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Construction And Investment At Admiralty Shipyard

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Foreword

This report is the latest in a series on the cost and timing of construction of buildings and facilities at the four Soviet installations known to be engaged in the production of nuclear-powered submarines. [redacted]

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Construction And Investment At Admiralty Shipyard

Background

1. Soviet efforts to build and deploy nuclear submarines have been under way for more than a decade. Since the launching of the first Soviet nuclear submarine in 1958, four years after the first US nuclear submarine was launched, the USSR has greatly accelerated its program. Soviet investments in shipyards and technology have resulted in growing numbers and types of nuclear submarines. The USSR now builds at least four third-generation classes of nuclear submarines, including a ballistic-missile type (Y-class) and three classes of attack-type (C, V, and [ ] class) submarines. It is quite likely that another attack-type submarine (A class) launched in Leningrad during 1969 will soon be identified as the fourth new class of nuclear-powered attack submarine. In addition, several Soviet nuclear-powered submarines of earlier production classes are being converted to enable them to undertake new operational missions. For example, three nuclear-powered cruise missile submarines (E-I class) are being converted to attack-class units.

2. The first shipyard in the USSR to launch a nuclear submarine was Severodvinsk Shipyard [ ], located west of Archangelsk. At least three other yards, Komsomolsk [ ], Gorkiy [ ], and Admiralty* [ ] at Leningrad, now are engaged in the nuclear submarine building program.

3. Admiralty Shipyard is the newest of the established nuclear submarine producers. Even after recent new investments, Admiralty remains a small yard in area and is made up largely of older buildings and structures. Located along the Neva River

* *Started in the early part of this century, Admiralty Shipyard has also been known at various times as the Marti Yard and the Krylov Yard. There were repair and wharf facilities at this location as early as 1850. The current name is taken from the nearby Admiralty Naval Center in Leningrad which now serves as a naval college.*

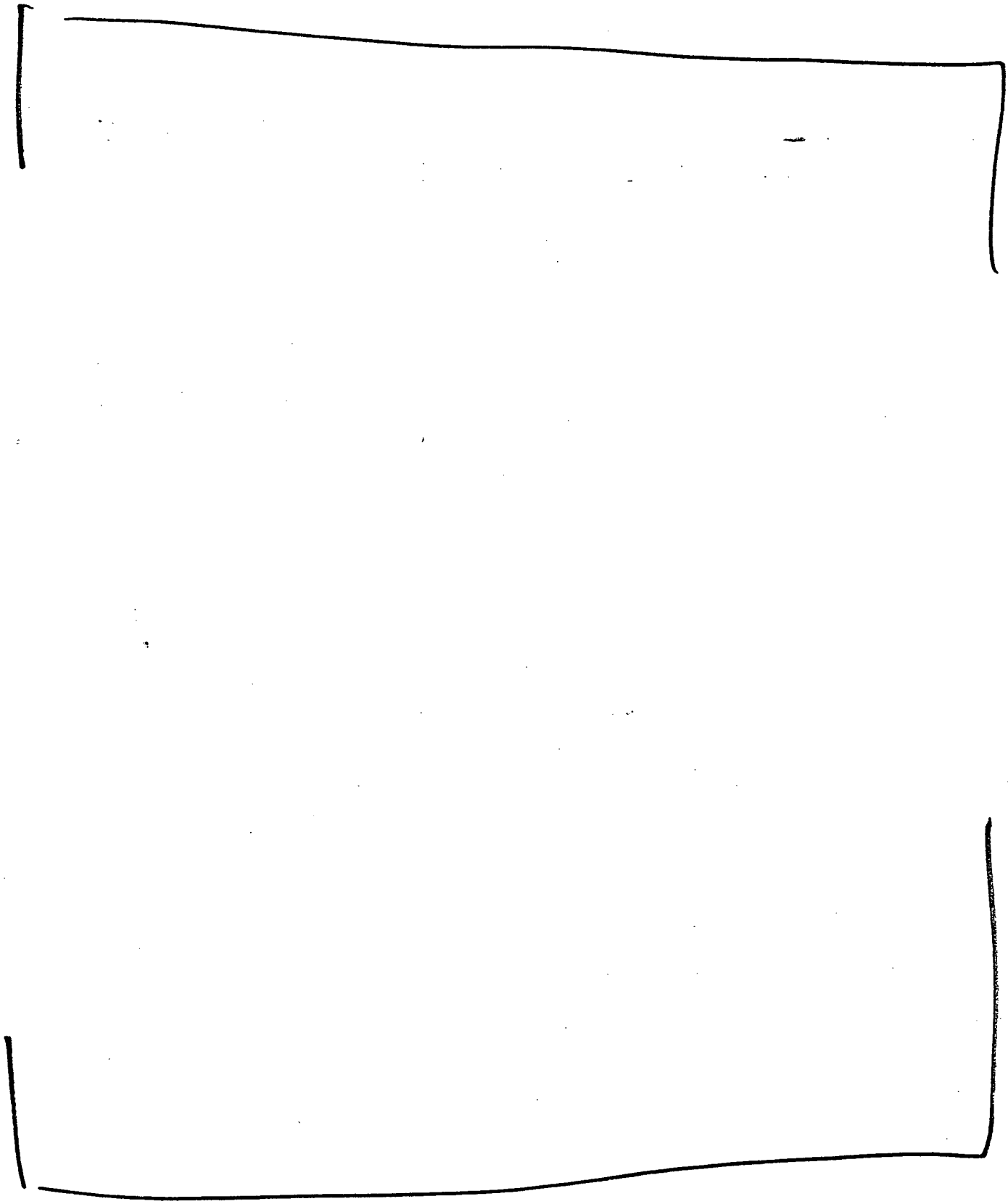
in Leningrad, Admiralty Shipyard has been known more for its output of merchant ships rather than naval ships. Merchant ship production has consisted of dry cargo ships and tankers, passenger ships, and fishing ships, including the newly launched 45,000-ton fish factory ship *Vostok* which is now fitting out at the shipyard berth. Although Admiralty Shipyard was a late entrant in the building program for nuclear submarines, it was the lead yard in nuclear powerplants for Soviet surface ships when it produced the world's first nuclear-powered icebreaker, *Lenin*. Naval ship construction has included a battleship (prior to World War II), cruisers, submarines, and motor gunboats.

Development

5. Construction and investment in facilities at Admiralty can be divided roughly into four phases: 1900-31, 1932-42, 1946-59, and 1960-69. Almost two-thirds of the yard's development took place prior to World War II. Of the remaining investment, the major share took place during phase three (1946-59) and less than 10% of total investment was completed in the last phase (1960-69) (see the table). Construction of new facilities related to the production of nuclear submarines has all taken place since 1960.

6. The earliest construction of facilities at Admiralty Shipyard -- mostly specialized workshops and shipbuilding halls -- took place on Galerny, one of three island-like areas separated by canals within the yard. The yard was first expanded northward from Galerny and later expanded southward to accommodate the hall and shops where submarine production now takes place. The main fabrication hall (1),* which includes subassembly and final assembly work on new submarines, fronts on the Fontanka Canal (12) where completed submarines are launched into floating docks and moved to fitting out berths nearby.

* *Numbers shown in parentheses after buildings and structures mentioned in the text refer to the numbering system used in the chart and in the Appendix where descriptions and other data are given for major buildings and structures at the shipyard.*



7. The basic industrial plant at Admiralty Shipyard includes about 100 buildings and structures. By contrast, two of the other three known Soviet yards producing nuclear submarines have less than one-half that number of buildings. The third, and largest yard, at Severodvinsk has a much larger number of buildings than Admiralty, but it is engaged in several different types of naval activities; Severodvinsk Shipyard alone contains about 172 buildings. Moreover, because Severodvinsk is an isolated area, it has a number of plants producing component parts and assemblies that are not available locally as they are in the Leningrad area.

8. Admiralty Shipyard shares a common boundary with Sudomekh Shipyard. There is no conclusive evidence that the two yards are associated with each other, but it is possible that they share processing of materials and that they jointly fabricate some assemblies and components. Each shipyard over the years has had a distinct type of end-product, but there have been examples of cooperation in past shipbuilding programs, including submarine production, at the two shipyards. In mid-1969 a new class of submarine (designated A-class), which is probably nuclear powered, was launched from Sudomekh Shipyard. In this case, some form of cooperation between Admiralty and Sudomekh must be considered a possibility because of Admiralty's long-time work in nuclear reactors and the previous history of cooperation by the two yards in submarine production. The A-class submarine launched at Sudomekh, however, is not a variant of the V-class produced at Admiralty.

Characteristics

9. Admiralty Shipyard has fewer buildings that are standard shipbuilding structures than the other yards which produce Soviet nuclear submarines. It is made up largely of industrial-type units laid out in a haphazard fashion that reflects the age of the shipyard. Two-thirds of the buildings are more than 25 years old and many approach 50 years.

10. Most of the shipyard's buildings are wooden-frame structures, but some all-brick buildings are located near the Neva River and at the eastern boundary with the city. Several of the brick units were originally apartment buildings which have been

converted into design and administrative offices. The limited size of many of the old buildings makes efficient production techniques difficult. Some of the smaller buildings probably are not used at all or are used only as warehouses. Whereas considerable work was undertaken at Gorkiy to rebuild and expand existing structures to adapt them to new uses, little construction along this line has taken place at Admiralty. Plans have been announced, however, to replace many of the older buildings at Admiralty with new shops and equipment.

11. The use of reinforced concrete wall panel construction has been confined to multibay units near the Sudomekh boundary area and at the south end of the yard. The main fabrication hall (1) for submarines is one of these units; it is now a modern industrial building which matches the quality of the main production buildings at other nuclear submarine yards. The hall probably was completed in 1955 and was built originally for the W-class submarine program which started to phase out before the facility came into production. Following the Soviet commitment to produce nuclear-powered submarines, the hall was enlarged during 1962-64 in preparation for production of the new V-class submarine. The enlargement of the main hall provided a new high-bay section (2) for assembling nuclear submarines. At the same time the overall building was doubled in size, the interior of the original building probably was remodeled and re-equipped, and a transverser system (3) was added to the south side of the hall for the movement of heavy hull sections between bays. The large subassembly facility and workshops (5) located immediately across the Fontanka Canal from the main hall probably are closely associated with the nuclear submarine program. These units, like the main hall, are constructed of heavy steel frame and concrete panels; some of the construction in this area was undertaken at the time the main hall was built for the W-class program.

12. The layout of both the main fabrication hall and the adjacent transverser is consistent with facilities built at other nuclear submarine producers. A subassembly building is missing, but construction is under way in an area adjacent to the main hall on what probably will be a subassembly-prefabrication building (4).

13. [C]

[U] *
The construction of a new subassembly building (4) near the main fabrication hall would permit stuffing and other allied production operations to be transferred from the main hall. In addition, the new facility would permit a more direct flow of hull sections to the final assembly area of the main hall and would release space in the eastern bays for other work.

14. It is evident from external construction features of the main hall [C]

[U] that heavy support columns were built in the high-bay during 1962-63. Such construction is consistent with requirements for heavy-duty cranes having capacities of 50 to 100 tons which are installed at other nuclear submarine producers. Given the yard's basic mission of building merchant ships, however, it is likely that the cranes in most shops are lightweight, lower capacity overhead bridge cranes. Outside, at the quays and the open building ways, there are many large portal-type cranes which are used mainly for moving large pieces for the fabrication of the cargo ships, icebreakers, fishing ships, and barges produced by the yard.

15. In comparison with other shipyards in the USSR, the unit costs of most of the buildings at Admiralty are relatively low, reflecting the quality of construction. The exceptions are the buildings devoted to nuclear submarine production, including both the main hall and the new subassembly facility (4). Construction costs for these units are even greater than their normally high relative costs because of the marshy construction sites. [C]

[U]

* *Stuffing consists of installing components, wiring, piping, and other equipment in hull sections which are later joined to other hull sections in final assembly.*

[ ] The original open building ways used for major surface ship production predate World War II and are little changed except for some postwar reconstruction work.

Capital Investment

16. Capital investment at Admiralty Shipyard is estimated at $89 million (see the table). Of this total only about $7 million, or 8%, took place during 1960-69 when submarine-related facilities were being constructed. Investment expenditures for the submarine program at Admiralty are the smallest of any of the nuclear submarine producers. At Gorkiy Shipyard, for example, investment during 1960-68 was more than $60 million, and roughly comparable expenditures were made at the other nuclear submarine yards in the USSR. Estimates of investment related to nuclear submarine production at Admiralty do not include internal modifications to the original main fabrication hall (1) that might have been made when the high-bay section was constructed; such costs probably would not have exceeded $1 million. Moreover, investment estimates include only the early construction work (less than $100,000) on the probable subassembly facility (4). This facility probably will represent an investment of more than $2 million when completed.

17. Of total investment, the cost of construction of existing buildings and structures at Admiralty Shipyard is estimated at nearly $48 million. About $4 million of the construction costs are directly related to the new submarine production program. Estimates of construction costs were obtained by costing each building and structure, including transportation lines and utilities. Ruble costs were derived from Soviet construction handbooks and include all direct costs, overhead, profits, costs for temporary buildings, and other indirect costs. Only buildings and structures under construction and substantially complete are included in this estimate. The inclusion of the probable subassembly building, which is under construction, would add about $1 million to $2 million to building costs since 1960.

18. Some of the buildings required the use of cost data not included in the Soviet handbook for construction in the shipbuilding industry. For example, the enlarged main fabrication hall exceeds the size limitations for standard Soviet assembly buildings. In this case, construction rates for the machine building and aircraft industries were used, as recommended in Soviet practice whenever suitable buildings and structures are not contained in a particular industry handbook. There were no special costs added for either climatic or locational conditions as Leningrad is in the base zone used to determine such cost factors.

19. The estimated total cost of miscellaneous investment for the construction of Admiralty Shipyard is about $7 million. Miscellaneous investment includes design and engineering services, building inspection, and the training of production cadres.

20. The cost of installed equipment at Admiralty Shipyard is about $34 million, or 38% of the total capital investment in the yard. The cost of equipment was estimated in relation to the cost of construction of buildings and structures. Studies show that there is a reasonably consistent relationship between these costs in Soviet industries. A recent Soviet study on the economics of shipbuilding gave the shares of equipment which were used in this report. Similar studies were used to fix the share of miscellaneous investment costs which are calculated in relation to the costs of buildings and structures.

Conclusions

21. Admiralty Shipyard was the first Soviet shipyard to produce a nuclear-powered surface ship, the celebrated icebreaker *Lenin*, but it did not launch its first nuclear-powered submarine until 1966 after nuclear-powered units had been produced at Severodvinsk, Komsomolsk, and Gorkiy. The production of nuclear submarines at Admiralty Shipyard was initiated with an investment in new facilities of only about $7 million compared with

investment expenditures on the order of $60 million for each of the other producers of nuclear submarines.

22. The achievement of Admiralty Shipyard in producing a new class of nuclear submarine despite the small outward changes in its basic plant is linked to its location and to its highly skilled workers. Leningrad, with its numerous maritime and industrial installations, is a source of shipbuilding components, materials, and personnel probably without comparison in the USSR. The adjacent location of Sudomekh Shipyard, another submarine builder, may have been a factor in the choice of Admiralty for the new program. The earlier choice of Admiralty to build the nuclear-powered icebreaker *Lenin* underlines the skills of the yard's staff and the high-quality production capability of the plant despite its external appearance. Although primarily a producer of surface ships, Admiralty has produced submarines prior to the V-class.

23. Production of a nuclear submarine at Admiralty Shipyard, even though there were few apparent changes in facilities at the yard, was a remarkable accomplishment, matched by no other Soviet producer. But it now is evident that while the size of the facilities construction program there does not compare with other yards it will include the set of facilities associated with Soviet nuclear submarine production. Thus a large main assembly hall was created when an older one was enlarged. Next, a transverser was built for moving hull sections between stages of production from prefabrication to stuffing to final assembly. Currently, a probable subassembly facility is being built adjacent to the other two units, completing the set. At present a major share of the subassembly work on the V-class submarine probably is carried on in the main assembly hall. The addition of the new building, which could be near completion during 1970, should add significantly to the efficiency of the nuclear submarine production program at Admiralty Shipyard.

Capital Investment at Admiralty Shipyard

Thousand 1965 US $

Major Components	Phase One (1900-31)	Phase Two (1932-42)	Phase Three (1946-59)	Phase Four (1960-69)	Total
Buildings and structures	14,926	16,543	12,385	3,826	47,680
Miscellaneous investment	2,239	2,482	1,858	574	7,153
Equipment	10,545	11,687	8,750	2,703	33,685
Total	*27,710*	*30,712*	*22,993*	*7,103*	*88,518*

TOP SECRET

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APPENDIX

Major Buildings and Structures at Admiralty Shipyard

Number	Identification	[redacted]	Remarks
1	Main fabrication hall	[redacted]	Submarine assembly facilities. Includes high-bay (2). Original construction started 1953; enlarged 1962-64. Estimated cost, $5.7 million ($2.9 million new construction).
2	High-bay section/ assembly	[redacted]	Main building ways for submarines. Estimated cost, $1.8 million. Contains two ways.
3	Transverser	[redacted]	Contains seven rail sets; used to transfer materials and hulls between bays. Will link new building (4) with assembly hall. Cost: $300,000.
4	Subassembly building	--	Under construction.
5	Subassembly shops	[redacted]	Probably connected with subassembly work on hulls and components for V-class submarines. Estimated cost, $823,000.

TOP SECRET

Major Buildings and Structures at Admiralty Shipyard
(Continued)

Number	Identification	[redacted]	Remarks
6	Open building ways	--	Hull fabrication for submarines takes place adjacent to ways (used for surface ships).
7	Subassembly shops	[redacted]	Old assembly hall and special shops, possibly associated with new submarine construction. Built during 1939-42.
8	Offices	[redacted]	Old style apartment building; shops and offices. Constructed in 1940.
9	Laboratory/administration building	[redacted]	Modern building constructed during 1965-66. Cost: $380,000.
10	Machine shop	[redacted]	High-bay general machine shop. Constructed during 1954-56; cost, $590,000.
11	Fire department	[redacted]	Also contains water and sewage facilities. Constructed in 1960.

Major Buildings and Structures at Admiralty Shipyard
(Continued)

Number	Identification	[redacted]	Remarks
12	Fontanka canal	--	Major waterway through yard; launch area (see 1, above).
13	Assembly workshop	[redacted]	Built in 1940-42; remodeled in 1958. Cost: $800,000.
14	Carpenter shop	[redacted]	Pattern work and general carpentry. Built in 1939.
15	Combination shops	[redacted]	Built in the early 1930s. Estimated cost, $300,000. Also used for storage.
16	Administrative building	[redacted]	Built for combination school and living quarters. Built in the early 1930s and 1940s (remodeled).
17	Administrative building	[redacted]	See 16, above.
18	Oxygen station	[redacted]	Also identified as powerplant. Built in 1940.

TOP SECRET

Major Buildings and Structures at Admiralty Shipyard
(Continued)

Number	Identification	[redacted]	[redacted]	Remarks
19	Entry and administration building	--		Complex includes garage, sentry houses, and offices. Built in 1941, 1942, and 1946-48. Total cost estimated at $137,000
20	Quay	[redacted]		Built in 1941-42 and 1948-50. Used for materials deliveries and fitting out. Estimated cost, $1.2 million.
21	Machine shop complex	--		Five units, including a small power station. Built during 1937-47. Estimated cost, $1.3 million.
22	Machine shop	[redacted]		Built during 1942-48. Cost, $355,000.
23	Warehouse	[redacted]		General storage, materials. Built in 1940. Cost, $118,000.
24	Fabrication shop	[redacted]		Plate-working. Built during 1940-42. Estimated cost, $166,000.

TOP SECRET

Major Buildings and Structures at Admiralty Shipyard
(Continued)

Number	Identification	[redacted]	Remarks
25	Subassembly hall	[redacted]	Originally built during 1937-39; added to in 1967. Total cost, $828,000.
26	Fabrication complex	--	Five-unit combination machine shops, offices, and storage. Built during 1937-50.
27	Machine shop	[redacted]	Major machine installation. Possibly serves both Admiralty and Sudomekh. Built before 1939. Cost, $513,000.
28	Laboratory/administration building	[redacted]	Modern building, constructed in 1966. Cost, $380,000.

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