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PROVISIONAL INTELLIGENCE REPORT

SUPPLIES OF IRON AND STEEL SCRAP IN THE SOVIET BLOC

CIA/RR PR-20
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PROVISIONAL INTELLIGENCE REPORT

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CIA/RR PR-20

(ORR Project 70-51)

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SUPPLIES OF IRON AND STEEL SCRAP IN THE SOVIET BLOC*

Summary

In 1952 and 1953, as the iron and steel industries of the Soviet Bloc increase production, their requirements for scrap metal likewise will increase. Over-all requirements of the Soviet Bloc for iron and steel scrap in 1952 are estimated at 28,243,000 metric tons. Over-all availabilities of scrap in the Bloc in 1952 are estimated at only 27,938,000 metric tons, and actual procurement probably will fall short of this amount. The scrap supply problem is particularly critical in East Germany, and the situation in the USSR, Poland, Czechoslovakia, and Hungary is serious. Rumania and Communist China should fulfill requirements without difficulty.

Iron and steel industries themselves annually generate large amounts of scrap, and additional amounts are generated by metalworking and fabricating industries, but the annual requirements of modern iron and steel industries for scrap greatly exceed the amounts annually generated as a byproduct of their operations. The difference must be made up by scrap recovered from disused or obsolescent equipment of various kinds. One major source of iron and steel scrap since World War II has been surplus military equipment and the wreckage resulting from battle and bombardment. Stocks of war scrap in the Soviet Bloc have now been depleted to the point where they are no longer important factors in the supply situation. Scrap collection drives have been established in most of the Soviet Bloc countries and have become an integral part of the iron and steel economy. In the USSR the scrap collection drive of 1951 fell short of planned goals. Every effort is being made by the Soviet Bloc to import scrap from the West, but the amounts obtained have been limited by strong Western demand and Western European export controls.

It is concluded that although scrap metal will be utilized in the Soviet Bloc at close to the maximum possible rate of supply in 1952 and 1953, the supply of scrap will not be sufficient to maintain the 1951 rates of increase in steel production in the Bloc (estimated at 4,763,000 metric tons). Therefore, to maintain the 1951 rates of increase, pig

* This report contains information available to CIA as of 15 April 1952.

iron production would have to be increased by the more efficient operation of existing installations and by the construction of additional blast furnace facilities. It is not believed, however, that the increase in pig iron production will be sufficient to sustain in 1952 and 1953 the 1951 increases in steel production.

I. Introduction.

In an expanding steel economy such as exists in the USSR and the Satellites the recovery of iron and steel scrap from disused or obsolescent equipment is the hope for short-term increases in steel production. Iron and steel scrap and pig iron are complementary and interchangeable raw materials. But scrap is a superior raw material in steelmaking because certain steps in the refinement process have already been taken. Scrap is superior to pig iron not only for making certain kinds of steel -- the highest grades of alloy steels are made in electric furnaces charged principally with scrap -- but also for saving labor and equipment in the production of steel of any kind. Each ton of scrap used in steelmaking results in the conservation of between 3 and 4 tons of natural resources. Approximately 2 tons of iron ore, 1 ton of coking coal, one-half ton of limestone, and small quantities of other raw materials are used to make 1 ton of pig iron. 1/* To extract, transport, and handle these raw materials requires far more labor and equipment than to collect, transport, and handle the scrap that may be used to replace 1 ton of pig iron. Scrap, moreover, may be used directly in steel production in open-hearth furnaces, which are comparatively easy to build. The intermediate step of refining strictly raw materials into pig iron, on the other hand, requires blast furnaces, which are more difficult to erect and which require certain types of machinery (such as turboblowers) in critical supply in the Soviet Bloc.**

1. Evolution of Scrap Uses.

For about the first 20 years of steelmaking by bulk methods there was no need for scrap metal. The first such process, the Bessemer process, used 100-percent pig iron, and, with the rapid increase of steel

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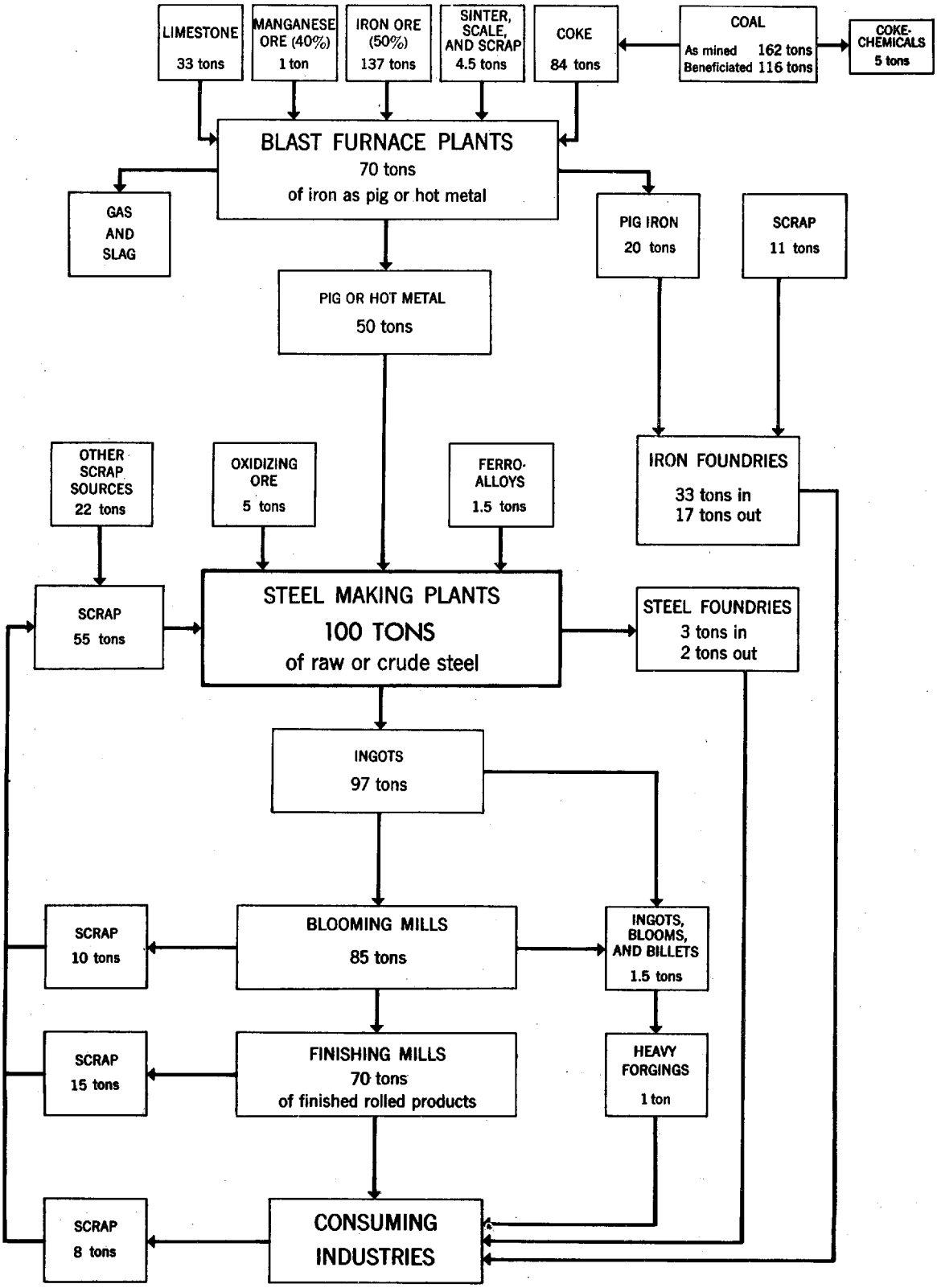
* Footnote references in arabic numerals are to sources listed in Appendix C.

** For flow of materials in USSR iron and steel industry, see the chart which follows p. 2.

FLOW OF MATERIALS IN USSR IRON AND STEEL INDUSTRY*



production during this period, large reserves of scrap accumulated. It was to take advantage of these reserves of scrap metal that the open-hearth steel furnace was developed on a wide commercial basis. This development led in turn to increased dependence on scrap and a decline in reserves of scrap.

This cycle began in the US with the building up of large reserves of scrap in the period 1880 to 1900. Since 1908, when open-hearth production overtook production by the Bessemer process, more scrap has been consumed than generated in the US. 2/ The present acute scrap shortage in the US can in part be traced to the depletion of these early Bessemer reserves of steel scrap.

The availability of scrap and the proportion of scrap used in the open hearths, blast furnaces, electric furnaces, and foundries have depended on the prevailing smelting methods and conditions. Until 1940 the USSR used such a small percentage of scrap in open-hearth furnaces that more scrap was generated than consumed. Since then, first in order to meet the urgent needs of World War II and then to hasten the attainment of the goal of self-sufficiency for the USSR, Soviet leaders have placed great emphasis on the open-hearth process, by which the USSR could most rapidly expand steel production, utilizing the large reserves of scrap available. The extensive adoption of this process in the USSR has depleted these reserves rapidly and has created a critical situation in the supply of scrap.

2. Sources of Scrap.

The sources of scrap metal are much the same in every country. Scrap metal is divided into two principal categories: home scrap* and purchased scrap.** Home scrap is the waste metal material generated in a mill from all the casting, rolling, and finishing operations. From every 100 tons of steel ingots produced, 15 to 25 tons of home scrap are generated. 3/ The largest identifiable source of purchased scrap is the process scrap turned out by the metalworking and fabricating industry. In normal times, about 12 to 15 percent of the total weight of steel used in the metalworking industry becomes process scrap. In wartime the proportion rises to 18 to 20 percent. 4/

* Also called circulating scrap.
** Also called dealer scrap, outside scrap, revert scrap, open market scrap, and country scrap.

The retirement of rails and rail transport equipment contributes a small but consistent stream of scrap for the mills. Railways are the source of about 15 percent of all purchased scrap. 5/

The remainder of the purchased scrap generated represents the toll taken by obsolescence, corrosion, accident, and other causes that result in the retirement of iron and steel products from active service. Scrap is recovered from shipbreaking, building demolitions, and detinning operations. In the US the automobile junk yard is an important source but is not in the Soviet Bloc. Other sources of purchased scrap are city dumps and farms.

In addition, there are two extraordinary means of acquiring scrap, exploited only in times of necessity or when economically profitable. These are the collection drive and the recovery of war scrap. The industrial collection drive is an action to force plants and factories to contribute scrap from obsolescent equipment. In reality, the acquisition of scrap in this way will be offset by a shortage later, when the obsolescent scrap normally would return to the mills. The household collection drive brings in scrap that ordinarily might go uncollected, but in percentage terms the contribution is small. War scrap and surplus war equipment were an important part of scrap supply in the USSR and East Germany up until about 1951.

II. Process of Estimation.

In estimating requirements it is necessary to know what scrap practices* are used in each country for open-hearth, electric, and blast furnaces. In the course of fulfilling the Third Five Year Plan (1938-42) in the USSR, minimum and maximum uses of scrap were established, as shown in Table 1.**

* Scrap practice refers to the percent of scrap in a furnace charge.
** Table 1 follows on p. 5.

Table 1

Use of Iron and Steel Scrap:
Scrap Rates in the USSR under the Third Five Year Plan 6/
1938-42

Type of Steel	Minimum Use of Scrap (Metric Ton per Metric Ton of Steel)
Open-Hearth Steel	0.411
Bessemer Steel	0.039
Electric Steel	0.807
Type of Pig Iron	**Maximum Use of Scrap (Metric Ton per Metric Ton of Pig Iron)**
Open-Hearth Pig Iron	0.050
Foundry Pig Iron	0.060

In lieu of any definite information, scrap practice was taken at 95 percent in electric furnaces in all Soviet Bloc countries, even though US practice is about 98 percent. Table 2* shows estimated open-hearth and blast-furnace scrap practices in the Soviet Bloc and the US for the period 1951-53.

* Table 2 follows on p. 6.

Table 2

Use of Iron and Steel Scrap:
Estimated Scrap Practices in the Soviet Bloc and the US 7/
1951-53

Percent

Country	Open-Hearth Furnaces	Blast Furnaces
USSR	50	5.5
Czechoslovakia	38	10.0
Poland	48	2.0
East Germany	85 a/	5.0
Hungary	54	5.0
Rumania	54	5.0
Communist China	15	5.0
US	46	3.5

a. 1951, 85 percent; 1952, 80 percent; 1953, 75 percent.

III. Requirements.

The construction of new blast furnaces and the consequent increase in the production of pig iron is the only way to lower scrap requirements and maintain (or increase) steel production. Improved technology such as the use of high-pressure tops in blast furnaces, already in use in the USSR at Magnitogorsk, will also reduce scrap requirements.

Estimated scrap requirements of open-hearth furnaces, electric furnaces, blast furnaces, and foundries in the Soviet Bloc for 1951 are shown in Table 3*; for 1952, in Table 4**; and for 1953, in Table 5.*** (Although Bessemer and Thomas converters occasionally utilize scrap, the amounts are negligible.) Allowance has been made for metal losses in the smelting and refining of steel.

* Table 3 follows on p. 7.
** Table 4 follows on p. 8.
*** Table 5 follows on p. 9.

Table 3

Estimated Requirements of Iron and Steel Scrap in the Soviet Bloc
1951

Million Metric Tons

Country	Raw Steel Production	Pig Iron Production [a]	Scrap Metal Requirements				
			Open Hearth	Electric	Blast Furnace	Foundry	Total
USSR	30.300	22.200	14.100	1.730	1.220	3.820	20.870
Czechoslovakia	2.700	1.950	0.964	0.129	0.126	0.156	1.375
Poland	2,300	1.550	0.965	0.100	0.031	0.154	1.250
East Germany	1.200	0.400	0.864	0.057	0.020	0.415	1.356
Hungary	0.800	0.450	0.435	0.053	0.023	0.050	0.561
Rumania	0.275	0.250	0.153	0.014	0.013	0.017	0.197
Communist China	0.873	1.280	0.134	0.046	0.064	0.029	0.273
Total	38.448	28.080	17.615	2.129	1.497	4.641	25.882

a. A considerable amount of the pig iron production is used in the iron foundry industries of the various Soviet Bloc countries.

Table 4

Estimated Requirements of Iron and Steel Scrap in the Soviet Bloc
1952

Million Metric Tons

Country	Raw Steel Production	Pig Iron Production a/	Scrap Metal Requirements				
			Open Hearth	Electric	Blast Furnace	Foundry	Total
USSR	33.300	24.500	15.400	1.900	1.350	4.200	22.850
Czechoslovakia	2.800	2.000	0.982	0.133	0.125	0.160	1.400
Poland	2.400	1.600	1.013	0.100	0.032	0.160	1.305
East Germany	1.500	0.500	1.053	0.066	0.025	0.464	1.608
Hungary	0.825	0.475	0.447	0.055	0.024	0.051	0.577
Rumania	0.275	0.250	0.153	0.014	0.013	0.017	0.197
Communist China	1.000	1.300	0.153	0.054	0.065	0.034	0.306
Total	42.100	30.625	19.201	2.322	1.634	5.086	28.243

a. A considerable amount of the pig iron production is used in the iron foundry industries of the various Soviet Bloc countries.

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Table 5

Estimated Requirements of Iron and Steel Scrap in the Soviet Bloc
1953

Million Metric Tons

Country	Raw Steel Production	Pig Iron Production a/	Scrap Metal Requirements				
			Open Hearth	Electric	Blast Furnace	Foundry	Total
USSR	36.300	27.200	16.880	2.070	1.500	4.580	25.030
Czechoslovakia	2.900	N.A.	1.000	0.138	0.126	0.161	1.425
Poland	2.750	N.A.	1.155	0.120	0.037	0.184	1.496
East Germany	1.800	0.550	1.170	0.132	0.028	0.495	1.825
Hungary	0.850	0.500	0.461	0.057	0.026	0.053	0.597
Rumania	0.300	0.275	0.168	0.015	0.014	0.019	0.216
Communist China	1.000	1.300	0.153	0.054	0.065	0.034	0.306
Total	45.900	29.825 b/	20.987	2.586	1.796	5.526	30.895

a. A considerable amount of the pig iron production is used in the iron foundry industries of the various Soviet Bloc countries.
b. Excluding Czechoslovakia and Poland.

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IV. Availabilities.

The available sources of scrap in the Soviet Bloc in 1952 and 1953 will be exploited to the fullest extent. For estimated availabilities of iron and steel scrap in the Soviet Bloc in 1952 and 1953 see Table 6* and Table 7.** The attempt to reach steel targets will depend largely on the success or failure of scrap procurement efforts. In several of the countries the fulfillment of scrap requirements hinges on ability to import scrap and on nation-wide collection drives.

The West German export controls on scrap shipments to Eastern Europe will definitely have a detrimental effect on the production of iron and steel in the Soviet Bloc in 1952. Information on scrap collection drives is negligible. Household scrap collections are helpful but net only small amounts. Industrial collections provide considerable tonnages but are only of temporary aid, as the plants would eventually return such scrap anyhow. This condition of critical supply has caused the countries in the Soviet Bloc to increase their efforts to import scrap from world markets. 8/

Little information is available on the amounts of war scrap used in the Soviet Bloc and on the remaining reserves, if any. There are indications, however, that stocks of war scrap have been fully depleted except in China and the Soviet Far East, where there is access to Korean battlefields. In addition, a small amount may still exist in East Germany, particularly in the form of sunken ships. 9/

The amortization rate on mechanical equipment in the Soviet Bloc is lower than in the US. In the absence of better data, however, it is assumed that the rate of scrap formation from obsolescent equipment follows the rate in the US except for rails and rail transport equipment (US, 3 percent; Soviet Bloc, 2 percent).

Because of lack of information about scrap availabilities in the Soviet Bloc, analogies were drawn from data supplied by a US organization, the

* Table 6 follows on p.11.
** Table 7 follows on p.12.

Table 6

Estimated Availabilities of Iron and Steel Scrap in the Soviet Bloc
1952

Million Metric Tons

Country	Scrap Metal Requirements	Home Scrap a/	Railroad Rails	Rail Transport Equipment	Metal and Fabricating Industry	Foundry Cast Iron	Obsolescent Equipment	Collection Drives	War Scrap	Total Known Available	Imports b/
USSR	22.850	9.300	0.058	0.442	3.600	3.950	4.650	N.A.	Negligible	22.000	N.A.
Czechoslovakia	1.400	0.784	0.009	0.029	0.305	0.150	0.283	N.A.	Negligible	1.560	0.100 c/
Poland	1.305	0.670	0.014	0.048	0.260	0.183	0.261	N.A.	Negligible	1.436	0.050 d/
East Germany	1.608	0.420	0.011	0.035	0.162	0.050	0.305	0.600 f/	0.050 g/	1.633	Negligible e/
Hungary	0.577	0.231	0.005	0.012	0.089	0.046	0.108	?	Negligible	0.491	0.050 e/
Rumania	0.197	0.077	0.008	0.020	0.030	0.052	0.037	?	Negligible	0.224	0.010 e/
Communist China	0.306	0.280	0.018	0.026	0.108	0.103	0.059	?	N.A. h/	0.594	Negligible
Total	28.243	11.762	0.123	0.612	4.554	4.534	5.703	0.600	0.050	27.938	0.210

a. Allowance is made for obsolescent steel mill equipment.
b. With the exception of certain relatively small imports from Lebanon, Italy, Austria, Albania, and Bulgaria, these figures indicate the probable trade pattern within the Soviet Bloc.
c. Some small imports from East Germany and China.
d. Minimum amount to be supplied by the USSR; also small imports from East Germany, Italy, and Austria.
e. Minimum amount to be expected from East Germany.
f. 1951 figure.
g. Maximum rate of salvage of 0.500 million metric tons of salvageable ships on the East German coast.
h. Mostly from Korea.
i. From Bulgaria; other small amounts from Albania, Austria, the USSR, and Lebanon.

Table 7

Estimated Availabilities of Iron and Steel Scrap in the Soviet Bloc
1953

Million Metric Tons

Country	Scrap Metal Requirements	Home Scrap a/	Rail-road Rails	Rail Transport Equipment	Metal and Fabricating Industry	Foundry Cast Iron	Obsolescent Equipment	Collection Drives	War Scrap	Total Known Available	Imports b/
USSR	25.030	10.150	0.064	0.486	3.920	4.430	4.800	N.A.	Negligible	23.850	N.A. c/
Czechoslovakia	1.425	0.810	0.010	0.032	0.314	0.171	0.300	N.A.	Negligible	1.637	0.100 d/
Poland	1.496	0.770	0.015	0.053	0.297	0.345	0.319	N.A.	Negligible	1.799	0.050 e/
East Germany	1.825	0.505	0.012	0.039	0.194	0.060	0.364	0.500 f/	0.050 g/	1.724	Negligible
Hungary	0.597	0.239	0.006	0.013	0.097	0.051	0.119	?	Negligible	0.525	N.A.
Rumania	0.216	0.084	0.009	0.020	0.032	0.071	0.043	?	Negligible	0.259	0.010 i/
Communist China	0.306	0.280	0.020	0.029	0.108	0.103	0.061	?	N.A. h/	0.601	Negligible
Total	30.895	12.838	0.136	0.672	4.962	5.231	6.006	0.500	0.050	30.395	0.160

a. Allowance is made for obsolescent steel mill equipment.
b. With the exception of certain relatively small imports from Lebanon, Italy, Austria, Albania, and Bulgaria, these figures indicate the probable trade pattern within the Soviet Bloc.
c. Some small imports from East Germany and China.
d. Minimum amount to be supplied by the USSR; also small imports from East Germany, Italy, and Austria.
e. Minimum amount to be expected from East Germany.
f. Adjusted 1951 figure.
g. Maximum rate of salvage of 0.500 million metric tons of salvageable ships on the East German coast.
h. Mostly from Korea.
i. From Bulgaria; other small amounts from Albania, Austria, the USSR, and Lebanon.

Institute of Scrap Iron and Steel. Table 8 indicates the sources of scrap and the contribution of each source of scrap to the US iron and steel industry.

Table 8

Sources of Iron and Steel Scrap in the US 10/

Sources	Percent of Total: Purchased Scrap	Percent of Total: All Scrap
Home Scrap		55
Purchased Scrap		45
Process Scrap	40	
Rails and Rail Equipment	15	
Obsolescent Equipment, etc.	45	
Total Purchased Scrap	100	
Total All Scrap		100

1. USSR.

In the USSR there has been an intense nation-wide effort for the last several years to make a sufficient supply of scrap available to the iron and steel industry. 11/ If scrap requirements, both for home consumption and for foreign commitments, are to be met in 1952 and 1953, it will be necessary for Glavotorchermet (Main Administration of Procurement, Processing, and Sale of Scrap Metal) to intensify its activities.

After World War II the available supplies of scrap were plentiful. They consisted mainly of war scrap from the USSR and East Germany as well as scrap obtained from the wholesale dismantling of plants in East Germany. Now, however, war stocks are depleted, and the dismantling has virtually ceased. In 1951 the supply of scrap was so short in the USSR that mills in the Dnepropetrovsk area were forced to suspend open-hearth production

temporarily. 12/ The 1951 Soviet scrap collection drive was not fulfilled according to plan. 13/ In the future it will be necessary to increase the collection drive efforts. The USSR will not be able to rely on imports and war scrap to fill any substantial part of the scrap requirements.

2. Czechoslovakia.

The Czechoslovak iron and steel industry probably will be able to obtain sufficient quantities of scrap metal to maintain planned levels of production in 1952 and 1953. Regular sources of supply are apparently sufficient to fulfill requirements, although the government has instituted scrap collection drives* and trade agreements for importing scrap. A large portion of the necessary imports has been supplied in the past by the USSR and East Germany. 14/ In the future, Czechoslovakia must rely on the USSR for imports of scrap metal, particularly in view of the increasingly strict embargoes on scrap shipments to the Soviet Bloc by Italy, Western Germany, the Western Zones of Austria, Switzerland, Belgium, and the Netherlands, all former sources of supply for scrap. If the iron and steel industry of Czechoslovakia is unable to make proper use of the Soviet iron ores which are now being substitued for high-grade Swedish ores, shipments of which to Czechoslovakia have been reduced, the scrap situation in Czechoslovakia will become increasingly more serious. 15/

3. Poland.

Poland's iron and steel industry will not suffer any loss in planned production in 1952 and 1953 for lack of scrap metal. Although the Polish government has made an assignment of responsibility for the procurement of scrap metal,** few data were found to substantiate evidence of an intense scrap collection drive. But in 1952 and 1953 the necessity of replacing declining imports from East Germany may focus attention on the need for nation-wide efforts to obtain sufficient scrap metal for the iron and steel industry. 16/

4. East Germany.

If the USSR relaxes the present scrap requirements levied against

* Supervising agency -- Salvage Raw Materials (Sberne Suroviny), a national corporation.
** Central Office for Waste Utilization and Salvage and the Central Committee for Scrap.

East Germany, the supply in East Germany will be sufficient in 1952 and 1953. Up to the present time, Soviet policy has been to call on East Germany to fulfill any scrap deficiencies existing elsewhere in the Soviet Bloc. The USSR has demolished some East German factories solely for the salvageable scrap metal. Continuance of mandatory exports at the present rate will seriously disrupt the economy of the East German iron and steel industry. 17/

A German source in 1947 estimated that in East Germany there existed a war scrap metal reserve of 4 million to 5 million metric tons. At the same time a Soviet source placed the reserve at 6.5 million to 7 million metric tons. In either case the reserve is now exhausted, with the possible exception of about 500,000 metric tons of sunken ships along the East German coast. 18/ In 1951, scrap collection drives* collected 600,000 metric tons of scrap metal. It is possible that this amount will be collected during 1952, but it is doubted if the figure will be met in 1953. By the end of 1953, however, the East German government hopes to have a sufficient number of the new low-shaft blast furnaces in operation to eliminate imports of pig iron and partially relieve the scrap shortage. 19/

5. Hungary.

Hungary cannot sustain iron and steel production in 1952 and 1953 without importing at least 50,000 metric tons of scrap. In the past, Hungary's scrap imports have come principally from East Germany, the USSR, Austria, and Bulgaria. 20/ Imports from East Germany, Hungary's largest external source of supply, will decrease markedly during the next year. 21/ Some scrap will come from Lebanon. 22/ There are insufficient data to indicate whether a scrap collection drive exists.

6. Rumania.

Rumania will be able to sustain operations at planned production levels through the use of internal sources of scrap metal. Rumania imports about 10,000 metric tons of scrap a year from Bulgaria. Small amounts also come from Lebanon. 23/

* Run by the Volkseigene Handelszentrale Schrott (People-Owned Scrap Trading Center).

7. China.

China has a relatively greater surplus of scrap metal than any of the countries in the Soviet Bloc, and the supply is entirely sufficient for the iron and steel industry. In addition, stocks of war scrap from Korea are readily available and are being utilized in Manchuria and the Soviet Far East. Reports do exist, however, of repeated Chinese attempts to import scrap through Hong Kong. 24/

V. Exports.

Except for important strategic reasons, the Soviet Bloc does not export scrap. The Finnish-Soviet Trade Agreement for 1952 calls for the shipment of 20,000 metric tons of scrap from the USSR to Finland. However, the delivery of the scrap is subject to the understanding that the steel produced will be returned to the USSR. The Finns expressed surprise that the USSR had an exportable surplus, and they believe that the scrap will come from East Germany, not from the USSR. 25/.

VI. Stockpiling.

Stockpiling of scrap metal against future strategic needs is not done anywhere in the Soviet Bloc. The supply situation is so critical that it is impossible to stockpile without a loss in production. The aggregating of scrap stocks at the mills is not to be considered stockpiling.

APPENDIX A

GAPS IN INTELLIGENCE

Although reporting on East Germany, Czechoslovakia, and Poland is relatively good, information on Hungary and Rumania is sparse. Intelligence reports on scrap metal activities in Communist China are almost totally lacking. On the USSR there was one good report. Import-export information was spotty and incomplete. In no case was the coverage sufficient for all the needs of the report.

Further and more complete coverage on the following items would be an aid in formulating requirements and availabilities in all Soviet Bloc countries: production data on pig iron as used for open-hearths, converters, and iron foundries; raw steel data for open-hearth, electric furnace, converter, and steel casting production; information about scrap practices in blast furnaces, open hearths, electric furnaces, and foundries; data on recovery of metallics from slag dumps; and figures showing the amount of available scrap by source and the ability of that source to fulfill requirements.

APPENDIX B

METHODOLOGY

The requirements of the various Soviet Bloc countries for iron and steel scrap have been derived for this report from estimates of iron and steel production and of scrap practices in those countries. These estimates in turn are based on such information as is available for those countries, both as regards their iron and steel industries as a whole and as regards individual steel mills. To arrive at the availabilities of iron and steel scrap in the Soviet Bloc, it was necessary for the most part to draw analogies from US availabilities and modify them with such adjustments as were possible. The sample computations below show the methods used in arriving at scrap requirements and availabilities in 1952 for all the countries of the Soviet Bloc.

I. Scrap Requirements, 1952.

A. Open-Hearth Furnace Scrap Requirements.

1. USSR.

a. Steel production (ingots and castings) = 33,300 million metric tons.

b. Open-hearth steel is 86 percent of the steel production. (0.86) (33.300) = 28.600 million metric tons.

c. A scrap practice of 50 percent is used for open-hearth furnaces. (0.50) (28.600) = 14.300 million metric tons.

d. The allowance for melting losses for open-hearth scrap is 8 percent. (0.08) (14.300) = 1.100 million metric tons.

e. Total open-hearth scrap (c plus d) = 15.400 million metric tons.

2. Czechoslovakia.

a. Total scrap required = 1.115 million metric tons.

b. Scrap for open-hearth furnaces is total scrap less electric furnace scrap. (1.115) - (0.133) = 0.982 million metric tons.

3. Poland.

a. Total scrap required in 1951 = 1.250 million metric tons.

b. Total scrap required in 1952 based on an increased production from 2.300 to 2.400. $(1.250)\left(\frac{2.400}{2.300}\right) = 1.305$ million metric tons.

c. Scrap for open-hearth furnaces is 77.6 percent of the total scrap required. (0.776) (1.305) = 1.013 million metric tons.

4. East Germany, Hungary, Rumania, and Communist China.

a. Percentage of the total steel production which is open-hearth steel.

	Percent
East Germany	81.4
Hungary	93.0*
Rumania	95.0*
Communist China	94.6*

b. Open-hearth scrap total arrived at by the same method as used for the USSR but with the following scrap practices.

	Percent
East Germany	80
Hungary	54
Rumania	54
Communist China	15

B. Electric Furnace Scrap Requirements.

1. USSR.

* No allowance made for Bessemer or Thomas converter steel production.

a. Electric furnace steel is 6 percent of the steel production. (0.06) (33.3) = 2.000 million metric tons.

b. A scrap practice of 95 percent is used for the electric furnaces. (0.95) (2.00) = 1.900 million metric tons.

2. Czechoslovakia, East Germany, Hungary, Rumania, and Communist China.

a. Percentage of the total steel production which is electric furnace steel.

	Percent
Czechoslovakia	5.0
East Germany	7.2
Hungary	7.0
Rumania	5.0
Communist China	5.4

b. Electric furnace steel scrap requirement arrived at by the same method as used for the USSR, with all countries using a scrap practice of 95 percent.

3. Poland.

a. Total scrap required = 1.305 million metric tons.

b. Of the total scrap needed 7.65 percent is required by the electric furnaces. (0.0765) (1.305) = 0.100 million metric tons.

C. Blast Furnace Scrap Requirements.

1. USSR.

a. Pig iron production = 24.500 million metric tons.

b. Scrap for blast furnaces, using a 5.5 percent scrap practice. (0.055) (24.5) = 1.350 million metric tons.

2. Czechoslovakia.

a. Total scrap required for iron and steel making = 1.400 million metric tons.

b. Of the 1952 scrap allocation, 8.9 percent is for blast furnace requirements. (0.089) (1.4) = 0.125 million metric tons.

3. Poland.

Blast furnace scrap total arrived at by the same method as used for Czechoslovakia, on the basis that 2.45 percent of the total scrap required (1.305 million metric tons) is required by the blast furnace.

4. East Germany, Hungary, Rumania, and Communist China.

Blast furnace scrap total arrived at by the same method as used for the USSR but with the following scrap practices.

	Percent
East Germany	5
Hungary	5
Rumania	5
Communist China	5

D. Foundry Scrap Requirements.

1. USSR.

Assumption is made that the foundry production increased directly with steel production between 1937 and 1953; 1937 foundry scrap required was 2.222 million metric tons for a steel production of 17.630 million metric tons.

$$\frac{(33.300)(2.220)}{17.630} = 4.200 \text{ million metric tons.}$$

2. Czechoslovakia.

The foundry scrap required is the total scrap less the open-hearth scrap, the electric furnace scrap, and the blast furnace scrap.

3. Poland.

The foundry scrap required is 12.3 percent of the total scrap. (0.123) (1.305) = 0.160 million metric tons.

4. East Germany. 25X1C300

[redacted]

5. Hungary and Rumania.

a. In the total absence of any information, the amount of foundry scrap required was arrived at by taking the average of the Polish and Czechoslovak requirements for 1950 and then directly relating the average to Hungarian and Rumanian steel production.

(1) Poland.

Foundry scrap = 0.150 million metric tons. 1950 steel production = 2.250 million metric tons.
$\frac{(0.150)}{2.250} \equiv 0.066$

(2) Czechoslovakia.

Foundry scrap = 0.150 million metric tons. 1950 steel production = 2.600 million metric tons.
$\frac{(0.150)}{2.600} \equiv 0.058$

b. By averaging the Polish and Czechoslovak requirements, a result is obtained to be used in deriving the Hungarian and Rumania requirements.
$\frac{(0.066) + (0.058)}{(2)} = 0.062$

c. Steel production in Hungary in 1952 $\equiv$ 0.825 million metric tons.

d. Foundry scrap required in Hungary in 1952 (b multiplied by c) = 0.051 million metric tons.

e. Steel production in Rumania in 1952 = 0.275 million metric tons.

f. Foundry scrap in Rumania in 1952 (b multiplied by e) =

0.017 million metric tons.

6. Communist China.

a. Foundry production in 1952 27/ = 0.112 million metric tons.

b. Scrap practice in Chinese foundries is estimated to be 30 percent. (0.30) (0.112) = 0.034 million metric tons.

II. Scrap Availabilities, 1952.

A. Home Scrap Availability.

1. USSR.

a. Total steel production (ingots and castings) = 33.300 million metric tons.

b. Finished steel production = 24.000 million metric tons.

c. Home scrap (a less b) = 9.300 million metric tons.

d. Railroad equipment obsolescence. The estimated USSR depreciation rate of 2 percent gives scrap from locomotives as 70,000 metric tons, scrap from railroad cars as 276,000 metric tons, and scrap from other equipment as 96,000 metric tons -- a total of 0.442 million metric tons.

e. Rate of rail scrap formation based on US rail scrap. The US has 227,244 miles of railroad track which yields approximately 0.250 million metric tons of scrap. The USSR has approximately 58,000 miles of track which will yield a somewhat lower return than the US, or about 0.058 million metric tons.

f. Metalworking and fabricating industry scrap based on US practice. In peacetime, 12 to 15 percent of the total weight of metal shipped goes into scrap when the metal is fabricated. In wartime the yield rises from 18 to 20 percent. A figure of 15 percent has been used -- (24.00) (0.15) = 3.600 million metric tons.

g. Foundry cast iron scrap is estimated as shown. Total steel production (ingots and castings) = 33.300 million metric tons. Electric furnace steel production -- (0.06) (33.3) = 2.000 million metric tons. The Bessemer and Thomas convertersteel production -- (0.08) (33.3) = 2.700 million metric tons. Open-hearth furnace steel production -- (0.86) (33.3) = 28.600 million metric tons. Assumptions are that electric furnace steel uses no pig iron, that the Bessemer and Thomas converters use 100-percent pig iron, and that the open-hearth furnaces use 50-percent pig iron. However, since about one-half of the converter production may be used in the duplex process (a combination of the converter system and the open-hearth system) the pig iron should be halved to avoid duplication. Total pig iron needed in steel-making processes -- (1.300) + (14.300) = 15.600 million metric tons. Total pig iron production = 24.500 million metric tons. Pig iron available for other purposes = 8.900 million metric tons. Allowance for exports and miscellaneous uses = 1.000 million metric tons. Pig iron available to the foundry industry = 7.900 million metric tons. About 50 percent of the foundry production is scrap. Available foundry cast iron scrap -- (0.05) (7.900) = 3.950 million metric tons.

h. Obsolescent equipment should, according to US practice, contribute about 45 percent of the purchased scrap, which is approximately 45 percent of the total scrap -- (0.45) (0.45) (22.850) = 4.65 million metric tons.

2. Czechoslovakia, Poland, East Germany, Hungary, Rumania, and Communist China.

a. The same method as used in computing USSR availability is used here in all categories.

APPENDIX C

SOURCES AND EVALUATION OF SOURCES

1. Evaluation of Sources.

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Exploitation through the CIA Library of documents proved to be the most valuable source of information. Of particular use were [redacted] Aside from CIA sources, State Department despatches were found to contain much of interest. Some information was also obtained from Army and Air Force Intelligence reports. FDD furnished one outstanding translation on the USSR. The Scrap Iron and Steel Institute was the source of much valuable data pertaining to the US.

A complete listing of sources is furnished, although only one-third of the sources are numerically referenced in the body of the report. Those sources listed but not numerically referenced were of assistance in formulating methodology, as well as in furnishing general background for the analyst.

2. Sources.

a. Referenced Sources.

1. J.M. Camp and C.B. Francis, The Making, Shaping and Treating of Steel, Carnegie-Illinois Steel Corporation, 1950; Physical Chemistry of Steelmaking Committee, Basic Open Hearth Steelmaking, AIME, 1951.
2. E.C. Barringer, Speech at Industrial War College of the Armed Forces, 22 Nov 1946.
3. Ibid.
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b. Background Sources.

AISI, Annual Statistical Report, 1950.
UN, Scrap Iron and Steel, E/CN.11/I&S/13, 4 Mar 1950.
UN, Circulating Scrap, E/ECE/Steel/60, 12 Nov 1950.
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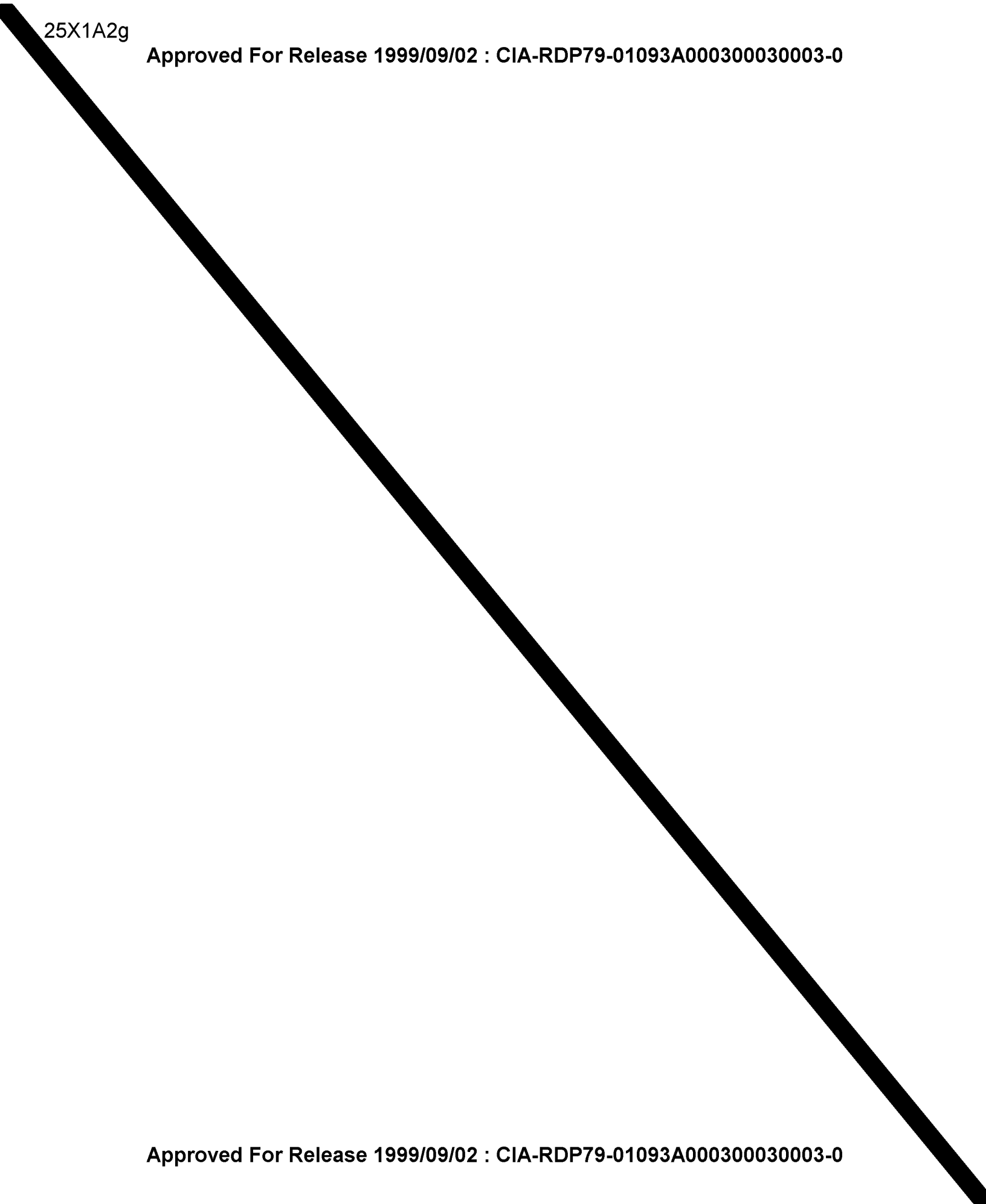

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