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PROVISIONAL INTELLIGENCE REPORT

**INPUTS FOR THE PEACETIME PRODUCTION
OF SMALL ARMS, MORTARS,
AND ARTILLERY PIECES
IN THE USSR**



CIA/RR PR-47
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OF SMALL ARMS, MORTARS, AND ARTILLERY PIECES
IN THE USSR

CIA/RR PR-47

(ORR Project 108-51)

NOTICE

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FOREWORD

The primary purpose of this report is to determine the quantities of productive services, or inputs, consumed annually in the peacetime production of small arms, mortars, and artillery pieces in the USSR. The report also attempts to describe the past development of the Soviet weapons industry, its organization, and its annual output.

No reliable Soviet information is available which can serve as a basis for a study of weapons input or of weapons production. Input estimates have therefore been derived from US analogy and from an interpretation of Soviet weapons requirements based on Army, Navy, and Air Force production estimates in addition to data obtained from other intelligence sources.

This methodology, even when employed with caution, is obviously not exact. It is, however, the only practicable technique to employ in this study and produces results which can be considered reasonable, if not firm, estimates.

Industry-wide estimates of inputs are ordinarily derived on the basis of a summation of individual input requirements for each end item produced by the industry. For an industry producing as many different items as does the weapons industry, the determination of inputs for each item in the usual manner would involve an almost prohibitive number of computations and would vastly increase the total margin of possible error.

To avoid these limitations, a unit of output representative of the weapons produced in the weapons industry of the USSR was constructed. The unit of product to which the inputs are related is termed a "bundle" of weapons. Once the number of these bundles produced is established, the inputs consumed by the industry are easily computed as a simple multiple of the inputs per representative unit of output.

The bundle of weapons consists of all types of small arms, mortars, and artillery pieces in direct proportion to their requirements as indicated by the equipment tables of the Soviet armed forces and the estimated annual production of aircraft and naval vessels in the USSR. Adjustments in these peacetime requirements are made to account for different rates of attrition and for the introduction of new models.

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The further development of the concept of the bundle of weapons to include all items of munitions would provide a working tool for analysts dealing with the production of munitions comparable to the division slice used by military planners. It promises to be useful in appraisals of the wartime resource requirements of an economy and of the capabilities of that economy to produce munitions. In short, the bundle of weapons is a first attempt to measure the balance in a munitions mix.

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(ORR Project 108-51)~~SECRET~~INPUTS FOR THE PEACETIME PRODUCTION
OF SMALL ARMS, MORTARS, AND ARTILLERY PIECES IN THE USSR*Summary

The production of small arms, mortars, and artillery pieces by the Soviet weapons industry during 1953 was concentrated in 22 plants. The majority of these plants are dispersed throughout the USSR, but the largest groups of plants are located in the industrial area surrounding Moscow and in the newly developed industrial areas east of the Urals.

The peacetime production of the 22 plants in the Soviet weapons industry represents about 78,000 short tons of equipment. According to Army G-2 estimates, Soviet production for 1952 was 317,500 small arms, 6,000 mortars, and 22,500 artillery pieces and tank guns. It is assumed that the 22 plants also produce the weapons required to meet the annual needs of the Soviet air and naval forces. The requirements for these forces are 27,000 aircraft cannons, 230 naval artillery units, and 400 naval and antiaircraft artillery units.

The inputs required to produce the indicated quantities of weapons are as follows:

Labor	43,000 Man-years
Steel	202,000 Short tons
Aluminum	620 Short tons
Copper	2,000 Short tons
Coal	472,000 Short tons
Petroleum	4.6 Million gallons
Lumber	3.9 Million board feet
Rubber Tires	35,000 Units
Antifriction Bearings	227,000 Units
Electric Power	218 Million kilowatt-hours
Natural or Producer Gas	1.4 Billion cubic feet
Machine Tools	376 Units
Capital Equipment and Construction	17,600 Short tons
Transportation	546 Million short-ton-kilometers

*This report contains information available as of 1 December 1953.

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The value of all input services for the Soviet weapons industry in 1952 prices is about 1.9 billion rubles, which is almost 3 percent of the estimated allocations to munitions procurement in the Soviet defense budget. The value of inputs would represent approximately the same proportion of such allocations in the 1953 defense target.

The annual productive capacity of the 22 plants in the Soviet weapons industry is about 395,000 short tons of finished weapons, or about 5 times the current peacetime output. It is probable that the wartime capacity of the weapons industry is in excess of this amount because new plants may be built and other plants converted to weapons production. Limits to the production of weapons would depend on the amounts and relative priorities of other goods produced.

In the event that the Soviet weapons industry were placed on a wartime production schedule, the ratios of inputs to peacetime output implicit in the estimated figures in this report would probably remain stable enough to permit their use in making labor and resource cost estimates for the production of a given volume of Soviet weapons during wartime.

I. Introduction.

The Soviet weapons industry, for the purposes of this report, includes those plants primarily concerned with the production of small arms, mortars, and artillery pieces, as well as weapons produced for use in armored fighting vehicles and in aircraft.

The term "weapons" includes all forms of small arms, mortars, and artillery. All weapons with bore measurements less than 20 mm in diameter are treated as small arms, whereas weapons of a larger bore diameter are considered artillery pieces, or guns. Mortars are not generally placed in either of the two classes but are treated separately. The term "gun" as used in this report applies only to artillery pieces.

Soviet weapons can be characterized in general as simple, rugged, and effective, although not particularly impressive when compared with

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their US counterparts. All models now standard are well suited both to mass production and to ease of handling and maintenance. Their simplicity of design and relatively wide tolerances enable them to function well even under extremely adverse conditions. 1/*

A. Products.

1. Small Arms.

The small arms currently in use in the USSR are essentially those developed and used during World War II. A few changes have occurred, such as the replacement of the Maxim heavy machine gun by the light machine gun M1946. 2/

The small arms in military use in the USSR 3/ during 1953 were as follows:

Tula-Tokarev M1933 Pistol	Standard side arm
PPsh-1941 and PPS-1943	Submachine guns
M1944 Carbine	Standard shoulder arm
7.62-mm Degtyarev Series	Light machine gun and tank machine gun
7.62-mm Guvyunov	Heavy machine gun
7.62-mm M1946	Light machine gun, replacing the 7.62-mm Guvyunov
12.7-mm Degtyarev-Shpagin M1938	Heavy machine gun and anti-aircraft (AA) machine gun

2. Artillery.

Soviet artillery weapons are generally equal in effectiveness to those of the Western powers, although some refinements and characteristics making for maneuverability are lacking in the large sizes. Deficiencies of modern fire control have been overcome by detailed tactical preparation and the use of additional pieces. Emphasis is placed on dual-purpose, high-velocity, direct-fire pieces.

The guns in military use in the USSR during 1953 4/ were as follows:



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76-mm Divisional Gun M1942	Dual-purpose, antitank (AT) and field gun
85-mm Gun M1945	Dual-purpose, AT and field gun, replacing the 76-mm gun
100-mm Field Gun M1944	Dual-purpose, AT and field gun
122-mm Howitzer M1938	Divisional field artillery
122-mm Gun M1931/37	Corps artillery
152-mm Howitzer M1943	Standard in the artillery division
152-mm Gun Howitzer	Used for counterbattery and long-range interdiction fire
152-mm Gun M1935	Heavy artillery
203-mm Howitzer M1931	Standard heavy howitzer
210-mm Gun M1939	Super-heavy Skoda-designed weapon
280-mm Howitzer M1937	Short-range heavy howitzer
306-mm Howitzer M1940	Used in army group support
57-mm AT Gun M1943	Divisional AT gun
37-mm AA Gun M1939	Standard divisional AA gun
57-mm AA Gun	Replacing the 37-mm AA gun
85-mm AA Gun M1939 and M1944	Standard heavy AA gun
100-mm AA Gun	Replacing the 85-mm AA gun
85-mm Gun	Mounted on the medium tank, T-34 (85)*
100-mm Gun	Mounted on the medium tank, T-54*
122-mm Gun	Mounted on the heavy tanks, JS-2, JS-3*
100-mm Gun	Mounted on SU-100*
152-mm Gun	Mounted on JSU-152*
132-mm Rocket Launcher M13	Found in tank and mechanized divisions
82-mm Recoilless Rifle	Probably standard in the division
23-mm Aircraft Cannon	Used by MIG-15, IL-28, Type 35, TU-4
37-mm Aircraft Cannon	Used by MIG-15

3. Mortars.

There are 3 models of mortars currently in use in the USSR, the 82-mm, the 120-mm, and the 160-mm. 5/

4. Naval Guns.

The naval guns in military use in the USSR during 1953 were as follows:

37-mm AA Single Gun	0 and modified 0 destroyers
37-mm AA Twin Gun	Sverdlov cruisers

* Only the guns, as distinguished from the self-propelled unit, are considered in this report.

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45-mm AA Single Gun	Submarines and merchant vessels
3-inch 55 Single Gun	Subchasers
3-inch 55 DP Twin Gun	O and modified O destroyers
3.9-inch 51 Wet, Single Gun	K class ocean-going submarine
3.9-inch 56 DP Single Gun	Main battery of coastal destroyer
3.9-inch 56 DP Twin Gun	Secondary battery, Sverdlov cruiser
4.8-inch 46 Twin Gun	O and modified O destroyer
6-inch 50 Three-Gun Turret	Chapayev and Sverdlov cruisers

B. History and Organization of the Soviet Weapons Industry.

In 1940 there were 12 gun factories and 30 small arms factories in the USSR. 6/ The most important plants were in Tula, Izhevsk, Nizhniy Tagil, Kovrov, Zlatoust, Podlipki, Leningrad, Stalingrad, Molotov, and Sverdlovsk. The German invasion of 1941 and the consequent evacuation of factories from the western part of the USSR resulted in a net decrease in the total number of weapons plants as well as in a general shift of the industry. In 1942 the number of gun factories had been reduced to six. By 1944, however, 2 new gun factories had been added, bringing the total to 8.

In spite of the evacuation, the production of artillery in December 1942 was 1.8 times greater than in December 1941. 7/ By 1944 the production of guns had reached the high level of about 120,000 pieces as compared with an output of 25,000 guns in 1940. Similarly, the production of rifles and machine guns expanded rapidly. The average yearly production of rifles during the last 3 years of World War II was approximately 3 million 8/ as compared with an estimated peacetime production rate of 600,000 in 1940. 9/ The production of machine guns increased from about 72,000 in 1940 10/ to an average annual output of about 450,000 during the last 3 years of the war. 11/*

Following World War II, Soviet weapons plants were converted to peacetime production. Many gun and small arms plants, particularly the larger ones, however, continued to produce weapons but at a rate much lower than wartime levels. The plants which converted to complete peacetime production were, in the main, small arms plants.

* See footnote on p. 31.

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These factories could be readily reconverted to wartime production in case of a new national emergency.

Until the latter part of 1936, all gun production was directed by the People's Commissariat for Heavy Industry. From the end of 1936 until early 1939 the responsibility for gun production fell to the People's Commissariat for Munitions. From 11 January 1939 until the reorganization of March 1946, which involved not only a change in structure but also a change in titles from People's Commissariats to Ministries, the People's Commissariat of Armaments was responsible for the production of all guns 37 mm and upward. Since then the Ministry has been responsible for small arms as well. 12/ On 15 March 1953 the Supreme Soviet created a new Ministry of Defense Industry, which assumed the functions of the former Ministry of Armaments.

II. Coefficients of Production.

The major purpose of this report is to determine the peacetime inputs of the Soviet weapons industry. This section is devoted to an examination of the proper unit for measuring the output of the weapons industry and to the computation of the various production coefficients. A production coefficient is defined as the quantity of an input necessary to produce one unit of output, given the appropriate amounts of cooperating inputs or services. The discussion is limited to the following inputs: steel, aluminum, copper, coal, petroleum, lumber, rubber tires, antifriction bearings, electric power, man-hours, gas, machine tools, capital equipment, and capital construction.

A. Unit of Output.

The value of production coefficients, relating inputs to outputs, is affected by the size and nature of the units in which both input and output are expressed. The units adopted for measuring inputs are widely used units such as tons and gallons. There are 33 types of weapons currently being produced or used in the USSR, and, consequently, there are 33 units for measuring output. Treatment of each weapon separately would involve considerable detail and would at times become unwieldy. It is desirable, therefore, to construct a representative unit of output in order to facilitate computations and simplify presentation.

The proportions in which the various weapons are produced are known only to a very limited degree. Thus representativeness must

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be based on the next best alternative to the known composition of supply -- the composition of demand. This report is concerned with establishing a level for peacetime demand as contrasted with two other demands -- mobilization demand and wartime demand. Obviously, peacetime demand stems from conditions and requirements different from wartime or mobilization demand. The principal difference is a change in the attrition rates for each type of weapon in use.

In this report, Soviet production schedules for weapons will be established in accordance with peacetime demand for weapons in any given year. Peacetime demand for weapons will reflect (1) maintenance of existing weapons inventory and (2) replacement of obsolete models with new models. This statement assumes that there will be no increase in the size of the weapons inventory. The inventory has been built up over a period of years and does not necessarily contain a complete stock of new models. New models are being produced continually to replace old models, but replacement is spread out over a number of years. Not all weapons in existence are in the hands of troops; approximately 60 percent are in storage. ^{13/} Because the attrition rate on stored weapons is relatively small, it is ignored. It is also assumed that exports consist entirely of obsolete models not subject to replacement. The exceptions to this assumption are discussed in the footnotes for Table 1.*

In addition to ground weapons, it is necessary to include aircraft and naval guns in a unit which represents peacetime demand. Peacetime demand for naval guns, however, stems from a different use pattern from that for ground and aircraft weapons. Therefore, two units representing peacetime demand are established. One unit provides a measure for naval guns, and the other combines ground and aircraft weapons in a single unit. Aircraft weapons are produced by the same establishments as other weapons, which justifies their inclusion for input purposes. Table 1 illustrates the two representative units, or bundles of weapons. In the case of Bundle 1, ground force and aircraft weapons, total peacetime weapons demand per year is divided by 100, and for Bundle 2, naval weapons, total peacetime demand per year is equal to 1 bundle. The footnotes for Table 1 explain the detailed method for establishing the peacetime demand for each weapon.

* Table 1 follows on p. 8.

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Table 1

Representative Unit, or Bundle,
for Measuring Weapons Output in the USSR
1953

<u>Bundle 1, Ground and Aircraft Weapons ^a/_*</u>	
<u>Type of Weapon</u>	<u>Number of Weapons</u>
Rifles and Carbines	970.0 <u>b/</u>
Pistols	230.0 <u>b/</u>
Submachine Guns	291.0 <u>b/</u>
7.62-mm Machine Gun	32.4 <u>b/</u>
12.7-mm Machine Gun	14.8 <u>b/</u>
57-mm AA Gun	23.5 <u>b/</u>
100-mm AA Gun	44.1 <u>b/</u>
57-mm AT Gun	11.7 <u>b/</u>
132-mm Rocket Launcher	2.5 <u>b/</u>
82-mm Recoilless Rifle	8.2 <u>b/</u>
82-mm Mortar	3.4 <u>b/</u>
120-mm Mortar	6.7 <u>b/</u>
160-mm Mortar	3.2 <u>b/</u>
85-mm Gun	3.7 <u>b/</u>
122-mm Gun and Howitzer	7.7 <u>e/</u>
152-mm Howitzer, Gun, Gun Howitzer	5.0 <u>e/</u>
203-mm Howitzer	0.3 <u>b/</u>
100-mm Tank Gun (T-54)	63.0 <u>c/</u>
122-mm Tank Gun (JS)	14.6 <u>c/</u>
100-mm SP Gun (SU-100)	11.0 <u>c/</u>
152-mm SP Gun (JSU-152)	21.9 <u>c/</u>
23-mm Aircraft Cannon	212.9 <u>d/</u>
37-mm Aircraft Cannon	58.3 <u>d/</u>
Total	<u>2,039.9</u>

* Footnotes for Table 1 follow on p. 9.

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Table 1

Representative Unit, or Bundle,
for Measuring Weapons Output in the USSR
1953
(Continued)

<u>Bundle 2, Naval Weapons f/</u>	
<u>Type of Weapon</u>	<u>Number of Weapons</u>
37-mm AA Single Gun	266.0
37-mm AA Twin Gun	78.6
45-mm AA Single Gun	60.0
3-inch/55 Single Gun	50.0
3-inch/55 DP Twin Gun	18.0
3.9-inch/51 Wet, Single Gun	40.0
3.9-inch/56 DP Single Gun	40.0
3.9-inch/56 DP Twin Gun	26.1
4.8-inch/46 Twin Gun	36.0
6-inch/50 Three-Gun Turret	17.4
Total	<u>632.1</u>

a. The weapons included in Table 1 are those believed to be in current production in the USSR. The 100-mm Gun and various types of heavy artillery pieces are probably manufactured in very small quantities, but the total input for these weapons is negligible. These weapons, therefore, are not listed in the bundle of weapons.

b. Peacetime demand per year for all weapons in this category is calculated on the following basis -- the number of weapons needed to maintain existing inventory plus the number of weapons needed to replace obsolete weapons.

The maintenance factor is equal to the weapons in use by troops on active duty multiplied by the peacetime attrition rate. The total weapons being used by troops is equal to 40 percent of the total mobilization requirements as estimated by the Department of the

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Table 1

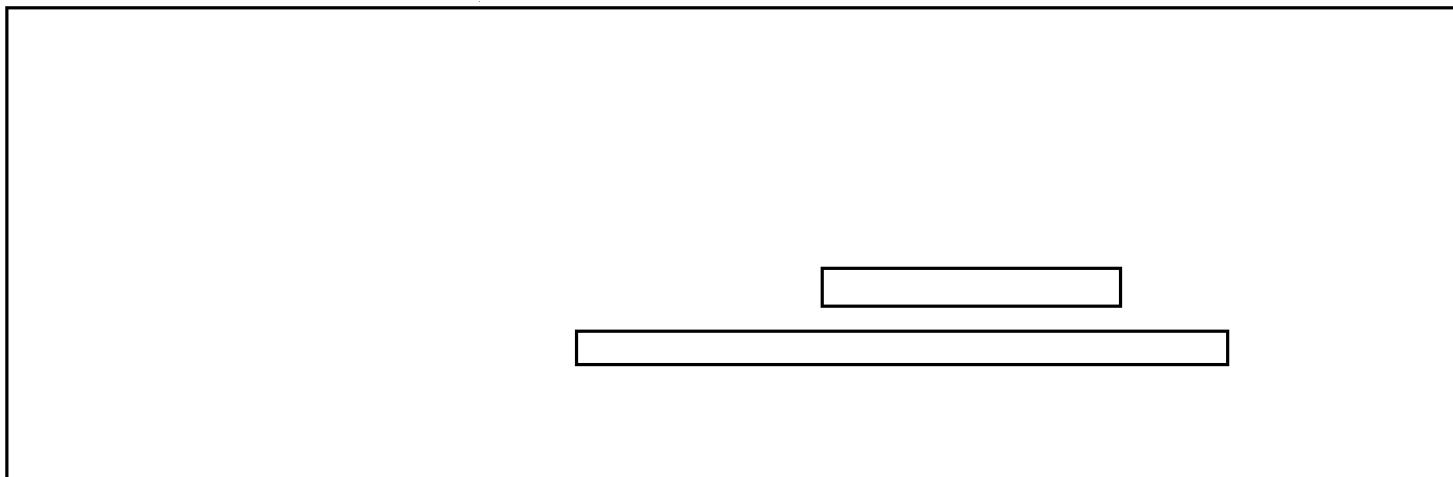
Representative Unit, or Bundle,
for Measuring Weapons Output in the USSR
1953
(Continued)

Army in NIS 26, dated March 1951. The total mobilization requirement is equal to 420 field divisions plus 100 divisions in the process of training. The 40-percent factor includes the estimated 175 active duty divisions (33 percent) plus 7 percent for various supporting troops on active duty. Department of the Army training attrition factors are used as the peacetime attrition rates.

The replacement factor allows for the introduction of new models in the Soviet weapons system. Replacement per year is equal to the total number of weapons needed for full mobilization requirements multiplied by a factor of 20 percent. The 20-percent factor is based on known Soviet practice in the tank industry which introduces the new model T-54 medium tank over a period of approximately 5 years. This tank replacement rate is assumed correct for other categories of weapons.

For the 100-mm AA Gun the replacement rate is based on a total weapons inventory estimated by the Department of the Army. A new and heavier AA gun has been seen, and it is assumed to be the 100-mm AA Gun which will supersede the older 85-mm AA Gun when the replacement program is completed. The replacement rate is equal to zero in all cases where a new model is not being introduced during the period covered by this report.

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B. Computed Coefficients.

1. Steel, Aluminum, and Copper.

The coefficients for steel, aluminum, and copper are taken without adjustment from the World War II production data for equivalent US weapons. There is not enough information with respect to these coefficients in the USSR either for their direct computation or for providing adjustment factors. In order to avoid errors resulting from differences in the weight of end items performing similar functions in the US and the USSR, the coefficients settled on are those giving the ratio of the weight of material input to the weight of the finished output. The less satisfactory alternative is to relate units of input to full units of output.

The first column of Table 2* repeats the list of 33 weapons composing Bundle 1 and Bundle 2. Column 2 in Table 2 gives the weight of the individual Soviet weapons which, multiplied by Column 3 (the number of weapons per bundle), yields the weight (Column 4) of each type of weapon per bundle. The coefficients of Column 5 are the ratios of the input of finished steel products, aluminum, and copper to pound of finished weapon, based on US production data. ^{14/} The input of steel includes all the steel required for the production of each weapon and the spare parts ordinarily produced with the weapon; machining wastage and losses from rejects are therefore included. In the absence of definite information, it is assumed that the same holds true for nonferrous metal inputs. Column 6, the product of Columns 4 and 5, indicates the input per bundle by weapon.

The steel, copper, and aluminum requirements for Bundle 1 are 1,861, 13, and 6 short tons, respectively, and for Bundle 2, 17,737, 729, and 23 short tons, respectively.

Table 14** lists, with their Soviet equivalents, the types of US weapons used to compute these input coefficients.

2. Coal, Petroleum, Gas, Lumber, and Electric Power.

The data for this group of inputs are not so extensive as the data for steel, copper, and aluminum, which covered the US

* Table 2 follows on p. 13.

** P. 48, below.

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Table 2

Inputs of Steel, Aluminum, and Copper per Bundle of Weapons
1953

(1) Weapons in Bundle 1	(2) Weight per Weapon (Pounds) ^{16/}	(3) Number of Weapons per Bundle	(4) Weight per Bundle (Pounds)	(5) Coefficients ^{15/} a/*				(6) Inputs per Bundle (Pounds)			
				Steel		Aluminum	Copper	Steel			
				Carbon	Alloy			Carbon	Alloy	Aluminum	Copper
Rifles and Carbines	8.8	970.0	8,536	1.33	1.24	0	0	11,353	10,585	0	0
Pistols	2.0	230.0	460	5.80	0.67	0	0.003	2,668	308	0	1.4
Submachine Guns	6.6	291.0	1,921	3.60	0.09	0	0.003	6,916	173	0	5.8
7.62-mm Machine Gun	28.7	32.4	930	2.60	1.00	0.008	0.004	2,418	930	7.4	3.7
12.7-mm Machine Gun	89.1	14.8	1,319	0.33	1.73	0	0	435	2,282	0	0
57-mm AA Gun	4,630.0 b/	23.5	108,805	1.22	0.64	0	0	132,742	69,635	0	0
100-mm AA Gun	15,000.0 b/	44.1	661,500	1.33	1.37	0.010	0.028	879,795	906,255	6,610.0	18,522.0
57-mm AT Gun	2,535.0	11.7	29,660	0.53	2.26	0	0.020	15,720	67,032	0	593.0
132-mm Rocket Launcher	2,300.0 c/	2.5	5,750	0.82	1.35	0.007	0.050	4,715	7,763	40.2	288.0
82-mm Recoilless Rifle	166.0 d/	8.2	1,361	0.82	1.35	0.007	0.050	1,116	1,837	9.5	68.0
82-mm Mortar	128.0	3.4	435	0.82	1.35	0.007	0.050	357	587	3.0	21.8
120-mm Mortar	606.0	6.7	4,060	0.82	1.35	0.007	0.050	3,329	5,481	28.4	203.0
160-mm Mortar	2,381.0	3.2	7,619	0.57	3.15	0.007	0.050	4,343	24,000	53.3	381.0
85-mm Gun	3,748.0	3.7	13,868	0.67	1.50	0	0.025	9,292	20,802	0	346.7
122-mm Gun and Howitzer	7,643.0 c/	7.7	58,851	0.50	2.22	0	0.024	29,426	130,649	0	1,412.4
152-mm Howitzer, Gun, Gun Howitzer	15,714.0 c/	5.0	78,570	0.43	1.84	0	0	33,785	144,569	0	0
203-mm Howitzer	39,021.0	0.3	11,706	0.33	2.22	0	0.016	3,863	25,986	0	187.3
100-mm Tank Gun (T-54)	2,382.0 d/	63.0	150,066	0.03	2.85	0	0	4,500	427,688	0	0
122-mm Tank Gun (JS)	4,454.0	14.6	65,028	0.03	2.85	0	0	1,951	185,330	0	0
100-mm SP Gun (SU-100)	2,382.0 d/	11.0	26,202	0.03	2.85	0	0	786	74,676	0	0
152-mm SP Gun (JSU-152)	4,500.0 b/	21.9	98,550	0.03	2.85	0	0.005	2,957	280,868	0	492.8
23-mm Aircraft Cannon	150.0	212.9	31,935	0.21	3.08	0.17	0.090	6,706	98,360	5,430.0	2,874.2
37-mm Aircraft Cannon	405.0 d/	58.3	23,612	0.21	3.08	0	0.021	4,959	72,725	0	495.9
Total (Pounds)			<u>1,390,744</u>					<u>1,164,132</u>	<u>2,558,521</u>	<u>12,181.8</u>	<u>25,897.0</u>
Total (Short Tons)			<u>695.9</u>					<u>582.1</u>	<u>1,279.3</u>	<u>6.1</u>	<u>12.9</u>

* Footnotes for Table 2 follow on p.14.

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Table 2
Inputs of Steel, Aluminum, and Copper per Bundle of Weapons
1953
(Continued)

(1) Weapons in Bundle 2	(2) Weight per Weapon (Pounds) ^{16/}	(3) Number of Weapons per Bundle	(4) Weight per Bundle (Pounds)	(5) Coefficients ^{15/} _{a/}				(6) Inputs per Bundle (Pounds)			
				Steel		Aluminum	Copper	Steel		Aluminum	Copper
				Carbon	Alloy			Carbon	Alloy		
37-mm AA Single Gun	4,430.0 ^{b/}	266.0	1,178,380	1.17	1.35	0	0.131	1,378,704	1,590,813	0	154,368
37-mm AA Twin Gun	7,970.0 ^{b/}	78.6	626,442	1.17	1.35	0	0.131	732,937	845,697	00	82,064
45-mm AA Single Gun	1,124.0 ^{b/}	60.0	67,440	0.69	1.91	0	0	46,534	128,810	0	0
3-inch/55 Single Gun	10,913.0 ^{b/}	50.0	545,650	0.94	1.19	0.003	0.107	512,911	649,323	1,637	58,385
3-inch/55 DP Twin Gun	19,600.0 ^{b/}	18.0	352,800	0.94	1.19	0.003	0.107	331,632	419,832	1,058	37,750
3.9-inch/51 Wet, Single Gun	12,400.0 ^{b/}	40.0	496,000	1.15	2.77	0	0.141	570,400	1,373,920	0	69,936
3.9-inch/56 DP Single Gun	22,266.0 ^{b/}	40.0	890,640	0.94	1.19	0.003	0.107	837,202	1,059,862	2,672	95,298
3.9-inch/56 DP Dual Gun	90,000.0 ^{b/}	26.1	2,349,000	0.94	1.19	0.003	0.107	2,208,060	2,795,310	7,047	251,343
4.8-inch/46 Twin Gun	88,500.0 ^{b/}	36.0	3,186,000	0.94	1.19	0.003	0.107	2,994,840	3,791,340	9,558	340,902
6-inch/50 Three-Gun Turret	460,000.0 ^{b/}	17.4	8,004,000	0.17	1.48	0.003	0.046	1,360,680	11,845,920	24,012	368,184
Total (Pounds)			17,696,352					10,973,900	24,500,827	45,984	1,458,230
Total (Short Tons)			8,848.2					5,486.9	12,250.4	22.99	729.1

a. Pounds of raw material per weight of finished weapon in pounds.
b. Estimated weight based on specifications of US and Soviet weapons.
c. Weighted average for all weapons in the category.
d. Weight of US prototype.

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equivalents for all 33 Soviet weapons. The data for these inputs are for only 11 US ground and aircraft weapons and include partial data for 3 US naval weapons. To apply the coefficients for the 11 US ground and aircraft weapons to all 23 Soviet ground and aircraft weapons, it is necessary to treat 1 or more of the 11 US weapons as representative of a class of Soviet weapons. Seven of the ground force weapons (see Table 3)* are assigned to separate classes; the type of weapons and coefficients differ sufficiently to warrant separate treatment. The other four are assigned to one class because of the homogeneity of their input coefficients. The inputs of coal, petroleum, and natural gas are not available for the first three weapons of Table 3. The weapon most nearly like the first three weapons in Table 3 is the one in Class F. The inputs of coal, petroleum, and natural gas for Class F are therefore used for the first three weapons of Table 3. Bundle 2, naval weapons, is broken down into three classes. Because of the similarity of the input coefficients, ground force weapons coefficients are used in all cases where data are not available for the specific naval weapon.

The weapons listed in Table 3 are divided into 11 classes. The inputs per 1,000 pounds of weapons of each class are assumed to be representative of the inputs per 1,000 pounds of output for all of the weapons assigned to that class. Class A, including the US Rifle, M1, is assumed to be representative of all the Soviet weapons of that class -- namely, the carbine, the rifle, the pistol, and the submachine gun. Class B, including the US Browning Automatic Rifle, is assumed to be representative of the Soviet light machine gun. Other classes are assumed to be similarly representative.**

* Table 3 follows on p. 17.

** The Soviet weapons included in each class are as follows:

Bundle 1:

Class A includes the carbine, rifle, pistol, and submachine gun.

Class B includes the 7.62-mm Machine Gun.

Class C includes the 12.7-mm Machine Gun, the 23-mm Aircraft Cannon, and the 37-mm Aircraft Cannon.

Class D includes the 82-mm Mortar and the 82-mm Recoilless Rifle.

Class E includes the 120-mm Mortar, the 160-mm Mortar, and the 132-mm Rocket Launcher.

Class F includes the 57-mm AA Gun.

(footnote continued on p. 16)

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Table 4* gives the results of the application of the inputs per 1,000 pounds of output from Table 3 to the 11 classes consisting of 33 different Soviet weapons. The portion of the total weight of the representative bundles accounted for by each class of weapons (in units of 1,000 pounds) is given immediately below each class designation. The inputs per 1,000 pounds of output make up the first row following each input. The second row is the quantity of that input required per bundle, or the product of the input per 1,000 pounds and the weight of the weapons (in units of 1,000 pounds) in each class. The total inputs per bundle appear in the last column.

3. Rubber Tires and Antifriction Bearings.

The number of antifriction bearings and rubber tires for Bundle 1 as determined from the descriptive data of Soviet and US weapons is 2,209 units and 356 units, respectively. ^{17/} The number of antifriction bearings for Bundle 2 is 8,256.

4. Labor.

Labor is an important input in the production of weapons, making up a considerable proportion of their cost. It is also an

(footnote continued from p. 15)

Class G includes the 85-mm Gun; the 122-mm Gun and Howitzer; the 152-mm Gun, Howitzer, and Gun Howitzer; the 57-mm AT Gun; and the 100-mm AA Gun.

Class H includes the 100-mm Tank Gun, the 122-mm Tank Gun, the SU 100-mm SP Gun, the JSU 152-mm SP Gun, and the 203-mm Howitzer.

Bundle 2:

Class J includes both 37-mm AA Guns and the 45-mm AA Gun.

Class K includes the 3-inch/55 DP Twin Gun.

Class L includes the 3-inch/55 Single Gun, the 3.9-inch/51 Single Gun, both 3.9-inch/56 Guns, the 4.8-inch/46 Twin Gun, and the 6-inch/50 Three-Gun Turret.

* Table 4 follows on p. 20.

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Table 3

Input per Weapon and Input per 1,000 Pounds of Output
for Eleven US Weapons 18/
1953

Item	Weight of Weapon (Pounds)	Coal (Short Tons)	Petroleum (Gallons)	Natural or Producer Gas (Thousand Cubic Feet)	Lumber (Board Feet)	Electric Power (Kilowatt- Hours)
Class A						
Rifle, M1	10.3	N.A.	N.A.	N.A.	29	95
Input per 1,000 Pounds		1.10 <u>a/</u>	11 <u>a/</u>	2.8 <u>a/</u>	2,815	9,223
Class B						
Browning Automatic Rifle, Caliber .30, M1, 1918, H3	19.4	N.A.	N.A.	N.A.	25	414
Input per 1,000 Pounds		1.10 <u>a/</u>	11 <u>a/</u>	2.8 <u>a/</u>	1,289	21,340
Class C						
Machine Gun, Caliber .50 AC	113	N.A.	N.A.	N.A.	15	1,380
Input per 1,000 Pounds		1.10 <u>a/</u>	11 <u>a/</u>	2.8 <u>a/</u>	133	12,212
Class D						
81-mm Mortar, M29, with Mount M23A1	136	0.47	4.4	1.2	0	142

a. The same as the values in Class F.

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Table 3

Input per Weapon and Input per 1,000 Pounds of Output
for Eleven US Weapons 18/
1953
(Continued)

Item	Weight of Weapon (Pounds)	Coal (Short Tons)	Petroleum (Gallons)	Natural or Producer Gas (Thousand Cubic Feet)	Lumber (Board Feet)	Electric Power (Kilowatt- Hours)
Class D (Continued)						
Input per 1,000 Pounds		3.46	32.0	8.8	0	1,044
Class E						
4.2-inch Mortar, M30, with Mount M24	340	1.47	14.1	3.7	0	450
Input per 1,000 Pounds		4.32	41.0	10.9	0	1,324
Class F						
40-mm Gun, Twin, Automatic, T141	2,000	2.20	21	5.5	0	775
Input per 1,000 Pounds		1.10	11	2.8	0	388
Class G						
105-mm Howitzer	6,565	7.33	70	20.7	0	2,233
Input per 1,000 Pounds		1.11	11	3.2	0	340

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Table 3

Input per Weapon and Input per 1,000 Pounds of Output
for Eleven US Weapons 18/
1953
(Continued)

Item	Weight of Weapon (Pounds)	Coal (Short Tons)	Petroleum (Gallons)	Natural or Producer Gas (Thousand Cubic Feet)	Lumber (Board Feet)	Electric Power (Kilowatt- Hours)
Class H						
155-mm Gun SP, T97	7,350	57.66	533	162.0	0	17,533
Input per 1,000 Pounds		7.84	75	22.0	0	2,385
8-inch Howitzer SP, T108	6,392	45.66	440	133.0	0	13,933
Input per 1,000 Pounds		7.14	69	20.8	0	2,180
105-mm Howitzer SP, T98	942	6.50	62	19.0	0	1,970
Input per 1,000 Pounds		6.90	66	20.2	0	2,091
155-mm Howitzer SP, T99	3,490	20.72	196	72.0	0	6,300
Input per 1,000 Pounds		5.94	56	20.6	0	1,805
Underweighted Average of In- puts in Class H, per 1,000 Pounds		6.96	67	20.6	0	2,115

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Table 4

Inputs of Coal, Petroleum, Natural or Producer Gas, Electric Power, and Lumber per Bundle of Soviet Weapons
1953

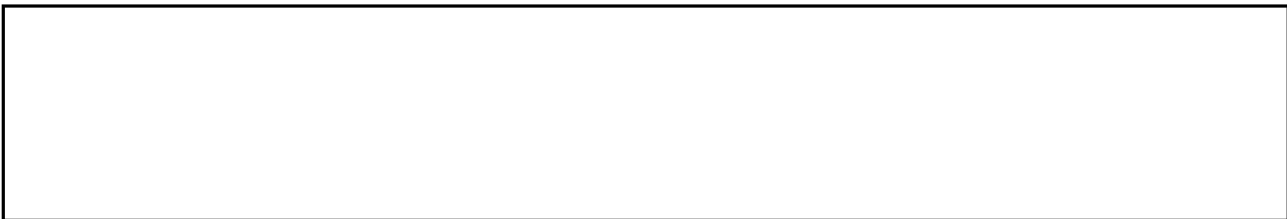
	Bundle 1									Bundle 2			
	Class A (1,000 Pounds)	Class B (1,000 Pounds)	Class C (1,000 Pounds)	Class D (1,000 Pounds)	Class E (1,000 Pounds)	Class F (1,000 Pounds)	Class G (1,000 Pounds)	Class H (1,000 Pounds)	All Classes Total per Bundle	Class J (1,000 Pounds)	Class K (1,000 Pounds)	Class L (1,000 Pounds)	All Classes Total per Bundle
Input	10.9 x a/	0.9 x a/	56.8 x a/	1.8 x a/	17.4 x a/	108.8 x a/	842.5 x a/	351.5 x a/		1,872.3 x a/	352.0 x a/	15,471.3 x a/	
Coal (Short Tons)													
Input per 1,000 Pounds b/	1.1	1.1	1.1	3.46	4.32	1.1	1.1	6.96		1.1	6.96	6.96	
Input per Bundle	12.0	1.0	62.5	6.2	75.2	120.0	927.0	2,446.4	3,635.9	2,059.5	2,449.9	107,680.0	112,189.4
Petroleum (Gallons)													
Input per 1,000 Pounds b/	11.0	11.0	11.0	32.0	41.0	11.0	11.0	67.0		11.0	67.0	67.0	
Input per Bundle	120.0	10.0	625.0	57.6	713.4	1,196.8	9,270.0	23,550.5	35,546.6	20,595.0	23,584.0	1,036,577.0	1,080,756.0
Natural or Producer Gas (1,000 Cubic Feet)													
Input per 1,000 Pounds b/	2.8	2.8	2.8	8.8	10.9	2.8	3.2	20.9		2.8	20.9	20.9	
Input per Bundle	30.5	2.5	159.0	15.8	189.6	304.6	2,696.0	7,346.0	10,743.8	5,242.4	7,356.8	323,350.0	335,949.0
Lumber (Board Feet)													
Input per 1,000 Pounds b/	2,815.0	1,289.0	133.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Input per Bundle	30,683.5	1,160.0	7,554.4	0.0	0.0	0.0	0.0	0.0	39,397.9	0.0	0.0	0.0	0.0
Electric Power (Kilowatt-Hours)													
Input per 1,000 Pounds b/	6,700.0	16,000.0	9,150.0	1,044.0	1,324.0	388.0	340.0	2,115.0		388.0	4,780.0 c/	3,000.0	
Input per Bundle	73,030.0	14,400.0	519,720.0	1,879.2	23,037.6	42,214.4	286,450.0	743,423.0	1,704,154.0	726,452.0	1,682,560.0	46,413,900.0	48,822,912.0

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input which varies with production rates and time and between countries for a given amount of product. At the present time there is not enough information to calculate the productivity of labor in the production of weapons from Soviet data, nor is there enough information to allow a reliable comparison of the productivity of US and Soviet labor in the production of weapons.* It is therefore necessary, in spite of any error involved, to use unadjusted US data for the labor input.

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Estimated Direct Labor Inputs for Weapons Production in the USSR
1944

<u>Weapon</u>	<u>Weight of Weapon (Pounds)</u>	<u>Man-Hours per Weapon</u>	<u>Man-Hours per 1,000 Pounds of Product</u>
76-mm Regimental Cannon	1,323	800	605
76-mm Division Cannon	2,460	600	244
152-mm Howitzer	7,937	2,400	302
Average			<u>384</u>
Large-Caliber Machine Gun	89.1	329	3,692
Rifle	10.3	9	874
Average			<u>2,283</u>

The man-hour requirements for similar weapons in the US are as follows: (footnote continued on p. 22)

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Table 5* shows the man-hour requirements for the same 11 US ground force weapons used to determine inputs in the previous section. Column 1 of Table 5 gives the weight of the weapons; Column 2, the direct man-hours required to produce the weapons; and Column 3, the number of direct man-hours required to produce 1,000 pounds of the weapons, calculated by dividing Column 2 by Column 1 and multiplying by 1,000.

(footnote continued from p. 21)

Direct Labor Inputs for Weapons Production in the US
1944 and 1952 20/

<u>Weapon</u>	<u>Weight of Weapon (Pounds)</u>	<u>Man-Hours per Weapon</u>	<u>Man-Hours per 1,000 Pounds of Product</u>
75-mm Howitzer, Pack	2,000	1,649 <u>a/</u>	820
75-mm Howitzer	2,700	2,045 <u>a/</u>	757
105-mm Howitzer	6,565	4,200 <u>b/</u>	640
Average			<u>739</u>
Machine Gun, Caliber .50	126	45.0	357
Rifle, M1, Caliber .30	10.3	7.35	724
Average			<u>541</u>

a. 1944 data.

b. 1952 figure. The ratio of 1 to 4.2 for US to Soviet labor in small arms production is in line with general belief. 21/ The ratio of 1 to 0.52 in artillery production is, however, quite to the contrary. It may be that the Soviet figure is mainly an assembly time figure or a subtotal for only part of a finished weapon. The US figure includes direct labor only.

* Table 5 follows on p. 23.

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Table 5

Direct Man-Hour Requirements for Eleven US Weapons 22/
1953

Class	Weapon	Weight of Weapon (Pounds)	Direct Man-Hours per Weapon	Direct Man-Hours per 1,000 Pounds of Output
A	Rifle, M1	10.3	7.35	714
B	Browning Automatic Rifle, Caliber .30	19.4	36.5	1,881
C	Machine Gun, Caliber .50	126	45.0	357
D	81-mm Mortar	136	135	993
E	4.2-inch Mortar	340	285	838
F	40-mm Gun, Twin, Automatic	2,000	3,730	1,865
G	105-mm Howitzer	6,565	4,200	640
H	155-mm Gun, SP	7,350	2,475	337
	8-inch Howitzer, SP	6,392	2,690	421
	105-mm Howitzer, SP	942	830	881
	155-mm Howitzer, SP	3,490	2,240	642
	Unweighted Average of Class H			<u>570</u>

The labor input per 1,000 pounds of weapons output varies from 357 man-hours for a machine gun, caliber .50, to 1,865 man-hours for a 40-mm AA gun and finally to 1,881 man-hours for an automatic rifle.

In Table 6* the coefficients of Table 5 are applied to all 23 Soviet ground and air force weapons of the 8 classes. In addition, coefficients for each naval weapon, obtained from ORR, are listed in Table 6 and are applied in the same manner as the coefficients for each of the ground force classes. The first column gives the weight of the class in thousands of pounds. The second column gives the direct man-hours per 1,000 pounds of output (derived from Table 5).

* Table 6 follows on p. 24.

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S E C R E T

Table 6

Direct Man-Hour Requirements per Bundle of Soviet Weapons a/
1953

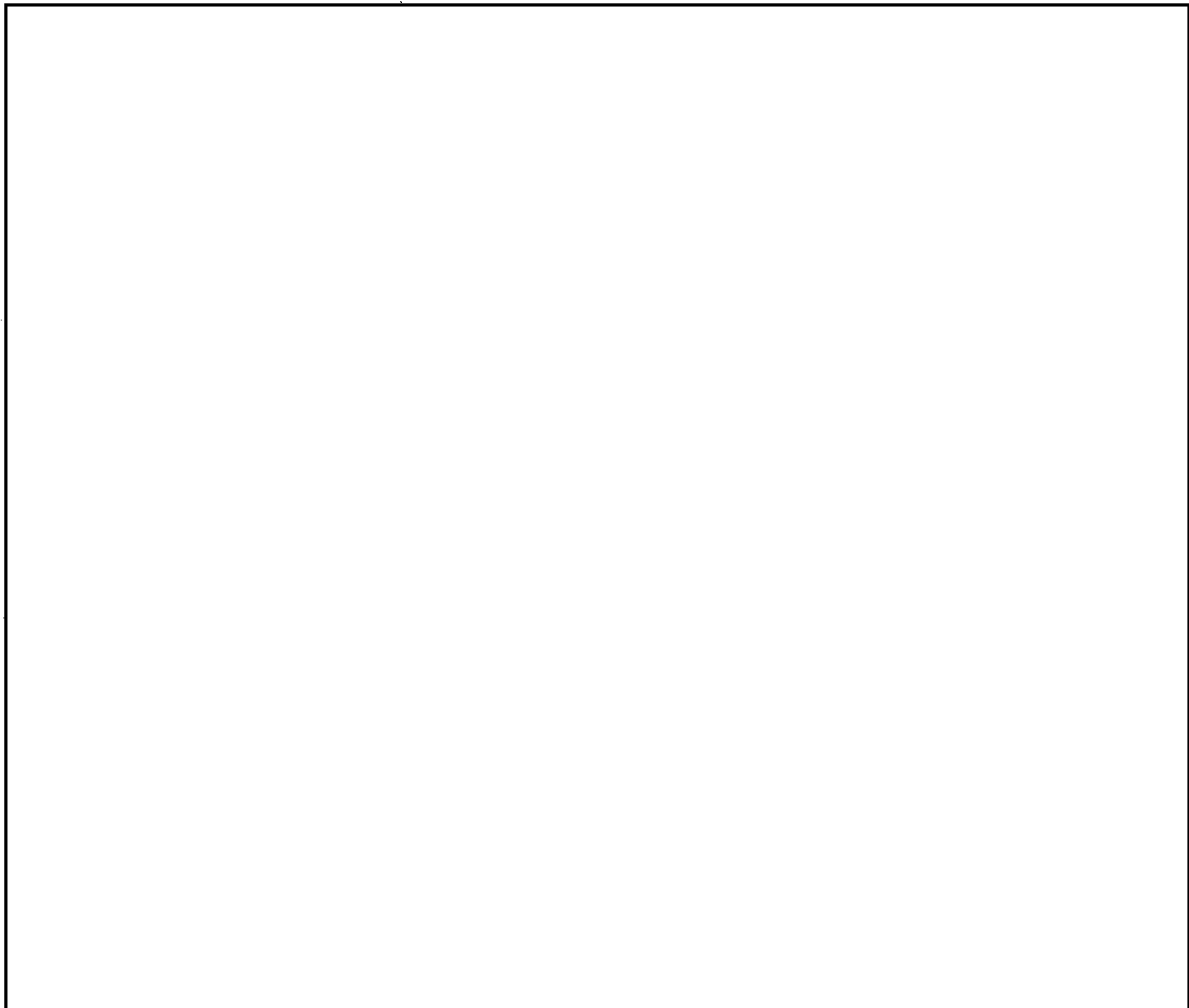
<u>Bundle 1</u>			
<u>Class of Weapons</u>	<u>Weight of Class <u>b/</u> (1,000 Pounds)</u>	<u>Man-Hours per 1,000 Pounds Output</u>	<u>Man-Hours per Bundle</u>
A	10.9	714	7,783
B	0.9	1,881	1,693
C	56.8	357	20,278
D	1.8	993	1,787
E	17.4	838	14,581
F	108.8	1,865	202,912
G	842.5	640	539,200
H	351.5	570	200,355
Total			<u>988,589</u>
<u>Bundle 2</u>			
37-mm AA Single Gun	1,178.4	1,400 <u>c/</u>	1,649,760
37-mm AA Twin Gun	626.4	1,400	876,960
45-mm AA Single Gun	67.4	500	33,700
3-inch/55 Single Gun	545.7	990	540,243
3-inch/55 DP Twin Gun	352.8	868	306,230
3.9-inch/51 Wet, Single Gun	496.0	612	303,552
3.9-inch/56 DP Single Gun	890.6	612	545,047
3.9-inch/56 DP Twin Gun	2,349.0	400	939,600
4.8-inch/46 Twin Gun	3,186.0	400	1,274,400
6-inch/50 Three-Gun Turret	8,004.0	289	2,313,156
Total			<u>8,782,648</u>

- a. See Table 5, p. 23, above.
 b. See Table 2, p. 13, above.
 c. ORR estimate.

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and the last column, the product of the first two, shows the direct man-hour requirements of each class and all classes per bundle of weapons. The total number of direct man-hours required for Bundle 1 is 988,589 and for Bundle 2, 8,782,648. Allowing 2,500 man-hours per man-year, 23/ the total labor requirements per Bundle 1 are 395.4 man-years, and for Bundle 2, 3,513.1 man-years.

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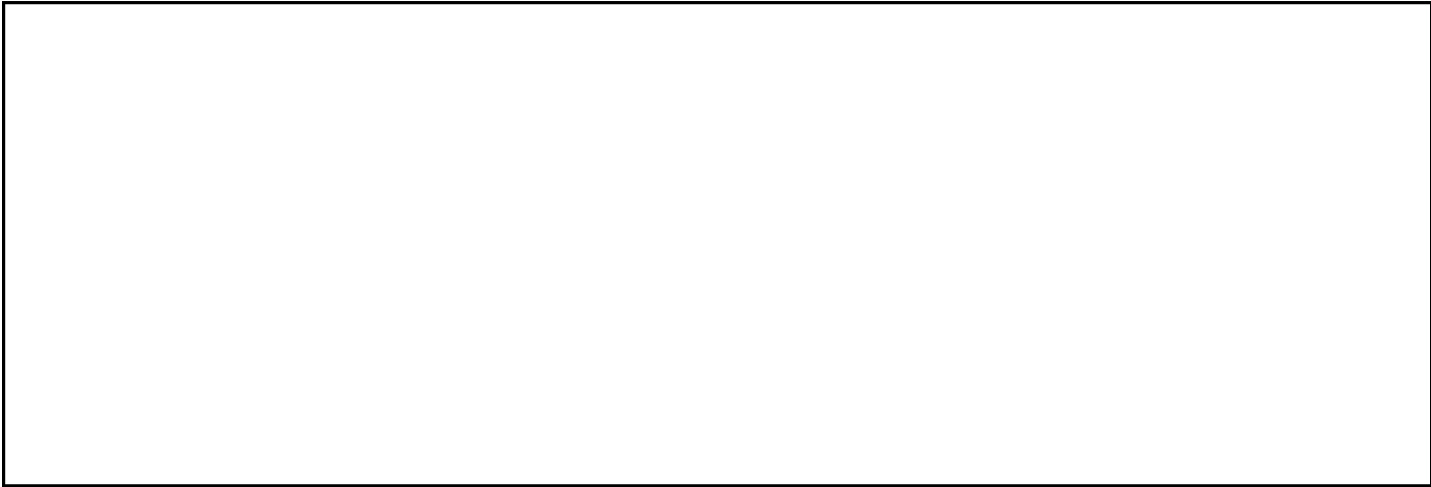
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S-E-C-R-E-T



III. Output and Input.

In this section, output is considered in terms of bundles of weapons. A level of output is established for the production estimates in order that estimates of total input may be made.

A. Output.

The trends in gun production for more than two decades are shown in Table 8.** The figures in Table 8 relating to the early 1930's are not so large as those quoted in the historical discussion of Section I, because all plants are not covered in the first series of estimates, nor are all guns included, particularly tank guns and heavy guns. The production indexes in the last column of Table 8, crude as they are, serve to indicate major changes in gun production. The base years for the two indexes are 1937 and 1941. The year 1937 was the middle year of three fairly stable years for gun production, and 1941 was the first year for which there are reliable data.

Production increased sharply from 1931 to 1933, corresponding to the final years of the First Five Year Plan (1928-32) and the beginning of the Second Five Year Plan (1933-37) and also increased steadily from 1933 to 1940, with the exception of the slight setback in 1934. The years from 1941 to 1944 were the

* Table 7 follows on p. 29.

** Table 8 follows on p. 30.

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Table 7

Transportation Input per Unit of Weapons in the USSR a/

<u>Material</u>	<u>Short Tons per Bundle of Weapons</u>	<u>Average Length of Haul <u>b/</u> <u>26/</u> (Short-Ton-Kilometers)</u>	<u>Short-Ton-Kilometers per Bundle of Weapons (Thousand Short-Ton-Kilometers)</u>
<u>Bundle 1</u>			
Coal	3,636	640 to 660	2,327.0 to 2,399.8
Petroleum	131 <u>c/</u>	950 to 1,000	124.5 to 131.0
Steel	1,861	900 to 1,000	1,674.9 to 1,861.0
Aluminum	6	900 to 1,000	5.4 to 6.0
Copper	13	900 to 1,000	11.7 to 13.0
Lumber, Nonconstruction	69 <u>d/</u>	1,000 to 1,100	69.0 to 75.9
Construction Material	150	240 to 250	36.0 to 37.5
Capital Equipment	25	690 <u>e/</u>	17.3 to 17.3
Total for Bundle 1			<u>4,265.8 to 4,541.5</u>
<u>Bundle 2</u>			
Coal	112,189	640 to 660	71,801.0 to 74,044.7
Petroleum	3,980 <u>c/</u>	950 to 1,000	3,781.0 to 3,980.0
Steel	17,737	900 to 1,000	15,963.3 to 17,737.0
Aluminum	23	900 to 1,000	20.7 to 23.0
Copper	279	900 to 1,000	251.1 to 279.0
Lumber, Nonconstruction	0	0	0 0
Construction Material	1,250	240 to 250	300.0 to 312.5
Capital Equipment	209	690 <u>e/</u>	144.2 to 144.2
Total for Bundle 2			<u>92,261.3 to 96,520.4</u>

- a. Not including transportation of rubber tires and antifriction bearings.
- b. These are average haul figures for 1950.
- c. Converted to weight from gallons.
- d. Converted to weight from board feet.
- e. Average haul for all freight.

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25X1C

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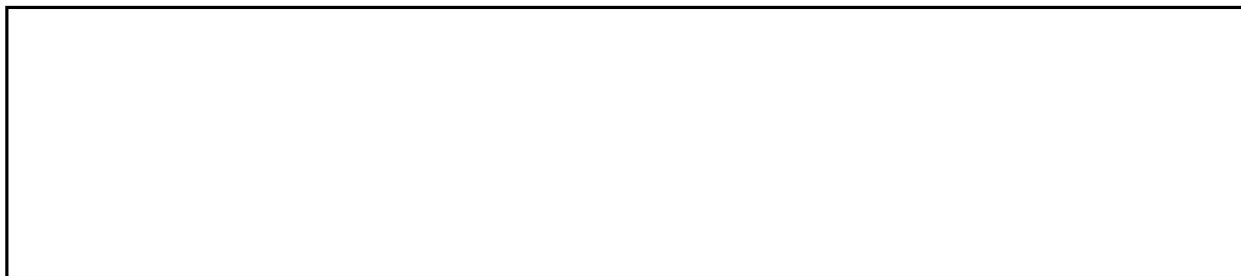
years of expanding war production, which occurred in spite of the structural changes in the armaments industry resulting from the German invasion and the evacuation of plants eastward into the Urals. The year 1944 was the high point in armaments output for the USSR. Stalin stated in a speech at Moscow in 1946 31/ that the average yearly production of weapons in the USSR during the last 3 years of the war was 120,000 guns, 450,000 machine guns, 3 million rifles, 2 million submachine guns, and 100,000 mortars.*

Gun production declined considerably from 1944 to 1945, from 40 to 47 percent. By 1948, after further declines, gun production leveled off to between one-sixth and one-fifth of the highest level in 1944, coinciding with a general trend in all armaments production. 33/

Table 8 gives the estimated figure for 1952 gun production as 22,500 units, including spare parts. This figure is less reliable than the figures up to and including 1949. From 1949 to the present, data with respect to gun plants have been less reliable and less extensive than data before that time. Recent estimates of gun production have been influenced by the stable trend of output from 1947 through 1949.

The Assistant Chief of Staff, G-2, US Department of the Army, has estimated that Soviet gun production in 1952 was 22,500 units. For small arms, the estimate is 317,500, and for mortars the estimate is 6,000, making a total for all units of 346,000. 34/ Table 9** shows the weight of the 346,000 weapons as 131,629,730 pounds, or 65,815 short tons. These weapons do not include the 23-mm and 37-mm aircraft cannons, rocket launchers, or naval guns. Excluding these weapons from the representative bundle, the weight of 1 bundle is 1,328,086 pounds, or 664 short tons. If 664 short tons of weapons are equal to 1 bundle of weapons, then 65,815 short tons of weapons are equal to 99 bundles. This number of bundles is accepted as the estimate of weapons production.

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Table 9

G-2 Estimates of Soviet Production of Weapons
and Weight of Weapons
1952

<u>Weapons</u>	<u>Weight of Weapon (Pounds)</u>	<u>Production Estimates (Units)</u>	<u>Total Weight of Weapons (Pounds)</u>
Pistols	2.0	35,000	70,000
Rifles	8.8	125,000	1,100,000
Submachine Guns	6.6	100,000	660,000
7.62-mm Machine Gun	28.7	50,000	1,435,000
12.7-mm Machine Gun	89.1	7,500	668,250
Subtotal		<u>317,500</u>	<u>3,933,250</u>
82-mm Mortar	128	3,000	384,000
120-mm Mortar	606	2,000	1,212,000
160-mm Mortar	2,381	1,000	2,381,000
Subtotal		<u>6,000</u>	<u>3,977,000</u>
76-mm Gun	2,460	4,200	10,332,000
85-mm Gun	3,748	1,000	3,748,000
100-mm Gun	7,628	1,000	7,628,000
122-mm Howitzer	4,960	1,200	5,952,000
122-mm Gun	15,692	600	9,415,200
152-mm Howitzer	7,937	800	6,349,600
152-mm Gun Howitzer	15,714	800	12,571,200
152-mm Gun	40,093	60	2,405,580
203-mm Howitzer	39,021	100	3,902,100
280-mm Howitzer	40,565	20	811,300
57-mm Gun	2,535	500	1,267,500
37-mm AA Gun	4,630	1,000	4,630,000
85-mm AA Gun	9,480	1,000	9,480,000
100-mm AA Gun	23,148	500	11,574,000
Super-Heavy Artillery	97,000 a/	20	1,940,000
76-mm Gun, Tank, SP, and Spares	1,190	500	595,000
85-mm Gun, Tank, SP, and Spares	3,210	6,000	19,260,000
100-mm Gun, Tank, SP, and Spares	2,382	1,200	2,858,000
122-mm Gun, Tank, SP, and Spares	4,500	1,000	4,500,000
152-mm Gun, Tank, SP, and Spares	4,500	1,000	4,500,000
Subtotal		<u>22,500</u>	<u>123,719,480</u>
Total		<u>346,000</u>	<u>131,629,730</u>

a. Average weight of the 210-mm Gun and the 305-mm Howitzer.

S-E-C-R-E-TB. Input.1. In Real Units.

The input coefficients per representative unit of output were developed in Section II. Multiplied by the output in representative bundles of weapons, the input coefficients yield the quantity of inputs required for the estimated levels of weapons output. Table 10 lists the quantity of inputs required for the production of 99 representative units of Bundle 1 and 1 representative unit of Bundle 2.

Table 10

Inputs per Bundle of Weapons and Quantities of Input
of the Soviet Weapons Industry a/*
1953

Input	Unit of Input	1	2	3	4
		Input for Bundle 1	Bundle 1 Input Required 99 Bundles	Input for Bundle 2	Total Inputs (Column 2 plus Column 3)
Labor	Man-Year	395.4	39,145	3,513	42,658
Steel	Short Tons	1,861	184,239	17,735	201,974
Aluminum	Short Tons	6	594	23	617
Copper	Short Tons	13	1,287	729	2,016
Coal	Short Tons	3,636	359,964	112,189	472,153
Electric Power	1,000 Kilowatt- Hours	1,704	168,696	48,823	217,519
Petroleum	1,000 Gallons	36	3,564	1,081	4,645
Natural or Producer Gas	1,000 Cubic Feet	10,744	1,063,656	335,949	1,399,605
Lumber, Noncon- struction	1,000 Board Feet	39	3,861	0	3,861
Antifriction Bearings	Units	2,209	218,691	8,256	226,947
Rubber Tires	Units	356	35,244	0	35,244

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Table 10

Inputs per Bundle of Weapons and Quantities of Input
of the Soviet Weapons Industry
1953
(Continued)

Input	Unit of Input	1	2	3	4
		Input for Bundle 1	Bundle 1 Input Required 99 Bundles	Input for Bundle 2	Total Inputs (Column 2 plus Column 3)
Machine Tools	Units	3.5	347	29	376
Other Produc- tive Equip- ment	Short Tons	13.7	1,356	114	1,470
Construction Materials	Short Tons	150	14,850	1,250	16,100
Transportation	1,000 Short-Ton- Kilometers	4,542	449,609	96,520	546,129

2. In Rubles.

The ruble value of the inputs received for the production of weapons in the USSR is indicated in Table 11.* With the exception of labor, the prices are those of 1 January 1950. For labor the best available estimate was that of current wages. It was not possible in all cases to find the price of a particular item -- roller bearings, for example. Instead, the price of a similar item was used, such as the price of ball bearings of similar dimensions and specifications.

The specific inputs listed in Table 12** are limited to direct charges against the cost of production of weapons. In order to establish the value of indirect charges, US cost data for weapons were examined. The cost analysis by the Springfield Arsenal for small arms

* Table 11 follows on p. 35.

** Table 12 follows on p. 36.

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Table 11

Ruble Value of Inputs at 1950 Prices Required
for Soviet Weapons Production in 1953

Input	Unit	Price per Unit ^{35/} (Rubles)	Total Input ^{a/}	Rubles Value of Total Inputs (Million Rubles)
Labor	Man-Years	7,800 to 8,400	42,658	358.3
Petroleum	Metric Tons	405	14,392	5.8
Steel	Metric Tons	1,650 ^{b/}	183,231	302.3
Aluminum	Metric Tons	10,360	560	5.8
Copper	Metric Tons	9,000	1,829	16.5
Coal	Metric Tons	89 ^{c/}	428,337	38.1
Electric Power	1,000 Kilowatt- Hours	500 ^{d/}	217,519	108.8
Lumber, Non- construction	1,000 Board Feet	800	3,861	3.1
Antifriction Bearings	Units	35	226,947	7.9
Miscellaneous Metals (Zinc, Tin, and the Like)	Metric Tons	8,000 ^{e/}	2,744	22.0
Transportation	1,000 Metric- Ton-Kilometers	50	495,448	24.8
Rubber Tires	Units	300	35,244	10.6
Natural or Producer Gas	1,000 Cubic Meters	50	42,814	2.1
Subtotal				<u>906.1</u>
Indirect Costs (125 Percent of Direct Costs)				1,132.8
Total				<u>2,038.9</u>

- a. The inputs expressed earlier in short tons are changed to metric tons.
 b. Steel price is weighted to include both carbon and alloy prices.
 c. Price at the mine.
 d. Price when usage is at the rate needed by the average plant.
 e. Miscellaneous metals is calculated as 1.5 times the weight of copper. This is an estimate of alloying elements, particularly those used in brass or solder.

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revealed an approximate 1 to 1 ratio for direct cost to indirect cost. Information for heavier weapons was not so precise but showed a higher value for indirect cost -- in one case as high as 150 percent of the direct cost. It is assumed that indirect costs are 125 percent of the direct costs as calculated in Table 12. The total value of direct and indirect inputs for 1952 is 2,040 million rubles in 1950 prices.

The defense budget including estimated supplementary allocations is divided into munitions and nonmunitions components in Table 12. The munitions portion is expressed both in current and in constant 1940 prices.

Table 12

Procurement in the Soviet Defense Budget
1949-53

Year	Explicit Defense Budget (Billion Rubles)	Supplementary Allocations (Billion Rubles)	Nonmunitions (Billion Rubles)	Munitions (Billion Rubles)	Price Index (1940=100)	Constant 1940 Munitions Price (Billion Rubles)
1949	79.2	15	55	39.2	135	29.0
1950	82.9	15	56	41.9	115	36.4
1951	93.9	16	56	53.9	109	49.4
1952	108.6	16	56	68.2	106	64.3
1953	110.2	16	56	70.2	104	67.3

The price index decreased from 115 in 1950 to 106 in 1952; therefore, the value of inputs in 1952 is $106/115 \times 2,040$ million rubles, or 1,880 million rubles. This value of inputs into the Soviet weapons industry in 1952 represents 2.75 percent of the munitions portion of the defense budget. US weapons production is 5 percent of the munitions portion of the defense budget, but that includes fire-control instruments and other pieces of equipment which ordinarily accompany the weapon.

There has probably been a great emphasis in the USSR during the postwar years on the production of aircraft, guided missiles, and

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electronic equipment in order to alleviate shortages and to enhance the power position of the USSR. The proportionate value of expenditures for weapons as defined in this report might well be lower than similar items in the US.

IV. Capacity.

The fundamental policy guiding the operation of the weapons industry in the USSR is that war industries should not be separated from other industries. In the words of the official Soviet press, "The problem is in the assimilation of war production with commercial processes. The manufacture of a tank and a tractor, of a commercial and military airplane, an automobile and an armored car, of an instrument used for military and civil communication, naval and merchant marine shipbuilding, and a number of other industries have a great many points in common. Even artillery, machine guns, and rifles could be manufactured successfully in the commercial factories. The cooperation of various enterprises in manufacturing separate parts, to be assembled later on in munitions factories, would further strengthen the national defense of Soviet Russia." 36/

Even though this official opinion was stated more than two decades ago, it is essentially valid today. For example, the 1941 Gosplan held the armaments and munitions ministries responsible for the production of such items as steam turbines, machine tools, instruments, steel bands, celluloid, and forging and pressing equipment. Postwar examples include motorcycles, bicycles, machine tools, fans, sewing machines, and many others.

In the USSR there are 22 plants believed to be devoting all or part of their facilities to producing guns, small arms, or both. (See Appendix A.) The average floor space of the 22 producing plants is 1,210,000 square feet. The average labor force is between 8,700 and 10,000, working in 2 full shifts.* The total number of

* It seems in most cases that 3 shifts are worked, but in total employees the number amounts to no more than 2 full shifts.

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workers engaged by these armaments plants ranges from a little more than 191,000 to slightly more than 222,000, working in 2 full shifts. 37/

With minor retooling, the plants now devoting only part of their facilities to weapons production probably could turn all of their facilities to that use, in which case all their workers would be producing weapons.* The maximum output resulting would be 555 ground and air force bundles per year (222,000 minus 3,513, the man-year requirement for 1 naval bundle, divided by 395.4 man-years).** The 555 ground and air force bundles and 1 navy bundle would represent the production of approximately 395,128 tons of weapons per year. Production from the existing 22 plants, however, cannot be considered the sole source of weapons for the Soviet armed forces. During World War II, many plants producing various types of industrial products were converted to weapons production, especially small arms and mortars. There is every reason to believe a similar policy would be followed during any future mobilization. The resulting output would be considerably higher than the 395,128 tons of weapons per year.

V. Export and Import.

The movement of weapons between the West and the Soviet Bloc is almost nonexistent, although some clandestine shipments are reported. 38/ There is, of course, movement of weapons between the USSR and the Satellites. The pattern of this exchange is generally of the following nature. Each of the Satellites produces some weapons or parts of weapons. Many of these are exported to the USSR, and in return the Satellites receive weapons which have become obsolescent or which are being replaced in the Soviet Army. On balance, the USSR probably exports more in the way of weapons to the Satellites than it imports. Czechoslovakia and East Germany (on balance probably an im-

* In the case of mobilization the number of workers employed in the plants would be increased. It is assumed that the increase would be sufficient to account for the indirect labor requirements, which are not included in the labor input per bundle.

** It is assumed that naval requirements would remain constant.

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porter of weapons) reportedly have exported weapons to the USSR.* Communist China, Poland, Hungary, Rumania, Bulgaria, and Albania are ultimately dependent in varying degrees on the USSR for supplies of weapons.** 40/

There may be a further limiting characteristic of the trade determined by the USSR's general policy of prohibiting the assembly of guns, as distinguished from small arms, in the Satellites: that is, the import of weapons into the USSR is likely to consist of small arms and unassembled gun parts, whereas the exports, consisting of all items, probably favor major-caliber guns. 41/

* Czechoslovakia reportedly delivered 540 100-mm Howitzers to the USSR in 1951 to 1 September. In addition, between 12,000 and 15,000 submachine guns, 24,000 to 25,000 rifles, and 7,000 to 8,000 pistols were delivered. 39/

** A report of a Sino-Soviet agreement stated that Communist China was to be supplied with 1.4 billion rubles worth of weapons, including 500 artillery pieces, 290 medium tanks and armored fighting vehicles, 780 fighter planes, 54 bombers, and AA equipment.

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Table 14

Soviet Weapons with the US Equivalent Used for Estimating Metal Inputs 88/

Soviet Weapon	US Equivalent
Bundle 1	
Rifles and Carbines	Springfield Rifle, MA1903A1, Caliber .30.
Pistols	Colt Pistol, M3, Caliber .45.
Submachine Guns	Thompson Submachine Gun, M3, Caliber .45.
7.62-mm Machine Gun	Browning Automatic Rifle 1918A2, Caliber .30.
12.7-mm Machine Gun	Browning Machine Gun, M2, Caliber .50.
57-mm AA Gun	40-mm M1, Mount (M-5)
100-mm AA Gun	90-mm M1 and MLH1, AA Mount M1A1
57-mm AT Gun	57-mm AT Gun
132-mm Rocket Launcher	Multiple Rocket Launcher, 6 x 6 Mount
82-mm Recoilless Rifle	75-mm Recoilless Rifle
82-mm Mortar	81-mm Mortar
120-mm Mortar	
160-mm Mortar	4.2-inch Mortar
85-mm Gun	75-mm Field Gun, M1A1
122-mm Gun and Howitzer	105-mm Howitzer, M2A1
152-mm Howitzer, Gun, Gun Howitzer	155-mm Howitzer
203-mm Howitzer	155-mm Gun, M2 and Carriage, M1
100-mm Tank Gun (T-54)	90-mm Gun, M3A1
122-mm Tank Gun (JS)	90-mm Gun, M3A1
100-mm SP Gun (SU-100)	90-mm Gun, M3A1
152-mm SP Gun (JSU-152)	90-mm Gun, M3A1
23-mm Aircraft Cannon	37-mm Automatic Gun, M9
37-mm Aircraft Cannon	37-mm Automatic Gun, M9
Bundle 2	
37-mm AA Single Gun	40-mm Single Gun, M3
37-mm AA Twin Gun	40-mm Twin Gun, Mark 1
45-mm AA Single Gun	
3-inch/55 Single Gun	3-inch/50 DP Single Gun
3-inch/55 DP Twin Gun	3-inch/50 DP Single Gun
3.9-inch/51 Wet, Single Gun	5-inch/25 Wet, Single Gun
3.9-inch/56 DP Single Gun	5-inch/38 DP Single Gun, Mark 30
3.9-inch/56 DP Twin Gun	5-inch/38 DP Single Gun, Mark 32, Model 12
4.8-inch/46 Twin Gun	5-inch/38 Twin Gun, Mark 38, Model 1
6-inch/50 Three-Gun Turret	6-inch/47 Three-Gun Turret, CL 155 Class

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