVO, 1966-75
(billions of current rubles, producers' prices)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Unadjusted Industrial Wage Fund	36.901	40.061	44.517	47.735	50.549	53.002	55.347	58.081	62.301	66.282
B.	x Social Ins. Adj. Factor	1.072	1.072	1.072	1.072	1.072	1.072	1.072	1.072	1.072	1.072
C.	Equals Unadjusted Wage Fund and Social Ins.	39.558	42.945	47.722	51.172	54.189	56.818	59.332	62.263	66.872	71.054
D.	Less Payments from Material Incentive Fund	---	.660	1.773	3.071	3.739	4.140	4.399	4.840	5.247	5.663
E.	Equals Adjusted Wage Fund and Social Insurance	39.558	42.285	45.949	48.101	50.450	52.678	54.933	57.423	61.625	65.391
F.	Divided by Share of E in Production Cost %	17.9%	16.9%	16.6%	16.5%	16.1%	15.5%	15.2%	14.8%	14.8%	14.6%
G.	Equals Production Cost	220.994	250.207	276.801	291.521	313.354	339.858	361.401	387.993	416.385	447.874
H.	Plus Profit	25.088	34.889	44.431	48.810	55.956	56.232	59.397	60.042	64.223	65.881
I.	Equals Estimated Industrial GVO	246.082	285.096	321.232	340.331	369.310	396.090	420.798	448.035	480.608	513.765
J.	Reported Industrial GVO	248.3	285.9	322.8	345.0	374.3	395.7	420.0	447.3	479.6	511.2
K.	I ÷ J	.991	.997	.995	.986	.987	1.001	1.002	1.002	1.002	1.005

Sources:
A. "Chislennost' i fond zarabotnoy platy rabochikh i sluzhashchikh po otraslyam promyshlennosti SSSR," Vestnik statistiki No. 4 (1971), 87; No. 11 (1972), p. 93; No. 9 (1974), 94; No. 8 (1976), 89.
B. Allina Tretyakova, "Labor and Capital in the Soviet Union by Republics," Duke University - University of North Carolina Occasional Papers on Soviet Input-Output Analysis, No. 20 (Chapel Hill-Durham, 1977), p. 24.
C. Calculated.
D. Vestnik statistiki No. 7 (1970), 94; Nar. khoz. 1969, p. 766; Nar. khoz. 1975, p. 737.
E. Calculated.
F. Yu. Kurmmov, Mezhdunarodnaya spetsializatsiya proizvodstva (Moscow, 1968), p. 56; Nar. khoz. 1967, p. 225; Nar. khoz. 1968, p. 233; Nar. khoz. 1969, p. 187; Nar. khoz. 1970, p. 174; Nar. khoz. 1922-1972, p. 157; Nar. khoz. 1972, p. 197; Nar. khoz. 1973, p. 249; Nar. khoz. 1974, p. 210; Nar. khoz. 1975, p. 230.
G. Calculated.
H. Nar. khoz. 1968, p. 745; Nar. khoz. 1970, p. 705; Nar. khoz. 1975, p. 727.
I. Calculated.
J. Nar. khoz. 1975, p. 191.
K. Calculated.

Table A-III
Estimated and Reported Industrial GVO, 1966-75
(billions of current rubles, producers' prices)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A. Unadjusted Industrial Wage Fund	36.901	40.061	44.517	47.735	50.549	53.002	55.347	58.081	62.381	66.282
B. x Social Ins. Adj. Factor	1.072	1.072	1.072	1.072	1.072	1.072	1.072	1.072	1.072	1.072
C. Equals Unadjusted Wage Fund and Social Insurance	39.558	42.945	47.722	51.172	54.189	56.818	59.332	62.263	66.872	71.054
D. Divided by Share of C in Production Cost (%)	17.9%	16.9%	16.6%	16.5%	16.1%	15.5%	15.2%	14.8%	14.8%	14.6%
E. Equals Production Cost	220.994	254.112	287.482	310.133	336.578	366.568	390.342	420.696	451.838	486.671
F. Plus Profit	25.088	34.889	44.431	48.810	55.956	56.232	59.397	60.042	64.223	65.881
G. Equals Estimated Industrial GVO	246.082	289.001	331.913	358.943	392.534	422.800	449.739	480.738	516.061	552.552
H. Reported Industrial GVO	248.3	285.9	322.8	345.0	374.3	395.7	420.0	447.3	479.6	511.2
I. G ÷ H	.991	1.011	1.028	1.040	1.049	1.069	1.071	1.075	1.076	1.081

Sources:
A. Table A-II, Row A
B. Table A-II, Row B
C. Calculated
D. Table A-II, Row F
E. Calculated
F. Table A-II, Row H
G. Calculated
H. Table A-II, Row J
I. Calculated

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-32-

Table A-IV

Estimated Payments from MIMW Material Incentive Fund, 1967-75
(billions of current rubles, producers' prices)

	1967	1968	1969	1970	1971	1972	1973	1974	1975
A. Unadjusted Industrial Wage Fund	40.061	44.517	47.735	50.549	53.002	55.347	58.081	62.381	66.282
B. Payments from Material Incentive Fund	.660	1.773	3.071	3.739	4.140	4.399	4.840	5.247	5.663
C. B ÷ A	.0165	.0398	.0643	.0740	.0781	.0795	.0833	.0841	.0854
D. Unadjusted MIMW Wage Fund	14.695	16.538	18.160	19.378	20.735	22.049	23.414	25.377	27.209
E. C x D =MIMW Payments from Material Incentive Fund	.242	.658	1.168	1.434	1.619	1.753	1.950	2.134	2.324

Sources:
A. *Table A-II, Row A*
B. *Table A-II, Row D*
C. *Calculated*
D. *As in Table A-II, footnote A*
E. *Calculated*

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-33-

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Table A-V
Estimated MBMW GVO, 1966-75
(billions of current rubles, producers' prices)

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	Unadjusted MBMW Wage Fund	13.426	14.695	16.538	18.160	19.378	20.735	22.049	23.414	25.377	27.209
B.	x Social Ins. Adj. Factor	1.077	1.077	1.077	1.077	1.077	1.077	1.077	1.077	1.077	1.077
C.	Equals Unadjusted Wage Fund & Social Ins.	14.460	15.827	17.811	19.558	20.870	22.332	23.747	25.217	27.331	29.304
D.	Less MBMW Material Incentive Fund Paid Out from Profits	---	.242	.658	1.168	1.434	1.619	1.753	1.950	2.134	2.324
E.	Equals MBMW Wage Fund Included in Production Cost	14.460	15.585	17.153	18.390	19.436	20.713	21.994	23.267	25.197	26.980
F.	Divided by Share of E in Production Cost	28.9%	27.6%	27.0%	26.6%	25.6%	25.1%	24.6%	24.3%	24.0%	23.6%
G.	Equals Production Cost	50.035	56.467	63.530	69.135	75.922	82.522	89.407	95.749	104.988	114.322
H.	Plus Profit	8.710	9.715	10.929	12.015	13.887	12.847	14.834	13.083	14.742	16.660
I.	Equals Estimated MBMW GVO	58.745	66.182	74.459	81.150	89.809	95.369	104.241	108.832	119.730	130.982

Sources:
A. Table A-IV, Row D
B. V.M. Piskov and M.L. Zakharov, *Sotsial'noye obespecheniye i strakhovaniye v SSSR* (Moscow, 1972), pp. 392-93; I.A. Boyarskiy and Ya. L. Vaysfel'd, *Bukhalterskiy uchet v promyshlennosti. Uchebnoye posobiye* (Moscow, 1974), p. 56.
C. Calculated
D. Table A-IV, Row E
E. Calculated
F. As in Table A-II, footnote F
G. Calculated
H. As in Table A-II, footnote H
I. Calculated

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Appendix B

MBMW Residual Calculations

Table B-I
Best MBMW Residuals, 1966-75 (billions of July 1, 1967 rubles, producers' prices)
Establishment Statistics

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	MBMW GVO	54.3	61.1	68.7	76.3	84.8	94.1	105.2	117.9	131.4	146.7
B.	Less Intermediate Use	22.5	25.8	29.4	33.2	37.5	42.3	48.1	54.7	62.0	70.3
C.	Equals Final Use MBMW	31.8	35.3	39.3	43.1	47.3	51.8	57.1	63.2	69.4	76.4
D.	Less Exports	1.4	1.6	1.8	2.0	2.1	2.3	2.6	2.9	3.4	3.8
E.	Plus Imports	2.3	2.6	3.1	3.5	3.8	3.8	4.6	5.3	6.1	9.0
F.	Less Investments 1.	16.9	18.2	19.4	21.0	22.9	24.4	26.4	28.7	31.9	35.6
	2.	0.2	0.8	0.8	-0.1	-0.1	0.1	0.1	0.1	0.6	0.6
	3.	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5
G.	Less Consumption	4.8	5.2	5.9	6.4	7.2	8.1	9.3	10.1	10.9	11.9
H.	Less Capital Repair	6.7	7.1	7.6	8.0	8.6	9.1	9.7	10.3	11.0	11.7
I.	Equals MBMW Residuals	3.1	3.9	5.8	8.1	9.2	10.3	12.3	15.0	16.3	20.3
J.	As Share of MBMW GVO	5.7%	6.4%	8.4%	10.6%	10.8%	10.9%	11.7%	12.7%	12.4%	13.8%
K.	Index (1966 = 100)	100	126	187	261	297	332	397	484	526	655

Sources:
A. Table 1, Row D
B. A x Row A of Table 2.
C. A - B
D. Table 3 Row A-3 (rounded)
E. Table 3, Row B-3 (rounded)

F. Table 4, Row E
   Table 5, Row B (rounded)
   Table 6, Column D
G. Table 7, Row C
H. Table 8, Row B

I. Calculated
J. I + A
K. Calculated

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-36-

SECRET

Table B-II
Low MBMW Residuals, 1966-75 (billions of July 1, 1967 rubles, producers' prices)
Establishment Statistics

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	MBMW GVO	54.3	61.1	68.7	76.3	84.8	94.1	105.2	117.9	131.4	146.7
B.	Less Intermediate Use	23.1	26.4	30.1	34.0	38.4	43.4	49.2	56.0	63.5	71.9
C.	Equals Final Use MBMW	31.2	34.7	38.6	42.3	46.4	50.7	56.0	61.9	67.9	74.8
D.	Less Exports	1.7	1.8	2.1	2.4	2.5	2.7	3.0	3.4	4.0	4.5
E.	Plus Imports	1.6	1.9	2.2	2.5	2.7	2.7	3.3	3.8	4.3	6.4
F.	Less Investments 1.	18.1	19.6	20.5	23.0	24.2	26.2	28.3	31.0	35.0	38.4
	2.	0.2	0.8	0.8	-0.1	-0.1	0.1	0.1	0.1	0.6	0.6
	3.	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5
G.	Less Consumption	5.3	5.7	6.5	7.0	7.9	8.9	10.2	11.1	12.0	13.1
H.	Less Capital Repair	7.4	7.8	8.4	8.8	9.5	10.0	10.7	11.3	12.1	12.9
I.	Equals MBMW Residuals	-0.9	-0.2	1.4	2.5	3.9	4.2	5.7	7.4	7.1	10.2
J.	As Share of MBMW GVO	----	----	2.0%	3.3%	4.6%	4.5%	5.4%	6.3%	5.4%	7.0%
K.	*Index (1968 = 100)*	----	----	*100*	*179*	*279*	*300*	*407*	*529*	*507*	*729*

Sources:
A. Table 1, Row D
B. A x Row C of Table 2.
C. A - B
D. Table 3, Row A-4 (rounded)
E. Table 3, Row B-2 (rounded)
F. Table 4, Row F
   Table 5, Row B (rounded)
   Table 6, Column D

G. Table 7, Row E
H. Table 8, Row D
I. Calculated
J. I ÷ A
K. Calculated

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-37-

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Tablo B-III
High MBMW Residuals, 1966-75 (billions of July 1, 1967 rubles, producers' prices)
Establishment Statistics

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	MBMW GVO	54.3	61.1	68.7	76.3	84.8	94.1	105.2	117.9	131.4	146.7
B.	Less Intermediate Use	22.0	25.2	28.7	32.4	36.5	41.3	46.9	53.4	60.6	68.7
C.	Equals Final Use MBMW	32.3	35.9	40.0	43.9	48.3	52.8	58.3	64.5	70.8	78.0
D.	Less Exports	1.2	1.3	1.5	1.7	1.8	1.9	2.1	2.4	2.8	3.2
E.	Plus Imports	2.9	3.3	3.9	4.4	4.7	4.8	5.8	6.7	7.6	11.3
F.	Less Investments 1.	15.7	16.9	18.3	19.1	21.5	22.6	24.5	26.4	29.0	32.7
	2.	0.2	0.8	0.8	-0.1	-0.1	0.1	0.1	0.1	0.6	0.6
	3.	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5
G.	Less Consumption	4.3	4.7	5.3	5.8	6.5	7.3	8.4	9.1	9.8	10.7
H.	Less Capital Repair	6.0	6.4	6.8	7.2	7.7	8.2	8.7	9.3	9.9	10.5
I.	Equals MBMW Residuals	6.8	8.0	10.1	13.4	14.4	16.2	19.0	22.5	24.9	30.1
J.	As Share of MBMW GVO	12.5%	13.1%	14.7%	17.6%	17.0%	17.2%	18.1%	19.1%	18.9%	20.5%
K.	Index (1966 = 100)	100	118	149	197	212	238	279	331	366	443

Sources:
A. Table 1, Row D
B. A x Row B of Table 2
C. A - B
D. Table 3, Row A-2 (rounded)
E. Table 3, Row B-4 (rounded)

F. Table 4, Row D
    Table 5, Row B (rounded)
    Table 6, Column D
G. Table 7, Row E
H. Table 8, Row C

I. Calculated
J. I ÷ A
K. Calculated

Table B-IV
MBMW Residuals for 1966 and 1972 (billions of current rubles, producers' prices)
Commodity Statistics

		1966			1972		
		Low	Best	High	Low	Best	High
A.	MBMW GVO	61.1	61.1	61.1	108.5	108.5	108.5
B.	Less Intermediate Use	26.0	25.4	24.7	50.8	49.6	48.4
C.	Equals Final Use MBMW	35.1	35.7	36.4	57.7	58.9	60.1
D.	Less Exports	1.7	1.4	1.2	3.0	2.6	2.1
E.	Plus Imports	1.6	2.3	2.9	3.3	4.6	5.8
F.	Less Investment 1.	18.1	16.9	15.7	27.5	25.6	23.8
	2.	0.2	0.2	0.2	0.1	0.1	0.1
	3.	1.0	1.0	1.0	1.3	1.3	1.3
G.	Less Consumption	5.3	4.8	4.3	8.7	7.9	7.1
H.	Less Capital Repair	7.4	6.7	6.0	10.7	9.7	8.7
I.	Equals MBMW Residual	3.0	7.0	10.9	9.7	16.3	22.8
J.	As Share of MBMW GVO	4.9%	11.5%	17.8%	8.9%	15.0%	21.0%

Sources:
A. Table 1, Row E
B. A x Rows A-C of Table 2
C. A - B
D. Table 3, Rows A-2 - 4 (rounded)
E. Table 3, Rows B-2 - 4 (rounded)
F. Table 4, Rows H-J
   Table 5, Row B (rounded)
   Table 6, Column D

G. Table 7, Rows D, F
H. Table 8, Rows B-D
I. Calculated
J. I ÷ A

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-40-

Table B-V
Best MBMW Residuals, 1966-75 (billions of current rubles, producers' prices)
Establishment Statistics

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	MBMW GVO	58.7	66.2	74.5	81.1	89.8	95.4	104.2	108.8	119.7	131.0
B.	Less Intermediate Use	24.4	27.9	31.9	35.3	39.7	42.9	47.6	50.5	56.5	62.7
C.	Equals Final Use MBMW	34.3	38.3	42.6	45.8	50.1	52.5	56.6	58.3	63.2	68.3
D.	Less Exports	1.4	1.6	1.8	2.0	2.1	2.3	2.6	2.9	3.4	3.8
E.	Plus Imports	2.3	2.6	3.1	3.5	3.8	3.8	4.6	5.3	6.1	9.0
F.	Less Investments 1.	16.9	18.2	19.3	20.7	22.5	23.8	25.6	27.7	30.6	33.9
	2.	0.2	0.8	0.8	-0.1	-0.1	0.1	0.1	0.1	0.6	0.6
	3.	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5
G.	Less Consumption	4.8	5.1	5.6	5.9	6.5	7.1	7.9	8.4	8.8	9.4
H.	Less Capital Repair	6.7	7.1	7.6	8.0	8.6	9.1	9.7	10.3	11.0	11.7
I.	Equals MBMW Residuals	5.6	7.0	9.5	11.6	13.1	12.6	14.0	12.8	13.5	16.4
J.	As Share of MBMW GVO	9.5%	10.6%	12.8%	14.3%	14.6%	13.2%	13.4%	11.8%	11.3%	12.5%
K.	Index (1966 = 100)	100	125	170	207	234	225	250	229	241	293

Sources:
A. Table 1, Row F
B. A x Row A of Table 2
C. A - B
D. Table 3, Row A-3 (rounded)
E. Table 3, Row B-3 (rounded)

F. Table 4, Row I
   Table 5, Row B (rounded)
   Table 6, Column D
G. Table 7, Row D
H. Table 8, Row B

I. Calculated
J. I + A
K. Calculated

-41-
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Table B-VI
Low MBMW Residuals, 1966-75 (billions of current rubles, producers' prices)
Establishment Statistics

		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	MBMW GVO	58.7	66.2	74.5	81.1	89.8	95.4	104.2	108.8	119.7	131.0
B.	Less Intermediate Use	24.9	28.6	32.6	36.1	40.7	44.0	48.8	51.7	57.8	64.2
C.	Equals Final Use MBMW	33.8	37.6	41.9	45.0	49.1	51.4	55.4	57.1	61.9	66.8
D.	Less Exports	1.7	1.8	2.1	2.4	2.5	2.7	3.0	3.4	4.0	4.5
E.	Plus Imports	1.6	1.9	2.2	2.5	2.7	2.7	3.3	3.8	4.3	6.4
F.	Less Investments 1.	18.1	19.6	20.4	22.7	23.8	25.6	27.5	29.9	33.5	36.6
	2.	0.2	0.8	0.8	-0.1	-0.1	0.1	0.1	0.1	0.6	0.6
	3.	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5
G.	Less Consumption	5.3	5.6	6.2	6.5	7.1	7.8	8.7	9.2	9.7	10.4
H.	Less Capital Repair	7.4	7.8	8.4	8.8	9.5	10.0	10.7	11.3	12.1	12.9
I.	Equals MBMW Residuals	1.7	2.8	5.1	6.0	7.8	6.6	7.4	5.6	4.9	6.7
J.	As Share of MBMW GVO	2.9%	4.2%	6.8%	7.4%	8.7%	6.9%	7.1%	5.1%	4.1%	5.1%
K.	Index (1966 = 100)	100	165	300	353	459	388	435	329	288	394

Sources:
A. Table 1, Row F
B. A x Row C of Table 2
C. A - B
D. Table 3, Row A-4 (rounded)
E. Table 3, Row B-2 (rounded)

F. Table 4, Row J
   Table 5, Row B (rounded)
   Table 6, Column D
G. Table 7, Row F
H. Table 8, Row D

I. Calculated
J. I + A
K. Calculated

Table B-VII
High MBMW Residuals, 1966-7 (billions of current rubles, producers' prices)
Establishment Statistics

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-42-

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		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
A.	MBMW GVO	58.7	66.2	74.5	81.1	89.8	95.4	104.2	108.8	119.7	131.0
B.	Less Intermediate Use	23.8	27.3	31.1	34.5	38.7	41.9	46.5	49.3	55.2	61.3
C.	Equals Final Use MBMW	34.9	38.9	43.4	46.6	51.1	53.5	57.7	59.5	64.5	69.7
D.	Less Exports	1.2	1.3	1.5	1.7	1.8	1.9	2.1	2.4	2.8	3.2
E.	Plus Imports	2.9	3.3	3.9	4.4	4.7	4.8	5.8	6.7	7.6	11.3
F.	Less Investments 1.	15.7	16.9	18.2	18.9	21.1	22.1	23.8	25.4	27.8	31.2
	2.	0.2	0.8	0.8	-0.1	-0.1	0.1	0.1	0.1	0.6	0.6
	3.	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5
G.	Less Consumption	4.3	4.6	5.0	5.3	5.9	6.4	7.1	7.6	7.9	8.4
H.	Less Capital Repair	6.0	6.4	6.8	7.2	7.7	8.2	8.7	9.3	9.9	10.5
I.	Equals MBMW Residuals	9.4	11.1	13.9	16.8	18.2	18.3	20.4	20.0	21.7	25.6
J.	As Share of MBMW GVO	16.0%	16.8%	18.7%	20.7%	20.3%	19.2%	19.6%	18.4%	18.1%	19.5%
K.	Index (1967 = 100)	100	118	148	179	194	195	217	213	231	272

Sources:
A. Table 1, Row F
B. A x Row B of Table 2
C. A - B
D. Table 3, Row A-2 (rounded)
E. Table 3, Row B-4 (rounded)

F. Table 4, Row H
    Table 5, Row B (rounded)
    Table 6, Column D
G. Table 7, Row F
H. Table 8, Row C

I. Calculated
J. I ÷ A
K. Calculated

Source References

1. USSR, Gosplan, Metodicheskiye ukazaniva k sostavleniyu gosudarstvennogo plana razvitiya narodnogo khozyaystva SSSR (Moscow, 1969), pp. 709-23; Metodicheskiye ukazaniya k razrabotke gosudarstvennykh planov razvitiya narodnogo khozyaystva SSSR (Moscow, 1974), pp. 713-28.
2. Narodnoye khozyaystvo SSSR v 1968 godu. Statisticheskiy yezhegodnik (Moscow, 1969), p. 254.
3. The literature on the estimation of military hardware output from MBMW data is extensive. The major unclassified works include Abraham S. Becker, Soviet Military Outlays Since 1955, Rand Corporation Memorandum RM-3886-PR, (Santa Monica, 1964), esp. pp. 41-50, 85-90 Michael Boretsky, "The Technological Base of Soviet Military Power," in Joint Economic Committee, U.S. Congress, Economic Performance and the Military Burden in the Soviet Union (Washington, D.C., 1970), pp. 189-231; Stanley H. Cohn, Estimation of Military Durables Procurement Expenditures From Machinery Production and Sales Data, SRI International Informal Note SSC-IN-78-13 (Arlington, VA, 1978) and William T. Lee, The Estimation of Soviet Defense Expenditures, 1955-75. An Unconventional Approach (New York, 1977).
4. The yearbooks in question are those in the series Narodnoye khozyaystvo SSSR. But a 1961 yearbook in another series reported MBMW GVO for 1960 and projected MBMW GVO for 1965, 1970, and 1980. SSSR v tsifrakh v 1961 godu. Kratkiy statisticheskiy sbornik (Moscow 1962), pp. 108-109.
5. Nar. khoz. 1975 (Moscow, 1976), p. 784. (This describes the index of industrial output, but the description applies to the indexes of the branches of industry as well.
6. N.I. Tsybakin, "Sistema pokazateley tekhnickeskogo urovnya mashinostroyeniya," Ekonomika i organizatsiya promyshlennogo proizvodstva, No. 5 (Nov. 1976), p. 92.
7. Yu. K. Kozlov, Razvitiye i razmeshcheniye mashinostroyeniya SSSR (Moscow, 1974), p. 34.
8. See for example, the following table:

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(Billions of Rubles, Producers' Prices)

		1960	1965
A.	Reported MBMW GVO in July 1, 1967 prices	27.0	48.6
B.	1967/1955 price ratio (I)	.769	.769
C.	1967/1955 price ratio (II)	.922	.922
D.	A ÷ B	35.1	63.2
E.	A ÷ C	29.3	52.7
F.	Reported MBMW GVO in July 1, 1955 prices	34.0	61.0

Sources

A. Table 1, Row C.
B. This is the ratio of 1967 to 1955 prices according to the MBMW producers' price index reported in Soviet economic yearbooks. <u>Nar. khoz. 1975</u>, p. 231.
C. This is the ratio of July 1, 1967 comparable prices to July 1, 1955 comparable prices reported by two Gosplan officials. P. Krylov and P. Kanunikov, "Ispol'zovaniye sopostavimykh optovykh tsen v planirovanii," <u>Planovoye khozyaystvo 9</u> (Sept. 1977), p. 63.
D. Calculated
E. Calculated
F. Statistics are from Soviet sources as reported by W.T. Lee, <u>The Estimation of Soviet Defense Expenditures</u>, pp. 157-60.
9. A.A. Shaporov, "Narodnokhozyaystvennoye znacheniye nauchno-tekhnicheskogo progressa v mashinostroyenii," in D.S. L'vov (ed.) <u>Ekonomicheskiye problemy razvitiya mashinostroyeniya, Sbornik statey</u> (Moscow, 1975), p. 7.
10. <u>Sotsialisticheskaya industriya</u>, Apr. 7, 1971, p. 4.
11. <u>Nar. Khoz. 1972</u> (Moscow, 1973), p. 197.
12. Yu. M. Shvyrkov, "Klassifikatsiya otrasley i produktov v mezhotraslevom balanse," in A.N. Yefimov & I.Ya. Berri, <u>Metody planirovaniya mezhotraslevykh proportsiy</u> (Moscow, 1965), p. 81.
13. Let: 1) "commodity" to "establishment" ratio = R
   2) non-MBMW produced by MBMW establishments ÷ "establishment" MBMW GVO = x
   3) MBMW produced by non-MBMW establishments "establishment" ÷ MBMW GVO = y
   $R = 1 - x + y$

For 1959 published Soviet sources have reported the values of R (0.92 - see footnote 12) and x (0.145 - M.R.

-44-

SECRET

Eidelman, _Mezhotraslevoy balans obshchestvennogo produkta_ (Moscow, 1966), p. 199. The value of y, therefore, was 0.065.

For subsequent years published Soviet sources have not reported the values of R or y. But one Soviet economist (see p. 15 of source in footnote 9) has reported that the value of x was 0.14 in 1970 and was scheduled to decrease to 0.11 by 1975.

Apparently x was fairly constant at 0.145-0.14 during 1959-70. If y was also roughly constant--at about 0.065-0.060--, then R was about 0.92 throughout that period. Thereafter, x was scheduled to decrease. If y decreased at the same rate R would have increased slightly during 1970-75. (Because x was greater than y, the change in x would outweigh the change in y).

14. P.G. Lyutko, _Planirovaniye i analiz struktury obshchestvennogo proizvodstva respubliki_ (Minsk, 1976), p. 9.

15. W.T. Lee, _The Estimation of Soviet Defense Expenditures,_ pp. 59, 63.

16. In 1972, for example, a Soviet economist reported that intrabranch purchases of MBMW were 28 percent of MBMW GVO in 1970, and implied that they would increase to about 29 percent of MBMW GVO in 1975. (A. Lalayants, "Opredeleniye materialoyemkosti obshchestvennogo proizvodstva," _Planovoye khozyaystvo,_ 2 (Feb. 1972), 12). But another Soviet economist reported that the share of intra-branch purchases in MBMW GVO was scheduled to increase by approximately 10 percent during 1971-79. This implies that the share of intra-branch purchases would grow at about double the rate implied by the earlier reports (R.A. Buzunov, "Metod mezhotraslevogo balansa v planirovanii razvitiya mashinostroyeniya," in L'vov (ed.) _Ekonomicheskiye problemy,_ p. 113.

17. On the question of whether prototypes are included in MBMW GVO see W.T. Lee, _The Estimation of Soviet Defense Expenditures,_ pp. 167-71.

18. Barry Kostinsky and Vladimir G. Treml, _Foreign Trade Pricing in the Soviet Union: Exports and Imports in the 1966 Input-Output Table_ (Foreign Economic Report No. 8, Washington, D.C.: US Dept. of Commerce, Mar. 1976), p. 10-11.

19. W.T. Lee, _The Estimation of Soviet Defense Expenditures_ p. 206.

20. Kostinsky and Treml, _Foreign Trade Pricing,_ pp. 27-33.

21. Barry Kostinsky, _Description and Analysis of Soviet Foreign Trade Statistics_ (Foreign Economic Report No. 5,

-45-

SECRET

Washington, D.C.: US Dept. of Commerce, Jul. 1974), p. 44.

22. As in Becker, <u>Soviet Military Outlays Since 1955,</u> pp. 86-88.

23. As in Lee, <u>The Estimation of Soviet Defense Expenditures</u>, pp. 191-99.

24. As in Rush V. Greenslade, "Industrial Production Statistics in the USSR", in Treml & Hardt (eds.) <u>Soviet Economic Statistics</u> (Durham, N.C., 1972), pp. 180-181.

25. As suggested by Boretsky ("The Technical Base of Soviet Military Power", p. 229) who estimates that transportation charges are equal to 5 percent and non-MBMW products equal to "between 5 and 10 percent" of the reported value of equipment, tool, and inventory.

26. <u>Ekonomika stroitel`stva</u> # 6 (June 1974), 73-76 (unattributed answers to readers' questions).

27. John Pitzer, "Reconciliation of Gross National Product and Soviet National Income," unpublished paper presented at a NATO colloquium, July 1977, pp. 28-29.

28. Nar. khoz. 1964 (Moscow, 1965), p. 582.

29. Franklyn D. Holzman, <u>Financial Checks on Soviet Defense Expenditures</u> (Lexington, Mass., 1975), p. 21.

30. V. Treml, D. Gallik, and B. Kostinsky, "1966 Ex Post Input-Output Tables for the USSR: A Survey," in V. Treml (ed.) <u>Studies in Soviet Input-Output Analysis</u> (New York, 1977).

31. Foreign Demographic Analysis Division (FDAD), U.S. Department of Commerce, "The Reconstructed Soviet Input-Output Table for 1972 in Producers' Prices," unpublished tables, 8 December 1977.

32. The rationale for the inclusion of military purchases in capital repair would be the same as that for the inclusion of such purposes in new investment. See Pitzer, "Reconciliation of Gross National Product and Soviet National Income," p. 33.

33. In 1974 a publication of the USSR Ministry of Defense reported that the 15 percent increase in announced Soviet spending for defense between 1967 and 1968 was related to the 1967 price reform-- P.V. Sokolov, <u>Politicheskaya ekonomiya: Sotsializm--Pervaya faza kommunisticheskogo sposoba proizvodstva</u> (Moscow, 1974) p. 294.

34. On the MBMW producers' price index see Abraham S. Becker, "The Price Level of Soviet Machinery in the 1960's," <u>Soviet Studies,</u> 26, No. 3 (July 1974), 363-67.

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Annex 1

Comparison of MBMW Residuals with

CIA Estimates of Soviet Military Machinery

Purchases

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Annex 1

Comparison of MBMW Residuals with CIA Estima
of Soviet Military Machinery Purchases

The purpose of this annex is to compare the three series of estimates presented in the basic paper with CIA's direct-costing estimates of Soviet military machinery purchases.

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The comparison is a difficult one for two reasons. First, the estimates based on MBMW data are residuals of uncertain composition and, therefore, there is uncertainty about what components of the direct-costing estimates they should be compared to. Second, some of the estimates based on MBMW data are expressed in 1 July 1967 prices and others are in current prices, but the CIA estimates are in 1970 prices.

25X1

To deal with the uncertainty about the composition of the residuals, two separate direct-costing estimates were calculated. The first--CIA Narrow--is an estimate, admittedly somewhat subjective and difficult to substantiate, of what the MBMW residuals are most likely to include. It includes all Soviet military machinery purchases less purchases of military hardware prototypes used for RDT&E, common-use durables such as trucks and construction equipment, machinery purchased for consumption by military schools, hospitals, etc., capital repair of military equipment, and ammunition and nuclear materials.* As the working paper explains, there is great uncertainty as to whether these specified types of products are included in the residuals. Here \

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*Ammunition and nuclear materials are produced in MBMW establishments, but it is uncertain whether they would be classified as MBMW output in "commodity" as well as in "establishment" terms. Also, for the reasons discussed on page 26 of the working paper it is uncertain whether they are included in either the "establishment" or the "commodity" residuals.

-48-

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however, it is assumed that they are not included.*   If
this assumption is incorrect, this would have a major
impact on the comparison of the residuals and the
direct-costing estimates. The second direct-costing
estimate--CIA Broad--is presented to give some sense of
how great this impact could be. It includes all Soviet
military machinery purchases.

25X1

　　To deal with the price differences among the
estimates the MBMW residuals were converted to the 1970
prices in which the CIA estimates are expressed. This
was done with two indices of MBMW prices which are
described in another CIA working paper. These indices,
it should be noted, purport only to reflect the changes
in MBMW prices in general rather than of military
hardware prices in particular. Their use in the annex
is not intended as an endorsement of the indices as
measures of the changes in military prices. (The price
indices, the unadjusted residuals, the residuals in 1970
prices, and the CIA estimates are presented in a summary
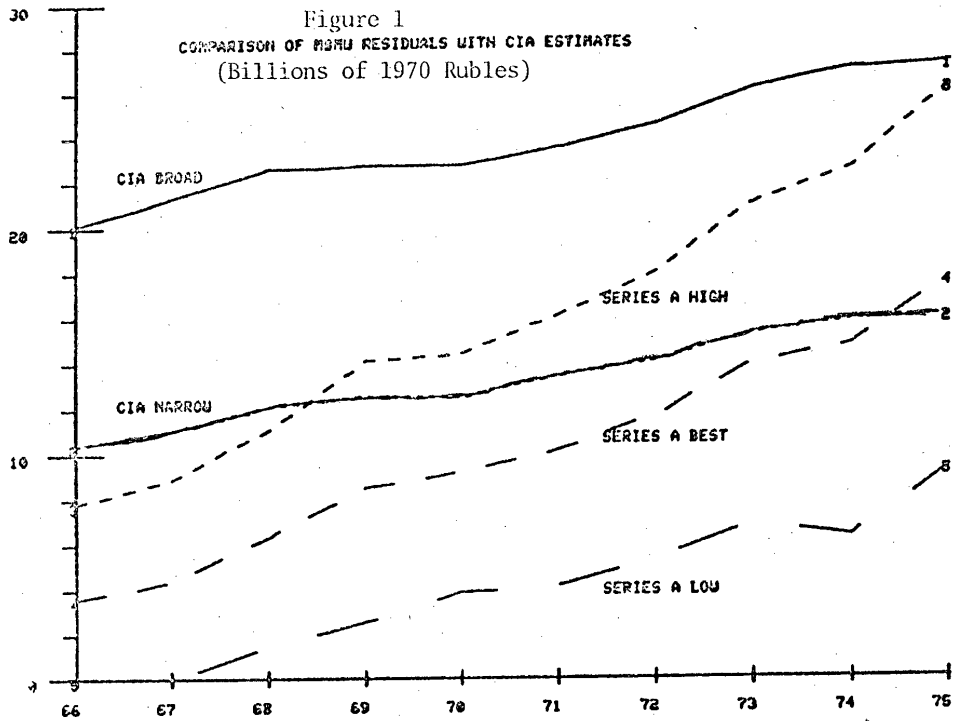table appended to this annex).

25X1

　　Figures 1, 2, and 3 compare each of the three
series of estimates based on MBMW data with CIA's
direct-costing estimates of Soviet military machinery
purchases. The Series A residuals in Figure 1
originally were calculated in 1 July 1967 prices from
reported statistics on MBMW GVO in "establishment"
terms. The Series B residuals in Figure 2 originally
were calculated in current prices from estimates of MBMW
GVO in "commodity" terms. (The original series included
residuals only for 1966 and 1972. The other residuals in

----

　　*Pitzer maintains that except for ammunition and
nuclear materials (see above) the specified types of
output are not included in the residuals
("Reconciliation of Gross National Product and Soviet
National Income", p. 33). Lee is less explicit on the
composition of the residuals, but apparently defines the
residuals in much the same fashion as Pitzer (The
Estimation of Soviet Defense Expenditures, pp. 32-33,
36, 40).

-49-

SECRET

20 DEC 1978

-50-
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Figure 1
COMPARISON OF MSMU RESIDUALS WITH CIA ESTIMATES
(Billions of 1970 Rubles)

20 DEC 1978

Figure 2
COMPARISON OF MBMW RESIDUALS WITH CIA ESTIMATES
(Billions of 1970 Rubles)

CIA BROAD

SERIES B HIGH

SERIES B BEST

CIA NARROW

SERIES B LOW

-51-
SECRET

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66 67 68 69 70 71 72 73 74 75

20 DEC 1978

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Figure 3

COMPARISON OF MBMW RESIDUALS WITH CIA ESTIMATES
(Billions of 1970 Rubles)

CIA BROAD

SERIES C HIGH

CIA NARROW

SERIES C BEST

SERIES C LOW
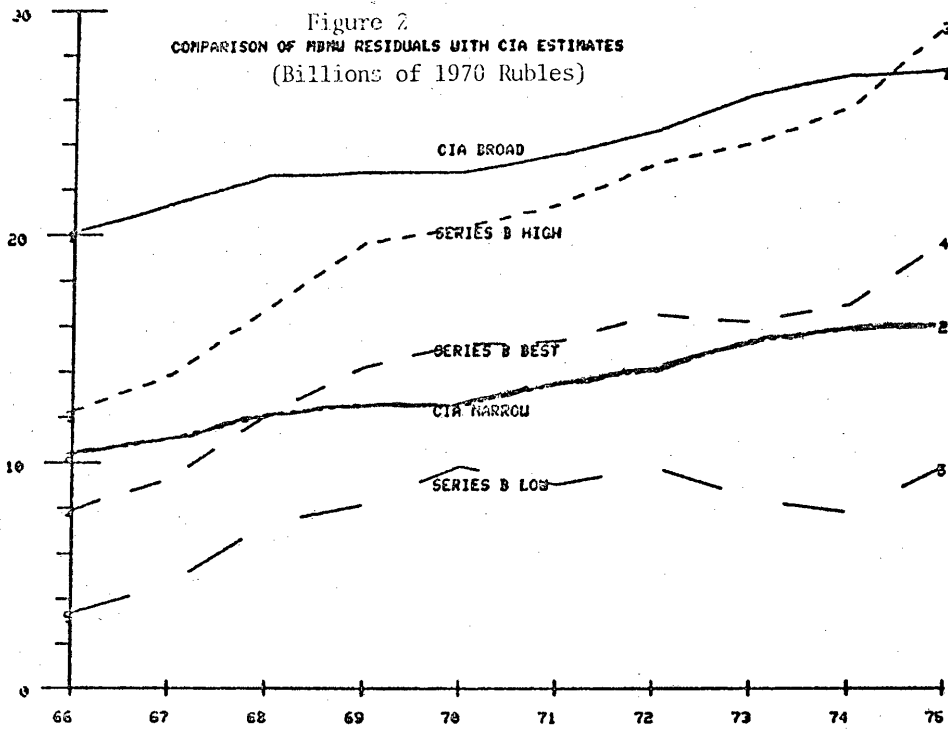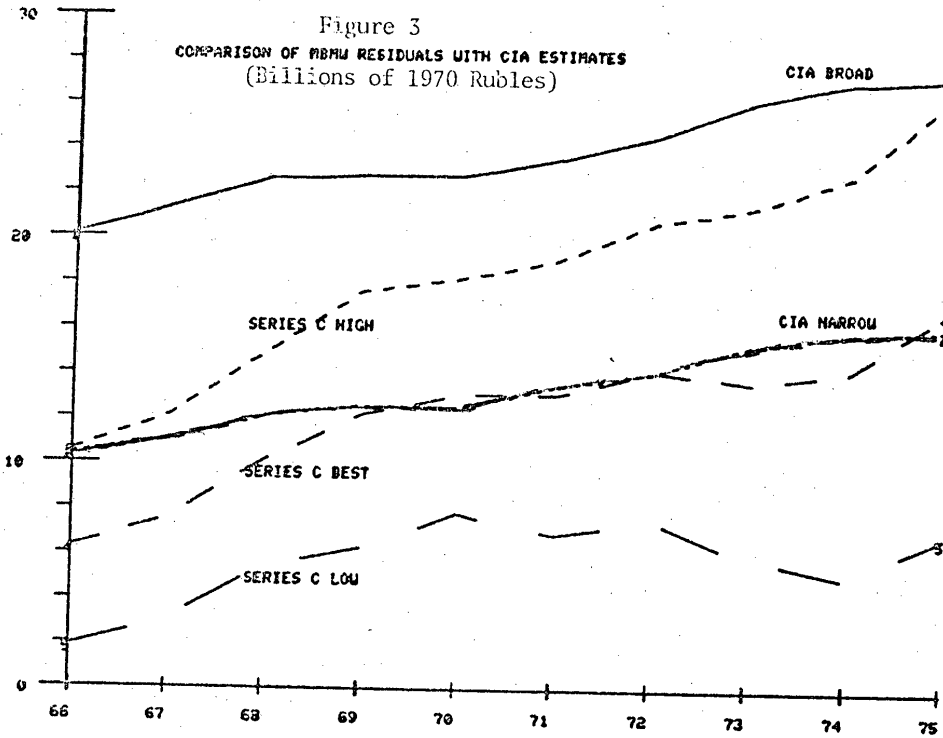
Figure 2 were interpolated or extrapolated.)** The
series C residuals in Figure 3 originally were
calculated in current prices from estimates of MBMW GVO
in "establishment" terms which were based on labor
costs, their share in production outlays and reported
profits. All three figures include high, best, and low
estimates of the MBMW residuals. These differ because
of differences in the estimates of non-defense
production which were subtracted from GVO to calculate
the residuals.   25X1

    With respect to their level and overall trend the
residuals in Figures 1, 2, and 3 provide some modest
support to the direct-costing estimates. After 1968 the
best estimates of the residuals in Series B and C are
not greatly different from the CIA Narrow estimates.
However, these data should be interpreted cautiously.
The residuals may include the value of military hardware
exports shipped from current production, while the
direct costing estimates do not. The Series A residuals
are substantially different from the direct-costing
estimates and the "true" residuals in all three series
could fall within a wide range. Also and most
important, if the residuals are not similar in
composition to the CIA Narrow estimates, the approximate
equivalence between the estimates based on MBMW data and
those based on direct-costing is deceptive.   25X1

    On balance, all three residual series also support
the direct-costing estimates in indicating a general
upward trend in Soviet military machinery purchases.
Again, however, the data should be interpreted
cautiously. The low estimates of the residuals in Series
B and C do suggest the possibility of flat or slightly
decreasing spending in the 1970s.   25X1

    With respect to the precise rates of growth which
they reflect, the residuals provide less support to the
direct costing estimates. Even when converted to 1970
prices, all three residual series grow much more rapidly
than the CIA Narrow estimates for the period 1966-75 as

    **In both 1966 and 1972 the values of MBMW output
from which the Series B residuals were calculated were
4.1 percent larger than those used to calculate Series
C. This relationship was assumed to have prevailed
throughout 1966-75, thus allowing for the calculation of
a complete time series of "commodity" residuals.   25X1

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a whole. The best estimates in Series A grow at an average of almost 20 percent a year and the best estimates in Series B and C grow at average annual rates of about 11 and 12 percent while the CIA Narrow estimates grow at an average annual rate of about 5 percent.* In large part, however, the difference in growth rates is due to the rapid growth of the residuals in 1967-68. This, in turn, may be due to the failure of the price indices to reflect the full impact which the 1967 price reform is believed to have had on military hardware prices.** For the 1969-75 period the best estimates of the residuals in Series B and C grow at average rates much closer to that of the CIA Narrow estimates (5.9 percent and 5.8 percent vs. 4.2 percent). Moreover, for 1970-75 the average annual growth rates of the best estimates in Series B and C and the CIA Narrow estimates are almost the same (5.6 percent, 5.5 percent and 5.2 percent). Even after 1968 the best estimates in Series A grow much more rapidly than the CIA Narrow estimates, but on the grounds of the non-homogeneity of the data used to calculate them the Series A residuals are the weakest of the three residual series.

25X1

The conclusions to be drawn from Figures 1, 2, and 3 are far from clear-cut, but given the failings of the estimates based on MBMW data, things could not be otherwise. The MBMW residual series are mutually inconsistent, imprecise, and ill-defined. Consequently, they do not allow for authoritative judgments on the accuracy of other estimates.

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*All growth rates discussed here were calculated using the least squares method.

** See footnote 33 to page 23 of the working paper.

Annex Table 1
CIA Estimates of Soviet Military Machinery Purchases and MBMW Residuals, 1966-1975
(Billions of Rubles, Producers' Prices)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1. CIA estimates (in 1970 rubles)										
a. Broad Estimate	20.1	21.3	22.6	22.7	22.7	23.5	24.5	26.1	27.0	27.3
b. Narrow Estimate	10.4	11.1	12.1	12.6	12.5	13.5	14.1	15.3	15.9	16.1
2. Series A Residuals (7/1/67 Prices)[1]										
a. High Estimate	6.8	8.0	10.1	13.4	14.4	16.2	19.0	22.5	24.9	30.1
b. Best Estimate	3.1	3.9	5.8	8.1	9.2	10.3	12.3	15.0	16.3	20.3
c. Low Estimate	-0.9	-0.2	1.4	2.5	4.9	4.2	5.7	7.4	7.1	10.2
3. Series B Residuals (Current Prices)[2]										
a. High Estimate	10.9	12.7[3]	15.7[3]	18.7[3]	20.3[3]	20.5[3]	22.8	22.5[3]	24.4[3]	28.5[3]
b. Best Estimate	7.0	8.5[3]	11.3[3]	13.5[3]	15.2[3]	14.7[3]	16.3	15.2[3]	16.1[3]	19.2[3]
c. Low Estimate	3.0	4.3[3]	6.8[3]	7.8[3]	9.8[3]	8.7[3]	9.7	8.0[3]	7.4[3]	9.5[3]
4. Series C Residuals (Current Prices)[1]										
a. High Estimate	9.4	11.1	13.9	16.8	18.2	18.3	20.4	20.0	21.7	25.6
b. Best Estimate	5.6	7.0	9.5	11.6	13.1	12.6	14.0	12.8	13.5	16.4
c. Low Estimate	1.7	2.8	5.1	6.0	7.8	6.6	7.4	5.6	4.9	6.7
5. Price Indices										
a. Index of Disguised Inflation in 7/1/67 MBMW Prices	.868	.896	.910	.951	1.00	1.009	1.054	1.072	1.104	1.144
b. Index of Current MBMW Prices	.883	.918	.935	.954	1.00	.963	.988	.936	.952	.968
6. Series A Residuals (1970 Prices)[1]										
a. High Estimate	7.8	8.9	11.1	14.1	14.4	16.1	18.0	21.0	22.6	26.3
b. Best Estimate	3.6	4.4	6.4	8.5	9.2	10.2	11.7	14.0	14.8	17.7
c. Low Estimate	----[4]	----[4]	1.5	2.6	3.9	4.2	5.4	6.9	6.4	8.9
7. Series B Residuals (1970 Prices)[2]										
a. High Estimate	12.3	13.8	16.8	19.6	20.3	21.3	23.1	24.0	25.6	29.4
b. Best Estimate	7.9	9.3	12.1	14.2	15.2	15.3	16.5	16.2	16.9	19.8
c. Low Estimate	3.4	4.7	7.3	8.2	9.8	9.0	9.8	8.5	7.8	9.8
8. Series C Residuals (1970 Prices)[1]										
a. High Estimate	10.6	12.1	14.9	17.6	18.2	19.0	20.6	21.4	22.8	26.4
b. Best Estimate	6.3	7.6	10.2	12.2	13.1	13.1	14.2	13.7	14.2	16.9
c. Low Estimate	1.9	3.1	5.5	6.3	7.8	6.9	7.5	6.0	5.1	6.9

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-55-

[1] Establishment Statistics
[2] Commodity Statistics
[3] Interpolated or Extrapolated
[4] Unadjusted residuals are negative values

Sources:

1.a.		25X1
b.	Ibid.	
2.a.	"Estimating Soviet Spending for Military Hardware from Machinebuilding and Metalworking Statistics," Appendix B, p. 38,,Table B-III, Row I.	
b.	Ibid., p. 36, Table B-I, Row I	
	Ibid., p. 37, Table B-II, Row I	
3.a.	1966 & 1972: Ibid.,p. 39, Table B-IV, Row I. For all other years multiply Row A of Table B-VII (p. 43) by 1.041 and recalculate the residuals.	
b.	1966 & 1972: Ibid., p. 39, Table B-IV, Row I. For all other years multiply Row A of Table B-V (p. 41) by 1.041 and recalculate the residuals.	
c.	1966 & 1972: Ibid., p. 39, Table B-IV, Row I. For all other years multiply Row A of Table B-VI (p. 42) by 1.041 and recalculate the residuals.	
4.a.	Ibid., p. 42, Table B-VII, Row I.	
b.	Ibid., p. 40, Table B-V, Row I.	
c.	Ibid., p. 41, Table B-VI, Row I.	
5.a.		25X1
b.	Ibid., p. 47	
6.a.	Row 2a ÷ Row 5a	
b.	Row 2b ÷ Row 5a	
c.	Row 2c ÷ Row 5a	
7.a.	Row 3a ÷ Row 5b	
b.	Row 3b ÷ Row 5b	
c.	Row 3c ÷ Row 5b	
8.a.	Row 4a ÷ Row 5b	
b.	Row 4b ÷ Row 5b	
c.	Row 4c ÷ Row 5b	

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