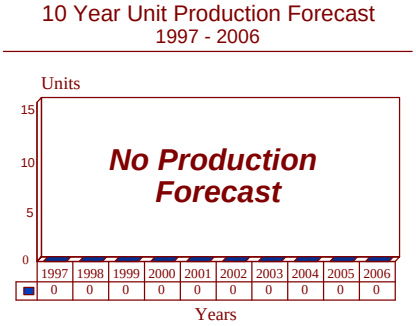
Oscar II Class (Project 949A) - Archived 3/98

Outlook

- Very large cruise-missile submarine; silos outside pressure hull
- Dedicated carrier killer
- Cargo version offered for export
- Little prospects for civilian sales
- Only possible buyers are countries that would reconvert to missile use



Orientation

Description. Nuclear-powered submarine carrying cruise missiles.

Sponsor
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Contractor
Sevmashpredpriyatie Production Association
Severodvinsk Shipyard 42
Severodvinsk
Russia

Licensee. No production licenses have been granted.

Status. In service.

Total Produced. A total of two Oscar and ten Oscar II class submarines have been commissioned. Two additional Oscar IIs, the K-512 and K-530, were canceled when they were 40 percent and 20 percent complete, respectively.

Pennant List

Name	Ordered	In Service
K-525 *Archangelesk*[(a)]	1972	12/1980
K-206 *Murmansk*[(a)]	1973	1981
K-148 *Krasnodar*[(b)]	1978	1986
K-132 *Belgorod*[(b)]	1979	1987
K-119 *Voronezh*[(b)]	1980	1988
K-173 *Tomsk*[(b)]	1981	1989
K-410 *Smolensk*[(b)]	1982	1990
K-442 *Omsk*[(b)]	1983	1991

Name	Ordered	In Service
K-456 *Kasatka*[b]	1984	1991
K-266 *Orel*[b]	1985	1991
K-380 *Severodinsk*[b]	1986	1992
K-186 *Pskov*[b]	1987	10/1993
K-141 *Kursk*[b]	1988	1/1995
K-512[b]	1989	Canceled 1993
K-530[b]	1990	Canceled 1993

[a]Oscar class
[b]Oscar II class

Application. The Oscar II class (Project 949A) submarines, as well as their predecessor Oscar (Project 949), are very large nuclear-powered submarines carrying heavy anti-ship cruise missiles, with a particular task of attacking and destroying US Navy's Carrier Battle Groups in the Norwegian Sea.

Price Range. No cost has ever been formally attributed to these submarines. However, their sheer size and sophisticated equipment fits strongly suggest that they could not have cost less than around US$3.0 billion.

Technical Data

Characteristics

Speed:	28 kts (dived), 19 kts (surfaced)
Endurance:	90 days
Crew:	130

Dimensions	**Metric**	**US**
Length:	154.0 m	505.2 ft
Beam (waterline):	18.2 m	59.7 ft
Beam (extreme):	20.1 m	65.9 ft
Draft:	9.0 m	29.5 ft
Displacement (Surface):	13,400 tons	
Displacement (Submerged):	18,000 tons	
Diving Depth:	300 m	1000 ft

Armament	**Type**	**Number**
Missiles:	P-700 Granit (SSN-19)	24
	P-100 Oniks (SSN-22)	4
	85-R (SSN-16)	4
Torpedo tubes:	65 cm	2
	53 cm	4
Torpedoes:	Total	16

Electronics	**Type**	**Number**
Radar:		
Navigation/FCS	MRK-50 Tobol (Snoop Pair)	1
Sonar:		
Integrated suite	MGK-503 Skat	1
Electronic warfare:		
ESM/FCS:	Kremlin-2 (Rim Hat)	1
HF/DF:	Khrom-KM (Park Lamp)	1
Command Control:		
SATCOM:	Tsunami (Punch Bowl)	1
Navigation complex:	Medvedka-949M	1

Propulsion	**Type**	**Quantity**
Nuclear reactors:	OK-650B	2x85 MW
Turbines:	GTZA OK-9	2x49,000 shp
Turbogenerators:	DG-190	4x3,200 KW
Shafts:	2	

Design Features. The Oscar II (Antey II) class submarines, also known as Project 949A, are relatively conventional in design, if their huge size is discounted. The pressure hull is a high-tensile steel cylinder, 11 meters in diameter. Cross-section diagrams appear to show this pressure hull volume divided into five decks, suggesting that the internal deck headspace is in the order of two meters, which makes for cramped living conditions.

The circular pressure hull is surrounded by an oblate external casing fitted with a large number of free-flood holes. The Oscar II's predecessor, the Oscar (or Antey) class (Project 949) was reputed to be an extremely quiet submarine; this implies that the free-flood holes were provided with snap-action closures and the same is expected to apply for the Oscar IIs. The outer casing is believed to be built of mild steel since it does not have to resist a pressure gradient.

Twelve P-700 or P-750 launch tubes are installed on each beam. These are arranged in horizonal pairs, each pair being covered by a single hatch. This arrangement means that there is a 4.5-meter stand-off distance between the outer casing and the pressure hull, a feature of great value in resisting damage from ice or Mk.48 torpedoes.

The stern configuration is the normal beavertail design used by the Russian navy for their larger submarines. This has two shafts placed on the extreme beam of the stern with a large diving plane between them. The separation of the two shafts is intended to remove the propellers from the turbulence caused by the sail, thus eliminating blade-beat. The arrangement of the propellers is ambiguous. Some drawings show single, seven-blades scythe propellers on each shaft but others show two six-bladed counter-rotating propellers with a divergent angle of 22.5 degrees per shaft. Both arrangements were used on the contemporary Project 671RTM/RTMK (Victor III) class submarines, so it is possible that both designs are used on the Oscar and Oscar II class.

The stern itself has the exaggerated, elongated lines frequently used by Russian submarines. This gives excellent streamlining aft at cost of buoyancy at the rear end of the moment arm. The sail structure is long, broad and relatively low, again probably in the interests of streamlining.

The submarine is provided with two OK-650B pressurized water nuclear reactors delivering 89 MW each. These drive two GTZA OK-9 turbines delivering 49,000 shp each. Although the internal details cannot be confirmed at this time, it appears that the machinery is arranged in two trains, each consisting of a nuclear reactor, a turbine and two turbo-generators. There are probably also emergency diesel generators but these have not been confirmed.

Operational Characteristics. The primary weapon of the Oscar and Oscar II is the P-700 (SSN-19) Granit anti-ship cruise missile. A battery of 24 missiles is carried in angled external launch tubes. The P-700 is an advanced version of the P-7D (SSN-3) anti-ship missile. The missile is 10 meters long, weighs 9.5 metric tonnes and is powered by an underslung turbojet. It has a range of around 300 nautical miles and a speed of Mach 2.5. Targeting is based on the information from a Punchbowl (Tsunami) satellite communications receiver.

The P-700 has a number of warhead options including a 1,000 kg shaped-charge conventional warhead. This is placed behind one of the fuel tanks so that the warhead detonation will blast burning turbojet fuel into the interior of the target. A nuclear-tipped version of this weapon has been also available, equipped with a 650 kt nuclear warhead, but this has been withdrawn from service. This warhead size was recently revealed in a Russian account of these missiles and is significantly larger than previously reported. Other reports speak of yields of 200 and/or 350 kt, suggesting that the nuclear device may be of the "dial-a-yield" type. Other reported warhead options include a submunitions cargo dispenser (with 750 1 kg bomblets) and chemical or biological warfare payloads. The utility of the latter for anti-ship work is highly questionable and the reports of their existence does not appear plausible.

The P-700 missiles are fired in salvoes of four. Surface-launched versions of the missile have an inverse synthetic aperture radar (ISAR) guidance facility which enables the missile to make a radar image of the proposed target and relay it back to the launch platform for attack confirmation. It seems unlikely that the submarine-launched version of the missile has this facility and the submarine-launched P-700 probably relies on a combination of active radar and passive radar homing. The missiles can make their attack runs either in sea-skimming mode or by approaching at very high

altitude (above 100,000 feet), then diving vertically on their target.

The submarine's secondary armament consists of two 65 cm and four 53 cm torpedo tubes. A total of 16 reload torpedoes are provided, probably passive-homing ASW torpedoes. A total of eight weapons are provided for the 65 cm tubes. Options for these are the P-100 (SSN-22) anti-ship missile, the 85-R (SSN-16) torpedo-carrying anti-submarine missile and the SEAT-65 65 cm wake-homing torpedo. There is no indication of which of these and how many are carried, but the installation of the Rim Hat (Kremlin-2) fire control complex is a strong indicator that at least some P-100 missiles are embarked. These are probably intended for close-in defense against ASW ships.

These weapons are controlled by two separate weapons control centers. The P-700 missiles are commanded from a large compartment extending over two decks situated behind the main submarine command room. The weapons for the torpedo tubes are controlled from a similar and equally large compartment behind the torpedo handling room. The reason for the large size of these command areas is not known but their volume appears to significantly exceed that demanded for their duties.

Variants/Upgrades

As far as is known, the only military variants of the Oscar class submarines are the Oscar (Antey) class (Russian navy designation Project 949) and its offshoot, the Oscar II (Antey II) class (Project 949A) submarine, the focus of this report.

Three civilian variants of the Oscar/Oscar II design have been proposed. The first would have its missiles, torpedoes and the associated command centers stripped in order to provide capacity for either 1,000 tons of cargo or passengers. While technically capable of cargo deliveries, the primary role of this variant is seen as oceanographic research and as a mothership for manned and unmanned submersibles. These would be presumably used for mining and seabed resource recovery work.

The second civilian variant would have a 30-meter hull stretch, taking its cargo capacity up to 3,500 tons at a penalty of 3 knots underwater speed. This would be presumably used to carry cargoes from ports on Russia's northern coast —which are icebound for most of the year — to ports in Europe, the Americas and Asia.

The final civilian variant would have two side-cylinders attached to the main hull to give a trimaran configuration. Presumably the side cylinders would be constructed out of pressure hull segments. This version would have greatly increased cargo capacity, possibly as much as 18,000 tons at great cost in underwater speed and handling characteristics.

Program Review

Background. The design of the Oscar class, or Project 949, as it is internally known in the Russian navy, appears to have its origins with a cruise-missile launching parallel program to the Project 667 (Proto-Yankee) ballistic missile submarine designated Project 666. By 1964, the Project 667 had been redesigned to replace the 12 external ballistic missile launch tubes with 16 missiles in launch tubes penetrating the pressure hull (as in the contemporary US George Washington class SSBN). Project 666 had been designed to carry 12 P-35 Bazalt (SSN-12 Sandbox) strategic cruise missiles in inclined tubes outside the pressure hull. These were the strategic land-attack original variant of Bazalt. However, in 1964 the Russian Navy discontinued its strategic land attack cruise missile capability, probably as a result of extreme difficulty with the Bazalt missile, and Project 666 was canceled.

The big cruise missile submarine was revived in 1969 with the issue of a Tactical-Technical Requirement (TTZ) for an anti-ship platform armed with the P-700 Granit (SSN-19 Shipwreck) missile. The extreme problems with Bazalt had led to two interim remedial programs, one being to place the electronics of the P-35 in the tried and true P-7D (SSN-3 Shaddock) airframe; this was designated the P-35B (SSN-3 Shaddock). The second stage was to develop a cleaned up P-7D with a much more powerful turbojet; this became the P-700. A parallel strategic land attack version of the P-700 was designated the P-500 Granit. This may not have been placed in production. The timing of these developments strongly suggests that there was an unknown interim design prepared during 1964 and 1969, to be armed with the P-35B missile.

The primary role quoted in the TTZ for Project 949 was to execute large-scale long-range missile attacks against

high-value enemy task forces. The TTZ envisaged using two Project 949 submarines in concert against an enemy task force consisting of an aircraft carrier screened by anti-air cruisers and destroyers and escorted by ASW assets such as frigates and long-range maritime patrol aircraft. The missile density required to defeat the defenses of such a task force implied that each submarine would have to carry double the number of missiles earlier envisaged, for a total of 24 per boat.

Two submarines of the Oscar class were laid down in 1971/1972. These were both of the original Project 949 design. What happened next remains largely unexplained. Construction abruptly ceased for a period of five years and resumed with a new variant on the basic design, the Project 949A, or Oscar II. This is 11 meters longer than the original Oscar, yet, apparently, has the same armament and sensor suite. One explanation has been that this was to correct a design deficiency in the hull, but this surely cannot be the case: the first Oscar did not run sea trials until three years after the initial Oscar II was laid down. This timing makes a major design defect rectification improbable.

A more likely explanation is that a change in armament was contemplated but not implemented. The Russian Navy started developing a new cruise missile in the early 1970s designated the P-750 Grom. This was a much larger weapon than the P-700 with an estimated range of 4,000 km and a speed of Mach 3. These figures seem to be incompatible in a weapon of the size claimed. Either the range is substantially overestimated or the missile accelerates to maximum speed for the last part of its run only. It had the most unusual feature of carrying two nuclear warheads capable of being dropped on targets hundreds of kilometers apart. These characteristics are usually thought to mark it as being a land attack weapon, suggesting that the 1964 decision to discard such weapons had been reversed.

This change in missile also coincided with the period when the US started to develop the Tomahawk cruise missile, a weapon compromised very early in its development period. It is tempting to see the Soviet Union attempting to parallel this development with their own cruise missile using two warheads and much higher speed to compensate for accurate guidance and low flight paths. A possible alternative explanation is that P-750 was always conceived as an anti-ship weapon with the twin warheads being designed to bracket the target — a US carrier task force operating in dispersed formation. An air-launched version of the P-750 was also developed.

The P-750 missile was 13 meters in length, three meters longer than the P-700. If the Russian Navy had decided to use the Oscar as the launch platform, they would be faced with the problem of fitting the longer launch tube into more or less the same hull. A plug could be inserted to provide additional length but basic hull construction geometry precluded any increase in depth. Basic calculations show that the three-meter-longer tube can only be fitted into a compartment of the same vertical height if that compartment is lengthened by 10.9 meters — almost exactly the length by which the Oscar was stretched to give Oscar II. In addition, the tubes have to be carried at an angle of 30 degrees rather than the 40 degrees in Oscar. There is no way we can confirm that this angle has been changed to the calculated figure.

The Russian missile was much larger than Tomahawk making the big Oscar a natural platform. Lengthening a submarine, particularly a nuclear-powered boat, is not a simple task and it is easy to see this process taking five years, especially when the missile is not yet ready for service and the job therefore has low priority. In fact, the P-750 Grom — and a variant thereof named Meteorit, the probability being that one is anti-ship and the other land attack — hit very severe development problems and the program was eventually canceled. The Oscar IIs went to sea with the P-700 in their missile tubes.

Production of Oscar II was conducted at a relatively slow rate, with one submarine being laid down each year until 1990. The original plan appears to have been to build at least 14 submarines to form two seven-boat brigades, one for the Red Banner Northern Fleet and one for the Pacific Fleet. However, the collapse of the Soviet Union and the economic distress of the Russian military prevented this from being completed, and production of the type terminated with the two Oscar and five Oscar II ships serving with the Northern Fleet plus five Oscar II ships in the Pacific.

Two vessels were eventually left incomplete, with one 40 percent built, and the other 20 percent. In addition, a significant number of pressure hull segments and power train components had been produced by the shipyard when the program came to a halt. These components were apparently for submarines due for delivery in the years 1998-2000, strongly suggesting that a third Brigade was planned. This left the yard with a stockpile of components for which there is no military application.

In an attempt to resolve this situation, the Russian Export Agency Rosvoorouzhenie has attempted to market a civilianized version of the Oscar II, as described in the Variants section of this report. Stripping the missile and torpedo tubes would provide capacity for up to 1,000 tons of cargo while installing a 30-meter hull stretch (presumably by using the existing additional pressure hull segments) would increase this

to 3,500 tons at a cost of around 5 knots submerged speed. The role envisaged for this cargo-carrying submarine would be moving freight along sea lanes at times of the year when these are normally blocked by ice. The submarine's capacity could be further increased to an estimated 18,000 tons by providing two side-mounted cargo cylinders, although we expect that this dramatically reduces underwater speed.

Funding

Development of Oscar and Oscar II was funded by the Supreme Soviet on behalf of the Soviet Navy. Possible civilian conversion of these designs is being funded by Rosvoorouzhenie.

Recent Contracts

No contractual information has been disclosed.

Timetable

	1969	Tactical-technical requirement released
	1972	First Project 949 ordered
	1978	First Oscar II ordered
Dec	1980	First Project 949 delivered
	1986	First Oscar II delivered
	1993	Production ceased
Dec	1995	Commercial variants offered

Worldwide Distribution

Russia - (Two Oscars and ten Oscar IIs).

Forecast Rationale

With the cancellation of the last two Oscar II class submarines, no additional construction of this class for the Russian Navy can be projected. If further hulls of this type are built, they will either be for export or the proposed civilian variants.

There is, so far, no evidence that the Russians intend to export the military Oscar II, although the increasing openness over the characteristics of the design could be taken as testing the wind for such activities. Shortly after the fall of the USSR, the Indian Navy approached the Russians with requests for the purchase of nuclear-powered submarines, the types in question being the Sierra (Project 945) and Oscar II classes. Nothing came of these approaches at that time and there is no suggestion that they have been repeated.

Nevertheless, this does highlight just how valuable a naval asset Oscar II would be in the hands of a capable navy. Without the assets inherently deployed by the US Navy as part of their normal operational profile, a surface ship formation would be defenseless against attack by a single Oscar II submarine. The rumored presence of a Oscar would deny the sea to a frigate navy. For this reason, acquisition of a Oscar II class submarine would be a politically highly explosive move and likely to be a closely held secret until the ship is actually delivered and the deal is beyond reversal.

The civilian variants of this design are frankly not commercially credible. They would be a very expensive way of moving small quantities of cargo, and there are very few commodities whose inherent value is high enough to make such a transportation mode viable. There are also very serious doubts as to whether nuclear-powered vessels would be allowed to dock in many commercial ports. For this reason we do not anticipate the sale of any "civilian" Oscar/Oscar II class submarines.

We do not anticipate any additional orders for these submarines from the Russian Navy, nor do we expect any serious interest in the proposed civilian versions except from those intending to convert them back to

missile-launching configuration. The possibility of obtaining such a lethally effective anti-ship platform as Oscar II will be irresistible to many navies, provided the funding for such a huge investment can be found. At the moment such acquisitions seem extremely remote, though, and we cannot forecast any such sales. As a result, no additional Oscar II production is projected. However, the political, military and economic implications of a possible Oscar purchase by an export customer would be so profound that we will be maintaining this report in case such orders do occur.

Ten-Year Outlook

No production is forecast.

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