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Soviet Submarine Warfare Trends

Special National Intelligence Estimate

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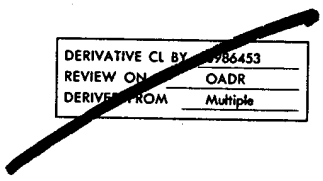

SNIE 11-20-84/D

SOVIET SUBMARINE WARFARE TRENDS

Information available as of 21 December 1984 was used in the preparation of this Estimate, which was approved by the National Foreign Intelligence Board on that date.

THIS ESTIMATE IS ISSUED BY THE DIRECTOR OF CENTRAL INTELLIGENCE.

THE NATIONAL FOREIGN INTELLIGENCE BOARD CONCURS, EXCEPT AS NOTED IN THE TEXT.

The following intelligence organizations participated in the preparation of the Estimate:

The Central Intelligence Agency, the Defense Intelligence Agency, the National Security Agency, and the intelligence organization of the Department of State.

Also Participating:

The Assistant Chief of Staff for Intelligence, Department of the Army

The Director of Naval Intelligence, Department of the Navy

The Assistant Chief of Staff, Intelligence, Department of the Air Force

The Director of Intelligence, Headquarters, Marine Corps

PREFACE

In its semiannual review of worldwide nuclear development, the DCI's Nuclear Intelligence Panel noted with alarm the apparent strides made in the past few years in Soviet submarine programs. The Panel recommended that a Community assessment for policymakers be undertaken to determine if these strides in fact marked an acceleration of Soviet undersea warfare capabilities and what future trends could be expected. The DCI approved the recommendation, which is fulfilled in this Estimate.

Any attempt to portray Soviet submarine trends must necessarily examine a number of undersea warfare technical fields of some scientific complexity. Further, mere description of improvements made in various fields is inadequate in allowing policymakers to determine the significance of such improvements. We have, therefore, compared Soviet developments not only with the USSR's previous capabilities, but with the established performance of Western submarines, sensors, and weapons.

These comparisons should not be interpreted as net assessments. A comparative net evaluation of US and Soviet submarines would require an examination of factors well beyond the scope of this paper—relative readiness, tactics, missions, force correlations, professional performance, variations in acoustics and bottom topography in the postulated battle area, and numerous other considerations. These aspects are so important that no predictions about even a single one-on-one engagement can be postulated from data in this Estimate.

Rather, we have attempted to portray Soviet undersea technology trends in terms of the current state of the art to determine if Soviet efforts are likely to result in major changes relative to Western capabilities in the next 10 years.

KEY JUDGMENTS

The Soviet submarine force will remain the most important element of the Soviet Navy into the 1990s. The key trends, we believe, will be:

— A commitment to building substantially improved submarines at about the same pace as in the last decade—by the mid-1990s a new generation of submarines will allow greater flexibility in Soviet tactics and operations.

— Improved sonars and reduced radiated noise[

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— Continued superiority in the ability to survive a conventional weapons hit—due mostly to use of double hull designs and high-strength hull material. The newest submarines may make some current antisubmarine warfare (ASW) weapons obsolete, and may require a significant—and potentially expensive—Western response.

— Maximum speeds in the 35- to 40-knot range for some of the newest SSNs, with a burst speed of 50 knots for a small number of special-purpose submarines in the 1990s. We project that the tactical speed of Soviet submarines—the maximum speed at which they may still effectively use their passive sonar systems—will remain inferior to that of their US counterparts.

— Improved submarine-launched ballistic missiles—better accuracy, with the possibility of achieving a hard-target kill capability. The long ranges of these missiles will allow the submarines that carry them to patrol close to the USSR, thus aiding their survivability.

— Introduction of long-range, land-attack cruise missiles—the Soviets are preparing for the deployment of two different types of these nuclear-armed cruise missiles: a supersonic high-altitude weapon and a subsonic low-altitude weapon.

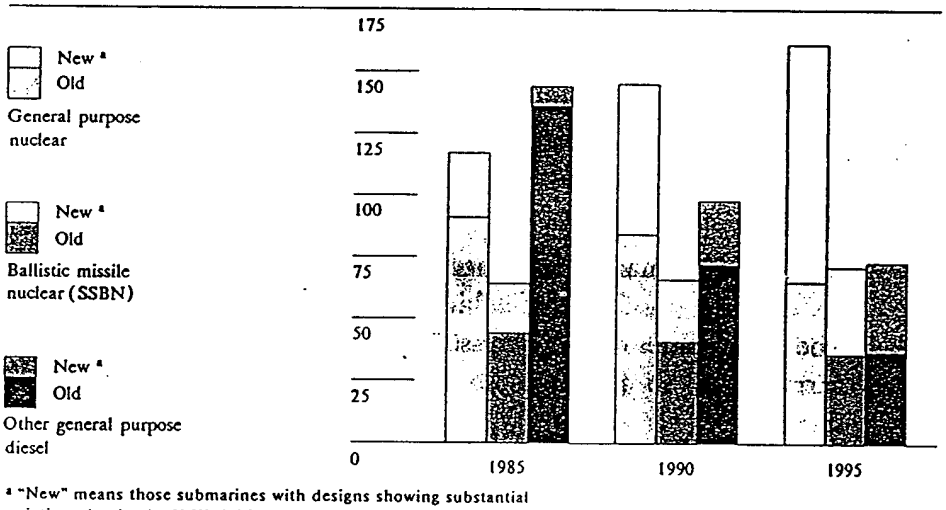
— The continued use of technology transfer to hasten the improvements in the Soviet submarine force.

— Greater use of icefields for operations of nuclear-powered ballistic missile submarines (SSBNs). By patrolling under the ice in wartime, Soviet SSBNs could avoid the ASW threat from enemy air and surface forces.

We project that the size of the Soviet submarine force will show a modest decline, but the percentage of units that are nuclear powered will grow substantially (see figure 1). The majority of the force will consist of older, less capable units until the early 1990s. By then new, quiet nuclear-powered attack submarines will be present in sufficient numbers to challenge Western ASW forces with a significantly increased undersea threat.

We believe these improvements do not signify a change in the missions of the Soviet submarine force, but rather that it will be more capable of performing them in the 1990s. In the areas of the ocean the Soviets would attempt to control in a conflict, their submarine force would be a formidable adversary. If, as we project, they initially station some three-quarters of their available attack submarines in these "sea control and sea denial" areas during a conflict, they can hope to provide

Figure 1
The Projected Soviet Submarine Force



[a] "New" means those submarines with designs showing substantial quieting—that is, the V-III (initial operational capability in 1978) and later classes.

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a major improvement to the survivability of their SSBNs. Their efforts to counter US ASW defenses will make the undersea protection of carrier battle groups increasingly difficult. Soviet quieting improvements represent a program to counter Western sensor systems, including the sound surveillance system (SOSUS). On the other hand, we believe that Soviet submarines will not be capable of attacking any more than a few US SSBNs, and possibly none, because of continued inability to reliably detect and track these units in the open ocean.[

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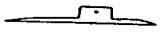
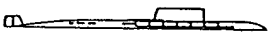
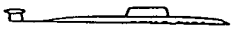
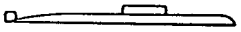
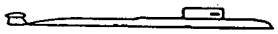
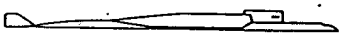
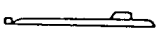
With their newest units the Soviets will potentially be able to operate on even terms with all but the most capable US submarines. These newest units will also pose much greater problems for other current US ASW systems; we cannot evaluate the effects on programed US improvements.

This assessment has by definition focused on the latest and most capable Soviet submarines. We estimate that by 1995 quiet submarines will compose somewhat more than half of the active nuclear-powered submarine force. Thus, nearly half of the force will continue to contend at marked operational disadvantage against even the oldest Western SSNs.

Figure 2
New Classes of Soviet Submarines Since 1980

Combatants	Year Operational	Units Launched to Date	Units Operational	Projected Number by 1995
K-class SS	1981	8	6	20
				
O-class SSGN	1981	2	2	10
				
Typhoon-class SSBN	1983	3	2	7
				
S-class SSN	1984	1	1	15
				
Y-class SSGN	1985	1	0	0
				
M-class SSN	1985	1	0	5
				
Y-class SSN	1985	1	1	8
				
Akula-class SSN	1985	1	0	20
				
D-IV-class SSBN	1986	1	0	3
				
Noncombatants				
X-class SSAN	1985	1	0	Unknown
No Drawing Available				
U-class SSAN	1985	1	0	1
				

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SUMMARY

Soviet Submarine Missions and Submarine Types

1. The Soviet submarine force is the most important element of the Soviet Navy; it consumes some 60 percent of the Navy's ship procurement budget. In wartime, Soviet submarines would participate in the Navy's primary initial tasks:

- Deploying and providing protection for nuclear-powered ballistic missile submarines (SSBNs) in preparation for and participation in intercontinental and theater nuclear strikes.
- Helping to defend the USSR by engaging Western aircraft carriers and ballistic missile submarines, as well as surface units and submarines armed with land-attack cruise missiles.

Other important submarine wartime tasks would include support of ground forces, and some attacks on Western sea lines of communication (SLOCs).

2. Since the late 1970s the Soviets have begun to compensate for longstanding deficiencies in their submarine force. In areas critical to submarine warfare—submarine quieting, signal processing, and weapons design—Soviet submarines have shown substantial improvement in recent years. Research and development in related fields in the USSR, along with the acquisition of Western technology, have been mainly responsible for this success. New classes of submarines (see figure 2) apparently combine the above improvements with traditional Soviet strengths in hull design, power-to-weight ratios, and propulsion technology. With their newest units the Soviets will potentially be able to operate on even terms with all but the most capable US submarines. These newest units will also pose much greater problems for other current US antisubmarine warfare (ASW) systems. We cannot evaluate the effects on programed US improvements.

3. We are particularly concerned about the potential capacity of the USSR to construct a large force of these newer submarines in a relatively short time. The V-III-class, which incorporated substantial quieting and more sophisticated combat systems, was built at about the same rate as earlier, less capable units. The newest units (M-, O-, S-, Akula-, and Typhoon-classes) represent a completely new generation of submarines, incorporating new propulsion plants, and, in some cases, titanium hull material that is more difficult to fabricate. If these units are to be built as fast as the previous generation (a challenging accomplishment that may be beyond the reach of Soviet shipbuilders), then the submarine force would pose a significantly improved threat by the early 1990s.

4. We have substantial evidence concerning the technical trends and improved characteristics the Soviets are incorporating into their new submarines and the general missions of the submarine force. The uncertainties, however, are also substantial—uncertainties about the purposes and missions of many of the different individual submarine classes as well as the numbers of submarines of each class the Soviets will be able to build.

Advances in Submarine Technology

5. ***Submarine Depth and Hull Design.*** Since the 1950s the Soviets have led the West in high-strength materials technology for submarine hulls. They manufacture submarine pressure hulls from high-strength steel and titanium. Figure 3 shows the diving depths

known or estimated to have been achieved. We estimate the new O- and Typhoon-class submarines are constructed of the most advanced high-tensile-strength steel. This will allow limiting depths of[ ] Because steel hulls are easier and faster than titanium hulls to construct, we believe the Soviets will retain them in a significant portion of their submarine force in the foreseeable future.

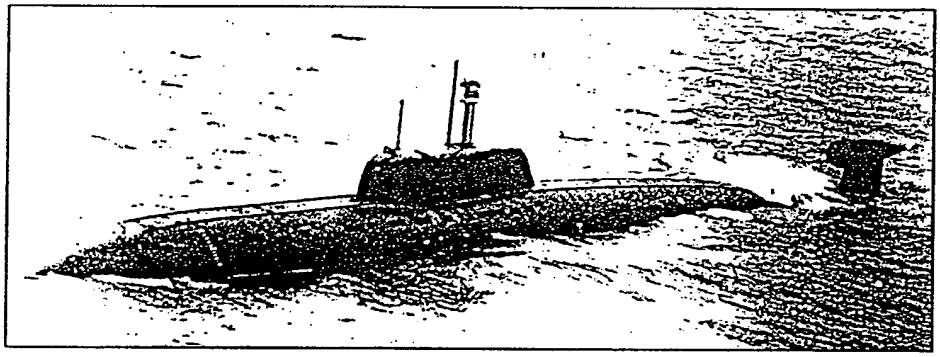
6. We estimate that the Soviet titanium submarine construction program will continue to receive a high priority. We believe that the M- and S-class nuclear-powered attack submarines (SSNs), both launched in 1983, probably are made of titanium (see figure 4 on next page). The USSR leads the world in this technology, and we expect some Soviet titanium-hull submarines to achieve operating depths of[ ] however, we believe that most future titanium hull construction will emphasize hull weight-saving trade-offs to achieve, among other things, high speeds.

7. *Speed and Power.* Historically, submarine designers in the USSR also have had a strong commitment to building fast submarines. This has been done through a combination of high power density (building powerful propulsion plants into smaller volumes) and more efficient hull forms. Two earlier classes, the P- and A-classes, have achieved maximum speeds of 39 and 42 knots, respectively. We expect at least some of the new types will achieve speeds in the range of 35 to 40 knots. Two types of reactors are now in use—pressurized water-cooled and liquid-metal-cooled. The majority of units have the former, which is more reliable and easier to maintain and is also used in all Western nuclear warships. More advanced types of reactors—high temperature gas-cooled, for example—are under investigation in the USSR, and we expect the Soviets will seek to maintain superiority in speed and power density.

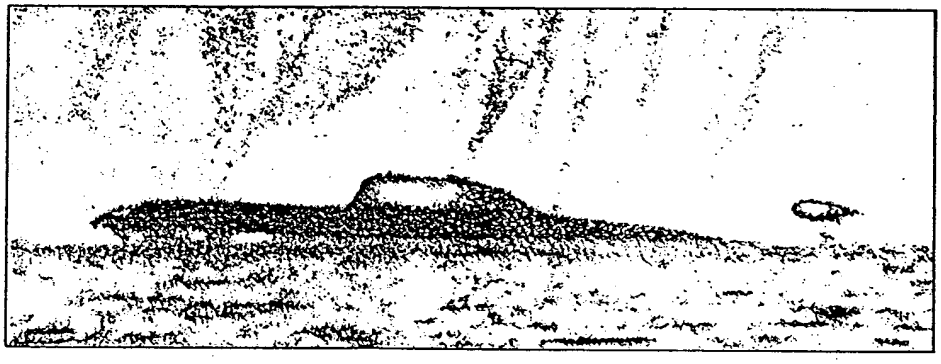
8. The Soviets are using designs that reduce the drag of their submarines, incorporating improvements to the hull shape and streamlining or eliminating drag-producing appendages. They are also investigating other methods of drag reduction, including the ejection of synthetic polymers from the bow to reduce hull turbulence. We estimate that, by the 1990s, the Soviets could deploy a submarine using current power densities and an active drag reduction method that would achieve burst speeds of up to 50 knots. This speed, however, probably could initially be achieved on only a limited number of special-purpose submarines.

Figure 4
Newest Soviet Nuclear-Powered General Purpose Submarines

S-class SSN



Akula-class SSN



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9. *Acoustic Advantage.* The Soviets have instituted a comprehensive program to improve the quality of their submarine sonars and reduce the noise levels of their units. This program has been based on the acquisition of Western equipment, investment in quality control for Soviet-manufactured components, and development of an elaborate system to monitor the ongoing quieting efforts of their operational submarine force.

10. ***Weapons Improvements.*** We estimate that most new classes of Soviet submarines have increased weapons capacity and have improved weapon systems accuracy, range, and payload. A new weapon with a new mission—the long-range, nuclear-armed, land-attack cruise missile—also has been created. Over the next few years several classes of Soviet submarines are expected to carry new long-range, land-attack cruise missiles. Two missiles are currently in flight-testing for limited deployment, beginning in 1985 and 1986. Advances have been especially significant for new submarine-launched ballistic missiles that carry more warheads and have much greater throw weight and better accuracy than their predecessors a decade ago. Soviet torpedo designers have developed large-volume weapons with wake-homing guidance. These torpedoes probably would be fired at ranges up to 10 km astern of the target ship. These will greatly improve the Soviets' antisurface warfare capabilities, particularly against large targets.

11. The Soviets have a variety of options for further advancement of submarine armaments technology. The SS-N-22 antiship cruise missile—up to now tested and deployed only on surface ships—possibly will be adapted for submarine launch. At Mach 2.3 this weapon would upgrade substantially the threat from Soviet submarines operating against Western carrier battle groups. For ASW the Soviets probably have adapted the large diameter (65 cm) torpedo—originally designed for use against surface ships—into a high-endurance antisubmarine torpedo. Such a weapon will improve their ability to engage an evasive enemy submarine.

12. ***Other Improvements.*** We expect that the Soviets will accomplish advances in all aspects of submarine warfare over the coming decade. Some of the other important areas will be:

— Submarine-launched surface-to-air missiles to defend Soviet submarines against low-altitude slow-flying aircraft. One system may already be deployed on Typhoon- and K-class submarines.

— More sophisticated decoys and countermeasures to make Soviet submarines more survivable.

— Better communications procedures and equipment, primarily to provide more centralized control of SSBNs. These advances also will improve the ability of Soviet submarines to react to Western ASW, to operate at more secure depths, and to coordinate their activity with other Soviet forces.

Production Base

13. During the last few years shipyards in the USSR have launched an unprecedented variety of nuclear-powered submarines. Submarine production has averaged about 10 units per year for the last five years, and about 65 percent of these units were nuclear. SSBN production has leveled off in recent years as the size of the force has stabilized within limitations of the SALT agreements. The most notable development has been the rapid growth in the diversity of nuclear-powered general purpose units (SSNs and SSGNs). In the late 1970s only three classes were known to be in series production. Since 1980, five new classes of nuclear-powered general purpose submarines have been launched, and as many as two more new classes may be under construction.

14. Over the next decade, the size of the submarine force is projected to decline modestly, but the proportion of nuclear units is estimated to grow significantly. Construction yard capacity is substantial. The single yard at Severodvinsk is the largest in the world and has more building positions than both US submarine yards combined. Furthermore, we estimate that the major Soviet shipyards involved in the construction of submarines are not operating at their full capacity. It appears that future overhaul requirements for nuclear submarines, normally done at dedicated repair yards and operating bases, will have relatively little impact upon the use of these facilities. Two major shipyards—Gor'kiy and Komsomol'sk—have been expanded in recent years and may contribute even more to general purpose submarine construction. Large-scale series production of new SSNs from these shipyards will create a force of at least 20 high-quality units as early as 1990, some 20 to 30 percent of the SSN force.

Operations and Strategy

15. *The Strategic Framework.* The key elements of Soviet naval planning are support for strategic strike operations and strategic defense.[1] Protecting Soviet SSBNs is the primary focus of much of the

[1] See NIE 11-15-84, *Soviet Naval Strategy and Programs Through the 1990s*, for a more complete discussion of the Soviet Navy's overall strategy.

Navy's efforts. Strategic defense will also include plans to attack US sea-launched cruise missile platforms and aircraft carriers before they could attack the USSR. It will, in addition, involve attempts to counter Western SSBNs at sea, although meaningful success in this task is beyond the current reach of the Soviet Navy. The Soviet submarine fleet of the 1990s would be more capable of SLOC interdiction, but only at the cost of other missions. We believe that through at least the mid-1990s the Soviets will continue to initially employ most of their SSNs for the more important missions of SSBN protection and homeland defense.

16. *Submarine Operations.* Improvements to the Soviet SSBN force over the next several years will enhance the force's survivability. Soviet SSBNs will share in the trends toward quieter, more survivable submarines armed with improved defensive weapons. The proportion of the force configured to carry longer range missiles will grow, allowing more Soviet SSBNs to operate in more secure waters near the USSR. D-class and Typhoon SSBNs routinely patrol under the ice. Those submarines operating under ice in wartime would be safe from enemy surface and air ASW forces—but remain potentially vulnerable to attack submarines.

17. General purpose submarines would play a variety of roles in the defense of SSBNs. There has been increased use of SSNs as escorts for SSBNs deployed near the Soviet homeland—operating in the vicinity of the patrolling SSBN in peacetime to detect foreign ships or submarines attempting to trail the SSBN. [ ] in the event of a conflict, both SSNs and diesel submarines would be arrayed in barriers along the approaches to Soviet home waters, forming an echeloned defense, not only against Western ASW forces that would threaten Soviet SSBNs, but also against US cruise missile platforms, aircraft carriers, and amphibious forces. In waters near the USSR, Soviet submarines would work closely with surface and air elements. They would also receive important contact information from the improved fixed acoustic monitoring systems in the Barents Sea and the northwestern Pacific Ocean. We believe these defensive operations will continue to receive the highest priority in the Soviet submarine force. The new, more capable classes of general purpose submarines would join in these operations—at least initially—and contribute substantially to the effectiveness of the defense.

18. *Sea Denial Operations.* [ ] general purpose submarines probably would also form barriers in waters more distant from the USSR, such as in the vicinity of the Greenland-Iceland-UK gap. These submarines probably would be supported by

Soviet aircraft, but not by surface ships or fixed acoustic systems. Without the synergistic effects of multiple sensors and platforms, even the newest Soviet submarines are expected to have limited success in an ASW role.

19. These new Soviet submarines, however, probably would be more effective than current platforms against Western surface forces in the open ocean. To intercept Western task forces the Soviets practice barrier operations in key choke points and use of multiple submarine attack groups. They have also trained to conduct independent attacks. Because of their improved quieting, more accurate longer range weapons, and upgraded communications systems, newer Soviet submarines would assist efforts to extend the scope and improve the effectiveness of sea denial operations, especially against Western carrier battle groups and other platforms armed with sea-launched cruise missiles (SLCMs).[

]

20. *Distant Operations.* In the open ocean, beyond the approaches to the USSR, the Soviet Navy would be expected to use a relatively small portion of its attack submarine force to search for Western SSBNs and to counter Western SLOCs in the initial stages of a war. In the coming decade, the Soviets would have to contend with SSBNs in much-expanded patrol areas. To find SSBNs, Soviet submarines, most likely some of the newest units, would attempt to trail the Western units leaving port or transiting choke points. More modern Soviet SSNs might have some fleeting success in covert trail operations against older SSBNs. On the whole we believe that, because of continued inability to reliably detect and track these units in the open ocean, predicted improvements in Soviet submarine warfare will not allow the Soviet Navy to threaten a meaningful percentage of the US SSBN force.

21. Soviet [ ] the possibility of more protracted general warfare. At the same time, the Soviets are clearly improving the capability of their forces to operate under a wider variety of potential wartime scenarios. We do not believe, however, that this portends any significant change in the Soviets' plans for employing their naval forces in the initial stages of general war, regardless of their expectations of its likely course. Initial conventional operations would be conducted with an eye toward escalation; and readiness to conduct SLCM strikes or strikes by submarine-launched ballistic missiles (SLBMs) and to attack enemy sea-based nuclear forces is likely to remain Moscow's major concern under any foreseeable circumstances. The importance of the anti-SLOC mission

would increase in the event of a prolonged prehostilities mobilization period or if conventional conflict with NATO became protracted. These situations could lead the Soviets to mount a major open-ocean anti-SLOC naval operation. They would almost certainly want to defer any such operation, however, until after they had successfully completed their critical sea control/sea denial tasks and had weakened NATO's capability to defend its sea lanes. Also, through the 1990s, we believe the Soviets will still have insufficient assets to conduct a major open-ocean anti-SLOC operation in the early stages of a NATO–Warsaw Pact war simultaneously with their strategic offensive and defensive tasks, even if such were operationally feasible. Hence, the relatively low priority of open-ocean SLOC interdiction as an initial wartime task probably will not change substantially in this century.

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