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## ECONOMIC INTELLIGENCE REPORT

# CONSTRUCTION AND IMPORTS OF VESSELS FOR THE INLAND FLEET OF THE USSR 1956-60



CIA/RR 116

13 December 1957

## CENTRAL INTELLIGENCE AGENCY

### OFFICE OF RESEARCH AND REPORTS

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ECONOMIC INTELLIGENCE REPORT

CONSTRUCTION AND IMPORTS OF VESSELS FOR THE INLAND FLEET OF THE USSR  
1950-60

CIA/RR 116  
(ORR Project 35.1673)

CENTRAL INTELLIGENCE AGENCY  
Office of Research and Reports

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FOREWORD

The purpose of this report is to revise in the light of more recent information the estimates of Soviet construction of inland vessels and the size of the Soviet inland fleet

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This report is part of a program of ORR to estimate the magnitude of the shipbuilding effort in the USSR.

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CONSTRUCTION AND IMPORTS OF VESSELS  
FOR THE INLAND FLEET OF THE USSR\*  
1950-60

Summary

Soviet efforts to develop a large-scale, highly efficient system of inland\*\* waterway transportation and the shipbuilding industry necessary to support such a system have continued from shortly after the Communist Revolution to the present. During World War II, many of the inland shipyards were severely damaged or destroyed. Since the end of World War II these damaged facilities have been rebuilt, and many new shipyards have been constructed. Even with its greatly increased facilities, domestic Soviet construction of inland vessels has not been able to produce the required additions for the Soviet inland fleet and at the same time to carry out the increasing maintenance and repair required by this expanding fleet. Reparations and purchases from abroad have supplemented construction of inland vessels in the past, and purchases should continue to supplement construction in the future.

Because of damages that occurred during World War II, the size of the inland fleet was reduced by 1945 to 3,148 self-propelled vessels totaling 610,000 horsepower (hp) and 5,644 non-self-propelled vessels totaling 3.8 million deadweight tons cargo capacity (dwtcc).\*\*\* By 1950, as a result of gross additions (Soviet construction plus imports), the inland fleet had grown to include self-propelled vessels totaling 910,000 hp and non-self-propelled vessels totaling 6.8 million dwtcc and was comparable with the US inland fleet on the

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\* The estimates and conclusions contained in this report represent the best judgment of ORR as of 15 September 1957.

\*\* The term inland as used in this report refers to inland waterways, which include rivers, lakes, and canals. The term inland fleet comprises all self-propelled and non-self-propelled vessels using the inland waterways and does not include harbor craft in maritime ports and vessels in, or intended for use in, the Caspian Fleet.

\*\*\* The deadweight tons cargo capacity (dwtcc) is the total weight of cargo in metric tons (tonnages are given in metric tons throughout

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Mississippi River system and the Gulf intracoastal waterways during 1951. This US inland fleet had self-propelled vessels totaling 926,000 hp and non-self-propelled vessels totaling 6,633,000 dwtcc. It is expected that the Soviet inland fleet by 1960 will have self-propelled vessels totaling more than 2 million hp and non-self-propelled vessels totaling more than 10 million dwtcc. The fleet of self-propelled vessels probably will continue to expand, and the fleet of non-self-propelled vessels probably will be stabilized in the 1960's at about 11 million dwtcc.

As of 1957 the USSR gives no indication of an intention of constructing naval vessels at those facilities now used for construction of inland vessels. In an emergency, however, conversion to construction of naval small craft could be accomplished easily. On the basis of the effort expended on construction of steel inland vessels in 1955, it is estimated that the shipyards which constructed these vessels could construct naval small craft at a rate of about 25,000 light ship displacement (LSD) tons, per year.

Soviet imports of self-propelled vessels for the inland fleet during 1951-55 represented 44 percent of the gross additions of these vessels measured in horsepower. Imports of non-self-propelled vessels during the same period represented 14 percent of the gross additions measured in deadweight tons cargo capacity. Imports of self-propelled and non-self-propelled vessels represented 22 percent of gross additions measured in rubles. The European Satellites and Communist China accounted for 72 percent of the ruble value of Soviet imports. Soviet construction of inland vessels during the Fifth Five

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this report unless otherwise indicated) which the vessel can carry in full load condition. The deadweight tons cargo capacity is equal to the deadweight tonnage minus the full load allowance weight of crew, passengers, provisions, fuel, water, and other items necessary for use on a voyage. The deadweight tonnage of a vessel is the carrying capacity (in metric tons) of the vessel. It includes the crew and their effects and all items of consumable or variable load such as stores, fuel, and cargo. The deadweight tonnage is the difference in tons between full load displacement and light ship displacement. Light ship displacement (LSD) is the weight (in metric tons) of the vessel complete, ready for service in every respect, including permanent ballast and liquids in the machinery at operating levels but excluding the crew and their effects and all items of consumable or variable load such as stores, fuel, and cargo. The term deadweight tonnage is used in this report only when direct references are made to quotations from Soviet publications.

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Year Plan (1951-55) is estimated to have included self-propelled vessels totaling 301,000 hp and non-self-propelled vessels totaling 3,490,000 dwtcc, or a total value of construction of inland vessels of 2.48 billion rubles (US \$430 million).\*

Soviet imports during 1956-60 are expected to increase to 29 percent of the ruble value of total gross additions to the inland fleet, with the European Satellites and Communist China furnishing 79 percent of the ruble value of these imports. Soviet construction of self-propelled inland vessels during the Sixth Five Year Plan (1956-60) is expected to increase to 571,000 hp, but construction of non-self-propelled vessels is expected to decrease to 1,610,000 dwtcc. The total expected value of construction of inland vessels, 2.33 billion rubles (\$446 million), is about the same as the value of inland vessels constructed during 1951-55, but the value of maintenance and repair during 1956-60 will continue to increase.

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#### I. Introduction.

Construction and procurement of vessels for the inland fleet of the USSR, as for any industrialized country, is dependent on and directly related to requirements for inland water transportation. The relationship between supply and demand is much closer in the case of inland vessels than that which normally governs the building or procurement of either a naval or a maritime fleet because these latter may be influenced to a varying degree by the desire for national prestige and by assumed requirements for military preparedness.

As part of the Soviet objective of making the USSR a highly industrialized nation without dependence on imports from other nations, the USSR has continued to expand its inland transportation systems. The lower cost of inland water transportation, compared with the cost of transportation on railroads and highways, together with the

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\* Unless otherwise indicated, ruble values are given in 1955 rubles and dollar values in 1955 US dollars throughout this report. Ruble-dollar ratios between 3.92 to 1 and 6.55 to 1 are indicated for construction of inland vessels. (See Tables 8 and 9, Appendix A, pp. 33 and 34, below.)

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economic and physical geography of the USSR, has resulted in the use of inland waterways for a sizable portion of all Soviet inland transportation. The proportion of inland waterway transportation in the over-all rail-water cargo turnover was 6.6 percent in 1950, decreasing to 6.1 percent in 1955, with the 1960 plans calling for an increase to 7.4 percent. 1/\* The actual cargo turnover for inland transportation amounted to 67.4 billion ton-kilometers (tkm\*\*) in 1955, with a planned 121.3 billion tkm by 1960. Cargo turnover for the US in 1955 was slightly in excess of 97 billion tkm. 2/ The USSR has more than 9 million km of inland waterways. Of this total, about 0.5 million km are suitable for seasonal rafting and more than 130,000 km for navigation of vessels.\*\*\* Movement of cargo north and south in the USSR is highly dependent on transportation on inland waterways. The principal waterways linking the Black and Caspian Seas with the Baltic and White Seas, along with the Dnieper and Don Rivers, at present carry most of the traffic on inland waterways required by the highly industrialized area west of the Urals. The general orientation of these waterways is north and south, railroads being used generally for transportation east and west. East of the Urals the movement of cargo north and south is almost entirely dependent on shipping along the Yenisey, Ob', and Lena Rivers, all of which have points of transshipment with the Trans-Siberian Railroad in the south and with the growing Northern Sea Route along the northern seacoast of the USSR.

## II. History.

In the USSR, immediately after the Communist Revolution, the segment of the shipbuilding industry that constructed inland vessels was almost nonexistent, and the system of inland waterways was widely damaged. Only about 52,000 km of usually navigable waterways were open to traffic, and there were no adequate shipyards. 4/ In plans for the national economy following the Revolution, the need for the development of transportation on inland waterways was recognized and the expansion of the inland fleet was included. Table 1\*\*\*\* shows the development of the inland waterways, transportation on inland waterways, and the inland fleet before World War II.

\_\_\_\_\_  
\*\* See the third footnote on p. 1, above.

\*\*\* The US has 46,700 km of inland waterways used for barge traffic. 3/

\*\*\*\* Table 1 follows on p. 5.

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Table 1

Total Length of Waterways Used by the Soviet Inland Fleet  
and Cargo Turnover, Horsepower, and Tonnage of Vessels Used  
in the USSR  
1913, 1928, and 1940

Type of Activity	Unit of Measure	1913	1928	1940
Total length of inland waterways used	Thousand kilometers <sup>a/</sup>	64.6	71.6	107.3
Cargo turnover	Billion ton-kilometers <sup>b/</sup>	28.9	15.9	35.9
Horsepower of self-propelled vessels used	Thousand horsepower	1,039	538	810
Cargo deadweight of non-self-propelled vessels used	Thousand deadweight tons cargo capacity	13,678	4,240	5,800

a. 5/  
b. 6/

The difference in the data for 1913 and 1928 reflects the deterioration of the Soviet inland fleet and the nonutilization of the inland waterways for transportation after the Communist Revolution, whereas a comparison of data for 1928 and 1940 reflects the subsequent emphasis by the Soviet planners on the inland fleet and inland waterways. In the Second Five Year Plan (1933-37), shipyards of the Main Administration of the River Industry produced 432 self-propelled vessels totaling 137,960 hp and 253 non-self-propelled vessels totaling 271,510 dwtcc. 7/

At the beginning of World War II the segment of the shipbuilding industry that constructed inland vessels comprised 211 industrial enterprises including 65 plants, 117 shops, and 29 shipyards for constructing wooden vessels. 8/ According to Soviet figures, more than 1,000 self-propelled vessels and more than 3,000 non-self-propelled vessels were destroyed, sunk, or damaged during World War II. Although there are reasons to believe that these figures

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exaggerate actual losses, it is estimated that the inland fleet was reduced by 1945 to 3,148 self-propelled vessels totaling 610,000 hp and 5,644 non-self-propelled vessels totaling 3.8 million dwtcc. 9/ Many of the shipyards constructing inland vessels had suffered direct damage, and the majority were in disrepair.

The first postwar Five Year Plan, the Fourth Five Year Plan (1946-50), envisioned an increase in the inland fleet of self-propelled vessels totaling 300,000 hp and non-self-propelled vessels totaling 3 million dwtcc. 10/ It was planned that 152 million rubles were to be spent during 1946-50 to rehabilitate and re-construct damaged shipyards, to re-equip existing shipyards, and to build new shipyards. 11/

Exact increases in the inland fleet during 1946-50 are not known. It is known, however, that sizable increases resulted from reparations, and it is believed that by including these reparations and purchases from abroad the plan substantially was met, with the resulting fleet at the end of 1950 including self-propelled vessels totaling 910,000 hp and non-self-propelled vessels totaling 6.8 million dwtcc. This fleet is to be compared with the US inland fleet, which included self-propelled vessels totaling 926,000 hp and non-self-propelled vessels totaling 6,333,000 dwtcc on the Mississippi River system and Gulf intracoastal waterways during 1951. 12/

### III. Organization.

In March 1946 the Peoples Commissariat of the River Fleet of the USSR (Narodnyy Komissariat Rechnogo Flota -- NKRF) was changed to the Ministry of the River Fleet (Ministerstvo Rechnogo Flota -- MRF). In March 1953, after the death of Stalin, the MRF, the Ministry of the Maritime Fleet (Ministerstvo Morskogo Flota -- MMF) and the Main Administration of the Northern Sea Route (Glavnoye Upravleniye Severnogo Morskogo Puti -- Glavsevmorput) were united into a single ministry -- the Ministry of the Maritime and River Fleet (Ministerstvo Morskogo i Rechnogo Flota -- MMRF). Reorganization in August 1954 again made the inland fleet a separate ministry. In June 1956, the MRF was abolished, and its organizations and establishments were transferred to the control of the republics concerned. In actual fact this last reorganization will probably not have much effect, because in terms of kilometers more than 90 percent of the navigable waterways of the USSR are in the Russian Soviet Federated Socialist Republic (RSFSR). 13/ From 1946 to the present, Z.A. Shashkov has been

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the Minister of the MRF and of the MRRF. In the latest reorganization, Shashkov became Minister of the MRF, RSFSR, and chairman of the collegium of the MRF, RSFSR, with deputy ministers N.G. Ovsyannikov, M.S. Nazarov, A.N. Vakhturov, V.M. Ptashnikov, Ye.S. Selesnev, N.P. Fedotov, and P.V. Cherevko. 14/

Details of the administrative structure of shipyards and ship repair yards under the new ministry are not yet known. It is believed, however, that the structure will remain substantially the same as before, with the MRF, RSFSR, controlling the principal design, technical, planning, and educational organizations.

Before October 1956, broad policy matters such as the types and numbers of vessels to be constructed were handled by the Planning-Economic Administration (Planovo-Ekonomicheskoye Upravleniye) of the MRF. Plans were prepared by either the shipyard or the central design organization of the Leningrad Central Planning and Design Bureau No. 1 (Tsentral'noye Proyektno-Konstruktorskoye Byuro -- TsPKB), the principal design organization. Subject to the approval of the minister, construction orders in accordance with these designs were placed in MRF shipyards or in shipyards of the Ministry of Shipbuilding (Ministerstvo Sudostroitel'noy Promyshlennosti -- MSP). Inspection for seaworthiness and classification during construction was handled by inspectors of the Soviet Register of Inland Vessels, an organization under the MRF, with functions similar to those of the American Bureau of Shipping. 15/

Many shipyards constructing for the inland waterways previously were under the jurisdiction of the main administration for the MRF area in which they were located but with much control exercised by the Main Administration of Shipbuilding and Ship Repair Plants (Glavnoye Upravleniye Sudostroitel'nykh i Sudoremontnykh Zavodov) of the MRF, RSFSR, as well as by the Scientific Technical Society (Nauchno-Tekhnicheskoye Obshchestvo -- NTO). 16/ Other shipyards producing for the inland waterways have been responsible directly to this main administration.

IV. Development During the Fifth Five Year Plan (1951-55).

A. Plan.

The only direct reference to Soviet construction of inland vessels in the published Fifth Five Year Plan (1951-55) envisioned

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an increase of 2.6 times in the number of inland passenger vessels to be launched in 1955 compared with the number launched in 1950. Individual reports concerning the plans for construction of individual types of inland vessels by specific shipyards, as well as the plan for increased transportation (an annual increase of 15 or 16 percent) on inland waterways, 17/ indicate that there was a plan for construction of inland vessels and that the rate of construction was probably higher than actual construction during the Fourth Five Year Plan (1946-50).

B. Change in Size and Composition of the Fleet.

Soviet statements of fulfillment of the Fifth Five Year Plan compared with data of 1950 show that by the end of 1955 the inland fleet of self-propelled vessels had increased 43 percent in terms of horsepower, the fleet of non-self-propelled vessels 42 percent in terms of deadweight tons cargo capacity, 18/ and construction of inland passenger vessels 187 percent in terms of horsepower. 19/ On the basis of the estimated size of the fleet at the end of 1950, it is estimated that the net additions (gross additions minus retirements) included self-propelled vessels totaling 390,000 hp and non-self-propelled vessels totaling 2.9 million dwtcc. These net additions are to be compared with the net additions planned for the Fourth Five Year Plan, self-propelled vessels totaling 0.3 million hp and non-self-propelled vessels totaling 3 million dwtcc. Net additions of inland vessels planned under the Fourth Five Year Plan are believed to have been fulfilled. The change in the composition of the net additions during the Fifth Five Year Plan compared with those during the Fourth Five Year Plan is related to problems encountered in operation and to changing conditions of operation.

The productivity of the inland fleet, in relation to the size of the fleet, in terms of both tons carried and ton-kilometers, had not been satisfactory. In 1953 the demurrage of the non-self-propelled dry cargo vessels was 65.6 percent, and the demurrage of vessels waiting for tugs and towboats\* was 28.3 percent more than that before World War II. 20/ Thus the necessity for increasing

\* Tugs and towboats are self-propelled vessels of small tonnage that have little or no cargo capacity, have high engine power in relation to the general dimensions of the vessel, and are used for towing barges, lighters, and other craft. In the US (and as used in this report) a tug pulls its tow, whereas a towboat pushes its tow ahead.



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the fleet of tugs in relation to the fleet of non-self-propelled vessels was clearly indicated. Still another factor influenced the necessity for a relative increase in the fleet of self-propelled vessels. The progressive building of dams had converted many rivers into chains of lakes and wide reservoirs resulting in changes in requirements for the vessels navigating on them. Long trains of non-self-propelled barges and lighters which had been satisfactory on the relatively narrow rivers became unsatisfactory for use on these new waterways, not only in regard to strength and stability but also in the inability of tugs to hold these tows under conditions of rougher waters and greater wind forces.

As a result, much effort was spent in strengthening existing vessels to conform to the requirements of the USSR Register of Inland Vessels. During 1954, Kovalev, the Chief of the Division of Future Planning of the Planning Economic Administration (Otdel Perspektivnogo Planirovaniya, Planovo-Ekonomicheskoye Upravleniye) of the MMRF made an effort to decrease production of non-self-propelled vessels. His plan called for the carrying of 35 percent of all dry cargo in self-propelled vessels by 1960. 21/

By the end of 1955 the inland fleet comprised self-propelled vessels totaling some 1.3 million hp and non-self-propelled vessels totaling 9.7 million dwtcc. For the composition of the inland fleet, see the accompanying chart, Figure 1.\* For figures on the growth of the fleets of self-propelled and non-self-propelled vessels, see Tables 5 and 6.\*\* Diesel propulsion accounted for approximately 43 percent of the horsepower of the self-propelled vessels.

C. Imports.

During 1951-55, exports of inland vessels from the USSR were negligible. Soviet imports of self-propelled vessels, however, totaled 237,000 hp (44 percent of the gross additions of self-propelled vessels), valued at 406 million rubles, and of non-self-propelled vessels 560,000 dwtcc (14 percent of the gross additions of non-self-propelled vessels), valued at 290 million rubles. The total value of imports of inland vessels was 696 million rubles (22 percent of the value of gross additions of inland vessels). Imports from the European Satellites and Communist China accounted for 94 percent of the horsepower of self-propelled vessels, 38 percent of the dead-weight tons cargo capacity of non-self-propelled vessels, and 72 percent of the total ruble value of both types of vessels. Among countries contributing to these imports, Finland was the only country

\* Following p. 10.

\*\* Appendix A, pp. 25 and 26, respectively, below.

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of the Free World. In terms of US costs, imports from the Bloc are valued at \$106 million and imports from Finland at \$33 million, a total of \$139 million. The accompanying chart, Figure 2,\* shows the relative importance of imports during 1951-55. The quantity of Soviet imports of inland vessels, by country of export, during 1950-60 is shown in Table 4.\*\* The quantity and value of Soviet imports of inland vessels from the European Satellites and Communist China, by type of vessel, during 1950-60 are shown in Table 13\*\*\* and of self-propelled inland vessels from the European Satellites and Communist China in Table 14.\*\*\*\* Soviet imports of inland vessels from Finland during 1950-60 are shown in Table 15,† of self-propelled inland vessels from Finland in Table 16,†† of non-self-propelled inland vessels from Finland in Table 17.††† All Soviet imports of inland vessels (those from the European Satellites, Communist China, and Finland) during 1950-60 are shown in Table 18,†††† of self-propelled inland vessels in Table 19,‡ and of non-self-propelled inland vessels in Table 20.‡‡

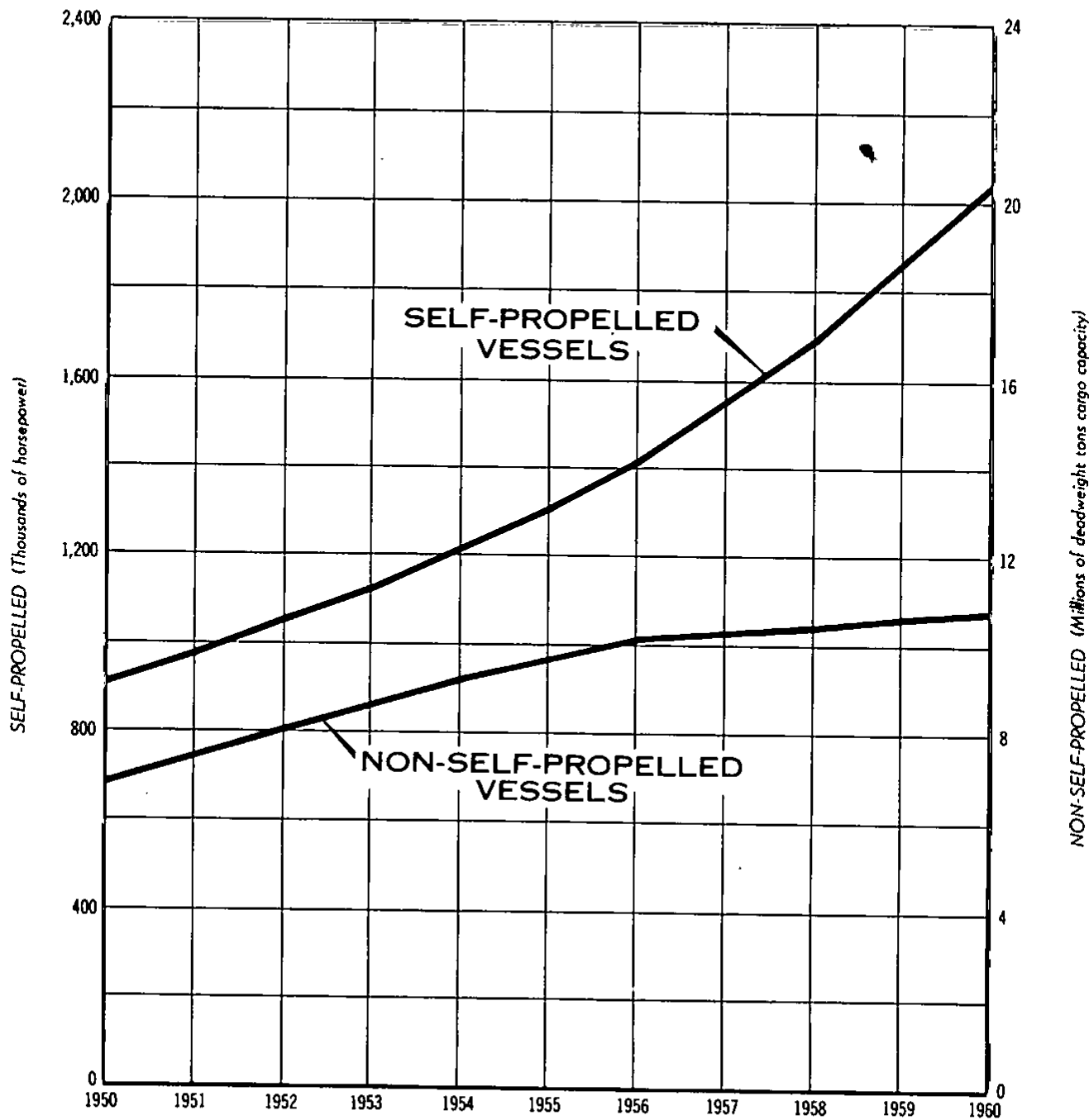
Rumania was the largest exporter of self-propelled inland vessels, exporting virtually only tugs, towboats, and barges. Following, in terms of horsepower, were Czechoslovakia, Hungary, and East Germany. Imports from these three countries contained a large proportion of cargo vessels and passenger vessels.

D. Soviet Construction.

As a result of the rehabilitation and the expansion of ship-building facilities in the USSR and of the continued emphasis on expanding the inland fleet, Soviet construction alone during 1951-55 was more than the estimated net additions, including both Soviet construction and imports, during the Fourth Five Year Plan (1946-50). Construction of self-propelled vessels totaling 301,000 hp and of

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- \* Following p. 10.
  - \*\* Appendix A, p. 24, below.
  - \*\*\* Appendix A, p. 38, below.
  - \*\*\*\* Appendix A, p. 39, below.
  - † Appendix A, p. 40, below.
  - †† Appendix A, p. 41, below.
  - ††† Appendix A, p. 42, below.
  - †††† Appendix A, p. 43, below.
  - ‡ Appendix A, p. 44, below.
  - ‡‡ Appendix A, p. 45, below.

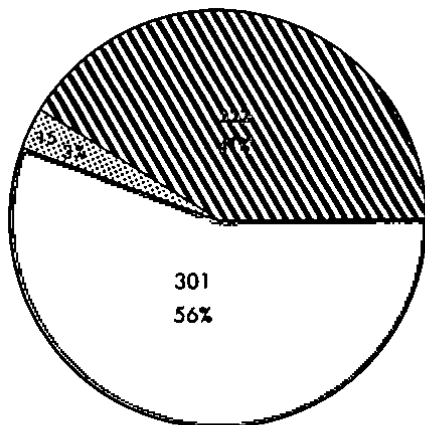
# USSR ESTIMATED COMPOSITION OF THE INLAND FLEET, 1950-60



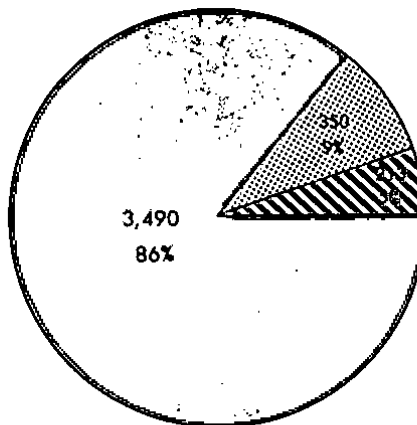
Estimates are as of 31 December, for years indicated.

# USSR ESTIMATED GROSS ADDITIONS\* TO THE INLAND FLEET,\*\* 1951-55

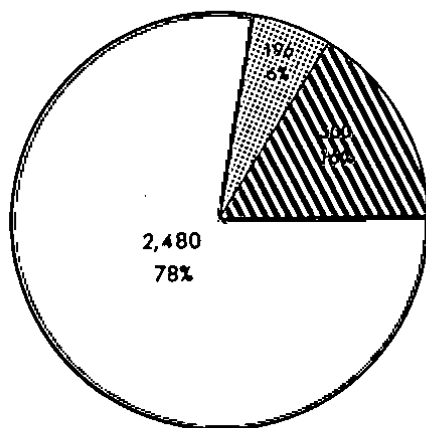
**SELF-PROPELLED**  
(Thousands of horsepower)  
538



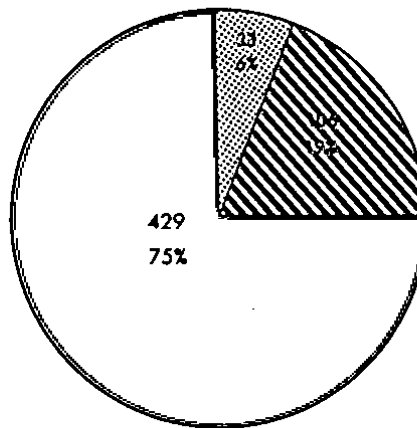
**NON-SELF-PROPELLED**  
(Thousands of deadweight  
tons cargo capacity)  
4,050






**SELF-PROPELLED  
AND NON-SELF-PROPELLED  
TOTAL VALUE: 3,170**  
(Millions of 1955 rubles)



**SELF-PROPELLED  
AND NON-SELF-PROPELLED  
TOTAL VALUE: 568**  
(Millions of 1955 US dollars)



-  Imports from the European Satellites and Communist China
-  Imports from Finland\*\*\*
-  Soviet Construction

\*Soviet construction plus imports.

\*\* Figures shown reflect the rounding of original data and may not add to the totals shown.

\*\*\* Finland was the only country of the Free World that has been exporting inland vessels to the USSR.

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non-self-propelled vessels totaling 3,490,000 dwtcc, had a total value of 2.48 billion rubles which represented, in terms of the total gross additions, 56 percent of the horsepower and self-propelled vessels, 86 percent of the deadweight tons cargo capacity of non-self-propelled vessels, and 78 percent of the total value of inland vessels, as shown in Figure 2.\* ' The quantity and value of construction of inland vessels in the USSR during 1950-60 are shown in Table 10,\*\* that of self-propelled inland vessels in Table 11,\*\*\* and of non-self-propelled vessels in Table 12.\*\*\*\*

US cost for similar construction of inland vessels would have been \$430 million based on a dollar ratio of 5.77 to 1 for Soviet construction during 1951-55.

Characteristics of Soviet construction during 1951-55 were the adoption of new standard designs, a decrease in the total number of standard designs,† an increased use of assembly-line construction, greater average horsepower per vessel, increased use of diesel power as opposed to steam, and a greater percentage of steel construction as opposed to wooden construction. Estimated Soviet construction of self-propelled vessels is shown in the accompanying chart, Figure 3,†† and estimated construction of non-self-propelled vessels is shown in the accompanying chart, Figure 4.†††

Some idea of the relative importance of the inland fleet was shown when the MRF and the MMF were combined in 1953. Z.A. Shashkov, the former Minister of the MRF, headed the new ministry. When the new ministry separated in 1954 into the MRF and the MMF, Shashkov was again appointed Minister of the MRF.

During 1951-55, lack of maintenance and repairs of the inland fleet and the resulting underfulfillment of the plans for transportation made it evident that as the fleet grew more attention and more facilities would have to be devoted to maintenance and repair. Although available information is not entirely conclusive,

\* Following p. 10.

\*\* Appendix A, p. 35, below.

\*\*\* Appendix A, p. 36, below.

\*\*\*\* Appendix A, p. 37, below.

† As of 1949 the All-Union Standards (Gosudarstvennyy Obshche-soyuznyy Standart -- GOST) for inland vessels included 48 types and sizes. 22/

†† Following p. 12.

††† Following p. 12.

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it appears that in about 1953 or 1954 some of the effort which had been devoted to new construction was being diverted to maintenance and repair.

V. Development During the Sixth Five Year Plan (1956-60).

A. Plan.

Under the Sixth Five Year Plan (1956-60) the inland fleet of the USSR is to be supplied with tugs and towboats and self-propelled cargo vessels totaling approximately 720,000 hp, passenger vessels totaling 180,000 hp, and non-self-propelled vessels totaling 2,245,000 dwtcc. 23/ Included in this plan are 5,000-dwtcc self-propelled cargo vessels of 1,600 hp, 2,400-hp tugs, 3,000-dwtcc tankers, refrigerator vessels, diesel ferryboats, icebreakers of up to 4,000 hp, and 460-berth passenger vessels, as well as numerous types of smaller vessels. 24/ Table 2\* shows a more complete listing of planned types. It is significant that the plan envisions reconstruction of existing ship repair enterprises and construction of new ship repair enterprises but does not include construction of new shipyards. 25/

B. Change in Size and Composition of the Fleet.

On the assumption that the plan for supplying vessels to the inland fleet of the USSR is fulfilled, with allowance for retirements, it is estimated that this fleet by 1960 will have self-propelled vessels totaling 2,040,000 hp (57 percent more than during 1955) and non-self-propelled vessels totaling 10,724,000 dwtcc (11 percent more than during 1955). Figure 1\*\* and Table 7\*\*\* show the estimated composition of the fleet during 1950-60. For figures on the growth of the fleets of self-propelled and non-self-propelled vessels, see Tables 5 and 6.\*\*\*\*

The largest increase is to be in total horsepower of self-propelled cargo vessels, an increase of 119 percent compared with 1955. According to the Soviet press, by 1960 diesel-propelled vessels

\* Table 2 follows on p. 13.

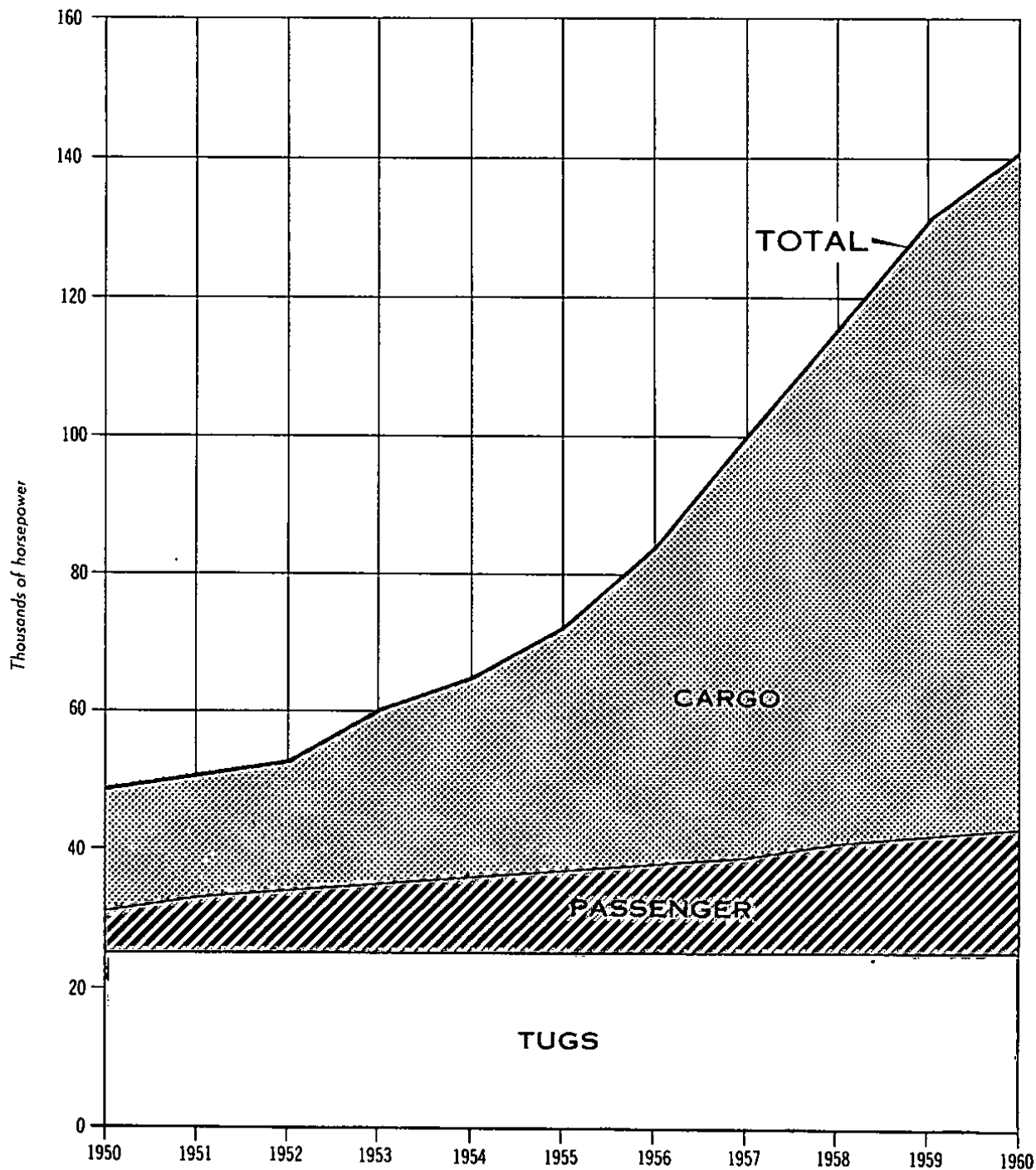
\*\* Following p. 10.

\*\*\* Appendix A, p. 28, below.

\*\*\*\* Appendix A, pp. 25 and 26, respectively, below.

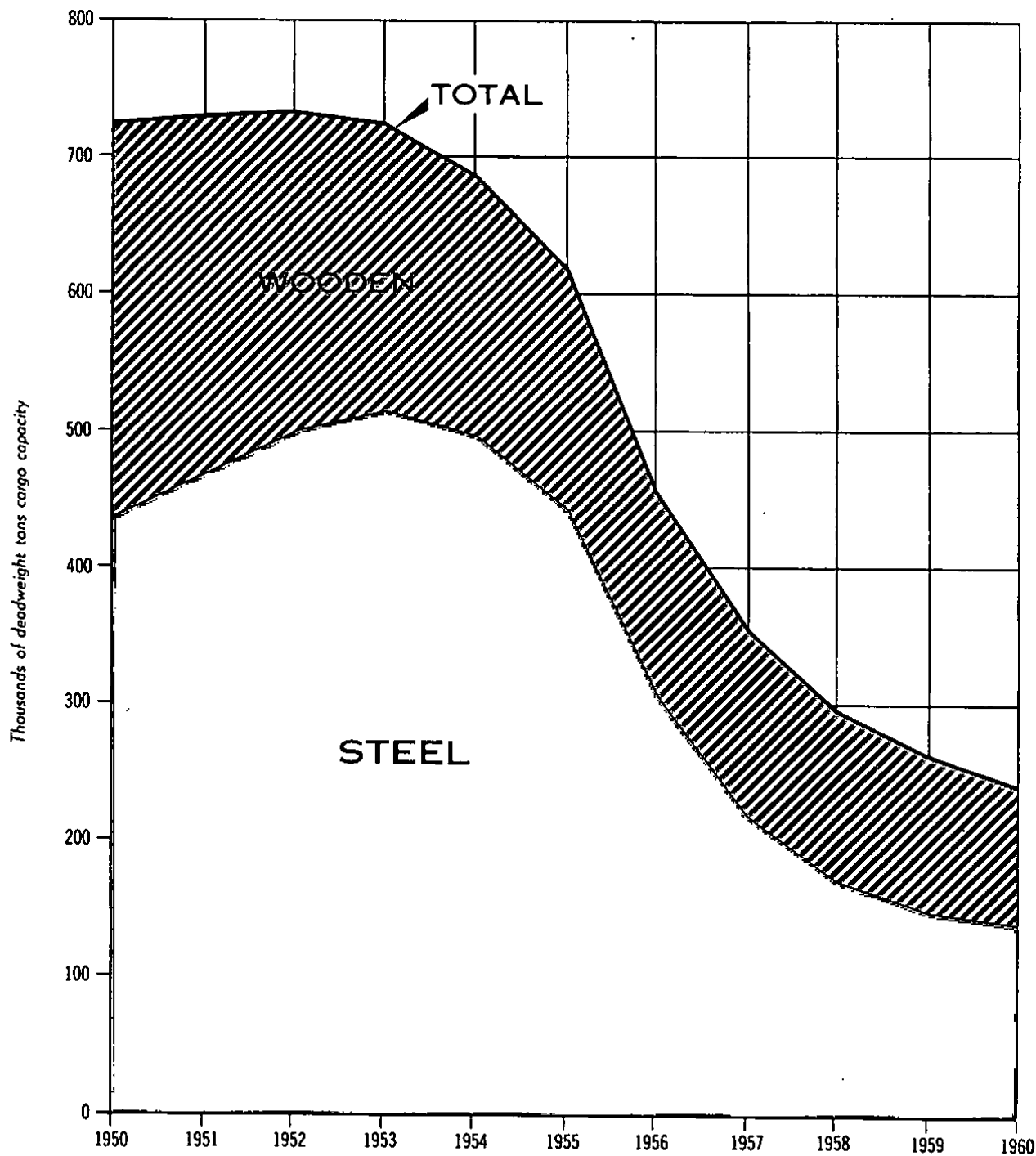
Figure 3

USSR  
ESTIMATED CONSTRUCTION OF SELF-PROPELLED  
INLAND VESSELS, 1950-60



USSR

### ESTIMATED CONSTRUCTION OF NON-SELF-PROPELLED INLAND VESSELS, 1950-60





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Table 2

Types of Inland Vessels to Be Constructed in the USSR  
During the Sixth Five Year Plan (1956-60) a/

Type of Vessel	Type of Propulsion	Deadweight Tons Cargo Capacity	Horsepower	Place of Use
Towboat	N.A.		2,200 to 2,400	
Towboat	N.A.		1,200	Volga, Kama, Yenisey, Irtysh, and Amur Rivers
Towboat	N.A.		600 to 800	
Ferry	Diesel		600	Reservoirs
Passenger-cargo	Diesel	80 (350 pas- sengers)	600 to 800	Siberian rivers
Passenger	Diesel-electric		2,700	Volga River
Dovator passenger b/	Diesel		1,200	Volga River and Siberian rivers
Passenger	Diesel		800	Lakes Ladoga and Onega and other lakes
200-passenger	Diesel (water-jet)		300	
150-passenger	Diesel (water-jet)		150	
Dry cargo	Diesel	5,000	1,600	Volga River
Dry cargo	Diesel	1,000	800	
Dry cargo	Diesel	600	N.A.	
Dry cargo	Diesel	150	N.A.	
Cargo	Diesel (water-jet)	60		Shallow rivers
Tanker	N.A.	200		
Tanker	N.A.	3,000 to 4,000	1,200	Reservoirs
Tanker	N.A.	600	300	
Refrigerator	N.A.	200 to 250		Shallow rivers
Icebreaker	N.A.		Up to 4,000	
Steel, dry cargo barge	None	4,500		Volga-Don Canal
Steel, dry cargo barge	None	3,000		Volga-Don Canal
Steel, dry cargo barge	None	1,800		
Barge, timber carrier	None	1,500		Siberian rivers
Barge, timber carrier	None	1,000		Dnieper and Don Rivers and other rivers
Barge, timber carrier	None	600		Dnieper and Don Rivers and other rivers

a. 26/

b. East German type of passenger vessel.

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will account for 12.4 percent of the over-all "deadweight tonnage" of dry cargo vessels compared with 4.4 percent in 1954; and self-propelled tankers for 7.2 percent of the over-all "deadweight tonnage" of inland tankers compared with 1.3 percent in 1954. 27/ These increases are in general conformity with the announcement that Kovalev made in 1954.\*

Self-propelled vessels operating on the better developed Soviet inland waterways are expected to show increasing average horsepower per vessel. Water-jet-propelled vessels are already in serial production. Experimentation is continuing with high-speed hydrofoil passenger vessels and with electrically propelled vessels connected to shore powerlines by trolleys. Either or both the hydrofoil vessels and the vessels using trolleys may be put into serial production in 1956-60.

The sharply diminishing rate of growth of the fleet of non-self-propelled vessels indicates that it will almost stabilize at roughly 11 million dwtcc shortly after 1960. Of the deadweight tons cargo capacity of non-self-propelled vessels, wooden barges, which comprised 42 percent in 1955, will comprise less than 35 percent in 1960, with an actual decrease of deadweight tons cargo capacity during 1955-60. Because the useful life of a steel barge is approximately double that of a wooden barge and because its cost per deadweight ton cargo capacity is only about 10 percent greater, the change in the composition of the inland fleet will decrease over-all expenditures for the fleet of non-self-propelled vessels.

C. Imports.

The East German plan for export of inland vessels to the USSR is the only such European Satellite plan available. It has been assumed that other countries of the Sino-Soviet Bloc will continue the trend of exports to the USSR established during 1951-55.

Soviet planned imports of self-propelled vessels from East Germany will increase from 24,500 hp during 1951-55 to 53,400 hp during 1956-60, an increase of 118 percent. It is estimated that imports of self-propelled vessels from the European Satellites and Communist China during 1956-60 will be 322,000 hp, an increase of 45 percent compared with imports during 1951-55, and of non-self-propelled vessels 308,600 dwtcc, an increase of 43 percent compared

\* See IV, B, p. 8, above.

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with imports during 1951-55. These estimated imports will be 98 percent of the total imports of self-propelled vessels in horsepower, 48 percent of the deadweight tons cargo capacity of imports of non-self-propelled vessels, 80 percent of the value of all imports of inland vessels, and 29 percent of the ruble value of total gross additions to the inland fleet. In view of the continued emphasis on shipbuilding in the European Satellites and Communist China and the controls exercised by the USSR through the Council of Mutual Economic Assistance (Sovet Ekonomicheskoy Vzaimopomoshchi -- CEMA), these increases appear quite reasonable. The accompanying chart, Figure 5,\* shows the relative importance of estimated Soviet imports of inland vessels during 1956-60. The estimated quantity of Soviet imports of inland vessels, by country of export, during 1950-60 is shown in Table 4.\*\* The estimated quantity and value of Soviet imports of inland vessels from the European Satellites and Communist China, by type of vessel, during 1950-60 are shown in Table 13,\*\*\* and estimated Soviet imports of self-propelled inland vessels from the European Satellites and Communist China in Table 14.\*\*\*\* Estimated Soviet imports from Finland of inland vessels are shown in Table 15,† of self-propelled inland vessels in Table 16,†† and of non-self-propelled inland vessels in Table 17.††† Estimated Soviet imports of all inland vessels during 1950-60 are shown in Table 18,†††† of self-propelled inland vessels in Table 19,‡ and of non-self-propelled inland vessels in Table 20.‡‡ Possible changes in Soviet imports resulting from changes in policy in the European Satellites because of unrest have not been considered in the derivation of these estimates.

Finland, the only country of the Free World that is known to have planned the future exports of inland vessels to the USSR, is expected to export to the USSR during 1956-60 self-propelled vessels totaling 7,400 hp and non-self-propelled vessels totaling 330,000 dwtcc. These estimates indicate a reduction of 53 percent in the exports of self-propelled vessels during 1951-55, and exports of non-self-propelled vessels are expected to remain fairly constant.

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\* Following p. 16.

\*\* Appendix A, p. 24, below.

\*\*\* Appendix A, p. 38, below.

\*\*\*\* Appendix A, p. 39, below.

† Appendix A, p. 40, below.

†† Appendix A, p. 41, below.

††† Appendix A, p. 42, below.

†††† Appendix A, p. 43, below.

‡ Appendix A, p. 44, below.

‡‡ Appendix A, p. 45, below.

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The total value of imports of inland vessels from the European Satellites, Communist China, and Finland is expected to be 942 million rubles (29 percent of gross additions), representing an increase of 35 percent compared with imports during 1951-55. Estimated exports of inland vessels from the USSR during 1956-60 are expected to remain negligible.

D. Soviet Construction.

Because the published plan deals only with gross additions to the inland fleet of the USSR, Soviet construction is estimated to be the plan figures less the estimated imports. Such estimates, although considered tentative, are generally compatible with related plans and with past trends. The estimated quantity and value of construction of inland vessels in the USSR during 1950-60 are shown in Table 10,\* of self-propelled vessels in Table 11,\*\* and of non-self-propelled vessels in Table 12.\*\*\*

Estimated Soviet construction of self-propelled vessels during 1956-60 is expected to be 571,000 hp, an increase of about 90 percent compared with construction during 1951-55; and construction of non-self-propelled vessels is expected to drop to 1,610,000 dwtcc, or only 46 percent of construction during 1951-55. Increased construction of self-propelled vessels and decreased construction of non-self-propelled vessels agree with requirements and plans set forth during the latter part of the period of the Fifth Five Year Plan (1951-55).\*\*\*\*

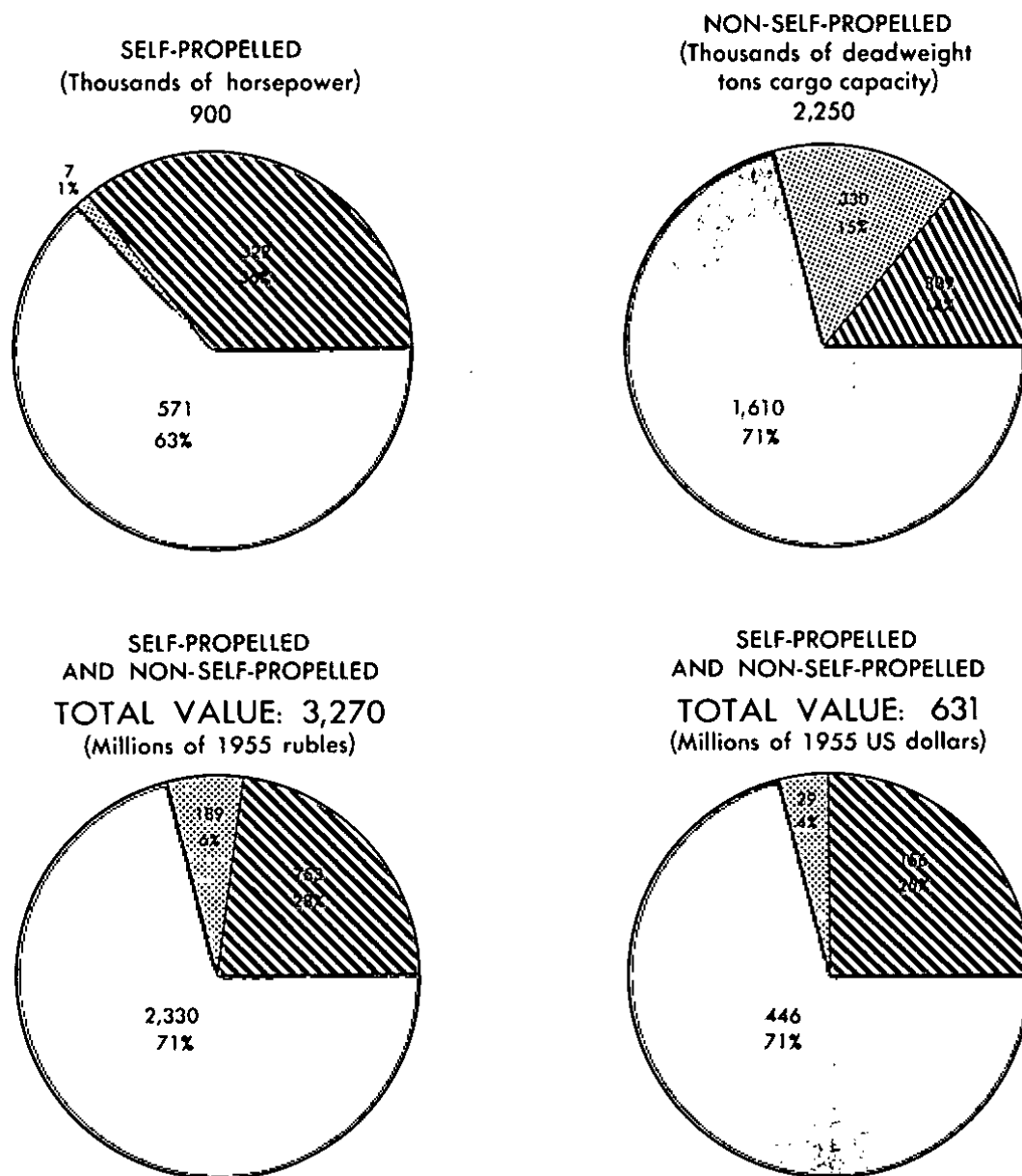
The estimated total value of construction during 1956-60 is 2.33 billion rubles (\$446 million) only 94 percent of the value of construction during 1951-55. The estimated value of self-propelled vessels of 1.5 billion rubles, however, shows an increase of 118 percent compared with the value during 1951-55.




This increase in the value of self-propelled vessels does not mean a relative increase in the effort of shipyards previously constructing these vessels. It is to be expected that some shipyards which previously constructed only non-self-propelled steel

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\* Appendix A, p. 35, below.  
\*\* Appendix A, p. 36, below.  
\*\*\* Appendix A, p. 37, below.  
\*\*\*\* See IV, B, p. 8, above.

USSR  
ESTIMATED GROSS ADDITIONS\*  
TO THE INLAND FLEET,\*\* 1956-60



-  Imports from the European Satellites and Communist China
-  Imports from Finland\*\*\*
-  Soviet Construction

\*Soviet construction plus imports.  
\*\*Figures shown reflect the rounding of original data and may not add to the totals shown.  
\*\*\*Finland has been the only country of the Free World that has been exporting inland vessels to the USSR, and it is assumed that Finland will continue to be the only such country.

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vessels will construct self-propelled vessels. It is known that some shipyards under the MSP have recently begun construction of self-propelled inland vessels. Because a large percentage of the value of self-propelled vessels is contained in the machinery and other components, which are normally manufactured outside the shipyard, the percentage of value added by the shipyard is less than that for non-self-propelled vessels. Estimated requirements for labor in shipyards constructing inland vessels during 1956-60 show a decrease of 22 percent compared with requirements during 1951-55. Actual requirements for labor in shipyards for the Sixth Five Year Plan (1956-60) probably will be even less because of an increase in assembly-line construction. Even on the assumption of constant productivity per man, approximately 9,000 persons previously engaged in new construction could be released during 1956-60, or their efforts could be diverted to maintenance and repair.

#### VI. Inputs for Soviet Construction During 1955.

Principal input requirements for Soviet construction of inland vessels during 1955 are shown in Table 3.\* Input factors are shown in Table 21.\*\* Inputs of material and power are approximately equivalent to those that would be required in the US for similar construction except that much of the wood used for both the barges and for the superstructures of self-propelled vessels would be replaced by steel in the US. It is to be expected that future requirements for inputs in the USSR, as in the US, will show a decided trend toward the use of steel instead of wood and toward a wider use of aluminum and other light materials.

Based on an average wage rate of 3.4 rubles per hour and 2,400 hours per man-year, the value of labor, including both direct and indirect labor, amounts to 33 percent of total value of construction of inland vessels in the USSR. 28/ An analysis of construction of a Soviet maritime dry cargo vessel shows the ratio of the total value of labor also to be 33 percent of the total value of the completed vessel. 29/ A Soviet text gives this percentage as 35 to 40 percent for usual methods of construction and from 30 to 32 percent for assembly-line construction. 30/ If other factors -- cost of materials, wages, and the like -- remain constant, it is expected that wages, as a percentage of total value, will decrease with the increased use of assembly-line methods.

\* Table 3 follows on p. 18.

\*\* Appendix A, p. 47, below.

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Table 3

Input Requirements for Construction of Inland Vessels  
in the USSR  
1955

<u>Material</u>	<u>Unit of Measure</u>	<u>Requirements</u>
Steel		
Carbon steel	Thousand metric tons	90
Alloy steel	Thousand metric tons	5
Total		<u>95</u>
Cast iron	Thousand metric tons	8
Copper and copper base alloys	Thousand metric tons	1.6
Aluminum	Thousand metric tons	0.7
Lead	Thousand metric tons	0.5
Tin	Thousand metric tons	0.1
Zinc	Thousand metric tons	0.3
Rubber	Thousand metric tons	0.01
Nickel and miscellaneous metals	Thousand metric tons	0.3
Lumber	Thousand metric tons	126
Power <u>a/</u>	Thousand equivalent kilowatt-hours	160
Labor (direct and indirect) <u>b/</u>	Man-years	20,200

a. Including not only electric power but also all inputs of other power and fuel, measured in equivalent kilowatt-hours.

b. Direct labor in a shipyard consists of that part of the shipyard manpower whose wages are charged directly to specific construction contracts. Indirect labor constitutes the remainder of the shipyard manpower. Because of the nature of the work performed by indirect labor their wages cannot be charged directly to specific construction contracts but instead are charged to overhead.

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VII. Capabilities, Limitations, and Intentions.

A. Capabilities.

The USSR has more than 500 shipyards, including those under the MSP, the MMF, the MRF, and the Ministry of the Fish Industry (Ministerstvo Rybnoy Promyshlennosti -- MRP). Of these, about one-half are believed to be under the MRF. Some of the shipyards under the MSP are constructing inland vessels.

The growth of the inland fleet will require increasing efforts in maintenance and repair. The continuing expansion and modernization of facilities of inland shipyards, the education and training of shipyard workers, the decrease in the number of types of vessels, and the increased use of assembly-line construction, however, leave no doubt as to the capability of the USSR to carry out its plans for constructing inland vessels.

On the basis of input of metals shown in Table 21,\* it is estimated that, in an emergency, the shipyards that constructed inland vessels in 1955 could construct naval small craft at the rate of about 25,000 LSD tons per year.

B. Limitations.

Limitations on the capacities of the Soviet shipyards for construction and repair of inland vessels can be derived from their past performances, from existing plans, and from other known facts. The value of the planned construction of inland vessels during 1956-60 varies only 5 percent from the value of construction during 1951-55. Furthermore, it is known that some of the larger shipyards which are under the MSP began construction of inland vessels in 1956. It is concluded that the inland shipyards under the MRF cannot appreciably increase their construction of inland vessels to more than the level of 1951-55 and at the same time continue to service the rapidly increasing inland fleet. Neither the supply of materials nor the supply of principal components, however, appears to be a critical or a limiting factor in constructing inland vessels.

\* Appendix A, p. 47, below.

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C. Intentions.

There has been no real change in the general Soviet intention to develop a shipbuilding industry able to construct practically all the vessels required by the USSR for a large, highly efficient inland fleet and the Soviet system of inland waterway transportation. Changing conditions through the years, however, have required different means of carrying out the basic intention. Recent experience has shown that effort expended on development and construction of more modern and more efficient types of vessels and on better maintenance and higher operating efficiency of the inland fleet will prove more advantageous in accomplishing the over-all objective than would maximum construction of older types of vessels.

Within the foreseeable future the USSR will continue to rely heavily on the European Satellites for new additions to the inland fleet even though the value of Soviet construction is increasing at the rate of about 4 percent per year. At present there are no indications of intentions to use the facilities for construction of inland vessels to construct naval vessels.

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APPENDIX A

METHODOLOGY

1. Construction.

a. General.

There is not sufficient information either on over-all Soviet construction of inland vessels during 1950-60, or on construction of individual vessels by the large number of Soviet shipyards engaged in this effort to permit direct estimates of national construction by summarizing individual units produced. Information published in the Soviet press on the increase in the inland fleet since 1945, however, is available, and this information can be used to estimate construction of inland vessels in the USSR.

From the estimated size of the fleet, which is based on plans and on data of plan fulfillment, and with an allowance for the retirement of overage and damaged vessels, the gross additions to the fleet for each 5-year period can be estimated.\* Construction in the USSR for any 5-year period is equal to these gross additions minus the total imports both from countries of the Sino-Soviet Bloc and from non-Bloc countries during the 5-year period. Quantities given in this report for Soviet construction have been adjusted to show constant trends rather than a constant rate of construction for each 5-year period. Therefore, it must be pointed out that although the totals for any 5-year period are accurate to the degree permitted by this methodology, construction for any given year is subject to error.

According to US practice, the average life of a steel towboat is about 25 years and that of a wooden towboat 15 to 20 years. In the immediate postwar period a Soviet retirement rate of 4 percent is reasonable. The large growth of the Soviet inland fleet of self-propelled vessels since World War II, caused almost entirely by the addition of new vessels, would indicate either a lower annual rate of retirement based on the size of the existing fleet or the rate of 4 percent based on the postwar size of the fleet. Because none of the vessels added after 1945 will be over 25 years old by 1960, it

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\* Exports of inland vessels from the USSR during 1950-60 are negligible.

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has been assumed that annual retirements of self-propelled vessels are 4 percent of the size of the fleet in 1945 and that losses caused by accidents are 0.5 percent of the existing fleet.

In the US the average life of a wooden barge is about 12 years and that of a steel barge about 30 years. The actual operating time per year of the Soviet fleet of barges is considerably less than that in the US not only because of more severe ice conditions but also because of excessive demurrage. According to a published Soviet survey the average period of service of wooden vessels, as of 1955, was 14 years -- 21 years for those receiving capital repair and 13 years for those not receiving capital repair. During the last 7 years (apparently 1949-55, inclusive), the MRF annually has written off as scrap 435 wooden vessels totaling 216,000 dwtcc. 31/ Retirement rates lower than those obtaining in the US seem to be indicated. The rates adopted are 2.5 percent for steel barges on the basis of the size of the fleet in 1945 and 5 percent for wooden barges on the basis of the existing fleet.

To estimate retirements as well as value of construction and quantity of inputs, it is necessary to classify the inland fleet and additions to it, by type. The assumptions made in deriving the classifications are given in e.\* It should be pointed out that although these classifications are in many cases based on tenuous assumptions, the results are more accurate than could be obtained by using average cost and input factors for the two main types, self-propelled vessels and non-self-propelled vessels.

b. Size of the Fleet During 1950.

The inland fleet of the USSR in 1950 comprised self-propelled vessels totaling 910,000 hp and non-self-propelled vessels totaling 6.8 million dwtcc. 32/

c. Construction During 1951-55.

Reports on plan fulfillment issued by the MRF state that by the end of 1955 the self-propelled fleet had increased 43 percent and the non-self-propelled fleet 42 percent compared with 1950. 33/ A further check on these data, from the Soviet press, states that at the end of the fourth year (1954) of the Fifth Five Year Plan (1951-55)

\* P. 27, below.

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the self-propelled fleet had been increased by 32 percent and the "deadweight tonnage" of cargo vessels (assumed to be the non-self-propelled fleet) by 35 percent. 34/

On the basis of these statements the size of the inland fleet of self-propelled vessels at the end of 1955 and construction in the USSR during 1951-55 are calculated in thousand horsepower as follows:

<u>Year</u>	<u>Size of Fleet</u>	<u>Net Additions</u>	<u>Retirements</u>	<u>Gross Additions</u>	<u>Total Imports</u>	<u>Soviet Construction</u>
1950	9,910					
1951-55		390	148	538	237	301
1955	1,300					

Estimated imports from countries of the Sino-Soviet Bloc and from non-Bloc countries are shown in Table 4.\* Construction of self-propelled vessels by the USSR for each year is shown in Table 5.\*\* The size of the inland fleet of non-self-propelled vessels at the end of 1955 and construction during 1951-55 are calculated in thousand deadweight tons cargo capacity as follows:

<u>Year</u>	<u>Size of Fleet</u>	<u>Net Additions</u>	<u>Retirements</u>	<u>Gross Additions</u>	<u>Total Imports</u>	<u>Soviet Construction</u>
1950	6,800					
1951-55		2,856	1,196	4,052	563	3,489
1955	9,656					

Construction of non-self-propelled vessels by the USSR for each year is shown in Table 6.\*\*\*

\* Table 4 follows on p. 24.

\*\* Table 5 follows on p. 25.

\*\*\* Table 6 follows on p. 26. (Text continued on p. 27.)

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Table 4

Estimated Imports of Inland Vessels by the USSR, by Country of Export  
1950-60

Type of Vessel, by Country	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Self-propelled	Thousand Horsepower										
European Satellites and Communist China											
Communist China	14.0	17.0	8.0	0	0	0	0	0	0	0	0
Czechoslovakia	7.2	7.2	3.2	8.0	10.4	12.8	12.8	12.8	12.8	12.8	12.8
East Germany	0	2.4	4.0	5.3	7.8	5.0	9.5	10.8	11.4	10.8	10.8
Hungary	2.4	2.4	5.7	9.3	8.8	10.2	10.2	10.2	10.2	10.2	10.2
Rumania	13.9	15.3	16.9	18.7	20.8	22.9	25.2	27.7	30.5	33.5	36.8
Total	<u>37.5</u>	<u>44.3</u>	<u>37.8</u>	<u>41.3</u>	<u>47.8</u>	<u>50.9</u>	<u>57.8</u>	<u>61.5</u>	<u>64.9</u>	<u>67.3</u>	<u>70.6</u>
Finland a/	4.2	5.8	4.1	1.6	1.6	2.0	0	2.6	1.6	1.6	1.6
Grand total	<u>41.8</u>	<u>50.1</u>	<u>41.9</u>	<u>42.9</u>	<u>49.4</u>	<u>52.9</u>	<u>57.8</u>	<u>64.1</u>	<u>66.5</u>	<u>68.9</u>	<u>72.2</u>
Non-self-propelled	Thousand Deadweight Tons Cargo Capacity										
European Satellites and Communist China											
Communist China	12.0	13.0	14.0	10.0	0	0	0	0	0	0	0
Czechoslovakia	2.4	2.4	7.2	3.0	14.6	16.8	18.8	18.8	18.8	18.8	18.8
Rumania	19.4	21.4	23.6	26.1	29.1	32.0	35.0	38.7	42.6	46.8	51.5
Total	<u>33.8</u>	<u>36.8</u>	<u>44.8</u>	<u>39.1</u>	<u>43.7</u>	<u>48.8</u>	<u>53.8</u>	<u>57.5</u>	<u>61.4</u>	<u>65.6</u>	<u>70.3</u>
Finland a/	65.0	80.0	94.0	66.0	60.0	50.0	86.0	64.0	60.0	60.0	60.0
Grand total	<u>98.8</u>	<u>116.8</u>	<u>138.8</u>	<u>105.1</u>	<u>103.7</u>	<u>98.8</u>	<u>139.8</u>	<u>121.5</u>	<u>121.4</u>	<u>125.6</u>	<u>130.3</u>

a. Finland has been the only country of the Free World that has been exporting inland vessels to the USSR, and it is assumed that Finland will continue to be the only such country.

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Table 5  
 Estimated Growth of the Inland Fleet of Self-Propelled Vessels  
 in the USSR  
 1950-60 a/

								Thousand Horsepower
<u>Imports</u>								
<u>Year</u>	<u>Soviet Construction</u>	<u>From the European Satellites and Communist China</u>	<u>From Finland <u>b/</u></u>	<u>Total Imports</u>	<u>Gross Additions to Fleet</u>	<u>Retirements</u>	<u>Net Additions to Fleet</u>	<u>Size of Fleet <u>c/</u></u>
1950	48.9	37.5	4.2	41.7	90.6	28.6	62	910
1951	50.9	44.3	5.8	50.1	101.0	29.0	72	982
1952	53.4	37.8	4.1	41.9	95.3	29.3	66	1,048
1953	59.7	41.3	1.6	42.9	102.6	29.6	73	1,121
1954	64.6	47.8	1.6	49.4	114.0	30.0	84	1,205
1955	72.6	50.8	2.0	52.8	125.4	30.4	95	1,300
1956	84.0	57.8	0	57.8	141.8	30.9	111	1,411
1957	99.5	61.5	2.6	64.1	163.6	31.5	132	1,543
1958	115.1	64.9	1.6	66.5	181.6	32.1	150	1,693
1959	130.7	67.3	1.6	68.9	199.6	32.9	167	1,860
1960	141.2	70.6	1.6	72.2	213.4	33.7	180	2,040

a. No figures are available for 1946-49.

b. Finland has been the only country of the Free World that has been exporting inland vessels to the USSR. It is assumed that Finland will continue to be the only such country.

c. In 1945 the self-propelled fleet of the USSR amounted to 610,000 horsepower.

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Table 6

Estimated Growth of the Inland Fleet of Non-Self-Propelled Vessels  
in the USSR  
1950-60

Thousand Deadweight Tons Cargo Capacity

Year	Soviet Construction			Imports			Gross Additions				
	Steel	Wooden	Steel and Wooden	From the European Satellites	From Finland <sup>a/</sup>	Steel	Wooden	Steel and Wooden	Steel	Wooden	Total
1950	435.1	290.1	725.2	33.8	65.0	47.8	51.0	98.8	482.9	341.1	824.0
1951	469.0	261.0	730.0	36.8	80.0	68.8	48.0	116.8	537.8	309.0	846.8
1952	499.7	234.0	733.7	44.8	94.0	100.8	38.0	138.8	600.5	272.0	872.5
1953	514.4	210.6	725.0	39.1	66.0	79.1	26.0	105.1	593.5	236.6	830.1
1954	496.6	189.5	686.1	43.7	60.0	86.7	17.0	103.7	583.3	206.5	789.8
1955	443.5	170.6	614.1	48.8	50.0	91.8	7.0	98.8	535.3	177.6	712.9
1956	302.9	153.5	456.4	53.8	86.0	139.8	0	139.8	442.7	153.5	596.2
1957	216.8	138.2	355.0	57.5	64.0	121.5	0	121.5	338.3	138.2	476.5
1958	170.6	124.4	295.0	61.4	60.0	121.4	0	121.4	292.0	121.4	416.4
1959	148.0	112.0	260.0	65.6	60.0	125.6	0	125.6	273.6	112.0	285.6
1960	139.2	100.8	240.0	70.3	60.0	130.3	0	130.3	269.5	100.8	376.3

a. Finland has been the only country of the Free World that has been exporting inland vessels to the USSR. It is assumed that Finland will continue to be the only such country.

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d. Construction During 1956-60.

The Sixth Five Year Plan (1956-60) calls for the supply to the inland fleet of towing and self-propelled freight vessels of approximately 720,000 hp, non-self-propelled vessels totaling 2,245,000 dwtcc, and passenger ships with a total horsepower of 180,000. <sup>35/</sup> The total planned gross additions are then 900,000 hp of self-propelled vessels and 2,245,000 dwtcc of non-self-propelled vessels. The estimated size of the inland fleet of self-propelled vessels at the end of 1960 and estimated construction in the USSR during 1956-60 are calculated in thousand horsepower as follows:

<u>Year</u>	<u>Size of Fleet</u>	<u>Net Additions</u>	<u>Retirements</u>	<u>Gross Additions</u>	<u>Total Imports</u>	<u>Soviet Construction</u>
1955	1,300					
1956-60		740	160	900	330	570
1960	2,040					

The estimated size of the fleet of non-self-propelled vessels at the end of 1960 and estimated construction in the USSR during 1956-60 are calculated in thousand deadweight tons cargo capacity as follows:

<u>Year</u>	<u>Size of Fleet</u>	<u>Net Additions</u>	<u>Retirements</u>	<u>Gross Additions</u>	<u>Total Imports</u>	<u>Soviet Construction</u>
1955	9,656					
1956-60		1,068	1,177	2,245	639	1,606
1960	10,727					

e. Composition of the Fleet and of Soviet Construction.

Inland vessels may be classified in numerous ways. To use best the available data which are pertinent to the objectives of this report the following classification has been used: self-propelled vessels (tugs and towboats, passenger vessels, and cargo vessels) and non-self-propelled vessels (steel and wooden). The.



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composition of the inland fleet according to these classifications is shown in Table 7.

Table 7  
Estimated Composition of the Inland Fleet in the USSR  
1950-60

Year	Self-Propelled Vessels (Million Horsepower)				Non-Self-Propelled Vessels (Million Deadweight Tons Cargo Capacity)		
	Tug	Passenger	Cargo	Total <sup>a/</sup>	Steel	Wooden	Total <sup>a/</sup>
1950	0.54	0.18	0.18	0.91	2.9	3.9	6.8
1951	0.60	0.19	0.20	0.98	3.4	4.0	7.4
1952	0.64	0.20	0.21	1.05	4.0	4.1	8.1
1953	0.68	0.21	0.22	1.12	4.5	4.1	8.6
1954	0.73	0.24	0.24	1.20	5.1	4.1	9.2
1955	0.77	0.26	0.27	1.30 <sup>b/</sup>	5.6	4.1	9.7
1956	0.82	0.28	0.31	1.41	6.0	4.0	10.0
1957	0.87	0.31	0.36	1.54	6.3	4.0	10.2
1958	0.92	0.34	0.43	1.69	6.5	3.9	10.4
1959	0.98	0.37	0.51	1.86	6.8	3.8	10.6
1960	1.04	0.40	0.60	2.04 <sup>c/</sup>	7.0	3.7	10.7

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

b. Diesel propulsion accounted for approximately one-half of this horsepower.

c. Sixty-seven percent of the vessels are planned to be diesel propelled.

(1) Self-Propelled Vessels.

Based on compilations of about 1949 and 1954, the composition of the inland fleet of self-propelled vessels of the USSR in 1950 is estimated to have been as follows: tugs and towboats, 544,000 hp; passenger vessels, 182,000 hp; and cargo vessels, 184,000 hp. 36/

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Because the gross additions to the fleet between the end of World War II and 1950 were approximately 30 percent of the self-propelled vessels and approximately 50 percent of the non-self-propelled vessels, it is reasonable to assume that the composition of the fleet had reached, by 1950, what the USSR considered a proper balance between tugs and barges. The ratio of the horsepower of tugs to the deadweight tons cargo capacity of non-self-propelled vessels existing at that time was 0.081. It is assumed therefore that construction of tugs for 1951-55 was planned to maintain this ratio. Such construction would be 25,100 hp per year. It was found that during 1951-55 this ratio resulted in excessive demurrage for non-self-propelled vessels and that the ratio should be increased. 37/ With this same rate of construction of tugs, 25,100 hp per year, the ratio may become almost 0.1 by 1960. It is assumed, therefore, that construction of tugs has remained and will remain constant at 25,100 hp per year.

There are more data for construction of inland passenger vessels than for construction of inland tugs. From the gross additions planned for 1956-60 and the estimated imports of inland passenger vessels, the expected average Soviet construction during 1956-60 is estimated at 15,600 hp per year. By 1955, construction of inland passenger vessels had increased 1.87 times that of 1950. 38/ On the assumptions that construction during 1958 of passenger vessels totaling 15,600 hp was average for 1956-60 and that construction would increase by a fixed amount each year during 1950-60, Soviet construction of passenger vessels each year was estimated to be as shown in Table 11.\*

Soviet construction of self-propelled cargo vessels for each year is obtained from the total construction of self-propelled vessels expressed in horsepower minus the sum of construction of tugs and passenger vessels expressed in horsepower. There is a rough check available on the results of these assumptions. Soviet planners called for 35 percent of the total cargo in 1960 to be carried in self-propelled cargo vessels. The composition of the fleet of self-propelled vessels derived from the foregoing assumption (see Table 7\*\*) shows that in 1960 the horsepower of self-propelled cargo vessels in the inland fleet was 36.5 percent of the sum of the horsepower of self-propelled cargo vessels plus the horsepower of tugs.

\* P. 36, below.

\*\* P. 28, above.

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Published Soviet data give the number and power of certain diesel engines and the percentage of the total number represented by certain types of diesel engines in use in the inland fleet. <sup>39/</sup> These data imply that in 1955 there were about 5,200 diesels in use, with an average of 158 hp for those listed, giving a total of 822,000 hp, or 63 percent of the total estimated horsepower of the fleet. Because some of the engines listed (the 2, the 4, and the 6 Ch) have such low horsepower that they probably are used for auxiliaries rather than for main propulsion, it appears that the total horsepower represented by diesel propulsion was actually below 63 percent. According to another statement in the Soviet press the "deadweight tonnage" of diesel vessels in the inland fleet of self-propelled vessels increased from 19 percent of the total in 1940 to 43 percent of the total in 1955. Because this latter statement is in terms of deadweight tons cargo capacity rather than horsepower, it does not give a check on the data listed above. It appears, however, that diesel propulsion represented roughly one-half of the total horsepower of the fleet in 1955. Estimated construction, by type of vessel, is shown in Table 11.\*

(2) Non-Self-Propelled Vessels.

According to the Soviet press, wooden vessels represented in 1949 considerably more than one-half of the inland fleet of non-self-propelled vessels. <sup>40/</sup> Other press reports state that new additions to the fleet of non-self-propelled vessels in 1948 consisted predominantly of steel vessels. Because of the lack of more specific data it is assumed that wooden vessels constituted 60 percent of the deadweight tons cargo capacity of the non-self-propelled fleet in 1949 and 40 percent of the deadweight tons cargo capacity of vessels constructed in the USSR in 1950. On the basis of these assumptions it is estimated that at the end of 1950 the fleet of non-self-propelled vessels consisted of steel vessels totaling 2,925,000 dwtcc and wooden vessels totaling 3,875,000 dwtcc and that construction during 1950 consisted of steel vessels totaling 435,100 dwtcc and wooden vessels totaling 290,100 dwtcc.

There is no specific information which will yield either a breakdown of the non-self-propelled Soviet fleet or of Soviet construction for this fleet subsequent to 1950. It is known, however, that the USSR has been stressing construction of steel vessels as

\* P. 36, below.

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opposed to wooden vessels. Most of the available new barge designs are for steel barges, and some shipyards have been converted from construction of wooden vessels to that of steel vessels. It is believed, therefore, that the actual amount of construction of wooden barges decreased during 1950-55. Soviet plans include reduced construction of wooden barges during 1956-60, 41/ and it is assumed that this decrease will be 10 percent per year after 1950.

2. Costs and Prices.

Data on US prices of various types and sizes of inland vessels constructed in 1955 were obtained from US shipbuilders. Data on Soviet prices during 1955 were taken directly from a Soviet price list. 42/ For self-propelled vessels the average costs in both rubles and dollars per horsepower were used. Costs for non-self-propelled vessels have a definite variation with the size of the vessel. It is possible, therefore, to select the unit cost corresponding to those sizes estimated to be constructed in the USSR. Table 8\* summarizes the basic data used.

The estimate of construction does not classify self-propelled cargo vessels or steel barges by dry and liquid cargo. It has been necessary, therefore, to combine these costs into self-propelled cargo vessels and non-self-propelled steel barges as shown in Table 9.\*\* Because liquid cargo carried on the inland waterways in the USSR is about 25 percent of the total cargo (in the US during 1956 it was 37 percent) a weighting of 1 for liquid cargo and 3 for dry cargo was used in the derivation of these combined prices. 43/ Because of the lack of any US data on prices of inland passenger vessels, none having been produced in the US in recent years, it has been assumed that the price per horsepower for this type is the same as that for dry cargo vessels of comparable size.

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\* Table 8 follows on p. 33.

\*\* Table 9 follows on p. 34.

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The quantity and value of construction of inland vessels in the USSR during 1950-60 are shown in Table 10,\* that of self-propelled inland vessels in Table 11,\*\* and of non-self-propelled vessels in Table 12.\*\*\* The quantity and value of Soviet imports of inland vessels from the European Satellites and Communist China, by type of vessel, during 1950-60 are shown in Table 13\*\*\*\* and of self-propelled inland vessels from the European Satellites and Communist China in Table 14.† Soviet imports of inland vessels from Finland during 1950-60 are shown in Table 15,†† of self-propelled inland vessels from Finland in Table 16,††† of non-self-propelled inland vessels from Finland in Table 17.†††† All Soviet imports of inland vessels (those from the European Satellites, Communist China, and Finland) during 1950-60 are shown in Table 18,‡ of self-propelled inland vessels in Table 19,‡‡ and of non-self-propelled inland vessels in Table 20.‡‡‡

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- \* Table 10 follows on p. 35.
  - \*\* Table 11 follows on p. 36.
  - \*\*\* Table 12 follows on p. 37.
  - \*\*\*\* Table 13 follows on p. 38.
  - † Table 14 follows on p. 39.
  - †† Table 15 follows on p. 40.
  - ††† Table 16 follows on p. 41.
  - †††† Table 17 follows on p. 42.
  - ‡ Table 18 follows on p. 43.
  - ‡‡ Table 19 follows on p. 44.
  - ‡‡‡ Table 20 follows on p. 45. (Text continued on p. 46.)

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Table 8  
Data on Prices of Inland Vessels  
in the US and in the USSR  
1955

Type of Vessel	US			USSR		
	Number of Samples	Range of Price 1955 US \$ per Horsepower	Estimate of Price	Number of Samples	Range of Price 1955 Rubles per Horsepower	Estimate of Price
<b>Self-propelled</b>						
Tug	7	196 to 400	348	12	846 to 4,438	1,365
Passenger	0		527 <sup>a/</sup>	10	1,518 to 8,432	2,770
Dry cargo	5	250 to 1,300	626	4	1,373 to 4,488	3,052
Tanker	4	438 to 1,130	673	1	0	3,280
			1955 US \$ per Dead- weight Ton Cargo Capacity			1955 Rubles per Dead- weight Ton Cargo Capacity
<b>Non-self-propelled</b>						
Steel dry cargo barge	0		76 <sup>b/</sup>	14	480 to 1,240	496
Steel tankers barge	2	83 to 117	100	6	662 to 3,750	660
Wooden barge	N.A.	N.A.	75	22	307 to 1,086	444

a. Derived on the assumption that the average price of the self-propelled passenger vessels was the same as that for a self-propelled dry cargo vessel of the same size.  
b. Derived on the assumption that the ruble-dollar ratio for these vessels was the average ruble-dollar ratio for other non-self-propelled vessels.

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Table 9  
 Weighted Figures on Prices of Inland Vessels  
 in the US and in the USSR  
 1955

Type of Vessel	US		USSR		1955 Ruble-Dollar Ratio
	Unit of Measure	Price	Unit of Measure	Price	
Self-propelled					
Tug	1955 US \$ per horsepower	348	1955 rubles per horsepower	1,365	3.92
Passenger	1955 US \$ per horsepower	527	1955 rubles per horsepower	2,770	5.26
Cargo	1955 US \$ per horsepower	637	1955 rubles per horsepower	3,109	4.88
Non-self-propelled					
Steel	1955 US \$ per deadweight ton cargo capacity	82	1955 rubles per deadweight ton cargo capacity	537	6.55
Wooden	1955 US \$ per deadweight ton cargo capacity	75	1955 rubles per deadweight ton cargo capacity	444	5.92

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Table 10

Estimated Quantity and Value of Construction  
of Inland Vessels in the USSR  
1950-60

Year	Self-Propelled Vessel			Non-Self-Propelled Vessel			Total Value of Inland Vessels <sup>a/</sup>		Ruble-Dollar Ratio
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Million 1955 US \$	Million 1955 Rubles	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles			
1950	48.9	23	106	725.2	57	362	81	468	5.81
1951	50.9	24	112	730.0	58	368	82	480	5.82
1952	53.4	26	119	733.7	59	372	84	492	5.82
1953	59.7	30	138	725.0	58	370	88	508	5.80
1954	64.6	33	153	686.1	55	351	88	504	5.75
1955	72.6	38	178	614.1	49	314	87	492	5.66
Total, 1951-55 <sup>a/</sup>	<u>301.2</u>	<u>150</u>	<u>701</u>	<u>3,488.9</u>	<u>279</u>	<u>1,774</u>	<u>429</u>	<u>2,475</u>	<u>5.77</u>
1956	84.0	45	213	456.4	36	231	81	444	5.47
1957	99.5	55	261	355.0	28	178	83	438	5.30
1958	115.1	64	309	295.0	23	147	88	456	5.20
1959	130.7	74	357	260.0	21	129	95	486	5.13
1960	141.2	81	389	240.0	19	120	100	509	5.10
Total, 1956-60 <sup>a/</sup>	<u>570.5</u>	<u>319</u>	<u>1,528</u>	<u>1,606.4</u>	<u>127</u>	<u>804</u>	<u>446</u>	<u>2,333</u>	<u>5.23</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 11  
Estimated Quantity and Value  
of Construction of Self-Propelled Inland Vessels in the USSR  
1950-60

Year	Tug			Passenger			Cargo			Total <sup>a/</sup>		
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles
1950	25.1	9	34	6.5	3	18	17.3	11	54	48.9	23	106
1951	25.1	9	34	7.7	4	21	18.1	12	56	50.9	24	112
1952	25.1	9	34	8.8	5	24	19.5	12	61	53.4	26	119
1953	25.1	9	34	9.9	5	27	24.7	16	77	59.7	30	138
1954	25.1	9	34	11.1	6	31	28.4	18	88	64.6	33	153
1955	25.1	9	34	12.2	6	34	35.3	22	110	72.6	38	178
Total, 1951-55 <sup>a/</sup>	<u>125.5</u>	<u>44</u>	<u>171</u>	<u>49.7</u>	<u>26</u>	<u>138</u>	<u>126.0</u>	<u>80</u>	<u>392</u>	<u>301.2</u>	<u>150</u>	<u>701</u>
1956	25.1	9	34	13.3	7	37	45.6	29	142	84.0	45	213
1957	25.1	9	34	14.5	8	40	59.9	38	186	99.5	55	261
1958	25.1	9	34	15.6	8	43	74.4	47	231	115.1	64	309
1959	25.1	9	34	16.7	9	46	88.9	57	276	130.7	74	357
1960	25.1	9	34	17.9	9	50	98.2	63	305	141.2	81	389
Total, 1956-60 <sup>a/</sup>	<u>125.5</u>	<u>44</u>	<u>171</u>	<u>78.0</u>	<u>41</u>	<u>216</u>	<u>367.0</u>	<u>234</u>	<u>1,141</u>	<u>570.5</u>	<u>319</u>	<u>1,528</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 12

Estimated Quantity and Value of Construction  
of Non-Self-Propelled Inland Vessels in the USSR  
1950-60

Year	Steel			Wooden			Total <sup>a/</sup>		
	Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value	
		1955 US \$	1955 Rubles		1955 US \$	1955 Rubles		1955 US \$	1955 Rubles
1950	435.1	36	234	290.1	22	129	725.2	57	362
1951	469.0	38	252	261.0	20	116	730.0	58	368
1952	499.7	41	268	234.0	18	104	733.7	59	372
1953	514.4	42	276	210.6	16	94	725.0	58	370
1954	496.6	40	267	189.5	14	84	686.1	55	351
1955	443.5	36	238	170.6	13	76	614.1	49	314
Total, 1951-55 <sup>a/</sup>	<u>2,423.2</u>	<u>199</u>	<u>1,301</u>	<u>1,065.7</u>	<u>80</u>	<u>473</u>	<u>3,488.9</u>	<u>279</u>	<u>1,774</u>
1956	302.9	25	163	153.5	12	68	456.4	36	231
1957	216.8	18	116	138.2	10	61	355.0	28	178
1958	170.6	14	92	124.4	9	55	295.0	23	147
1959	148.0	12	78	112.0	8	50	260.0	21	129
1960	139.2	11	75	100.8	8	45	240.0	19	120
Total, 1956-60 <sup>a/</sup>	<u>977.5</u>	<u>80</u>	<u>525</u>	<u>628.9</u>	<u>47</u>	<u>279</u>	<u>1,606.4</u>	<u>127</u>	<u>804</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 13

Estimated Quantity and Value of Imports of Inland Vessels by the USSR  
from the European Satellites and Communist China  
1950-60

Year	Self-Propelled Vessel			Non-Self-Propelled Vessel			Total Value of Inland Vessels <sup>a/</sup>	
	Quantity (Thousand Horsepower)	Value		Quantity (Deadweight Tons Cargo Capacity)	Value		Million 1955 US \$	Million 1955 Rubles
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		
1950	37.5	14	57	33.8	3	18	17	76
1951	44.3	17	70	36.8	3	20	20	90
1952	37.8	14	61	44.8	4	24	18	85
1953	41.3	17	76	39.1	3	21	20	97
1954	47.8	19	87	43.7	4	23	23	111
1955	50.9	21	91	48.8	4	26	25	118
Total, 1951-55 <sup>a/</sup>	<u>222.1</u>	<u>88</u>	<u>385</u>	<u>213.2</u>	<u>17</u>	<u>114</u>	<u>106</u>	<u>500</u>
1956	57.8	24	108	53.8	4	29	28	136
1957	61.5	25	113	57.5	5	31	30	144
1958	64.9	26	119	61.4	5	33	31	152
1959	67.3	27	121	65.6	5	35	33	157
1960	70.6	28	126	70.3	6	38	34	164
Total, 1956-60 <sup>a/</sup>	<u>322.1</u>	<u>131</u>	<u>587</u>	<u>308.6</u>	<u>25</u>	<u>166</u>	<u>156</u>	<u>753</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 14

Estimated Quantity and Value of Imports of Self-Propelled Inland Vessels  
by the USSR from the European Satellites and Communist China  
1950-60

Year	Tug			Passenger			Cargo			Total <sup>a/</sup>		
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles
1950	33.9	12	46	0	0	0	3.6	2	11	37.5	14	57
1951	38.3	13	52	2.4	2	7	3.6	2	11	44.3	17	70
1952	31.3	11	43	6.5	3	18	0	0	0	37.8	14	61
1953	27.5	10	38	13.8	7	38	0	0	0	41.3	17	76
1954	32.0	11	44	15.8	8	44	0	0	0	47.8	19	87
1955	35.7	12	49	13.8	7	38	1.4	1	4	50.9	21	91
Total, 1951-55 <sup>a/</sup>	<u>164.8</u>	<u>57</u>	<u>225</u>	<u>52.3</u>	<u>28</u>	<u>145</u>	<u>5.0</u>	<u>3</u>	<u>16</u>	<u>222.1</u>	<u>88</u>	<u>385</u>
1956	38.0	13	52	17.5	9	48	2.3	1	7	57.8	24	108
1957	40.5	14	55	21.0	11	58	0	0	0	61.5	25	113
1958	43.3	15	59	21.6	11	60	0	0	0	64.9	26	119
1959	46.3	16	63	21.0	11	58	0	0	0	67.3	27	121
1960	49.6	17	68	21.0	11	58	0	0	0	70.6	28	126
Total, 1956-60 <sup>a/</sup>	<u>217.7</u>	<u>76</u>	<u>297</u>	<u>102.1</u>	<u>54</u>	<u>283</u>	<u>2.3</u>	<u>1</u>	<u>7</u>	<u>322.1</u>	<u>131</u>	<u>587</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 15

Estimated Quantity and Value of Imports of Inland Vessels  
by the USSR from Finland <sup>a/</sup>  
1950-60

Year	Self-Propelled Vessel <sup>b/</sup>			Non-Self-Propelled Vessel			Total	
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Value of Inland Vessels <sup>c/</sup>	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles	Million 1955 US \$	Million 1955 Rubles
1950	4.2	1	6	65	5	30	6	36
1951	5.8	2	8	80	6	38	8	46
1952	4.1	1	6	94	7	47	9	53
1953	1.6	1	2	66	5	33	6	35
1954	1.6	1	2	60	5	31	5	33
1955	2.0	1	3	50	4	26	5	29
Total, 1951-55 <sup>c/</sup>	<u>15.1</u>	<u>5</u>	<u>21</u>	<u>350</u>	<u>28</u>	<u>175</u>	<u>33</u>	<u>196</u>
1956	0	0	0	86	7	46	7	46
1957	2.6	1	5	64	5	34	6	40
1958	1.6	1	2	60	5	32	5	34
1959	1.6	1	2	60	5	32	5	34
1960	1.6	1	2	60	5	32	5	34
Total, 1956-60 <sup>c/</sup>	<u>7.4</u>	<u>2</u>	<u>12</u>	<u>330</u>	<u>27</u>	<u>177</u>	<u>29</u>	<u>189</u>

a. Finland has been the only country of the Free World that has been exporting inland vessels to the USSR, and it is assumed that Finland will continue to be the only such country.

b. No inland passenger vessels were, or are expected to be, imported from Finland or any other country of the Free World.

c. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 16

Estimated Quantity and Value of Imports of Self-Propelled Inland Vessels  
by the USSR from Finland a/  
1950-60

Year	Tug			Cargo			Total b/		
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles
1950	4.2	1	6	0	0	0	4.2	1	6
1951	5.8	2	8	0	0	0	5.8	2	8
1952	4.1	1	6	0	0	0	4.1	1	6
1953	1.6	1	2	0	0	0	1.6	1	2
1954	1.6	1	2	0	0	0	1.6	1	2
1955	2.0	1	3	0	0	0	2.0	1	3
Total, 1951-55 b/	<u>15.1</u>	<u>5</u>	<u>21</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>15.1</u>	<u>5</u>	<u>21</u>
1956	0	0	0	0	0	0	0	0	0
1957	1.6	1	2	1.0	1	3	2.6	1	5
1958	1.6	1	2	0	0	0	1.6	1	2
1959	1.6	1	2	0	0	0	1.6	1	2
1960	1.6	1	2	0	0	0	1.6	1	2
Total, 1956-60 b/	<u>6.4</u>	<u>2</u>	<u>2</u>	<u>1.0</u>	<u>1</u>	<u>3</u>	<u>7.4</u>	<u>2</u>	<u>12</u>

a. Finland has been the only country of the Free World that has been exporting inland vessels to the USSR, and it is assumed that Finland will continue to be the only such country. No inland passenger vessels were, or are expected to be, imported from Finland or any other country of the Free World.

b. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 17

Estimated Quantity and Value of Imports  
of Non-Self-Propelled Inland Vessels  
by the USSR from Finland a/  
1950-60

Year	Steel			Wooden			Total <u>b/</u>		
	Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles
1950	14.0	1	8	51.0	4	23	65	5	30
1951	32.0	3	17	48.0	4	21	80	6	38
1952	56.0	5	30	38.0	3	17	94	7	47
1953	40.0	3	22	26.0	2	12	66	5	33
1954	43.0	4	23	17.0	1	8	60	5	31
1955	43.0	4	23	7.0	1	3	50	4	26
Total, 1951-55 <u>b/</u>	<u>214.0</u>	<u>18</u>	<u>115</u>	<u>136.0</u>	<u>10</u>	<u>60</u>	<u>350</u>	<u>28</u>	<u>175</u>
1956	86.0	7	46	0	0	0	86	7	46
1957	64.0	5	34	0	0	0	64	5	34
1958	60.0	5	32	0	0	0	60	5	32
1959	60.0	5	32	0	0	0	60	5	32
1960	60.0	5	32	0	0	0	60	5	32
Total, 1956-60 <u>b/</u>	<u>330.0</u>	<u>27</u>	<u>177</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>330</u>	<u>27</u>	<u>177</u>

a. Finland has been the only country of the Free World that has been exporting inland vessels to the USSR, and it is assumed that Finland will continue to be the only such country.

b. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 18

Estimated Quantity and Value of Imports of Inland Vessels by the USSR  
1950-60

Year	Self-Propelled Vessel			Non-Self-Propelled Vessels			Total Value of Inland Vessels <sup>a/</sup>	
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Dead- weight Tons)	Value		Million 1955 US \$	Million 1955 Rubles
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		
1950	41.7	16	63	98.8	8	48	23	112
1951	50.1	19	78	116.8	9	58	28	136
1952	41.9	16	66	138.8	11	71	27	137
1953	42.9	17	78	105.1	8	54	26	132
1954	49.4	20	90	103.7	8	54	28	144
1955	52.9	21	94	98.8	8	52	29	146
Total, 1951-55 <sup>a/</sup>	<u>237.2</u>	<u>93</u>	<u>406</u>	<u>563.2</u>	<u>45</u>	<u>290</u>	<u>139</u>	<u>696</u>
1956	57.8	24	108	139.8	11	75	35	183
1957	64.1	26	119	121.5	10	65	36	184
1958	66.5	27	121	121.4	10	65	37	186
1959	68.9	28	124	125.6	10	67	38	191
1960	72.2	29	128	130.3	11	70	40	198
Total, 1956-60 <sup>a/</sup>	<u>329.5</u>	<u>134</u>	<u>599</u>	<u>638.6</u>	<u>52</u>	<u>343</u>	<u>186</u>	<u>942</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 19

Estimated Quantity and Value of Imports  
of Self-Propelled Inland Vessels by the USSR  
1950-60

Year	Tugboat			Passenger			Cargo			Total <sup>a/</sup>		
	Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value		Quantity (Thousand Horsepower)	Value	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles
1950	38.1	13	52	0	0	0	3.6	2	11	41.7	16	63
1951	44.1	15	60	2.4	1	7	3.6	2	11	50.1	19	78
1952	35.4	12	48	6.5	3	18	0	0	0	41.9	16	66
1953	29.1	10	40	13.8	7	38	0	0	0	42.9	17	78
1954	33.6	12	46	15.8	8	44	0	0	0	49.4	20	90
1955	37.7	13	51	13.8	7	38	1.4	1	4	52.9	21	94
Total, 1951-55 <sup>a/</sup>	179.9	63	246	52.3	28	145	5.0	3	16	237.2	93	406
1956	38.0	13	52	17.5	9	48	2.3	1	7	57.8	24	108
1957	42.1	15	57	21.0	11	58	1.0	1	3	64.1	26	119
1958	44.9	16	61	21.6	11	60	0	0	0	66.5	27	121
1959	47.9	17	65	21.0	11	58	0	0	0	68.9	28	124
1960	51.2	18	70	21.0	11	58	0	0	0	72.2	29	128
Total, 1956-60 <sup>a/</sup>	224.1	78	306	102.1	54	283	3.3	2	10	329.5	134	599

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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Table 20

Estimated Quantity and Value of Imports  
of Non-Self-Propelled Inland Vessels by the USSR  
1950-60

Year	Steel			Wooden			Total <sup>a/</sup>		
	Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value		Quantity (Thousand Deadweight Tons Cargo Capacity)	Value	
		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles		Million 1955 US \$	Million 1955 Rubles
1950	47.8	4	26	51	4	23	98.8	8	48
1951	68.8	6	37	48	4	21	116.8	9	58
1952	100.8	8	54	38	3	17	138.8	11	71
1953	79.1	6	42	26	2	12	105.1	8	54
1954	86.7	7	47	17	1	8	103.7	8	54
1955	91.8	8	49	7	1	3	98.8	8	52
Total, 1951-55 <sup>a/</sup>	<u>427.2</u>	<u>350</u>	<u>229</u>	<u>136</u>	<u>10</u>	<u>60</u>	<u>563.2</u>	<u>45</u>	<u>290</u>
1956	139.8	11	75	0	0	0	139.8	11	75
1957	121.5	10	65	0	0	0	121.5	10	65
1958	121.4	10	65	0	0	0	121.4	10	65
1959	125.6	10	67	0	0	0	125.6	10	67
1960	130.3	11	70	0	0	0	130.3	11	70
Total, 1956-60 <sup>a/</sup>	<u>638.6</u>	<u>52</u>	<u>343</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>638.6</u>	<u>52</u>	<u>343</u>

a. Figures shown reflect the rounding of original data and may not add to the totals shown.

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3. Inputs.

a. General.

Input factors for construction of Soviet inland vessels have been derived from Soviet sources on the basis of presently available information. These factors, except in the case of labor, include all inputs for both the shipyards and the plants constructing components. Figures for labor represent only shipyard labor. Input factors and input requirements for Soviet construction in 1955 are shown in Table 21.\*

b. Materials.

(1) Self-Propelled Vessels.

Detailed hull weights for each of several types and sizes of Soviet inland tugs were classified by the principal basic materials used in shipbuilding. 44/ The estimates of inputs were increased as necessary to allow for waste. The result shows fairly constant inputs in terms of tons of material per ton of light ship displacement. The ratio of tons of material per horsepower, however, is a variable, and it was therefore necessary to assume an average horsepower. For example, in the use of steel the tons per horsepower vary from 0.364 ton for 100 hp to 0.218 ton for 1,600 hp. The average size selected as probably being representative of construction during 1955 was a tug of 600 hp, which shows an input of steel of 0.3182 ton per horsepower.

Soviet data on inland passenger vessels and cargo vessels similar to that obtained for tugs were treated in a similar manner. 45/ Because the classification into weight groups was not so detailed as that given for tugs, some analogy with the inputs for tugs was necessary in order to derive inputs for nonferrous materials.

(2) Non-Self-Propelled Vessels.

Input factors for materials for Soviet non-self-propelled inland steel barges were derived directly from published Soviet data. 46/ Analysis of US data showed agreement with the factors derived from Soviet sources. Similar to the inputs for self-propelled vessels,\*\*

\* Table 21 follows on p. 47.

\*\* Continued on p. 49.

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Table 21

Input Factors and Quantity of Inputs for Inland Vessels Constructed in the USSR a/\*  
1955

Material	Input Factor					Quantity of Input					
	Self-Propelled Vessel			Non-Self-Propelled Vessel		Self-Propelled Vessel			Non-Self-Propelled Vessel		Total
	Tug	Passenger	Cargo	Steel Barge	Wooden Barge	Tug	Passenger	Cargo	Steel Barge	Wooden Barge	
	Metric Tons per Horsepower			Metric Tons per Dead-weight Ton Cargo Capacity		Thousand Metric Tons					
Steel											
Carbon steel	0.2127	0.3407	0.3407	0.15	0.0126	5	4	12	67	2	90
Alloy steel	0.1055	0.0379	0.0379	Negligible	Negligible	3	0.5	1.3	Negligible	Negligible	5
Total	0.3182	0.3786	0.3786	0.15	0.0126	8	5	13	67	2	95
Cast iron	0.1041	0.1161	0.1161	Negligible	Negligible	2	1.4	4.1	Negligible	Negligible	8
Copper and copper base alloys	0.0142	0.0250	0.0250	0.000023	0.000023	0.4	0.3	0.9	Negligible	Negligible	1.6
Aluminum	0.0062	0.0110	0.0110	Negligible	Negligible	0.2	0.1	0.4	Negligible	Negligible	0.7
Lead	0.0040	0.0085	0.0085	Negligible	Negligible	0.1	0.1	0.3	Negligible	Negligible	0.5
Tin	0.0009	0.0019	0.0019	Negligible	Negligible	0.02	0.02	0.07	Negligible	Negligible	0.11
Zinc	0.0024	0.0050	0.0050	Negligible	Negligible	0.06	0.06	0.18	Negligible	Negligible	0.30
Rubber	0.0001	0.0002	0.0002	Negligible	Negligible	Negligible	Negligible	0.008	Negligible	Negligible	0.01
Nickel and miscellaneous metals	0.0032	0.0052	0.0052	Negligible	Negligible	0.08	0.06	0.18	Negligible	Negligible	0.33
Lumber	0.0438	0.230	0.230	0.083	0.449	1	3	8.1	37	77	126

\* Footnotes for Table 21 follow on p. 48.

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Table 21  
 Input Factors and Quantity of Inputs for Inland Vessels Constructed in the USSR a/  
 1955  
 (Continued)

	Input Factor					Quantity of Input					
	Self-Propelled Vessel			Non-Self-Propelled Vessel		Self-Propelled Vessel			Non-Self-Propelled Vessel		Total
	Tug	Passenger	Cargo	Steel Barge	Wooden Barge	Tug	Passenger	Cargo	Steel Barge	Wooden Barge	
<u>Material</u>	Equivalent Kilowatt-Hours per Horsepower			Equivalent Kilowatt-Hours per Dead-weight Ton Cargo Capacity		Million Equivalent Kilowatt-Hours					
Power <u>b/</u>	430	570	570	220	130	11	7	20	98	22	158
<u>Labor</u>	Man-Years per Horsepower			Man-Years per Dead-weight Ton Cargo Capacity		Man-Years					
	0.0745	0.106	0.0664	0.0177	0.040	1,900	1,300	2,300	7,900	6,800	20,200

a. Inputs include the requirements of both the shipyards and the manufacturers of components except in the case of labor. Labor includes only direct labor in shipyards increased by 20 percent to allow for indirect labor in shipyards.  
 b. Including not only electric power but also all inputs of other power and fuel, measured in equivalent kilowatt-hours.

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these inputs vary with the size of the vessel. The size of a steel barge assumed to be average and typical of construction during 1955 was 1,000 dwtcc.

Published Soviet data were used to obtain input factors for non-self-propelled inland barges. <sup>47/</sup> The factor for the principal input, wood, allows 35 percent for waste.

c. Power.

Previous studies of requirements for power in construction of Soviet inland vessels generally have listed electric power and fuel as separate inputs. Because most fuel in a shipyard is used to produce electric power and because the ratio of electric power generated in a shipyard to that obtained from outside varies for each shipyard, it is possibly more logical to consider these items as being combined into the single item, equivalent kilowatt-hours (kwh). An analysis of studies of various countries and of various shipyards has shown this reasoning to be valid. Studies of factors for converting tons of fuel to equivalent kwh in the shipbuilding industries of the USSR, East Germany, and the US show that the requirements for power in construction of self-propelled steel vessels is about 1,300 kwh per ton of steel. <sup>48/</sup>

Because of the lack of data on power required for construction of wooden vessels and wooden components, input factors for wooden vessels have been based on the relationship between requirements for labor and for power. An analysis of US requirements for labor during World War II shows that the man-hours per ton of wood used in construction of wooden vessels equal approximately one-half of the man-hours per ton of steel used in construction of steel vessels. <sup>49/</sup> It is known that consumption of power per man working in construction of wooden vessels is less than that per man working in construction of steel vessels. Although the exact proportion is unknown, it is assumed that the ratio is the same as that for man-hours per ton of wood used to man-hours per ton of steel used (0.5). The two ratios, combined with the input of power for construction of steel vessels, give an input factor of 320 kwh per dwtcc of wooden self-propelled vessels and 130 kwh per dwtcc of wooden non-self-propelled vessels.

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d. Labor.

Input factors for labor used in construction of steel vessels are derived directly from published Soviet figures. 50/ On the basis of specific cases the requirements for labor on serially constructed vessels has been taken as 80 percent of that required for construction of a single vessel. Because Soviet data give the requirements for direct labor only, these requirements have been increased 20 percent to allow for indirect labor. Input factors for labor used in construction of wooden barges are derived from data on construction of wooden barges in the US during World War II. 51/

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