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EXPENDITURES FOR NEW CONSTRUCTION, ALTERATIONS,
AND MAINTENANCE OF SOVIET NAVAL VESSELS
1946-55

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FOREWORD

The purpose of this report is to estimate expenditures for Soviet naval vessels in both US and Soviet monetary terms, implied by expenditures for new construction, alterations, and maintenance of the existing fleet. This report is a part of the program of ORR to estimate the size of implied Soviet military expenditures, their composition, and their effects on the economic structure and growth of the Soviet economy.

The estimates of Soviet expenditures on new construction of naval vessels are based on ORR production estimates which made use of US Navy data plus, . The estimates of expenditures were derived by analogy with US practice and by using order of battle information from the US Navy. The valuation process involved estimating the cost of performing these tasks in the US and then converting the dollar estimates into rubles by use of appropriate ruble-dollar ratios. Therefore the error in these estimates derives, first, from the physical estimates and, second, from the valuation process.

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EXPENDITURES FOR NEW CONSTRUCTION, ALTERATIONS,
AND MAINTENANCE OF SOVIET NAVAL VESSELS*
1946-55

Summary

Ten percent of the estimated Soviet defense budget expenditures were used for new construction, ** alterations, *** and maintenance**** of Soviet naval vessels during 1955. The estimates of these naval expenditures for the 10-year period 1946-55 amount to almost 60 billion 1955 rubles (1955 US \$13 billion†), the range of variation being from 0.6 billion rubles (\$0.15 billion) in 1946 to over 12 billion rubles (\$2.6 billion) in 1955, as shown in the accompanying chart, Figure 1.††

Expenditures for new construction of Soviet naval vessels in 1955 were about 11 billion rubles (\$2.3 billion) for somewhat more than 200,000 standard displacement tons.††† In 1946, expenditures were only 250 million rubles (\$52 million) for about 4,000 tons. In 1955, about half of the new construction of Soviet naval vessels, by tonnage, was represented by submarines; whereas only 6 years earlier, in 1949, destroyers had represented half of the new construction, and submarines 5 percent. In 1946, new construction was only about 1 percent of the order of battle

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 15 November 1956.

** Expenditures for new construction represent the cost of building new vessels.

*** Expenditures for alterations are different from modernization and conversion costs. Alteration represents a change in material or design of an individual component without change in its function. Modernization involves bringing all the components of the vessel up to the latest design, still without change in the function of the vessel. Conversion involves the change of the mission or function of the vessel.

**** Expenditures for maintenance, or overhauling costs, refer to the normal periodic overhauling of the vessel.

† Dollar values throughout this report are given in 1955 US dollars, and ruble values are given in 1955 rubles, unless otherwise indicated.

†† Following p. 2.

††† Standard displacement of a surface vessel is the displacement (in tons of 2,240 pounds) of the vessel complete, fully manned, engined, and equipped ready for sea, including all armament and ammunition, equipment, outfit, provisions and fresh water for crew, miscellaneous stores, and implements of every description that are intended to be carried in war, but excluding fuel or reserve feed water on board. Standard displacement of a submarine is the surface displacement and is similar to the standard displacement of a surface vessel but excluding lube oil, fresh water, or ballast water of any kind on board. Ton-nages throughout this report are given in standard displacement tons.

(OB*) in terms of tonnage, compared with 15 percent in 1955. Value added** in new construction of Soviet naval vessels is estimated at 4.5 percent of the total value added, which was generated by heavy industry in 1955.

Expenditures for alterations of Soviet naval vessels in 1955 reached 490 million rubles (\$123 million), the largest figure for this purpose since 1946, when expenditures were 170 million rubles (\$42 million). As percentages of new construction, alterations ranged from a high of 68 percent in 1946 to a low of 4 percent in 1955.

It is estimated that 650 million rubles (\$160 million) were expended on maintenance of existing Soviet naval vessels in 1955. These expenditures represent a high for the period studied, expenditures in 1946 having been 230 million rubles (\$56 million). In 1946, maintenance was 90 percent of new construction, whereas in 1955 it was only 6 percent.

Expenditures for new construction, alterations, and maintenance of Soviet naval vessels in percentages, during 1946-55, which are shown in Table 1 indicate clearly the Soviet buildup since World War II to a position as a major naval power.

Table 1

Expenditures for New Construction, Alterations, and Maintenance of Soviet Naval Vessels, in Percentages a/ 1946-55

	Percent			
<u>Year</u>	<u>New Construction</u>	<u>Alterations</u>	<u>Maintenance</u>	<u>Total</u>
1946	39	26	35	100
1947	63	16	21	100
1948	76	10	14	100
1949	89	5	6	100
1950	91	4	5	100
1951	90	4	6	100
1952	88	5	7	100
1953	89	5	6	100
1954	91	4	5	100
1955	91	4	5	100

a. See Table 3, p. 6, below.

* OB as used in this report is the total complement of the Soviet naval forces; comprising major combatant, patrol, and mine vessels, regardless of operational status.

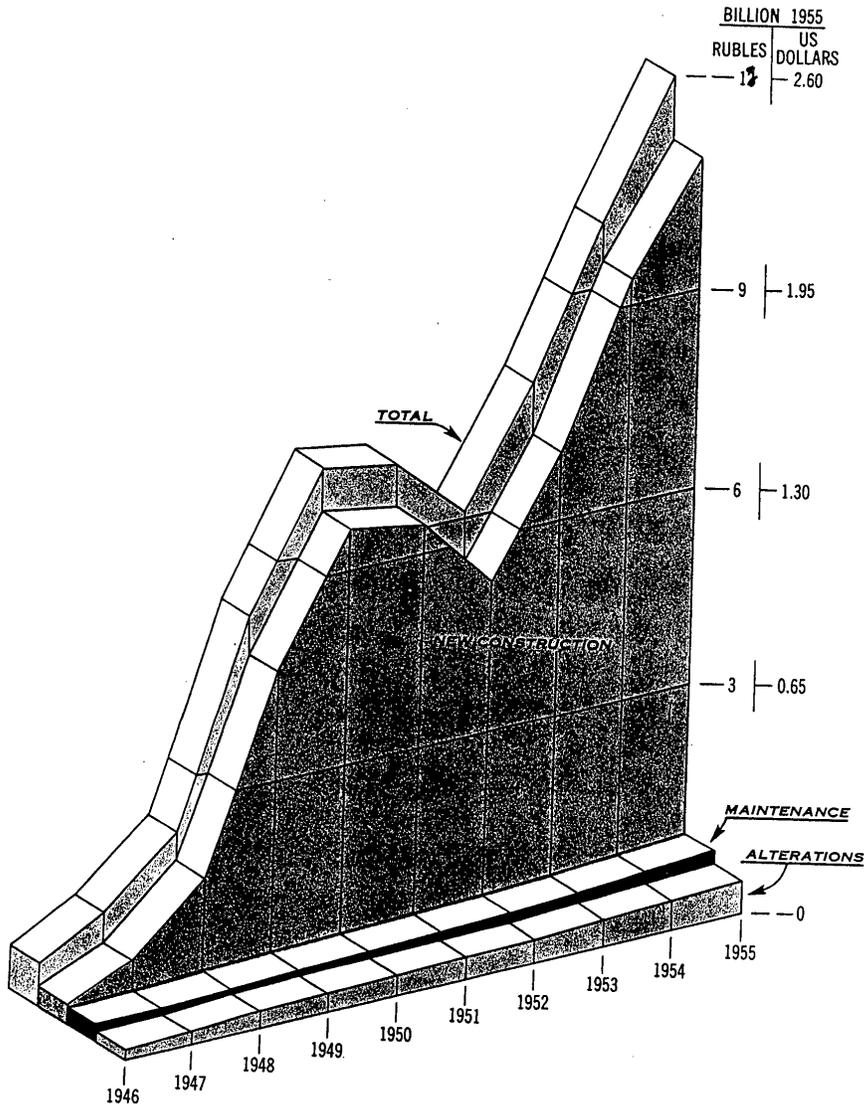
** The term value added as used in this report includes all factor payments plus depreciation and is equivalent to the gross national product (GNP) generated within the shipyards. The value added may be computed by subtracting from the total cost of the vessel purchases from other firms, including the cost of all components.

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USSR: EXPENDITURES FOR NEW CONSTRUCTION,
ALTERATIONS, AND MAINTENANCE OF NAVAL VESSELS
1946-55

FIGURE 1



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I. Introduction.

Expenditures for the activities covered by the defense budget of the USSR have been estimated at about 120 billion rubles (\$29 billion) in 1955.* Of this total, approximately 20 billion rubles (\$4.6 billion) were devoted to the naval forces.** Expenditures for new construction, alterations, and maintenance of Soviet naval vessels are compared with the announced Soviet defense budget in Table 2*** and are shown for the years 1946-55 in Table 3.****

A significant portion of expenditures on the Soviet naval forces was allocated to new construction of vessels and to alterations and maintenance of the existing fleet. These expenditures amounted to at least 60 percent of estimated total expenditures on the Soviet naval forces in 1955, or 10 percent of the estimated Soviet defense budget.

New construction of vessels completed during the 10-year period 1946-55 included 19 cruisers, 102 destroyers, and 286 submarines, 2/ in addition to numerous smaller craft. Initially, construction of cruisers and destroyers was emphasized, and later a very sizable submarine program was undertaken. Neither battleships nor aircraft carriers were built during the period. The Soviet Navy is being fashioned as a force of small to medium-sized surface vessels and a relatively large number of submarines.

In the 10-year period 1946-55 the Soviet Navy increased in rank among the navies of the world in number of ships from seventh to second place. 3/ Available information indicates that the Soviet Navy has 26 modern cruisers, 139 up-to-date destroyers, and a fleet of about 400 submarines. 4/ On the whole, only the US Navy is larger than the Soviet Navy. In number of submarines, the Soviet Navy is probably at least equal to the combined navies of the world. In the sections that follow, the expenditures for construction, alterations, and maintenance of the Soviet Navy will be quantified, by type of vessel, in more or less homogeneous monetary terms to present a picture of the structure, characteristics, and shifts in the Soviet naval buildup.

* These expenditures correspond to the announced Soviet defense budget and do not include the nuclear energy program; research and development; militarized components of the Ministry of Internal Affairs (Ministerstvo Vnutrennikh Del -- MVD) and the Committee on State Security (Komitet po Gosudarstvennoy Bezopasnosti -- KGB); the Voluntary Society for Cooperation with the Army, Air Force, and Navy (Dobrovol'noye Obshchestvo Sodeystviya Armii, Aviatsii, i Flotu -- DOSAAF); and the pay of military reserves. The estimate is based on data used in source 1/. (For serially numbered source references, see Appendix D.)

** These expenditures are budgeted to the Ministry of Defense but do not include those budgeted expenditures which could not be allocated to the services -- that is, guided missiles, the Anti-air Defense (Protivo-vozdushnaya Oborona -- PVO) command control and radar system, transportation, communications, construction, civilian personnel pay, medical expenses, publishing and printing, and retirement pensions.

*** Table 2 follows on p. 4.

**** Table 3 follows on p. 5.

Table 2

Expenditures for New Construction, Alterations, and Maintenance
of Soviet Naval Vessels
Compared with the Announced Soviet Defense Budget a/
1950-55

Year	Billion Current Rubles			Announced Defense Budget	Total as a Percentage of Announced Defense Budget <u>b/</u>
	New Construction	Alterations and Maintenance	Total		
1950	7.7	0.8	8.5	82.9	10.3
1951	7.0	0.8	7.8	93.9	8.3
1952	5.5	0.8	6.3	108.6	5.8
1953	7.3	0.9	8.2	105.6	7.8
1954	9.6	1.0	10.6	100.3	10.6
1955	11.0	1.1	12.1	112.1	11.1

a. Data for percentage calculations were converted from 1955 US dollars. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. See Tables 26 and 27, Appendix B, p. 28, below.

b. The margin of error involved in these estimates is minus 20 to plus 15 percent. This asymmetrical range reflects the belief that the best estimate is nearer the upper limit because the estimates of expenditures for new construction scarcely have considered the economies which serial production introduces. The use of US analogy in estimating expenditures for alterations and maintenance probably causes these estimates to be high because the USSR tends to allocate relatively less to alterations and maintenance than does the US. Other errors may be introduced through the use of ruble-dollar ratios and indexes in the process of conversion of 1955 dollars to current rubles. These errors are believed to be symmetrical and probably within plus or minus 15 percent.

II. New Construction.

A. Value.*

The value of new construction of Soviet naval vessels in 1955 was greater than that for any previous year during the period 1946-55,

* The value assigned to each Soviet naval vessel is based on analogy with US Navy value, which includes the contract price and the cost of all government-furnished materials including propulsion machinery, electronics, armament and armor, and other government-furnished materials. The value also includes shore spares (spare parts which are kept ashore and which have been specially procured for a particular ship or class of ships) and related costs and reflects all costs allocated by the navy to the individual vessel /footnote continued on p. 6/

Table 3
Expenditures for New Construction, Alterations, and Maintenance of Soviet Naval Vessels a/
1946-55

Year	New Construction			Alterations			Maintenance			Total		
	Million 1955		Percent b/	Million 1955		Percent b/	Million 1955		Percent b/	Million 1955		Percent
	US \$	Rubles		US \$	Rubles		US \$	Rubles		US \$	Rubles	
1946	52	250	39	42	170	26	56	230	35	150	650	100
1947	149	720	63	46	190	16	61	240	21	256	1,200	100
1948	342	1,600	76	56	230	10	75	300	14	473	2,100	100
1949	976	4,700	89	60	240	5	79	320	6	1,120	5,300	100
1950	1,370	6,600	91	70	280	4	92	370	5	1,530	7,300	100
1951	1,330	6,400	90	76	310	4	101	410	6	1,510	7,100	100
1952	1,100	5,300	88	82	330	5	109	440	7	1,290	6,100	100
1953	1,440	6,900	89	95	380	5	124	500	6	1,660	7,800	100
1954	1,950	9,400	91	107	430	4	139	560	5	2,200	10,000	100
1955	2,340	11,000	91	123	490	4	160	650	5	2,620	12,000	100
Total	11,050	52,870		757	3,050		996	4,020		12,800	59,550	

a. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. See Tables 9, 10, 11, 14, 15, 16, and 17, Appendix A, pp. 11, 11, 12, 15, 16, 17, and 18, respectively, below.

b. The 10-year average for new construction was 81 percent; for alterations, 8 percent; and for maintenance, 11 percent.

reaching more than 11 billion rubles (\$2.3 billion).* The value of new construction of Soviet naval vessels, during 1946-55, in rubles and in dollars is shown in the accompanying chart, Figure 2**; in rubles, in Table 10***; and, in dollars, in Table 11.****

Soviet expenditures have increased steeply since 1946, when they were a negligible 250 million rubles (\$52 million). The temporary halt in the annual increase of expenditures in 1951 and 1952 was occasioned by changes in the emphasis of new construction among types of ships as discussed below.

B. Tonnage and Types.

New construction of Soviet naval vessels in 1955 was well over 200,000 tons. The volume of new construction of Soviet naval vessels, during 1946-55, is shown in the accompanying chart, Figure 3,† and in Table 9.†† Construction of cruisers and destroyers was emphasized during 1946-49; construction of submarines, during 1950-55.

New construction of Soviet naval vessels, by type of vessel, during 1949, 1951, 1953, and 1955, is shown in Table 4.††† In 1949, 48 percent of new construction of Soviet naval vessels was in destroyers; and 36 percent, in cruisers. By 1953, new construction of cruisers had slowed down, a program for the construction of submarines was developed, and construction of destroyers still remained an important part of the total. By 1955, submarines represented 49 percent of the tonnage constructed; destroyers, 29 percent; and cruisers, only 10 percent.

C. Compared with the Order of Battle.

Some measure of the scale of the new naval construction effort in the USSR is afforded by a comparison of Soviet construction and the Soviet OB. The volume of new construction of Soviet naval vessels, during 1946-55, is compared with the OB, in the accompanying chart, Figure 4,†††† and in Table 12.‡

when in new condition, with the exception of the initial design costs. The initial design costs are not included in the value of the vessel, because design costs should be prorated over the number of vessels built. If as many as 20 vessels were built from 1 set of designs, the design costs would be only about 1 percent of the total cost. Therefore, no great violence is done to the facts by ignoring the design costs.

* A ruble-dollar ratio of 4.8 to 1 has been used for expenditures for new construction. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

** Following p. 6.

*** Appendix A, p. 11, below.

**** Appendix A, p. 12, below.

† Following p. 6.

†† Appendix A, p. 11, below.

††† Table 4 follows on p. 7.

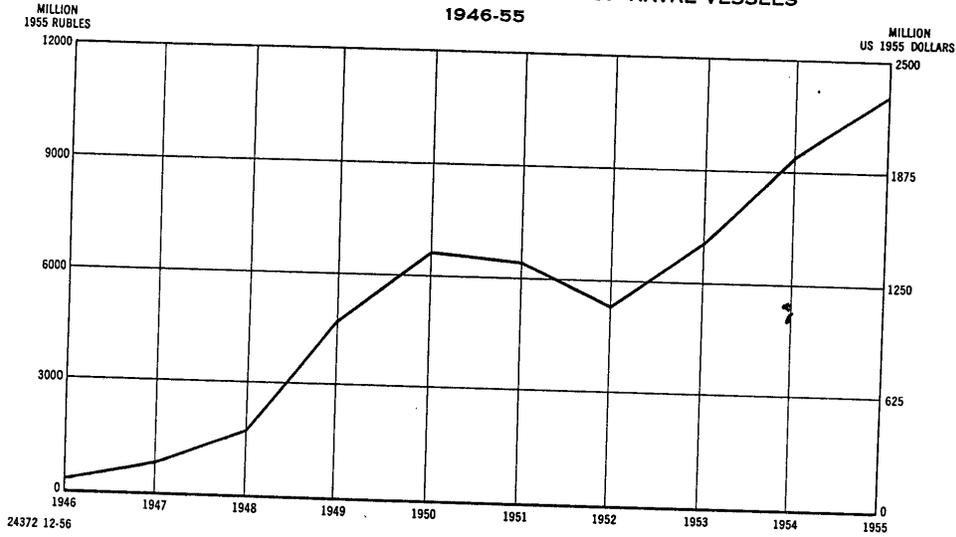
†††† Following p. 6.

‡ Appendix A, p. 13, below.



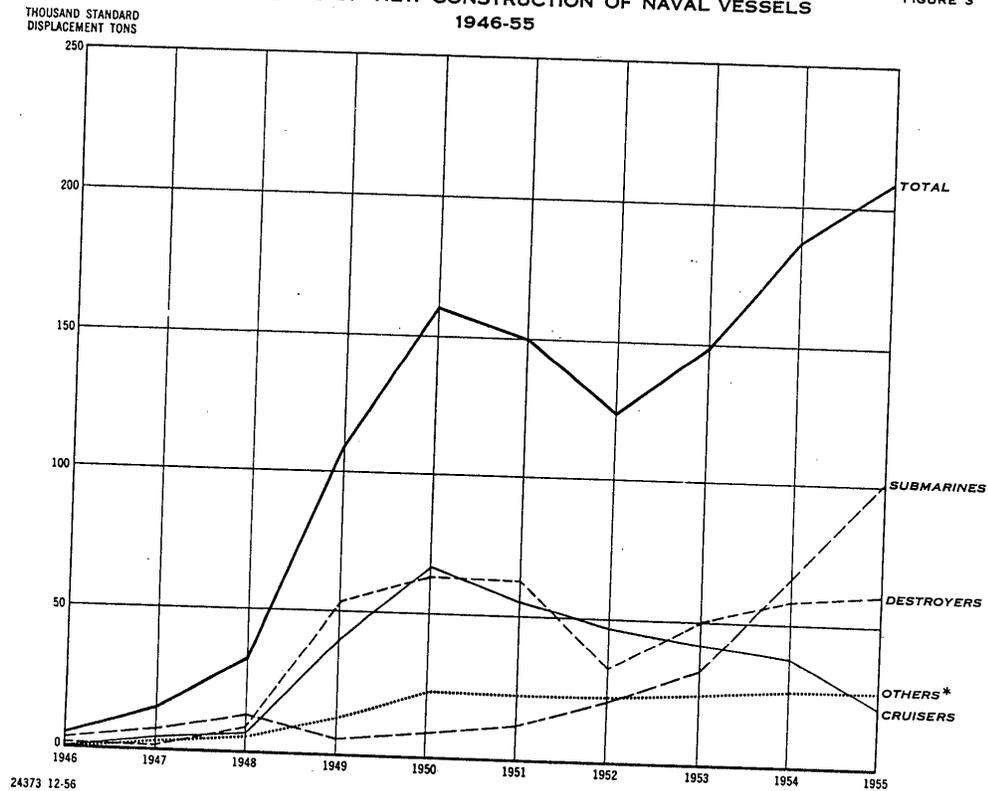
USSR: VALUE OF NEW CONSTRUCTION OF NAVAL VESSELS
1946-55

FIGURE 2



USSR: VOLUME OF NEW CONSTRUCTION OF NAVAL VESSELS
1946-55

FIGURE 3



* Patrol craft, minesweepers, and motor torpedo boats.



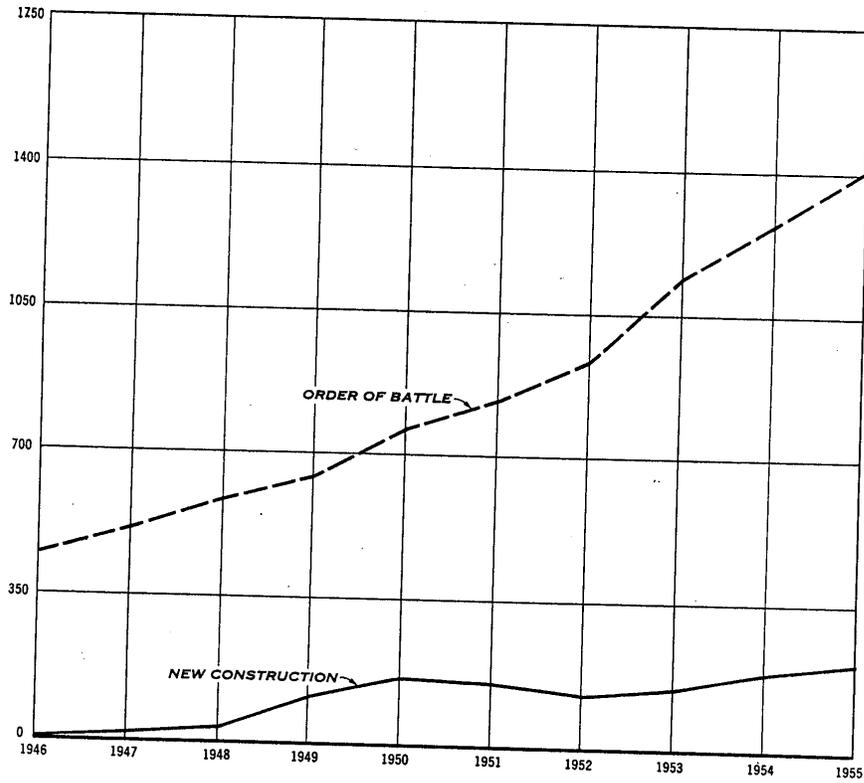
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FIGURE 4

USSR: VOLUME OF NEW CONSTRUCTION OF NAVAL VESSELS
COMPARED WITH THE ORDER OF BATTLE
1946-55

THOUSAND STANDARD
DISPLACEMENT TONS



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Table 4

New Construction of Soviet Naval Vessels
by Type of Vessel, in Percentages a/
1949, 1951, 1953, and 1955

Type of Vessel	Percent			
	1949	1951	1953	1955
Cruiser	36	36	28	10
Destroyer	48	42	33	29
Submarine	5	7	22	49
Patrol craft	5	6	6	4
Minesweeper	6	9	9	6
Motor torpedo boat	<u>b/</u>	<u>b/</u>	2	2
Total	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

a. Based on standard displacement ton-
nages. See Table 9, Appendix A, p. 11,
below.

b. Less than 0.6 percent.

New construction in 1946 was only about 1 percent of the OB, in terms of tonnage. In 1950, new construction rose to 21 percent, its 10-year high point relative to the OB. Between 1951 and 1955 the proportion of tonnage constructed relative to the OB varied within narrow limits of 13 and 18 percent. New construction of Soviet naval vessels as percentages of the OB, during 1946-55, is shown in Table 5.

Table 5

New Construction of Soviet Naval Vessels
as Percentages of the Soviet Order of Battle a/
1946-55

Year	Percent	Year	Percent
1946	1	1951	18
1947	3	1952	13
1948	6	1953	13
1949	17	1954	15
1950	21	1955	15

a. See Table 12, Appendix A, p. 13, below.

To test the consistency of data on the OB and on new construction, successive differences in the OB were calculated and compared with new construction. The total increase in the OB over the 10-year

period 1946-55 was 949,000 tons. New construction during this period was 1.14 million tons. The 1955 construction was not added to the OB in 1955. Thus the construction for 1955 when subtracted from the 10-year total, 1.14 million tons, yields 930,000 tons of new construction, which was added to the fleet during the period. Increases in new construction of Soviet naval vessels and in the Soviet OB, during 1946-55, are shown in Table 6. During 1946-55 the yearly average of additions to the fleet was 106,000 tons, whereas the yearly construction was 104,000 tons. The explanation for the additions to the fleet being slightly greater than the construction is probably found in the reparations received by the USSR in the early years of the 10-year period. The data tend to show, however, that very little tonnage, if any, was retired during this period. Recently, however, the USSR has announced that it would deactivate 375 vessels.

Table 6

Increases in New Construction of Soviet Naval Vessels
and in the Soviet Order of Battle
1946-55

<u>Thousand Standard Displacement Tons</u>		
<u>Year</u>	<u>New Construction ^{a/}</u>	<u>Increase in the Order of Battle over That of the Previous Year ^{b/}</u>
1946	4	
1947	14	61
1948	33	77
1949	110	52
1950	161	124
1951	150	71
1952	124	95
1953	149	216
1954	188	126
1955	209	129
1947-55 yearly average		106
1946-54 yearly average	104	

a. See Table 9, Appendix A, p. 11, below.

b. See Table 21, Appendix B, p. 22, below.

D. Value Added.

The value added in new construction of Soviet naval vessels in 1955 is estimated to be about 4.5 percent of the total value added generated in the heavy industrial sector of the Soviet economy for that year. The estimated value added for new construction of Soviet naval vessels, during 1946-55, is shown in the accompanying chart, Figure 5.* The range

* Following p. 8.

from \$25 million in 1946 to over \$1 billion in 1955 emphasizes the Soviet program for a rapid increase in new construction of Soviet naval vessels. As is to be expected, the trend for the value added follows closely that of new construction as shown in Figure 3.* In Table 13,** the estimated value added is compared with that of heavy industry for 1946-55.

III. Alterations.

Expenditures for alterations of Soviet naval vessels, which increased steadily as the OB increased, during 1946-55, are shown, in rubles and in dollars, in the accompanying chart, Figure 6 ***; in rubles, in Table 14****; and, in dollars, in Table 15.† As shown in Figure 6, in 1955, 490 million rubles (\$123 million††) were expended for alterations.

Expenditures for alterations of Soviet naval vessels, which are shown as percentages of new construction, during 1946-55, in Table 7, remained reasonably stable between 1949 and 1955, ranging from 4 to 6 percent during this period. It is estimated, however, that in 1946, at the beginning of the period, expenditures for alterations were 68 percent of expenditures for new construction. These expenditures for alterations were obviously a reflection of the fact that the new Soviet program for naval construction had not yet been undertaken.

Table 7

Expenditures for Alterations of Soviet Naval Vessels
as Percentages of New Construction a/...
1946-55

<u>Year</u>	<u>Percent</u>	<u>Year</u>	<u>Percent</u>
1946	68	1951	5
1947	26	1952	6
1948	14	1953	6
1949	5	1954	5
1950	4	1955	4

a. See Tables 11, 12, 15, and 16, Appendix A, pp. 12, 13, 16, and 17, respectively, below.

* Following p. 6, above.

** Appendix A, p. 14, below.

*** Following p. 10.

**** Appendix A, p. 15, below.

† Appendix A, p. 16, below.

†† A ruble-dollar ratio of 4 to 1 has been used for expenditures for alterations. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

IV. Maintenance.

Expenditures for maintenance of Soviet naval vessels in 1955 are estimated at 650 million rubles (\$160 million*) -- almost 3 times expenditures for 1946. Expenditures for maintenance of Soviet naval vessels, during 1946-55, are shown, in rubles, in the accompanying chart, Figure 7**; in rubles, in Table 16***; and, in dollars, in Table 17.**** Between 1949 and 1955, these expenditures for maintenance varied in a narrow range from 6 to 8 percent of expenditures for new construction. Expenditures for maintenance of Soviet naval vessels as percentages of new construction, during 1946-55, are shown in Table 8. It is estimated, however, that in 1946, at the beginning of the period, expenditures for maintenance were 90 percent of expenditures for new construction because the new Soviet program for naval construction had not then begun.

Table 8

Expenditures for Maintenance of Soviet Naval Vessels
as Percentages of New Construction a/
1946-55

<u>Year</u>	<u>Percent</u>	<u>Year</u>	<u>Percent</u>
1946	90	1951	6
1947	34	1952	8
1948	19	1953	7
1949	7	1954	6
1950	6	1955	6

a. See Tables 10, 11, 16, and 17, Appendix A, pp. 11, 12, 17, and 18, respectively below.

* A ruble-dollar ratio of 4 to 1 has been used for the expenditures for maintenance. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

** Following p. 10.

*** Appendix A, p. 17, below.

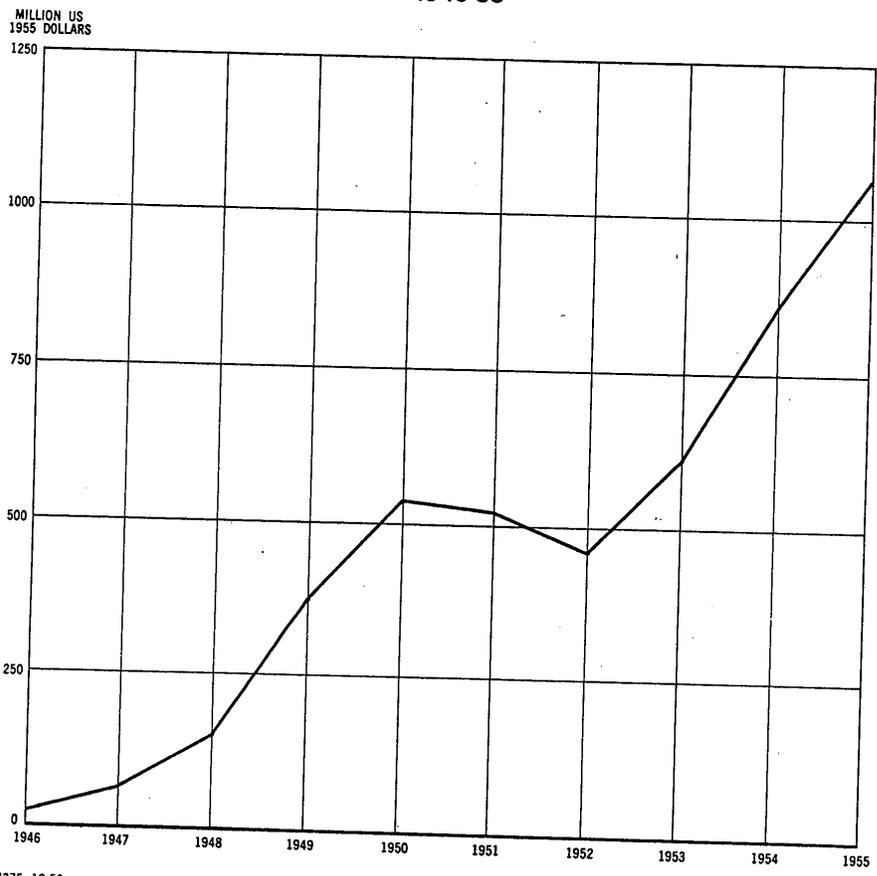
**** Appendix A, p. 18, below.

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FIGURE 5

USSR: ESTIMATED VALUE ADDED FOR NEW CONSTRUCTION
OF NAVAL VESSELS
1946-55



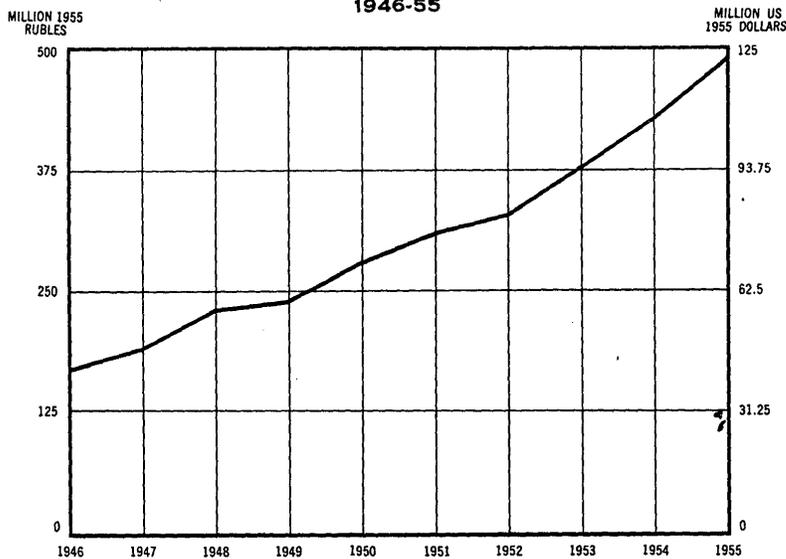
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USSR: EXPENDITURES FOR ALTERATIONS
OF NAVAL VESSELS
1946-55

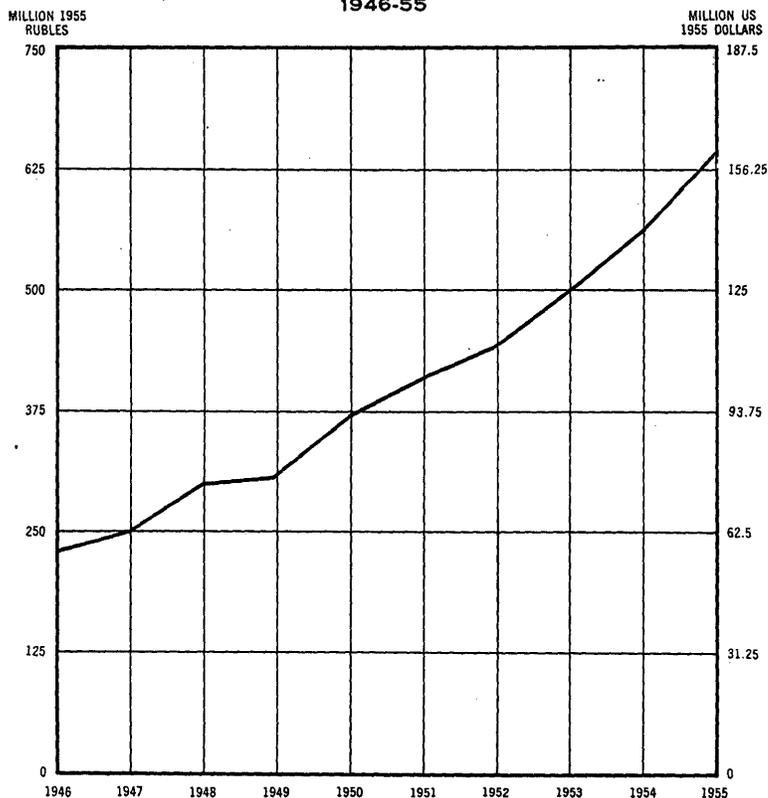
FIGURE 6



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USSR: EXPENDITURES FOR MAINTENANCE
OF NAVAL VESSELS
1946-55

FIGURE 7



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APPENDIX A

STATISTICAL TABLES

Table 9

Standard Displacement Tonnage of New Construction
of Soviet Naval Vessels a/
1946-55

Year	Standard Displacement Tons						Total
	Cruiser	Destroyer	Submarine	Patrol Craft	Mine- sweeper	Motor Torpedo Boat	
1946		1,100	3,120				4,220
1947	3,600	1,900	7,250	1,500			14,200
1948	6,000	8,900	12,500	3,000	2,000	360	32,800
1949	40,100	53,000	5,250	6,000	6,200	360	110,000
1950	66,700	63,000	8,400	9,000	13,000	360	161,000
1951	54,400	62,000	11,200	9,000	13,000	360	150,000
1952	46,900	33,000	20,500	9,000	13,000	810	124,000
1953	41,900	50,000	32,900	9,000	13,000	2,800	149,000
1954	37,800	58,000	66,800	9,000	13,000	3,600	188,000
1955	20,500	61,000	102,000	9,000	13,000	4,000	209,000

a. 5/. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data.

Table 10

Value of New Construction of Soviet Naval Vessels
in 1955 Rubles a/*
1946-55

Year	Million 1955 Rubles						Total
	Cruiser	Destroyer	Submarine	Patrol Craft	Mine- sweeper	Motor Torpedo Boat	
1946		58	190				250
1947	100	96	450	72			720
1948	160	460	770	140	82	26	1,600
1949	1,100	2,700	330	280	260	26	4,700
1950	1,800	3,300	520	420	530	26	6,600
1951	1,500	3,200	700	420	530	26	6,400
1952	1,300	1,700	1,300	420	530	60	5,300
1953	1,100	2,500	2,000	420	530	210	6,900
1954	1,000	3,000	4,100	420	530	260	9,400
1955	560	3,100	6,300	420	530	300	11,000

* Footnote for Table 10 follows on p. 12.

Table 10

Value of New Construction of Soviet Naval Vessels
in 1955 Rubles a/
1946-55
(Continued)

a. 6/. The value assigned to each Soviet naval vessel is based on analogy with US Navy value, which includes the contract price and the cost of all government-furnished materials including propulsion machinery, electronics, armament and armor, and other government-furnished materials. The value also includes shore spares and related costs and reflects all costs allocated by the navy to the individual vessel when in new condition, with the exception of initial design costs. The initial design costs are not included in the value of the vessel, because design costs should be prorated over the number of vessels built. If as many as 20 vessels were built from 1 set of designs, the design costs would be only about 1 percent of the total cost. Therefore, no great violence is done to the facts by ignoring the design costs. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. The ruble-dollar ratio used is 4.8 1955 rubles to 1955 US \$1. For a discussion of prices used and ruble-dollar ratios, see Appendix B.

Table 11

Value of New Construction of Soviet Naval Vessels
in 1955 US Dollars a/
1946-55
Million 1955 US Dollars

Year	Cruiser	Destroyer	Submarine	Patrol Craft	Mine- sweeper	Motor Torpedo Boat	Total
1946		12	40				52
1947	21	20	93	15			149
1948	34	95	161	29	17	5.5	342
1949	229	560	68	58	54	5.5	976
1950	380	680	108	88	110	5.5	1,370
1951	310	670	144	88	110	5.5	1,330
1952	267	360	264	88	110	12.0	1,100
1953	239	530	423	88	110	44.0	1,440
1954	216	620	861	88	110	55.0	1,950
1955	117	650	1,310	88	110	62.0	2,340

a. 7/. The value assigned to each Soviet naval vessel is based on analogy with US Navy value, which includes the contract price and the cost of all government-furnished materials including propulsion machinery, electronics, armament and armor, and other government-furnished materials. The value also includes shore spares and related costs and reflects all costs allocated by the navy to the individual vessel when in new condition, with the exception of initial design costs. The initial design costs are not included in the value of the vessel, because design costs should be prorated over the number of vessels built. If as many as 20 vessels were built from 1 set of designs, the design costs would be only about 1 percent of the total cost. Therefore, no great violence is done to the facts by ignoring the design costs. All data are rounded. Totals and percentages are derived from unrounded

Table 11

Value of New Construction of Soviet Naval Vessels
in 1955 US Dollars
1946-55
(Continued)

data and do not always agree with the rounded data shown. The ruble-dollar ratio used is 4.8 1955 rubles to 1955 US \$1. For a discussion of prices used and ruble-dollar ratios, see Appendix B.

Table 12

Comparison of New Construction of Soviet Naval Vessels
with the Soviet Order of Battle
1946-55

Year	New Construction (Thousand Standard Displacement Tons) ^{a/}	Order of Battle (Thousand Standard Displacement Tons) ^{b/}	New Construction as a Percentage of Order of Battle
1946	4	452	1
1947	14	513	3
1948	33	590	6
1949	110	642	17
1950	161	766	21
1951	150	837	18
1952	124	932	13
1953	149	1,148	13
1954	188	1,274	15
1955	209	1,403	15

a. See Table 9, p. 11, above.

b. See Table 21, Appendix B, p. 22, below.

Table 13

Estimated Value Added for New Construction of Soviet Naval Vessels
as Percentages of Value Added by Heavy Industry a/
1946-55

Year	(Million 1955 US \$)										Total	Value Added by Heavy Industry	Total as a Percent- age of Value Added by Heavy Industry
	Cruiser	Destroyer	Submarine	Patrol Craft	Mine- sweeper	Motor Torpedo Boat	Negligible		Negligible				
1946	Negligible	4.2	20.7	Negligible	Negligible	Negligible	4.7	Negligible	Negligible	2.9	24.9	N.A.	N.A.
1947	8.7	7.2	48.0	4.7	Negligible	Negligible	9.4	7.8	2.9	2.9	68.6	N.A.	N.A.
1948	14.5	33.9	82.8	18.7	24.6	2.9	18.7	24.6	2.9	2.9	151.3	N.A.	N.A.
1949	97.2	200.1	34.7	28.1	51.2	2.9	28.1	51.2	2.9	2.9	378.2	N.A.	N.A.
1950	161.6	241.7	55.6	28.1	51.2	2.9	28.1	51.2	2.9	2.9	541.1	12,700	4.3
1951	131.8	237.7	74.2	28.1	51.2	6.7	28.1	51.2	23.3	6.7	525.9	14,600	3.6
1952	113.6	127.4	135.7	28.1	51.2	23.3	28.1	51.2	29.2	29.2	462.7	15,500	3.0
1953	101.5	190.1	217.6	28.1	51.2	29.2	28.1	51.2	32.9	32.9	611.8	17,700	3.5
1954	91.6	219.5	442.3	28.1	51.2	29.2	28.1	51.2	32.9	32.9	861.9	20,300	4.2
1955	49.7	230.9	675.9	28.1	51.2	32.9	28.1	51.2	32.9	32.9	1,068.7	23,500	4.5

a. See Table 28, Appendix B, p. 29, below.

b. For a discussion of value added in Soviet heavy industry, see Appendix B, pp. 24 and 25.

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Table 14

Expenditures for Alterations of Soviet Naval Vessels in 1955 Rubles a/
1946-55

Thousand 1955 Rubles

Year	Battleship	Cruiser	Destroyer	Minelayer	Minesweeper and		Submarine		Motor Torpedo Boat		Total
					Patrol Craft	Submarine	Boat	Boat			
1946	3,800	5,000	32,000	760	32,000	89,000	5,600	170,000			
1947	5,800	5,500	38,000	760	34,000	95,000	6,800	190,000			
1948	5,800	5,500	42,000	760	48,000	113,000	7,200	220,000			
1949	5,800	7,100	45,000	760	52,000	118,000	9,200	240,000			
1950	5,800	10,000	54,000	960	60,000	136,000	12,000	280,000			
1951	5,800	10,000	65,000	1,400	68,000	145,000	12,400	310,000			
1952	5,800	13,000	70,000	1,500	76,000	147,000	16,000	330,000			
1953	5,800	18,000	110,000	1,700	88,000	142,000	14,000	380,000			
1954	5,800	21,000	120,000	1,300	96,000	162,000	20,000	430,000			
1955	5,800	22,000	130,000	1,800	100,000	212,000	21,000	490,000			

a. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. See Tables 18 and 21, Appendix B, pp. 20 and 22, respectively, below. The ruble-dollar ratio used is four 1955 rubles to 1955 US \$1. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

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Table 15

Expenditures for Alterations of Soviet Naval Vessels in 1955 US Dollars a/
1946-55

Thousand 1955 US Dollars

Year	Battleship	Cruiser	Destroyer	Minelayer	Minesweeper and		Motor Torpedo Boat		Total
					Patrol Craft	Submarine	Submarine	Boat	
1946	958	1,250	8,070	190	8,100	22,300	1,400	42,300	
1947	1,440	1,380	9,390	190	8,400	23,800	1,700	46,200	
1948	1,440	1,380	10,600	190	12,000	28,300	1,800	56,000	
1949	1,440	1,770	11,300	190	13,000	29,400	2,300	59,600	
1950	1,440	2,500	13,600	240	15,000	33,900	3,000	69,700	
1951	1,440	2,500	16,300	340	17,000	36,200	3,100	76,500	
1952	1,440	3,220	17,600	370	19,000	36,800	4,000	82,100	
1953	1,440	4,440	27,400	430	22,000	35,600	3,500	94,800	
1954	1,440	5,169	30,700	330	24,000	40,500	5,000	107,000	
1955	1,440	5,520	32,200	440	25,000	53,000	5,300	123,000	

a. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. See Tables 18 and 21, Appendix B, pp. 20 and 22, respectively, below. The ruble-dollar ratio used is four 1955 rubles to 1955 US \$1. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

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Table 16

Expenditures for Maintenance of Soviet Naval Vessels in 1955 Rubles a/
1946-55

Thousand 1955 Rubles

Year	Battleship	Cruiser	Destroyer	Submarine	Minesweeper and Patrol Craft	Motor Torpedo Boat		Total
						Minesweeper and Patrol Craft	Motor Torpedo Boat	
1946	2,000	6,300	34,000	130,000	2,600	48,000	5,600	230,000
1947	3,000	7,000	40,000	130,000	2,600	52,000	6,800	240,000
1948	3,000	7,000	45,000	160,000	2,600	76,000	7,200	300,000
1949	3,000	8,900	48,000	170,000	2,600	80,000	9,200	320,000
1950	3,000	13,000	58,000	190,000	3,200	88,000	12,000	370,000
1951	3,000	13,000	69,000	200,000	4,600	100,000	12,000	400,000
1952	3,000	16,000	75,000	210,000	5,000	110,000	16,000	440,000
1953	3,000	22,000	120,000	200,000	5,800	130,000	14,000	500,000
1954	3,000	26,000	130,000	230,000	4,400	140,000	20,000	550,000
1955	3,000	28,000	137,000	300,000	6,000	150,000	21,000	640,000

a. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. See Tables 19 and 21, Appendix B, pp. 21 and 22, respectively, below. The ruble-dollar ratio used is four 1955 rubles to 1955 US \$1. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

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Table 17

Expenditures for Maintenance of Soviet Naval Vessels in 1955 US Dollars a/
1946-55

Thousand 1955 US Dollars

Year	Battleship	Cruiser	Destroyer	Submarine	Minelayer	Minesweeper and Torpedo Boat		Total
						Patrol Craft	Boat	
1946	505	1,570	8,560	31,500	641	12,000	1,400	56,300
1947	758	1,740	9,960	33,500	641	13,000	1,700	60,800
1948	758	1,740	11,200	39,900	641	19,000	1,800	74,600
1949	758	2,230	12,000	41,400	641	20,000	2,300	79,300
1950	758	3,140	14,400	47,900	808	22,000	3,000	92,400
1951	758	3,140	17,200	51,000	1,140	25,000	3,100	101,000
1952	758	4,060	18,700	51,900	1,250	28,000	4,000	109,000
1953	758	5,590	29,000	50,300	1,450	33,000	3,500	124,000
1954	758	6,510	32,500	57,100	1,110	36,000	5,000	139,000
1955	758	6,900	34,200	74,800	1,500	37,000	5,300	160,000

a. All data are rounded. Totals and percentages are derived from unrounded data and do not always agree with the rounded data shown. See Tables 19 and 21, Appendix B, pp. 21 and 22, respectively, below. The ruble-dollar ratio used is four 1955 rubles to 1955 US \$1. For a discussion of ruble-dollar ratios, see Appendix B, p. 24.

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APPENDIX B

METHODOLOGY

1. Number of Significant Digits and Decimal Places.

The data in this report are rounded to the appropriate number of significant digits and decimal places on the basis of careful consideration of the original data. For multiplication and division, no more significant digits were retained in the final answer than were contained in the item of original data having the smallest number of significant digits. For addition and subtraction, no more significant decimal places were retained in the final answer than were contained in the item of original data having the smallest number of significant decimal places.

2. Expenditures for Alterations and Maintenance.

The data used to estimate the expenditures for alterations and maintenance of Soviet naval vessels are based on the cost of alterations and maintenance for US ships of the same type, as shown in Tables 18* and 19,** respectively. The US data were furnished by the Bureau of Ships, US Navy, and approximate 1955 US prices. The US data were converted to a monthly basis by dividing total expenditures by the number of months in the alterations or maintenance cycle, as appropriate. Annual expenditure per ton then was derived and applied to the appropriate categories in the Soviet OB.***

It should be emphasized that the use of US experience as a basis for estimating Soviet expenditures probably overstates actual expenditures for both alterations and maintenance. Although expenditures for alterations probably are somewhat sporadic and uneven in their application, expenditures for maintenance are certainly more even and less subject to fluctuations. For this reason, estimates of expenditures for maintenance have a greater degree of reliability than those for alterations, although both have considerably less reliability than estimates of expenditures for new construction. Soviet expenditures probably are overstated. The safest assumption is that the figures obtained by the methodology described above are close to the upper limits of expenditures for alterations and maintenance of Soviet naval vessels during 1946-55.

3. Soviet Naval Vessels in the Order of Battle.

The OB information was converted into tons to secure a single aggregate for the entire Soviet Navy. The distribution of Soviet naval vessels

* Table 18 follows on p. 20.

** Table 19 follows on p. 21.

*** See 3 and 5, below.



Table 18

Expenditures for Alterations of US Naval Vessels a/

Type of Vessel b/	Length of Alteration Cycle (Months)	Expenditures		Annual Expenditures (1955 US \$ per Standard Displacement Ton)
		per Alteration Cycle	Monthly Expenditures	
		(Thousand 1955 US \$)		
Battleship	25	1,900	76	910
Cruiser	24	480	20	240
Destroyer	21	380	18	220
Submarine	20	480	24	290
Auxiliary cargo ship c/	22	100	4.8	58
Minesweeper and patrol craft			2.5 d/	30 d/
Motor torpedo boat			0.6 d/	7 d/
				100 d/
				1,800 d/

a. Except for minesweepers, patrol craft, and motor torpedo boats, data are from source 8/.

b. The standard displacement tonnage for a battleship is 45,000 tons; for a cruiser, 14,700 tons; for a destroyer, 2,400 tons; for a submarine, 1,600 tons; for an auxiliary cargo ship, 8,000 tons; for a minesweeper or a patrol craft, 300 tons; and for a motor torpedo boat, 40 tons.

c. The analogy is with minelayers.

d. Estimated by analogy with data for other vessels for which information was available, with consideration of differences in sizes and requirements of the vessels.

Table 19
Expenditures for Maintenance of US Naval Vessels a/

Type of Vessel b/	Length of Maintenance Cycle (Months)	Expenditures per Main-tenance Cycle	Expenditures		Annual Expenditures (1955 US \$ per Standard Displacement Ton)
			Monthly Expenditures	Annual Expenditures	
		Thousand 1955 US \$			
Battleship	25	1,000	40	480	11
Cruiser	24	600	25	300	20
Destroyer	21	400	19	230	95
Submarine	20	680	34	410	250
Auxiliary cargo ship c/	22	360	16	200	25
Minesweeper and patrol craft					
Motor torpedo boat			3.8 d/	45 d/	150 d/
			0.6 d/	7 d/	180 d/

- a. Except for minesweepers, patrol craft, and motor torpedo boats, data are from source 9/.
- b. The standard displacement tonnage for a battleship is 45,000 tons; for a cruiser, 14,700 tons; for a destroyer, 2,400 tons; for a submarine, 1,600 tons; for an auxiliary cargo ship, 8,000 tons; for a minesweeper or a patrol craft, 300 tons; and for a motor torpedo boat, 40 tons.
- c. The analogy is with minelayers.
- d. Estimated by analogy with data for other vessels for which information was available, with consideration of differences in size and requirements of the vessels.



in the OB, during 1946-55, is shown, in percentages, in Table 20, for selected years, and, in standard displacement tons, in Table 21. In 1955 the total tonnage of the Soviet Navy was 1,403 thousand tons. The distribution of tonnage in 1955 was 27 percent in destroyers, 24 percent in cruisers, 21 percent in submarines, and 28 percent in other types. The relative importance, as measured by tonnage, of cruisers and destroyers has increased since 1949, whereas that of submarines has declined somewhat.

Table 20

Distribution of Soviet Naval Vessels
in the Soviet Order of Battle in Percentages a/
1949, 1951, 1953, and 1955

Type of Vessel	Percent <u>b/</u>			
	1949	1951	1953	1955
Battleship	11	8	6	5
Cruiser	17	18	24	24
Destroyer	21	22	27	27
Minelayer	4	6	5	4
Minesweeper	16	15	12	11
Patrol craft	4	5	7	6
Motor torpedo boat	2	2	2	2
Submarine	25	24	17	21
Total	100	100	100	100

a. See Table 21, below.

b. Based on standard displacement tonnage.

Table 21

Distribution of Soviet Naval Vessels
in the Soviet Order of Battle, in Standard Displacement Tonnage a/
1946-55

Type of Vessel	Thousand Standard Displacement Tons									
	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Battleship	47	71	71	71	71	71	71	71	71	71
Cruiser	77	85	85	109	154	154	199	274	319	340
Destroyer	90	105	118	126	152	181	196	306	342	360
Minelayer	26	26	26	26	33	46	51	59	45	61
Minesweeper	60	60	97	105	120	122	142	143	158	159
Patrol craft	20	24	26	29	30	44	46	77	85	87
Motor torpedo boat	8	10	10	13	17	18	23	20	29	30
Submarine	124	132	157	163	189	201	204	198	225	295
Total	452	513	590	642	766	837	932	1,148	1,274	1,403
Index: 1950 = 100	59	67	77	84	100	109	122	150	166	183

a. 10/

Manning requirements, during 1946-55, for the Soviet OB, which are shown in Table 22, indicate that by 1955, it took 133,000 men afloat to satisfy the OB. This requirement is three times the 1946 figure. The ratio of tons in the OB to men, during 1946-55, is about 10 tons per man, as shown in Table 23. This ratio seems to exhibit much stability.

Table 22

Manning Requirements for Soviet Naval Vessels
in the Soviet Order of Battle a/
1946-55

Type of Vessel	Thousand Men									
	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Battleship	2.5	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Cruiser	6.6	7.3	7.3	9.1	12.6	12.6	15.6	20.6	23.6	24.8
Destroyer	11.1	12.8	14.3	15.2	18.2	21.3	22.9	34.1	38.3	40.8
Minesweeper	9.0	9.0	14.0	15.2	17.2	2.5	2.7	3.2	2.4	3.2
Minelayer	1.4	1.4	1.4	1.4	1.8	17.5	20.4	20.8	22.8	23.0
Patrol craft	4.8	5.3	5.8	6.1	6.3	10.9	11.3	15.4	16.7	16.9
Motor torpedo boat	1.6	1.9	2.1	2.6	3.4	3.6	4.5	4.0	5.3	6.1
Submarine	6.5	6.9	8.1	8.5	10.0	10.8	10.9	10.6	11.2	14.2
Total	43.5	48.2	56.6	61.7	73.1	82.8	91.9	112.3	123.9	132.6
Index: 1950 = 100	60	66	77	84	100	113	126	154	169	181

a. These data are for personnel afloat only. 11/

Table 23

Relation of Standard Displacement Tonnage to Manning Requirements
of Soviet Naval Vessels in the Soviet Order of Battle
1946-55

Year	Order of Battle <u>a/</u> (Thousand Standard Displacement Tons)	Manning Require- ments <u>b/</u> (Thousand Men)	Standard Displacement Ton per Man
1946	452	43.5	10.4
1947	513	48.2	10.6
1948	590	56.6	10.4
1949	642	61.7	10.4
1950	766	73.1	10.5
1951	837	82.8	10.1
1952	932	91.9	10.1
1953	1,148	112.3	10.2
1954	1,274	123.9	10.3
1955	1,403	132.6	10.6

a. See Table 21, p. 22, above.

b. These data are for personnel afloat only. See Table 22, above.

4. Costs.

The costs used to value Soviet naval vessels are the cost per ton of the same type of vessel to the US Navy. US Navy costs were secured from the Bureau of Ships, US Navy, in terms of 1955 labor and material prices. Costs of selected US naval vessels during 1955 are shown in Table 24.* In the case of the 2 sets of costs for minesweepers shown in Table 24, the average of the 2 was used to value Soviet minesweepers.

5. Ruble-Dollar Ratios.

Ruble-dollar ratios used in this report are 4.8 rubles to \$1 for new construction and 4.0 rubles to \$1 for expenditures for alterations and maintenance. The ruble-dollar ratios refer to 1955. These ratios are based on preliminary calculation for 1951 which took into account the following ruble-dollar ratios: steel, 11 rubles to \$1; electronics, 9 to 1; tanks and self-propelled guns, 5 to 1 (the analogy here is with armament and armor); and shipbuilding wages, 3.5 to 1. These ratios were used with data which broke down shipbuilding costs into labor and various component categories. Preliminary calculations for ratios of rubles to US dollars for cruisers, destroyers, and submarines in 1951 are shown in Table 25.** The basic ratios used for 1951 were 6 to 1 for new construction and 5 to 1 for alterations and maintenance. These ratios then were moved to 1955. Conversion of 1951 rubles to 1955 rubles is shown in Table 26;*** and the ratio of 1955 rubles to 1955 US dollars is shown in Table 27.****

6. Value Added.a. US Naval Vessels.

The value added for US naval vessels was estimated from US data, by type, and the resulting coefficients were applied to estimates of Soviet production. US data were furnished by the Bureau of Ships, US Navy. Computation of value added for new construction of selected US naval vessels during 1955 is shown in Table 28.†

b. Soviet Heavy Industry.

The calculation for value added by Soviet heavy industry was obtained first in 1950 rubles as shown in source 12/. These data, in billion 1950 rubles and by year, follow:

<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>
123	141	150	170	195	225

* Table 24 follows on p. 26.

** Table 25 follows on p. 27.

*** Table 26 follows on p. 28.

**** Table 27 follows on p. 28.

† Table 28 follows on p. 29.



The 1950 rubles were converted to 1950 US dollars at a ruble-dollar ratio of 11 to 1, which is the ruble-dollar ratio for heavy industry as calculated for source 13/. The 1950 dollars were converted to 1955 dollars by the use of the same deflators as were used in source 14/ for producers' durable equipment. One dollar's worth of producers' durable equipment in 1950 was found to cost \$1.142 in 1955. The final series, in billion 1955 US dollars and by year, follow:

<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>
12.7	14.6	15.5	17.7	20.3	23.5



Table 24

Costs of Selected US Naval Vessels a/
1955

Type of Vessel	Total Cost (Thousand 1955 US \$)	Tonnage (Standard Displacement Tons)	Cost per Standard Displacement Ton (1955 US \$)
Cruiser	77,532	13,600	5,701
Destroyer	29,966	2,800	10,702
Submarine	21,260	1,650	12,885
Fleet minesweeper b/	6,645	705	9,426
Coastal minesweeper b/	3,042	384	7,922
Patrol craft	2,920	300	9,734
Motor torpedo boat	538	35	15,372

a. 15/

b. The average of the 2 types of US minesweepers, \$8,647, has been used to value Soviet mine-sweepers.

Table 25

Preliminary Calculations for Ratios of Rubles to US Dollars
for Cruisers, Destroyers, and Submarines
1951

Equipment and Activity	Ratio of Rubles to US Dollars a/	Cruisers		Destroyers		Submarines	
		Million Rubles	Million US \$ b/	Million Rubles	Million US \$ b/	Million Rubles	Million US \$ b/
Materials	11 to 1	132	12.0	66	6.0	61	5.5
Propulsion machinery	6 to 1	42	7.0	27	4.5	9	1.5
Electronic equipment	9 to 1	4	0.4	5	0.6	5	0.6
Armor and armament	5 to 1	110	22.0	40	8.0	4	0.8
Power	15 to 1	15	1.0	5	0.3	8	0.5
Shore spares c/	6 to 1	13.2	2.2	3	0.5	8	1.3
Shipbuilding labor	3.5 to 1	115	32.9	35	10.1	39	11.1
Total cost		431	77.5	181	30.0	134	21.3
Ratio of rubles to US dollars for totals			5.6 to 1		6.0 to 1		6.3 to 1

a. The ratios for materials, electronic equipment, and power are from source 16/. Other ratios are estimated.

b. Except for power and shipbuilding labor, the data are from source 17/. Figures for power were estimated at 10 percent of the overhead. Figures for shipbuilding labor are residual. The dollar values are in 1955 prices. Thus, 1951 ratios for rubles to US dollars were weighted by 1955 values. The assumption was made that the relative values would have been substantially the same in 1951.

c. Shore spares are spare parts which are kept ashore and which have been specially procured for a particular ship or class of ships. The spares indicated here are counted in as original cost of ship because they are procured at the time the ship is built.

Table 26

Conversion of 1951 Rubles to Current Rubles

Year	Ruble Index <u>a/</u> (1951 = 100)	Value of Five 1951 Rubles <u>b/</u> (Current Rubles)	Value of Six 1951 Rubles <u>c/</u> (Current Rubles)
1950	106	5.3	6.4
1951	100	5.0	6.0
1952	94	4.7	5.6
1953	95	4.8	5.7
1954	93	4.6	5.6
1955	91	4.6	5.5

- a. 18/. Shipbuilding prices are assumed to move with investment goods.
 b. The ratio of 5 rubles to 1951 US \$1 is used in expenditures for alterations and maintenance.
 c. The ratio of 6 rubles to 1951 US \$1 is used in expenditures for new construction.

Table 27

Ratio of Current Rubles to 1955 US Dollars a/

Year	For Alterations and Maintenance	For New Construction
1950	4.7	5.6
1951	4.4	5.3
1952	4.2	5.0
1953	4.2	5.0
1954	4.1	4.9
1955	4.0	4.8

a. 19/. The ruble-dollar ratios in this table are derived by dividing the values obtained in Table 26, above, by 1.13, which is the estimated change in the value of a dollar expended in shipbuilding from 1951 to 1955. The index of shipbuilding costs in the US used in this table reflects changes in shipbuilding wages and materials as reported by the Bureau of Labor Statistics of the US Department of Labor. The index is as follows: 1950 -- 94, 1951 -- 100, 1952 -- 104, 1953 -- 109, 1954 -- 112, and 1955 -- 113. Although this index is based on merchant vessel costs, it has been applied in this report to naval vessel costs because it has been found to be a fairly reliable index for this use.

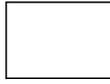


Table 28
 Computation of Value Added for New Construction of Selected US Naval Vessels a/
 1955

	Thousand 1955 US Dollars						
	Goods Purchased	Cruiser	Destroyer	Submarine	Minesweeper	Subchaser	Motor Torpedo Boat
Total cost	<u>77,532</u>	<u>29,966</u>	<u>21,260</u>	<u>6,645</u>	<u>2,920</u>	<u>538</u>	
Less purchases from other firms							
Materials (contractor-furnished)	10,900	3,861	4,143	899	410	77	
Materials (government-furnished) b/	30,452	14,660	4,425	2,251	1,487	162	
Power c/	1,000	340	460	55	38	5	
Shore spares and related items	2,190	450	1,300	425	48	6	
Total purchases from other firms	<u>44,542</u>	<u>19,311</u>	<u>10,328</u>	<u>3,630</u>	<u>1,983</u>	<u>250</u>	
Value added d/	32,990	10,655	10,932	3,015	937	288	
Value added as percent of total cost	43	36	51	45	32	54	

a. 20/

b. Includes propulsion machinery, electronic equipment, armament and armor, and other government-furnished materiel.

c. Calculated as 10 percent of overhead. This estimate is based on a price of 0.05 cents per kilowatt for electric power and the estimates of power input used in building of naval vessels.

d. The difference between the grand total and the total.



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APPENDIX C

GAPS IN INTELLIGENCE

There was no information on expenditures for alterations and for maintenance of the Soviet Navy. Nor was there available any cost information on Soviet naval vessels.

Additional analysis and information are needed to refine the ruble-dollar ratios used. Some refinement of estimates of expenditures for maintenance and alterations may be obtained from analysis of naval vessel movements [redacted] which may indicate Soviet practice with respect to the temporary retirement of vessels.

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APPENDIX D

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

<u>Source of Information</u>	<u>Information</u>
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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1. CIA. NIE 11-4-56, Soviet Capabilities and Probable Courses of Action Through 1961, 2 Aug 56, p. 75-80. TS.
 2. CIA. ORR Project 35.1037, Naval Ship Construction in the USSR, 1950-60 (to be published). TS
Navy. ONI-32R, Naval Vessels of the USSR, 25 Jun 56. S. Eval. RR 2.
 3. "Soviet Navy Seen 2d to That of the US," New York Times, 21 Sep 56, p. 40. U. Eval. RR 2.
 4. Navy. ONI-30SD, Strength and Disposition of Foreign Navies, revised, 10 Aug 56. S. Eval. RR 2.
 5. CIA. ORR Project 35.1037 (2, above).
 6. Ibid.
 7. Ibid.
 8. Navy, Bureau of Ships. Memorandum dated 6 Feb 56. C. Eval. RR 1.
 9. Ibid.
 10. Navy. ONI-30SD (4, above).
Navy. ONI-32R, (2, above).
 11. Navy. ONI-30SD (4, above).

12. CIA. CIA/RR 78, The Soviet Economy in 1955 and Plans for 1956-61, 21 Sep 56, p. 19. S.
13. CIA. ORR Project 10.824, Representative Ruble-Dollar Ratios (to be published). S.
14. President of the US. Economic Report of the President Transmitted to the Congress, 24 Jan 56, Washington, 1956, p. 165-166. U.
15. Navy, Bureau of Ships. Memorandum dated 19 Jan 56. OFF USE. Eval. RR 1.
16. CIA. ORR Project 10.824 (13, above).
17. Navy, Bureau of Ships (15, above).
18. CIA. CIA/RR RA 2, Unit-Cost Index for Capital Investment in the USSR, 1925-54, 18 Nov 55. C.
19. Commerce, Maritime Administration. Index of Shipbuilding Costs in the United States, 1956. U. Eval. RR 1.
20. Navy, Bureau of Ships (15, above).

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