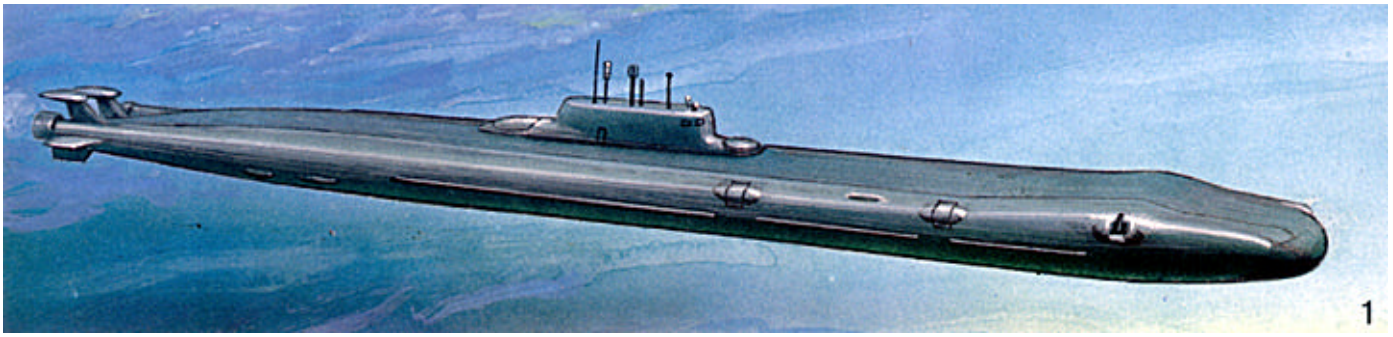


UNDERWATER TRANSPORT LEVIATHANS

★ Radii Shmakov, Vsevolod Zharkov ★

1.
Large nuclear troop-landing/transport/ mine-laying submarine of Project 717

In the early 1950s, the Navy prepared proposals for the project-definition study on a mine-laying submarine capable of taking on board not less than 80 mines.

Originally, the task to build the submarine and the relevant proposals were forwarded by the State Committee for Shipbuilding to TsKB-18 (Central Design Bureau #18). At that time the Bureau was headed by P. Pustyntsev. The project's Chief Designer was Ya. Yevgraphov.

The development work on the mine-laying submarine (Project 632) was revived in the first quarter of 1956. Some time later, when project documentation was 33 percent complete, the task was relegated to TsKB-16 (in 1974, TsKB-16 and SKB-143 merged to form the present St. Petersburg Malachite Marine Engineering Bureau).

Under the concept, the large mine-laying submarine, powered by a diesel-electric plant, was supposed to take on board 80 to 100 PLT-6 mines developed specifically for submarine-laying. Moreover, engineers were tasked to produce a design of the submarine that could be reengineered into a submersible transport capable of carrying troops, fuels and oils.

In September 1958, the design of the Project 632 mine-laying submarine was accepted, but a decision was taken to build a more capable similar-purpose vessel propelled by a diesel-electric power plant and equipped with silver-zinc batteries. The submarine was code-named Project 648.

Proposals for the project-definition study on this submarine were being developed concurrently with those on the Project 632 diesel electric submarine and were approved by the Commander in Chief of the Navy in May, 1957.

Originally, the Project 648 diesel-electric submarine was conceived as a purely transport vessel designed to supply strike submarines, subordinate to the job of patrolling the enemy's sea and ocean communication lanes, with torpedoes and missiles (cruise missiles), fuel, lubricants, provisions, fresh water, and air regeneration facilities, as well as supply amphibian planes with fuel at sea.

The chief designer of the Project 648 submarine was N. Kiselev.

In March 1958, five alternative conceptual designs were submitted to the Main Shipbuilding Directorate for consideration. A month earlier, the conceptual design of the Project 632 mine-laying submarine was accepted. The similarity of the missions for which the two ships were designed made simultaneous implementation of the projects impracticable.

Radii Shmakov
Chief Designer of the Malachite Marine Engineering Bureau, St. Petersburg
Vsevolod Zharkov
is a Deputy Chief Designer

Three months later, on July10, 1958, a new conceptual design of the Project 648 submarine, based on new project-definition proposals, was accepted. Under the new conceptual design, the submarine was additionally tasked with mine-laying missions, as the work on the Project 632 submarine was terminated.

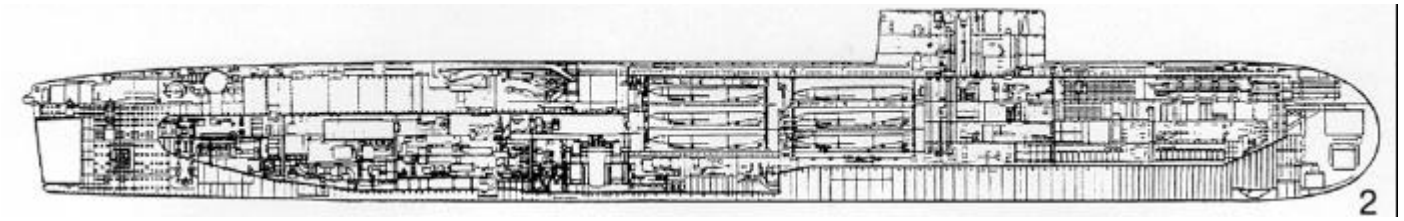
The new project-definition proposals for the Project 648 large mine-laying submarine classified its purpose as a supplier (of cruise missiles, torpedoes, fuels, lubricants and life-support means) to combat submarines operating on an enemy's sea and ocean communication routes; transporter of personnel and various cargoes to remote points on unprepared shores; mine-laying ship operating on the enemy's communication routes.

The new project-definition proposals outlined the types of cargoes, mines and torpedoes to be carried by the submarine and prescribed new basic construction and performance specifications (see the Table.)

In March 1959, the design project was submitted to naval authorities in Moscow for consideration. The submarine's specifications defined her roles as prescribed by the project-definition proposals, except for the amphibian aircraft refueling (at sea) capability.

Following comprehensive coverage, the design project was given joint approval by the authorities of the Navy and Ministry of Shipbuilding Industry and the Bureau was obligated to hand over all working drawings to the Severnoye Machine-Building Enterprise (SME).

The submarine was laid down early in 1961. The problems of construction were severe. The plant's director tried to get the work relegated to another shipbuilder, because the covered slipways on which the mine-laying submarine could have been built were occupied by first-generation missile submarines. Moreover, the plant had an order for the construction of a large group of



2.

Cut-out view of Project 664 nuclear transport/mine-laying submarine

Project 667A submarines. The director's point of view was supported by proponents at the Ministry of the Shipbuilding Industry and Main Shipbuilding Directorate, the more so, by that time the fleet had already placed an order for the development of a similar-purpose submarine equipped with a nuclear power plant. Naturally, this submarine outstripped the diesel-electric boat in terms of her basic capabilities.

Having weighed all pros and cons of the matter, the Soviet Government issued a resolution, dated 21 June 1961, under which the construction of the Project 648 submarine was stopped. N. Kiselev, who had previously directed the development work on the Project 648 diesel-electric submarine, was appointed Chief Designer of the Project 664 nuclear boat. As the interests of various armed services, including the Army and Air Force, were in conflict, the project-definition proposals were approved by the Defense Minister on 1 March 1960, following lengthy deliberations. The Army's requirement was to considerably broaden the type range of the landing force assets that could be transported by the vessel, but the officials of the Navy refused to complicate the existing design. In September that year, four alternative conceptual designs of the large nuclear troop-landing/transport/mine-laying submarine were submitted to the customer. They differed mainly in the inner hull architecture and power plant components. While in the first three alternatives the inner hull was cylindrical, in the fourth it had a double-eight figure configuration, where three cylinders intersect in the horizontal plane. Such a configuration considerably reduced the ship's length and increased her breadth. The submarine had two cargo load/unload lines, making her heavier but reducing the time required to load/unload cargoes.

Under the resolution, dated 19 April 1962, passed by the Ministry of the Shipbuilding Industry and the Navy, the project-definition proposals were approved, but the submarine's basic characteristics were approved only in late December 1962. The resolution defined the submarine construction terms and procedures.

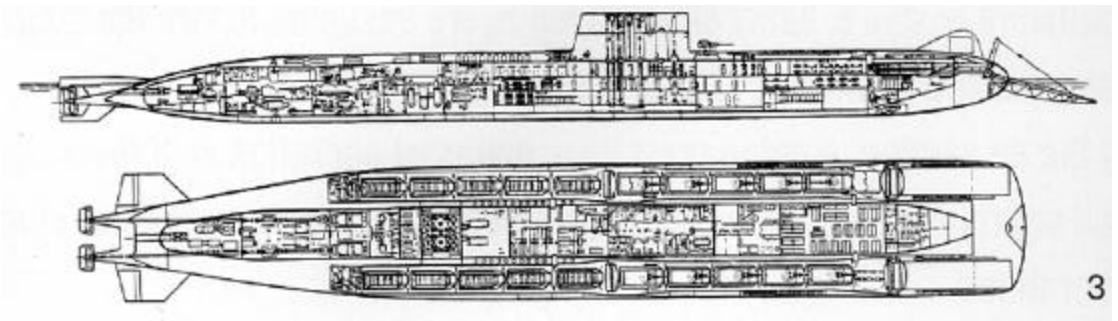
The Bureau was supposed to provide the plant with the drawings of the ship's hulls by the end of the next year and with the entire set of the working drawings by June 1964. Due to the triple-purpose submarine's design complexity, the failure of subcontractors to timely develop component equipment items and inability of researchers to implement their relevant developments on schedule, the Bureau failed to produce the working drawings as had been originally planned. And only at the end of 1964 a few diesel-electric submarines were retrofitted at naval ship repair plant #35 (SRZ-35) to conduct experiments on the transfer of fuel from the transport submarine into a strike diesel-electric submarine towed in the surfaced and dived positions. Trials in diverse weather conditions were conducted in the cold Barents Sea. There were successful trials during which the B-82 (Project 611) diesel-electric submarine towed the S-346 (Project 613) diesel-electric boat, a fuel-filling hose was extended to the boat being refueled, and the two submarines dived together. As the entire system proved effective, it was accepted for service and installation on board the Project 664 nuclear submarine.

In 1964, the ship was laid down and all major technological preparations were made. Early next year, the plant's director requested the Ministry of the Shipbuilding Industry to transfer the construction of the submarine to a shipbuilding plant in Leningrad and promised to build two nuclear ballistic missile submarines instead (as it was in the case of the Project 648 diesel-electric submarine). And despite the fact that the plant had already finished all welding operations involving 1,000 tons of hull and other metal structures, a decision was made to stop the work.

Although the construction of the Project 664 nuclear submarine was terminated due to the pressing need for the maintenance of nuclear missile parity at sea, the naval specialists and specialists at the General Headquarters of the Soviet Army did not give up the idea of building a troop-landing/transport submarine, capable of delivering a marine landing force to remote areas of the ocean. Therefore, the development of the troop-landing submarine was again included in the new five-year (1965 - 1970) shipbuilding plan.

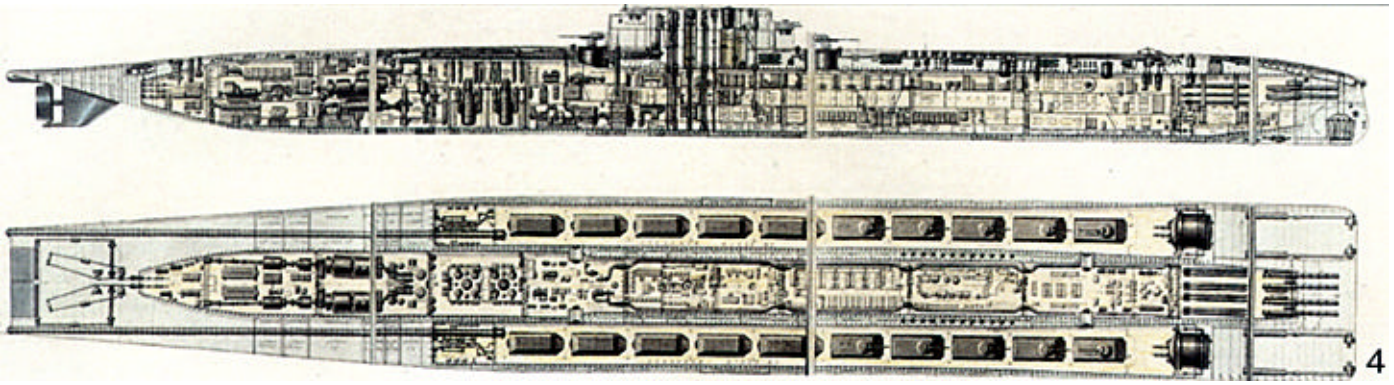
In August 1965, the Bureau was tasked to develop a troop-landing diesel-electric submarine (Project 748) that was intended to covertly transport sea landing parties and lodge them on an unprepared coast, take on board landing parties and the wounded and bring them back to home base or carry them to other points on the enemy-occupied coast. The submarinel was also supposed to furnish ammunition, food and other supplies to troops operating far from shores occupied by friendly forces.

Under the design concept, the submarine would have been equipped with a diesel-electric power



3.

Cut-out view of Project 748 troop-landing submarine equipped with nuclear power plant



4.

Cut-out view of Project 717 nuclear submarine

plant and take on board a 470-men strong landing party (up to a reinforced battalion of marines) with organic arms and equipment, three amphibious tanks, two armored personnel carriers, six company-level mortars, machine guns, and small arms. The work was headed by N. Kiselev. Development of the submarine design concept was started in August 1965. However, two months later, the Main Shipbuilding Directorate submitted for consideration two additional alternatives of a submarine equipped with a nuclear power plant and asked to study the feasibility of using the boat in the mine-laying role.

As the submarine was intended to carry a large number of landing troops, as well as tanks and APCs and discharge the vehicles into the water under their own power, the Chief Designer offered a unique architecture of the inner hull made up of three separate cylinders arranged one beside another, providing for the most rational accommodation of the boat's machinery, equipment and crew and the landing party's personnel and equipment.

At the forward end of the boat there were two ramps designed to deliver vehicles and landing troops ashore. The submarine's breadth provided for her minimal draught and 50 percent floatage.

The specific configuration of the twin-shaft after end proved its worth on the super high-speed submarine of Project 661 and attributed to her controllability and course-keeping qualities.

Consequently, the Bureau's standpoint was to proceed with the development of the project of such a ship that would be powered with a nuclear plant and have an inner hull made up of three cylinders.

When the conceptual design was delivered to the customer, it was not accepted. However, the ship's design documentation was used to develop the next and last Soviet troop-landing/transport/mine-laying submarine.

Fully committed to the development of such a submarine, the marine specialists of the Main Shipbuilding Directorate convinced naval authorities of the expediency of developing a design of a large nuclear troop-landing/transport/mine-laying submarine (Project 717).

Under the project-definition proposals, the submarine was intended to covertly deliver sea landing parties, military hardware, ammunition, fuel, food and other cargoes to remote ocean areas, including reinforcements to garrisons blocked by the enemy. The submarine was also designed to evacuate troop units and wounded personnel from isolated coastal areas and islands, and install active mine obstacles in remote regions of the ocean. By that time, the team of engineers headed by N. Kiselev, Chief Designer, had accumulated a decade-long experience in designing transport/mine-laying submarines, and, naturally, it was given the task of developing the new design. Moreover, the designers were obliged to make the maximum possible use of the equipment that had been developed for the Project 664 submarine.

The Chief Designer's decision was to accept the architecture of the Project 748 boat for the future submarine to make it capable of carrying vehicles and large contingents of troops. The ship's hull was made up of three level cylinders. The middle cylinder had the largest diameter and accommodated the ship's weaponry and crew, sea landing party, equipment and power systems. The port and starboard cylinders were of a smaller diameter and accommodated vehicles or various cargoes, or mines.

While outfitting the fore and aft sections of the ship the designers faced the most complex problems.

The fore section must have accommodated torpedo tubes, sonar transducers, for which sufficient scan angles must have been provided, ramps to deliver sea party's hard-

The fore section must have accommodated torpedo tubes, sonar transducers, for which sufficient scan angles must have been provided, ramps to deliver sea party's hardware onshore, bulky onboard hardware designed to turn the landing party's vehicles and place them close to one another, and other devices.

In the aft section, nothing must have hindered operation of screws and rudders and appropriate measures must have been taken to ensure safety of mine-laying operations.

Basic Specifications of Transport/Mine-Laying Submarines

Project	**632** dp*	**648** dp	**664** dp	**748** cd**	**717** dp
Standard displacement, m^3	3,200	6,000	10,150	10,000 - 11,000***	about 18,000
Length, m	85	102	140.9	150-160***	about 190
Breadth, m		12.8	14.2	20-21***	about 23
Diving depth, m	300	300	300	300	300
Full submerged speed, knots	15	12.5	18	about 10 (17***)	17-18
Cruising range, miles	30	25	30,000	15 (30,000***)	30,000
Cruising range, underwater, at 2.5 knots economic speed, miles	about 700	about 550	-	60	-
Endurance, days	80	80	80	80	75
underwater incl., h	800		1,920	600	1,800
landing party incl., h	-	-	-	150 or 720	240
Armament:					
torpedo tubes, 53cm	4	4	6	4	6
torpedoes	4	4	18	14	18
torpedo tubes, 40cm	4	4	-	-	-
torpedoes	12	22			
Mines:					
RM-1 or APM, Lira, Serpey, UDM, pc	88	98	162	in place of torpedoes	252
or PM-1, RM-2 and PM-2			112		126
Freight:					
cruise missiles, pc	-	10 (P-5, P-6)	20 (P-5, P-6, P-7)		
or 53cm torpedoes		40	80		
PT-76 amphibious tanks	-	-	-	10	10
BTR-60P APCs	-	-	-	10	10
or marines with personal weapons				1,200	800 and 4 APCs

NOTES:
* design project
** conceptual design
*** nuclear power plant version

ware onshore, bulky onboard hardware designed to turn the landing party's vehicles and place them close to one another, and other devices.

In the aft section, nothing must have hindered operation of screws and rudders and appropriate measures must have been taken to ensure safety of mine-laying operations.

The complexity of the ship's architecture demanded that the designers create a host of scaled mock-ups to better comprehend the relative location of all elements and obtain satisfactory hull hydrodynamic characteristics.

At the time of the submarine's conceptual design examination, engineers were tasked to incorporate into it a crew rescue capability to be realized via specific crew rescue projectiles should the submarine sink. The additional capability involved a considerable reworking of the design project.

The submarine's design project was completed at the end of 1971 and approved in March 1972.

A decision was made to build five ships. The SME was the only enterprise that could build large ships. However, the problem of achieving nuclear parity with the USA again emerged on the way to the implementation of this project.

To counter the USA's Trident nuclear ballistic missile submarine program, the SME launched preparations for the construction of the Typhoon class large ballistic missile submarine. And in exactly the same way as in the case of the submarines of Projects 648 and 664, priority was given to the strategic missile boat. The development work on the nuclear troop-landing/transport/mine-laying submarine was stopped.