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Utilization of Soviet Submarines Against
Enemy Sea Lines of Communication Through
21 Months of War

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The Main Naval Staff of the Soviet Navy, through the Department for Study and Generalization of War Experience, continues the publication of collections of materials on the experience of combat activity of the Soviet Navy.

In contrast to the majority of the collections, which have been published with a SECRET classification and intended for a broad spectrum of the officer corps, this collection is a TOP SECRET document.

It is therefore to be used as an operational work by the upper echelon of the officer component of fleets and flotillas and for combat training of submarine crews and of crews of surface vessels in antisubmarine defense roles. This collection should also be used by the faculties of the Naval Academy and higher naval training institutions in scientific and instructional work.

In NKVMF (narodnyy komissariat voyennomorskogo flota—People’s Commissariat of the Soviet Navy) institutions, this collection’s use is limited to the highest and most senior officer personnel who are associated with issues of submarine service and antisubmarine defense.

When the war ends, the classification of this volume will be downgraded to SECRET.

Main Naval Staff, VMF
Department for Study and Generalization of War Experience
This work, Utilization of Soviet Submarines Against Enemy Sea Lines of Communication Through 21 Months of War, was completed by the chief of the faculty of submarine tactics of the Naval Academy, Captain First Rank A.V. Tomashevich, in response to a tasking of the Main Naval Staff.

Through 21 months of the Great Patriotic War, the submarine forces of our navy have sunk 439 enemy transport ships with an aggregate displacement when fully loaded of 2.2 million [metric] tons.

By inflicting such great losses on the enemy at sea, our navy has significantly undermined the national economic might of Germany and Romania and their forces at sea. This has had a substantial influence on combat actions on the land front. Submarines have destroyed more than half of all the enemy transports that have been sunk.

Our submarine operations against enemy sea lines of communication played a leading role in these combat activities. Consequently, this work somewhat broadly examines the operational and tactical employment of submarines.

In the course of the research, the author could not avoid operational and tactical evaluations of theaters, discussing combat training issues, or examining the organization of major commands and the specific features of combat command and control of submarines, which broadens the theme even more.

Having set aside only the special missions that submarines accomplish (intelligence collection, patrol, landing of reconnaissance–diversionary groups, actions against an enemy coastline, hydrographic and meteorological support of a surface force’s mission), the author, to a significant degree, has thoroughly researched the combat activity of our submarine fleet.

Operational and submarine force personnel, as well as officers of the surface fleet, should use this work to acquaint themselves with antiship defense issues.

The author’s methodology and all his conclusions are based on analyses of countless examples and should provide the reader the opportunity to approach each suggested conclusion critically and enable him to reach independent conclusions in accordance with the conditions in which he might have to operate.

This work is valuable because it reflects all the specific features of the conditions of naval combat in our theaters. However, it must be noted that in other operating conditions (for example, operations far out at sea), some solutions may require further analysis.

This work is applicable to other situational conditions because the author has presented the necessary theoretical bases that suggest new methods.

Chief of the Department for the Study and Generalization of War Experience

Captain First Rank N. Ozarovskiy
From the Author

Commanders of all branches of forces and combined arms commanders must become masters of leading troops by knowing how to organize and coordinate all branches of forces and how to command and control them in battle . . . (From Order No. 195, 1 May 1943, of the Supreme Commander in Chief, Marshal of the Soviet Union J. Stalin)

This generalization of the experience of our submarine force’s combat operations against enemy sea lines of communication through 21 months of war has the following goals:

- To establish new methods which have been used successfully by submarines in order that they be adopted into the combat activity of our submarine force.

- To expose shortcomings which have emerged in the utilization and actions of submarines in order to eliminate them quickly and prevent their reoccurrence.

At the same time, this work should give theoretical bases to several suggestions so commanders can intelligently implement them in varying conditions of the combat situation. Methods of resolution are suggested for a series of new issues that have arisen.

The systematic recording of this wide range of experience gained during submarine combat operations against enemy sea lines of communication permits each commander to compare his own observations with the experiences of other commanders. This should ensure one against false conclusions, which are sometimes reached on the basis of a single isolated incident.

Decisions must be made quickly in a combat situation; there is generally no time for lengthy consideration. Often, the speed with which a decision is reached determines its success. A correct decision made a minute later than was necessary has no value. To make a rapid, correct decision is easier when the commander has already given thought to such situations and when he can recall similar, critically evaluated examples drawn from other submarine commanders’ experiences. Following this line of thinking, this work presents many examples that have been critically analyzed.

The examples in this work are not given to place blame on particular submarine commanders or major commands, or even to render a personal evaluation. They are used only to make a particular point. Everyone should understand that it is easier to criticize a decision while sitting behind a desk than to make a correct decision in a difficult combat situation. But in order to make a correct decision in combat, it is quite useful to ponder critically one’s own and others’ combat experiences.

In the end, this work should provide our commanders with material through which they can improve their mastery in command and control of submarines. Supreme Commander in Chief Marshal of the Soviet Union Comrade Stalin requires this from us in his Order No. 195.

This work will achieve its purpose only if it is published without delay. Therefore, this limited the use of illustrative materials (sketches) to only the most necessary and instructive.

Because the entire period of the first 21 months of the war is captured here, some material that was published earlier in Bulletin No. 4 by the Directorate of Combat Training, VMF, is included. Reviewed documents and published material from intelligence organizations were utilized during the writing of this work. A number of essential details and facts had to be established at sea by personal observations and conversations with the commanders who
themselves organized submarine activities and with those who personally carried out these
activities.

The works of Doctor of Military Science Captain First Rank Ye.Ye. Shvede were used in
evaluating the enemy’s sea lines of communication in our theaters.
Chapter I
The Goal and Missions of Operations Against Enemy Sea Lines of Communication

The fleet’s ultimate goal in operations against sea lines of communication is to halt enemy sea transportation. However, as the experience of modern war has shown, to achieve total cessation of sea movement is not feasible. Therefore, in establishing the mission of the fleet or other forces operating against enemy sea lines of communication, more modest requirements are stipulated—to disrupt enemy lines of communication. This means that the maximum disruption of enemy lines of communication is their ceasing to operate for a given period of time or their complete shutdown. Enemy sea lines of communication can be cut by:

- Destroying ships at sea.
- Preventing ships from leaving ports.
- Destroying supply dumps, routes, loading and unloading assets, and ships in port.

The destruction of enemy cargo ships is the most radical method of stopping sea movement. The frequent sinking of ships can force the enemy to stop using sea transport. For these reasons, the destruction of enemy transport ships should be the fleet’s basic tactical mission in operations against sea lines of communication. Because warships support the movement of transport vessels, it becomes necessary to destroy the enemy warships along with the transports. In a number of cases, attacking the warships guarding transports in itself creates opportunities to destroy transport ships. Obviously then, the destruction of the enemy warships should be the first priority.

Just threatening to sink the transport ships is a viable means of preventing their sailing. This threat can be accomplished by sinking several transports during their exit from ports and at sea, by stationing a submarine near the base and on enemy transport routes, and by placing minefields along the enemy’s sea routes.

In 1914 and 1915, as a result of submarine mine laying operations, the sinking by mines of several German ships, and the actions in the southern reaches of the Baltic Sea, the Germans were forced at the end of both campaigns in this region temporarily to halt the movement of transports between Germany and Sweden. Also, for two months in the winter of 1942, two Italian tankers did not attempt to move from the Bosporus to Constanza in the Black Sea for oil. Each time they attempted to depart, they received reports that our submarines had been detected near the Bosporus. However, because our submarines were not positioned in the area during this period, a large number of these reports were false.

The destruction of ships in ports and of port facilities is best accomplished by air forces. However, inshore operations by surface ships and forays into enemy ports by submarines are not excluded. Such are the ways to halt enemy shipping along sea lines of communication.

To interrupt sea transport by destroying his cargo hulls, one can force the enemy both to limit his sea movements and implement measures that decrease the replenishing of supplies. Such measures include the introduction of a system of movement of transports in convoys, travel from port to port only at night, sailing by extended circuitous routes, and so on. All this increases the turnaround time of transports and, consequently, decreases the total tonnage of the enemy transport fleet. It is also possible to achieve this by creating a threat of attack on the transports by our submarine, aviation, and surface forces. Frequently, the mere existence of our submarines or the appearance of our boats in one region or another forces the enemy to react accordingly. For
example, in the early summer of 1942, the Germans, believing that our boats were unable to sail into the Baltic Sea, began to ply these waters as though it were peacetime. The sailing of our boats into the Baltic and their successful attacks against transports forced the enemy to move in convoys, cross dangerous areas at night, and execute their movements within the limits of the Swedish coastal waterways. Still more startling to the Germans in the fall of 1942 were the appearances of our submarines in the Gulf of Bothnia, an area which our submarines had not sailed before.

The naval forces’ actions in reducing the tonnage transported on enemy lines of communication, the resulting shortage of ores, and the need to replenish losses in transport hulls significantly affects the economy of a country. As a result, the production of war materiel destined for immediate support of the war effort is lowered.

For the enemy to defend his own lines of communication requires an extreme and intense effort that in itself demands expenditure of significant amounts of assets and continuously employing large numbers of forces. All this defines the significance of operations against enemy sea lines of communication.
Chapter II

The Role of Submarines in Operations Against Enemy Sea Lines of Communication

Preventing enemy naval shipping cannot be accomplished by a single or several brief strikes against his sea lines of communication. This mission requires systematic, prolonged and, to the degree possible, continuous actions against the enemy.

In the conditions that exist at the time of this writing, surface ships are capable of inflicting powerful, but brief, strikes in limited sectors of the enemy’s sea lines of communication. Air forces can also systematically control movement of enemy transports by striking powerful blows, but only in daylight and within their operational flight limits.

Submarines are the most effective in controlling the movement of transports by inflicting strikes on them along the entire length of the enemy sea route. However, submarine navigation is especially difficult in coastal waters and shallows. In addition, submarines have a small radius of observation, a lesser degree of maneuverability than surface ships, and significantly less maneuverability than air forces.

Thus, each branch of naval forces has positive and negative attributes in its operations against enemy sea lines of communication. When these various forces are combined, the strengths of one can balance the deficiencies of another. Thus, the inadequacies of submarines—small radius of observation and great maneuverability—can be compensated for by the large radius of observation and great maneuverability of air forces. Consequently, for the most successful execution of operations against enemy sea lines of communication, all naval forces should operate together as a combined force. Depending on the particular situations on sea routes, one or another branch of naval forces can be the principal means of carrying out the mission.

In our theaters, the conditions of operations against enemy sea lines of communication have developed in distinctive ways. In the initial period of the war, the numerical superiority of enemy aviation on sea lines of communication made our long-range surface ship sorties extremely risky, while at the same time in the Baltic and Black Seas, surface ships were widely utilized for joint operations on the flanks of the army. As a result, the actions of surface ships on enemy lines of communication were limited to only several short raids, which yielded no particular effect.

At the same time, until recently our naval air forces in all theaters have, in large measure, been diverted to support land operations. As a result, our aviation has operated only intermittently against enemy sea lines of communication. For some time, air force effectiveness on sea lines of communication has been reduced because it did not have fully capable, adequately trained torpedo bombers and crews at the beginning of the war.

Therefore, submarines have borne most of the responsibility for operations against enemy lines of communication in all our theaters for 21 months of war.

Table 1 shows the number of enemy transport ships sunk in our theaters by various forces of our fleet. Note that our submarines destroyed more than 50 percent of all enemy ships that were sunk. This table clearly demonstrates the role submarines played in operations against enemy sea lines of communication in the situation that unfolded.
In tables 2 and 3 are the causes of sinking (in percentages) of Allied transport ships and the causes of sinking of our transports on external sea lines of communication. Table 4 indicates the causes of our transport losses on internal sea lines of communication.

[Tables 1, 2, and 3 appear here in the original text.]

From an examination of tables 2 and 3, it is clear that we, the Allies, and neutral countries suffered the greatest losses from submarines on lines of communications in the open seas. However, it would be unwarranted to consider that in all circumstances submarines are the basic forces in the struggle on enemy lines of communication.

[Table 4 here in the original text.]

As shown in table 4, enemy submarines are far from first place among the forces operating on our internal lines of communication. Regarding the Black Sea, this can be attributed to the complexity of stationing German submarines there. However, this cannot be said for the Baltic and northern seas. With a large quantity of seaworthy submarines, the Germans could increase significantly the number of boats operating in these theaters. However, they have not done this, because the use of aircraft in the Gulf of Finland has given them good results with fewer losses. Submarine operations in the narrow and shallow regions of the Gulf of Finland are accompanied with great risk.

Thus, as experienced in these 21 months of war, submarines can be utilized quite effectively against enemy sea lines of communication. In some situations and with force realignments, the submarine branch of naval forces can accomplish the primary mission.

Submarine effectiveness is significantly increased with they are operating jointly with other fleet forces, particularly aviation. The question of which branch of naval forces should have preference in operations against sea lines of communication should be answered according to each specific case and the conditions of that given theater and region. Submarines have occupied a leading role in the situations that have developed in the first 21 months of the war in our theaters.

In essence, the utilization of submarines has depended on the following:

- The peculiarities of enemy lines of communication;
- The number of submarines on hand and their technical capability and basing conditions;
- The level of combat training of the submarine crews;
- The resourcefulness of the combat command and control of the submarines.

We will now examine these issues.
Chapter III

Enemy Sea Lines of Communication in Our Theaters

1. Northern Theater

General characteristics of the theater and enemy sea lines of communication

The northern naval theater is located beyond the Arctic Circle. However, the warm Atlantic current, which extends along the northern coastline of Norway and far toward the Murmansk area, makes year-round sailing possible in a coastal zone approximately 200 miles wide.

Beyond the Arctic Circle are polar days and nights and white nights. At latitude 70 degrees, white nights begin in the middle of April, then gradually shorten and lead to continuous polar days beginning in the middle of May. White nights start again by the end of July and last until early September. After this, the amount of darkness quickly grows, and polar nights extend from the end of November until mid-January. However, there is not total darkness. At twilight, which lasts from two to four hours, it is quite possible to observe through a periscope.

The open nature of the theater, the absence of neutral countries (which relieves submarines of the tasks of avoiding neutral waters and determining the origin of detected ships), and the presence of two parallel sea lines of communication—the Germans’ and ours with England and America (which brought the main portion of the German surface fleet to this theater)—make up the military peculiarities of this theater.

For the German government, the sea routes to the north are important due to the lack of good land routes between northern Finnish and Norwegian ports and Finnish and Swedish ports in the Baltic and southern Norwegian ports. No railroads connect these ports. Only improved highways connect Petsamo with the last railroad station at Rovaniemi (531 kilometers), Petsamo and Kirkenes with Vadsø and Vardo, and these ports with Hammerfest and Narvik. The trafficability of these roads is not great, especially during the winter months.

Lacking land routes of communication, the Germans were forced to utilize the sea lanes for all types of supply and replenishment of their forces operating on the far right flank of our entire front. At the same time, return trips carried the much needed nickel (from Petsamo) and iron ore (from Kirkenes). From Petsamo and Kirkenes, enemy sea routes lie along the northern and western Norwegian coastline. Our submarines regularly operate in sectors of these sea routes north and east of Tromsø. The western portion of these lines of communication is within the area of operations of British naval forces. Our submarines are sent into this zone in isolated circumstances after preliminary coordination with the British naval command (figure 1).

Our submarines service approximately 380 miles of enemy sea lines of communication. The farthest sector of enemy sea lanes (Lopp Havet) is 400 miles from our submarine bases, and the nearest sector (Vardo, Petsamo) is 100 miles.

The open nature of the theater does not permit the enemy to create serious submarine barriers on our submarine access routes to his sea lines of communication. The great depths of the Barents Sea lessen the danger from mines to submarines passing to the open sea. However, they are not entirely excluded. German mines with long mooring cables of 300–330 meters can...
be positioned in a large portion of the sea. In several regions, at a great distance from the shore are areas of shallow depths (the Nordkin area), where mines can threaten submarines.

The fjords are frequently very deep, making it impossible for enemy transports to anchor and our submarines to lie on the bottom. The irregular, sharply changing depths and rocky bottoms create danger for boats settling to the bottom. Submarines experience powerful blows from rocks during rapid submerging, while lying in stormy weather at shallow depths, or from nearby depth charge explosions. In addition, these same circumstances exacerbate the enemy’s use of his shore-based sound-ranging stations.

Northern Norway, along the coastline where the enemy lines of communication pass, is the most sparsely populated portion of this country. In recent times, the main inflow of people has been poor peasants who are alien to fascism. The larger part of the coastal region populace favors the Soviet Union.

The lack of a large population and its favorable attitude have permitted submarines to spend nights near the shore and, occasionally, make contact with local inhabitants. The active movement of fishing vessels and the possibility of using them for observation against submarines makes it difficult for submarines to preserve their security while in position.

The warm Atlantic current permits submarines to sail along the entire length of enemy sea routes throughout the year. Despite a whole series of difficulties that have arisen for our submarines, they were more successful in the winter months of 1941–42 than in the summer.

Using the high cliffs to mask themselves at night, our boats often remained near the shore to charge batteries or repair damage. In this manner, they maintained control of coastal shipping lanes both during the short winter days and also at night. Having gained some experience in conducting night attacks, submarine commanders began to sink enemy ships not only during the day but also at night.

In the summer months, during the polar day, submarine operations have been severely complicated by their need to move far out to sea to charge batteries. This is because the elevated enemy observation posts could see a surfaced submarine at great distances. The placement of observation posts at capes and the widespread development of a telephone communications system have permitted the enemy rapidly to learn of the approach of a submarine, open fire on it with shore batteries positioned on the capes extending out into the sea, and send out forces to pursue it.

The percentage of time submarines maintain their positions on enemy sea lanes is reduced and, concurrently, the time boats spend under water is increased. Each sortie to an enemy shipping lane requires a boat to be submerged for 24–30 hours, consequently expending electrical energy from rechargeable batteries. In this situation, a boat’s normal battery supply has been inadequate for the task. The number of batteries on each submarine has been increased significantly for these sorties.

For continuous control on enemy coastal sea routes, it has been necessary to increase the number of submarines operating in a given sector. When this was not possible, a decrease in the effectiveness of submarine actions had to be accepted. In the winter of 1941–42, the enemy recognized the futility of moving close to shore at night and, it seems, moved his transports into the open sea away from his own minefields. The depth of the sea, which exceeded the length of the mooring lines of our mines, made this passage completely safe for enemy ships. Our
submarines searched for enemy ships near the shore without results; it was pointless for a single boat to search for the enemy in the open sea. Searches by groups of submarines (surface ships were better suited for this mission) had to be organized, or submarine positions had to be shifted toward the destination ports of the undetected enemy convoy.

Thus, operating during the polar days (which extended from the middle of May through the end of July) and polar nights (which continued from the end of November until the middle of January) was difficult for submarines.

Low winter air temperatures caused submarine equipment onto which spray fell to freeze. During low temperatures in stormy weather, the freezing of the boat progressed very quickly and required a series of actions and continuous work of the crew to clear the ice from the conning tower hatch, the hatch-locking mechanism, deck guns, antennas, and so on. The crews’ clothing was totally unsuitable for winter conditions; it became wet and then froze into a hard shell. All this made the submarine crews’ work extremely difficult in winter sailings. Caked ice accumulated in the superstructure around the shields protecting the torpedo tubes, sometimes making the opening of the tube’s outer door impossible. To avoid this, the breakwater shields were removed prior to sailing. While complicating our submarine operations, freezing also hampered the enemy’s anti-submarine forces. Heavy freezing of hulls, naval guns, and depth chargers and their launchers created great difficulties for actions against submarines and small ships.

Freezing normally occurred during December, January, and February. It was rarely observed at other periods of the year.

Stormy weather is relatively rare in the summer months, but very frequent from October to March. A large wave pushing on a boat in a sea greater than force 5–6 often precludes it from attacking. Since submarines lack the ability to seek shelter from waves, they are forced to ride out a storm at sea. This exhausts the crew; wears out equipment; and damages the bow and stern planes, outer torpedo door shields (one of the reasons they are also removed in the summer), and superstructure of the boat. During sailing in high seas, the boat reduces its speed significantly.

In the Barents Sea area, there are very few clear days (only two or three days in February) and the overcast is normally low. This complicates the enemy’s aircraft searches for our submarines. At the same time, this also makes the coordinated operations of our submarines and air forces more difficult.

Dense fog is present primarily in the summer months. In July and August, there are as many as six foggy days per month. Fog is carried by northern and northeastern winds and normally does not penetrate beyond a narrow strip of coastal terrain. Often, it remains at some height off the surface of the water and shore; therefore, the ability to observe through the periscope is preserved. Usually, fog exists in winds from force 0–5, that is, during those sea conditions when submarines can conduct attacks on enemy ships.

The large number of dark periods in winter and frequent episodes of fog in summer require that special attention be given to submarines using hydroacoustic equipment for detecting and attacking the enemy, and training boat crews to carry out surface attacks.

Snowstorms occur frequently in the Barents Sea, during which visibility falls to zero. This impediment also forces a submarine caught by a storm during an attack to rely upon acoustic directing-finding equipment to maneuver.
Snow squalls in daylight do not hamper sailing, because the range of visibility is adequate for the submarine to determine its position in the intervals between squalls. At night, squalls sometimes follow each other continuously, creating great difficulty in determining the boats position. A strong refraction toward mirage, observed primarily in July and August, can also cause significant errors in confirming a position. Due to heavy refraction, the range of an observed shore feature or isolated objects increases by a factor of three to four. As a consequence of navigational errors, submarines, frequently unaware of their mistake, end up in known enemy minefields on the approaches to the coast. In this regard, the increased range of visibility favors the commanders. A coastline that is visible early can be detected at significantly greater distances. This increases the opportunity for submarines to attack. However, because of the distortion caused by refraction, it is difficult to determine the type of attacking ship and its angle on the bow. This can lower the success of the submarines’ torpedo firing.

Constant currents along the Norwegian coastline are not usually strong, but when they are, they can reach the level of onshore, offshore, and wind-driven currents. The velocity of onshore and offshore currents in the open sea can reach 2–3 knots, become several times greater near protruding capes, and reach great magnitude (up to 5–8 knots) in the straits of the Norwegian coastal waters. During changes of direction near capes and narrows, the current maintains sufficient force to make control of the boats significantly more difficult.

During periods of poor visibility, the changing onshore, offshore, and particularly wind-driven currents lead to significant navigational errors, which increase the danger from enemy minefields.

The water in the Barents Sea is quite translucent, but almost constant wave action and a cloudy sky make detection of a submerged submarine from the air a rare occurrence. The presence of enemy airfields along the entire trace of convoy movement allowed him to organize air searches for submarines along convoy routes and also to escort convoys.

Such are the naturally occurring peculiarities of enemy sea lines of communication in the north.

The enemy uses German and Norwegian cargo vessels and the fishing fleet to move cargo. Up to February 1942, the Germans had requisitioned 463 fishing vessels from the Norwegians. In the fall of 1942, a shortage of transport assets forced the enemy to utilize assault barges for cargo movement. The composition of the enemy transport fleet is approximately as follows:

- Capacity from 1,000–3,000 tons—45 percent of transports
- Capacity from 3,000–6,000 tons—28 percent of transports
- Capacity from 6,000–10,000 tons—23 percent of transports
- Greater than 10,000 tons—4 percent of transports

Transport vessels of significant tonnage and troop transports are armed with one or two 75mm guns, 20mm cannons, and machine guns. Transports of reduced tonnage are armed with 20mm cannons and machine guns. Germans man the guns on all ships.

As a result, transports move in small convoys, composed most frequently of 2–3 transports with 2–5 escort vessels. Transports carrying particularly valuable cargo are accompanied by up to 10 escorts. Single small transports carry less valuable cargo. Often, small
Norwegian and commercial ships not yet confiscated are used for this purpose, sailing under the Norwegian flag with Norwegian markings painted on their hulls.

In all ports along the convoy’s route are German officers who regulate the movement of the transports. The convoys move day and night on more open sectors of the route. When there is danger from submarines, the convoys, as well as the transports that are moving singly, are delayed in Batsfjord and Syltefjord.

The following numbers indicate the intensity of the movement on this route: from April through September, 178 convoys and single ships with an aggregate of 316 transports and 660 combat vessels were observed on the return route between Honningsvag and Vardo. Of these totals, 302 transports and 545 combat vessels were sailing in convoys. Sailing unescorted were 14 transports; 115 combat vessels sailed in a non-escort role. Thus, approximately 96 percent of all ships moved in convoys. By tonnage, the figure is even greater. Such a high percentage of ships moving in convoys indicates the great effectiveness of our submarine operations.

In the total number of transport ships observed (316), dry cargo ships made up 63 percent; self-propelled amphibious cargo barges 20 percent; tankers 8 percent; motorized sailing schooners 6 percent; hospital ships 2 percent; and tugboats and barges 1 percent.

Therefore, a large percentage of self-propelled cargo barges had been used already by the fall of 1942. Because of these barges’ poor seaworthiness, they must travel close to the shore. The destruction of these barges by torpedoes is complicated by their shallow draft, which requires a torpedo running depth of 1–1-1/2 meters. Because torpedoes run poorly at this depth in a choppy sea, it would be more effective to arm torpedoes with proximity fuses.

Of the 660 observed combat vessels, there were two destroyers, six destroyer escorts, 44 minesweepers, 507 escort ships, five or six escort cutters, seven patrol torpedo boats, four auxiliary cruisers, and three tenders. From these numbers, it is evident that escort ships were the principal class of vessels used for convoy security. Mainly, these are armed fishing trawlers—some requisitioned from Norwegians and others constructed in Germany before the war under the supervision of the naval command. These ships are equipped with hydroacoustic instruments, depth charges, one or two 75mm cannons, one or two 20mm antiaircraft canons, and machine guns. There is a great shortage of purely military vessels, thus limiting their employment.

Such are the general conditions in which our submarines operate on enemy sea lines of communication along the Norwegian coast.

However, enemy sea lines of communication are divided into two sectors, sharply differentiated by their geographic conditions. The submarine operating conditions in these sectors vary, making it necessary to examine them in more detail.

**Eastern portion of enemy lines of communication**

The eastern sector, closest to our bases, extends approximately 180 miles from Petsamo to Porsangerfjord (Honningsvag). There are no natural shelters from the sea in this sector of enemy sea lanes, making it the most accessible for our submarines.

The deep water and high shoreline permit enemy ships to follow a course quite close to shore. They are difficult to detect from the sea against the backdrop of the coast. Landward submarine attacks are impossible in these situations, which allow the enemy to strengthen his defense toward the open sea. Along the shipping lanes it is possible to visually search for
submarines from ships, aircraft, and shore posts, especially during the polar day. To reach their positions on enemy coastal shipping lanes during periods of good visibility, submarines must submerge some 30 miles out and approach underwater, expending their limited supply of electrical energy. During submarine attacks, enemy ships sometimes find cover up against the coast, which also facilitates the rescue of their crews.

All these circumstances have caused enemy ships to move close along the coast in this sector, in some places only 400–600 yards from shore. However, in crossing the mouths of fjords, the enemy has been forced to veer a significant distance away from the coastline, sharply worsening his position. With escort in one direction, the enemy must either halt or reconcile himself to a large separation of his flank toward the fjord. Thus, the fjords have become the most favorable locations for conducting our submarine attacks. In order to lessen the danger in these areas, the enemy has attempted to follow the features of the coastline as close as possible, sometimes sailing into the fjord itself. Thus, crossing Varangerfjord, the enemy holds to a course west of Kirkenes. Because of the situation in which the enemy has been forced to sail, pressed close to the shoreline and through waters less than 100 meters deep, our submarines can use tethered mines against him.2

However, frequent summer storms from the north that push large waves into the shore, and heavy onshore, offshore, and wind-driven currents that achieve a velocity of two knots in this area, significantly reduce the depth at which mines can be placed in these waters and make them short-lived.

All this also pertains to the enemy minefields that cover his own coastal routes from the sea. The enemy has been able to deploy mines with long mooring lines along the coast. However, a trench 330–400 meters deep extends along the northern shore of Varanger Peninsula, 5–6 miles out to sea. These depths have not prevented the placement of antenna mines against our deeply submerged boats (length of mooring cable—330 meters, length of antenna, up to 30 meters), but have made it impossible for the mines to be placed so as to threaten our surfaced submarines. Thus, it had to be presumed that the upper layer of mines would be the most dissipated. Taking into account that the level of high tide in this area reaches 2.6–3.3 meters, submarines can move on the surface during darkness at high tide above the enemy’s minefields with minimal danger.3 This is not possible in the summer months.

In the Vardo–Kirkenes sector, the enemy shipping lane is only 25–35 miles away from Soviet territorial waters. In the Kirkenes–Petsamo sector, the enemy ships pass even closer to our shores. This enables submarines operating in these areas to withdraw under the protection of our shore batteries during enemy pursuit.

In the stormy weather along the coast, the large wave action (and counteraction) makes it extraordinarily difficult to hold the boat at periscope depth. It tosses the boat about, making an attack impossible. When the submarine is grounded on the bottom, the current beats heavily on it. The difficulty boats experience along the coast at night is intensified by low visibility, changing currents, and danger from mines that have broken away from their anchors and drifted toward the coast. All this, taken together, requires boat commanders to forsake the enemy’s coastal shipping channels in stormy weather and withdraw to the sea or move into a fjord where the waves are not driven by the wind.
Floating mines are also dangerous to enemy transports. This forces him to disarm the mines when they surface or to delay night movements in stormy weather. However, during the summer time there are not many stormy days.

In winter months, the prevailing winds are from the southwest. With these frequent winds, a large portion of coastal shipping lanes are sheltered by the coast, with the exception of the northern and middle portion of Varangerfjord. In the sea lands from Honningsvag to Vardo, the enemy can anchor ships at Syltefjord and Batsfjord. He then can cross this sector in darkness, even during short nights, by making the passage in several stages. The trip from Honningsvag to Vardo is 130 miles long, requiring 16 hours at a speed of eight knots. Consequently, from November and until February, the enemy can negotiate this more exposed sector of his route during darkness in a single crossing.

The subsequent ports of Vadso, Kirkenes, and Petsamo are situated close (not less than 40 miles) to each other. Passage between them can be accomplished during darkness even during the short nights of spring and fall.

These four ports are linked by vehicular roads along which troops and cargo move toward the front line. Thus, transports unload at all of these ports.

Two medium transports can be unloaded simultaneously at the Vardo docks. Larger transports are sometimes transloaded at Vardo onto small coastal vessels, which then deliver the cargo as far as Petsamo. Enemy escort forces can easily be stationed at Vardo.

Vadso is a fishing port with a pier that currently bases torpedo cutters.

Kirkenes is a commercial port, linked by rail with nearby iron ore works and by improved roads with Rovaniemi [Finland], Petsamo, and Narvik. The port has five docks and at present is the enemy’s main unloading and loading port in the north. Enemy submarines and escort forces are also based here.

Liinakhamari, in the narrows of Petsamofjord, is the closest port to the front line. Four transports can be loaded simultaneously at this port. Because the largest cargo here is nickel ore, our air forces attack it frequently. Therefore the number of transports present in port at any time is not great.

In addition to the above-noted ports, Berlevog Bay, located somewhat east of Tanafjord, can be used for anchoring patrol cutters. Patrol cutters and motorized launches can be moored at the several piers located in the upper reaches of the bay. Thanks to the pier that was constructed not long ago, anchoring in the bay has become less dangerous during northern and northeastern winds.

Thus, the most heavily traveled sea route in this sector is between Porsangerfjord and Vardo. Traffic gradually diminishes farther east toward Liinakhamari.

**Western sector of enemy lines of communication**

The second portion of the enemy’s lines of communication, from Honningsvag to Tromso, lies in coastal channels formed by the chain of islands that constitutes the northern coastline of Norway. The enemy’s coastal shipping route passes through a series of sounds, sometimes narrow and relatively shallow, and crosses broad and deep stretches formed by the entrances to fjords extending inland. In several places, the enemy route branches off into several channels, then joins together again. Such is the case in the area of Rolvsøy Island.
The broad and deep mouths of the fjords permit submarines to penetrate into this part of the enemy’s lines of communication. Over the total extent of this 200-mile sector of shipping lanes, the enemy has to pass through nearly 120 miles of open stretches.

Eight miles of this open area are in straits between islands and the mainland capes that jut out toward them, in places very narrow (the narrow portion of Mageroysund does not exceed one mile). Maneuvering submarines for torpedo attacks is extremely difficult in such narrow straits, especially in the changing onshore and offshore currents. But these same straits, which in most places are less than 100 meters deep, present quite favorable conditions for the use of submarine-laid mines.

The enemy can prevent the penetration of our submarines into his coastal sea lanes by placing mines on the seaward side between the islands, where our boats pass. The enemy can accomplish this easily because the sea is shallow along the edge of the channels. Only in the northern sector of Lopp Havet, west of Soroy Island, does the sea depth exceed 300 meters. Placing antenna anti-submarine mines at the great depth of 300–350 meters is possible, but creating a dense barrier near the surface of the water is exceedingly difficult. Because the mines have to be placed in areas open to wave action, their working life, especially of those near the water’s surface and thus exposed at low tide, will be shortened. Hence our boats can pass through enemy minefields in darkness at high tide on the surface.

Because of the danger to his transports, the enemy will avoid placing mines that can be separated from their anchors by southern tides and wind currents and be driven into fjords.

The depth of the sea at the edge of the channels permits the placement of anti-submarine nets in many places. However, the significant velocity of the incoming and outgoing currents, which reaches 2–3 knots, and frequent stormy weather will not allow nets to remain in place very long.

As was noted above, enemy ships passing through narrow and shallow straits present favorable conditions for our submarines to lay mines. Because they are placed in areas sheltered from wave action, the influence of stormy weather on mines is insignificant; but at the same time, the influence of tidal currents and depth variations remains in full force. In some straits, the velocity of tidal currents can be greater than in open stretches; as a result, mines placed there will not last long. The survivability of mines in these conditions is insignificant because, one way or another, they will be detected by the enemy and swept out. The large variation in sea level, which reaches 5–6 meters, causes complications. With such level changes it is impossible to place mines so that they constantly threaten the enemy. Mines should not be exposed at low tide. But because their depth level is set prior to loading onto the submarine, mines have to be laid at a predetermined period of the tide (a large portion is set at zero tide). Thus, mines should be laid at precisely determined times. This is relatively easy in open stretches, but in straits boats encounter additional difficulties.

The requirement for the enemy to pass through particular straits frees our submarines from searching the entire breadth of an area and permits them to patrol day and night near the entrances or exits of straits.

Since the submarines frequently must negotiate a narrow passage to penetrate into the enemy’s coastal channel, the enemy’s task of monitoring our submarines has been made easier. He can utilize observation posts sited high on the cliffs of island shorelines and shore-based sound-ranging and direction-finding stations for this purpose. The latter could be broadly
employed at channel entrances, because a 100-meter depth profile extends 4–5 miles out from shore in these areas. Passages not observable from shore can be controlled by a few small naval craft. These circumstances have special significance during polar days. Before submarines can reach the enemy’s shipping lanes, they must traverse not 30 miles, as it would be in an open sector of enemy communications routes, but significantly more. This added distance increases the boat’s expenditure of electrical energy and, consequently, reduces the time that a boat can spend on enemy routes, lowers the boat’s maneuver speed during an attack, and increases the danger to the boat during a prolonged pursuit when it cannot lie on the bottom inside a fjord.

The danger of pursuit for submarines has been increased by the overall restrictions of the channel region and the presence of a large number of fishing ports and sheltered narrows that can base enemy anti-submarine patrol forces. All this combined significantly intensifies the difficulties that submarines must overcome during operations in these areas in the summer months. But at the same time, the ample cover that the channel area provides from wave action makes submarine operations easier during the stormy periods of the year.

Snow squalls, particularly frequent in this area in the winter, present specific difficulties for submarine operations. During a snow squall, observation through the periscope becomes impossible. Surfacing can improve observation but places the boat in a dangerous situation if it suddenly moves outside of the snow squall into good visibility. When in snow squalls, submarines have to supplement visual observation with hydroacoustic instruments.

Through the entire length of enemy sea lines of combination are sheltered narrows and fishing ports that the enemy uses for basing combat vessels and special anti-submarine forces. The enemy uses the fishing port of Honningsvag (located on Mageroy Island) as an anti-submarine base. Enemy convoys moving to the east strengthen their escort here for the eastward passage through the most dangerous sector of the route.

Approximately 70 miles to the west from Honningsvag is Hammerfest, a fishing port on Kvaloy Island. Somewhat north of it begins the long Soroysund Strait. Currently the Germans have transformed Hammerfest into a military naval base for light forces. The harbor can anchor many combat vessels simultaneously: up to two destroyers, 4–5 minesweepers, and many small craft. The construction of a road linking Hammerfest with Kirkenes was completed in 1941.

Thirty miles west of Hammerfest, south of the western end of Soroysund, is Altafjord, used for basing German combat ships that threaten our sea lines of communication with Europe and America. For a long time the LK (lineynyy korabl—ship of the line or battleship) Tirpitz and the cruisers Admiral Hipper, Koln, and Nurnberg were stationed here. The good anchorages among the high steep shores, long and deep water exits, and presence of three passages to the open sea are highly conducive to basing ships in Altafjord. The core of the German fleet in Altafjord has given special significance to Lopp Havet, though which these ships pass to reach the open ocean, as an area of operations for our submarines. In this manner, enemy shipping routes intersect with the routes of their large combat vessels in Lopp Havet.

The military naval base and commercial port of Tromso is farther to the west in the far reaches of the coastal navigable channel on Tromsoy Island. An improved highway, which leads northward to Hammerfest, Porsangerfjord, and Kirkenes and southward to Narvik, begins on the mainland opposite the port. Tromso, a fully equipped military port, currently bases German destroyers and submarines.
In the first sector of enemy sea lines of communication that we examined, the ports are located only at its eastern limit and, in the main, are unloading ports. In the second sector, the ports are located throughout its extent and are basing sites for enemy combat vessels. It is easy to see that submarine operations in this sector are more difficult than in the first, especially in the summer months during polar day.

These are some of the unique characteristics of each of these sectors that influence our submarine operations in the northern theater.

2. Baltic Theater

General characteristics of the theater and enemy lines of communication

The principal features of the Baltic Sea are:

- Freezing in its northern part, which curtails our submarine operations when the boats are based in the eastern part of the Gulf of Finland from December through May.

- Its shallowness, which allows the enemy to place minefields throughout the theater (depths greater than 350 meters only occur in a few places). Our submarines can place mines and lie on the bottom in a significant portion of the sea. The sandy nature of the coastline permits enemy ships to make crossings in shallow waters, which extremely complicates our submarine operations.

- The presence of neutral Sweden, the territorial waters of which extend along the entire Baltic Sea and Gulf of Bothnia and offer a safe route for German transports.

Important naval routes that connect Germany and Finland to each other and to Sweden lie in the Baltic Sea. Over these routes, the enemy supplies his armies operating in Finland and occupied Baltic [Soviet] territories and transfers the ores necessary for the German war industry. The most important type of ore transported to Germany from Swedish ports is iron ore, which comprises a significant percentage of Germany’s total requirements for that commodity.

Because of the British and American air threat to German ships in the North Sea, the Germans have rebased a large part of their surface fleet in Baltic ports, where they conduct combat training with these ships. Consequently, the sea lines of communication of the German military fleet lie in the southern portion of the sea.

All these circumstances contributed to the importance of the enemy’s Baltic sea lines of communication during the war.

The above-noted features of the theater, along with the advantages for Germany of Sweden’s neutrality, lead to a completely natural division of transport routes between Germany, Sweden, Finland, and German-occupied territories into two basic groups. One is from German Baltic ports along the Mecklenburg coast to Cape Arkona, crossing the southern portion of the Baltic Sea to Cape Sandhammeren, then using Swedish territorial waters into the Gulf of Bothnia (figure 2). Transports sailing to Swedish ports continue moving to the north; those going to ports in Finland turn to the east at the Simupnesklubb lighthouse and cross the Aland Sea or the southern part of the Gulf of Bothnia. The total length of this enemy sea line of communication from Fehmarn Island to Lulea [north Swedish coast] is 900 miles. The second group is common with the first from German ports to Cape Arkona. Beyond that point, transports travel along the eastern shore of Rugen Island to the Pomeranian narrows and in shallow waters along the coast.
on to the east, then to the north. The length of this route from Arkona to Memel is approximately 300 miles; from Arkona to Tallinn is 600 miles.

In addition to these two main sea lanes, west of Bornholm Island are still other heavily traveled routes from Cape Arkona to Trelleborg (regular passages of rail ferries that support movement between Sassnitz and Trelleborg); Arkona to Ystad; southern exit from Ore Sund (Falsterbo lighthouse) to Cape Sandhammeren; southern exit from Oresund to Mon Island to Kiel narrows or Cape Arkona. Thus, the most heavily traveled enemy communications network is west of Bornholm Island.

All these routes were fully used even during World War I. They were so vital to Germany and their presence so complicated our submarine actions that from the very first days of this war, it was possible to predict with confidence the enemy movement along these same routes.

In the Gulf of Finland, the coastal channels, which have been cut for a long time in the Hanko area, are the principal naval artery. A series of crossing channels have linked the northern and southern coasts of the gulf, the most important being Tallinn to Helsinki (50 miles in length). Because it lies outside the influence of our surface and air forces, it also has come into the sphere of our submarine activity.

Thus, the following main sectors of enemy sea lines of communication in the Baltic Sea are addressed:

- West of the line Rugen–Bornholm–Simrishamn.
- From Simrishamn along the Swedish coast to the Aland Sea.
- From Rugen along the southern and eastern shores of the Baltic Sea to Ovisi.
- From Ovisi to Ristna.
- Gulf of Bothnia.

Conditions for submarine activity in each of these regions are quite different, and therefore they will be addressed separately. However, before we proceed, we must consider several conditions that generally relate to submarine operations in the Baltic Sea.

In the first months of the war, when our submarines were operating from their western bases, their movement to the enemy sea lines of communication was not particularly difficult. Statements from brigade commands concerning the passage of boats past the Bornholm line (for operations west of there) and South Kvarken Strait (for actions in the Gulf of Bothnia) caused some apprehension. However, as the subsequent course of the war showed, the difficulties were significantly exaggerated.

The situation sharply changed with the rebasing of our submarines to facilities in the eastern portion of the Gulf of Finland, which is shaped like a shallow pipe 200 miles long and, for a significant portion, only 40–60 miles wide (only 18 miles of deep water). Submarines experience significant difficulties passing through the gulf where the enemy controls the northern shore.

An already troublesome situation for submarines was further complicated when the enemy gained control of the southern coastline. This allowed him to create anti-submarine
positions on our submarines’ operating routes. Our fleet was not able to prevent this. The enemy’s capture of Hogland [Hogland] Island and the surrounding islands in the spring of 1942 deprived our boats of the Suurkyul maneuver base and allowed the enemy to form the forward edge of his anti-submarine screen. Our boats’ exit into the Baltic Sea for operations on enemy sea lines of communication became extremely difficult. Figure 3, which indicates the locations of detected enemy minefields and anti-submarine nets and his observation and searchlight positions and patrols, gives some idea of the dangers that awaited our submarines in the Gulf of Finland. Namely, here were concentrated the basic obstacles that our submarines operating on Baltic Sea lines of communication had to overcome.

[Figure 3, a full-page map, here in original text.]

The repositioning of our submarines to eastern bases determined the length of time they could operate on enemy sea lines of communication. In the second half of December, the Gulf of Finland west of Kronshtadt is covered by ice. At the end of April or the beginning of May, the eastern portion of the gulf is sufficiently ice free to permit submarines to sortie out to sea. This defines the possible duration of the summer campaign for submarines.

It should be noted that west of Bornholm Island, the ice remains for relatively brief period (movement of ships through the winter is maintained by icebreakers). Submarine movement in this area is restricted for 2–3 months. The middle reach of the Baltic Sea does not freeze over at all. Thus, if we had had underwater submarine bases, our boats could have operated significantly longer in the southern part of the Baltic Sea and through the winter in its middle part.4

In the autumn months, low temperatures and stormy weather cause ice to form on some parts of the boats and creates the same difficulties as in the northern theater. In the northern portion of the sea, freezing begins in November.

The formation of ice on the Baltic Sea and its bays, besides its direct influence on submarines, has another important effect on combat operations. During the shifting of the ice, the mines in shallow waters often explode. Also, during stormy weather, ice floes strike against mines close to or on the surface, causing them to explode. As a result, the upper layers of minefields are significantly depleted in the spring. Therefore submarine crossings of a dangerous mined area, such as the Gulf of Finland, should be attempted as quickly as possible after the gulf is free of ice and before the enemy has renewed his minefields.

An important occurrence affecting submarine operations in the Gulf of Finland and also in the northern portion of the Baltic Sea and the Gulf of Bothnia is “white nights.” From the end of May until the end of July, visibility at night reaches several miles. In such conditions, surface submarine movement around the gulf becomes impossible, which hinders the recharging of batteries. For a few days in 1942, several of our boats could recharge only episodically, spending not more than 40 minutes on the surface each time. As a result, boats were forced to run on batteries almost until they were exhausted. With the state of the enemy’s anti-submarine defenses, passage through the gulf by our boats during this period became especially difficult and dangerous.

Conditions for submarine operations at this particular time of the year were still more complicated in that throughout the entire Baltic theater, the weather was more calm and clear. Such weather permits the enemy to detect submarines at greater distances, both during surface
movements and under periscope. In narrow places, the boat can easily be seen from shore, and the enemy can use less seaworthy cutters to search for boats. Good visibility and few clouds create favorable conditions for air operations against submarines. Naturally, what benefits submarines in the spring is the murky water. However, since the visibility from an aircraft of a submerged boat in the Baltic in general is not great (practically speaking, an aircraft loses sight of a boat as soon as it lowers its periscope), this does not give the submarine any significant advantage.

Submarines in the southern sector of the sea were advised to avoid enemy aircraft by moving through the middle portion of the Baltic Sea, where one could expect relatively frequent fog (up to 14 percent of the time) during this period of the year.

As a result, submarine operations in the Baltic Sea were most difficult at the end of spring and the first half of summer. This once again underscores the necessity of moving boats through the Gulf of Finland as quickly as possible after the ice is gone.

Submarine operations were significantly more favorable during the second half of August until the end of the campaign. Darkness facilitates recharging of batteries in the Gulf of Finland and Bothnia and the adjoining sector of the Baltic Sea. Frequent rough weather makes the utilization of less seaworthy small cutters against submarines difficult; low clouds and overcast weather complicates the enemy’s ability to organize aircraft searches for submarines. Strong winds in the western half, making submarine operations near the eastern coast of the sea more difficult, interfere relatively little with submarine operations against the western enemy sea lines of communication.

Luminescence of the water is observed in the autumn. It is not great, but because enemy aircraft were seen searching for submarines at night, it could be advantageous in these periods for submarines to withdraw out to sea to recharge their batteries. There was a case, in the area of Kikhelkon, when our submarine S-6 detected the illuminated wake of cutters passing in front of it at night.

There are no incoming and outgoing tides in the Baltic Sea, which significantly simplifies submarine laying of anchored mines.

A constant surface current with a velocity of .5–.7 knots moves from north to south along the Swedish coastal channel between Gotland and Oland from both sides of Bornholm and beyond toward the straits. Winds and inflows of fresh water influence this current and subject it to changes and divergence. Sometimes the velocity of such temporary currents reaches 2–3 knots. Deeper down is a meeting current of more salty, denser water.

Submarine captains should consider these circumstances during prolonged periods in these regions without a precise determination of position; during grounding on the bottom, especially in a layer, and when laying floating mines.

The density of the water is greater in the Baltic Sea than in the eastern portion of the Gulf of Finland, which should be considered when calculating the displacement of a boat sailing for an extended combat mission.

The temperature and salinity differential in the various layers of the water creates a condition of layers in many regions of the sea. Their level varies depending on the region and time of year. This phenomenon appears predominantly in the southern sector of the Baltic Sea.
The abundance of islands and capes that extend out into the sea permits the enemy to organize a broad network of observation posts. Existing lighthouses and markers, various castles, churches, and other tall objects along the coast are employed for this purpose. Posts are equipped with light-signaling devices and searchlights, and some with sound direction-finding instruments. Radio direction-finding stations are deployed by regions along the coastline of the Baltic Sea. German communications officers are stationed throughout the entire theater. When the enemy detects one of our submarines, all transports in the area are informed immediately by a receive-only method.

When the danger from our submarines subsides, fixed lights burn to aid in safe sailing. When our submarines appear again, the lights are extinguished. Illuminated buoys are sometimes set out on the coastal shipping routes.

Periodically, the enemy changes his sea route, along with his navigational security. German and Swedish minefields frequently cover coastal transport routes.

German escort forces accompany transports into Swedish and Finnish territorial waters. Old destroyer escorts, military escort vessels (type F), minesweepers, submarine chasers, torpedo cutters, mobilized fishing vessels of the RT type (rybolovnyy trauler—fishing trawler), motorized boats, and other light craft are used for anti-submarine escort. Aircraft search for submarines and escort cargo ships.

After the Germans blockaded our boats in the eastern sector of the Gulf of Finland beginning in the spring of 1942, they began to sail the Baltic Sea almost as though it were peacetime. The Germans were totally surprised by the subsequent appearance of our submarines in the Baltic Sea. Large combat ships which were based at Kiel, Swinemund, and Gottenhafen did not participate in operations in the Baltic.

These were the general conditions for our submarine operations on enemy lines of communication in the Baltic Sea. Now we will examine the features of individual sectors of enemy sea lines of communication.

**Region west of the line Simrishamn–Bornholm–Rugen**

Even in World War I, the most active operations of our and British submarines occurred in this region. To penetrate into this region, our submarines had to pass through a natural line that was formed between Cape Sandhammaren–Bornholm and Bornholm–Adlergrund–Yazmund.

The passage between Bornholm and the Swedish coast is narrower (20 miles between shores), but also deeper. A sandbank extends outward to the south from Cape Sandhammaren about seven miles, and beyond it, the depth of the entire reach of the passage is approximately 50 meters. Deep water flows off the western coast of Bornholm. Thus, the depth and bottom soil in the passage permitted the placement of mines and nets. However, because of heavy ship traffic, a zone wide enough for transports to sail safely through was left open. Such an open passage for ships should have been left near the Swedish coast. The sandbank mentioned above complicated the situation. Since the transport route ran along the shallow depths of the sandbar, the enemy was able to interrupt underwater submarine movement. Reports indicated that the enemy had placed mines in this passage. The ports of Ronne and Nekso and countless fishing ports and shelters provided basing for anti-submarine forces, which patrolled and searched the passage. However, our commanders familiar with this area reported that they did not meet particularly serious anti-submarine defenses. Initially the reason was that the Germans were counting on a
rapid conclusion to the war, and did not consider it necessary to create a firm position. Not anticipating the appearance of our submarines in this region, the Germans took no additional measures in 1942.

The passage between Bornholm and Rugen Islands is 47 miles wide, with a large portion of that taken up by the Ronne and Adlergrund sandbanks, where the depth of the water does not exceed 20 meters. That portion of the passage where the sea exceeds 20 meters in depth is only 21 miles wide. But here also the depths are not particularly great and do not exceed 35 meters. The narrowest part of this sandy isthmus is approximately 12 miles wide. There are magnetic anomalies in the deep-water portion of the passage.

The shallowness of this passage and the presence on its flanks of Bornholm and Rugen Islands, which can be used to base enemy anti-submarine forces, make it a more difficult passage to traverse than the passage between Bornholm Island and the Swedish coast.

The area west of these passages by the Danish islands extends about 75 miles in length and 40 miles in width. To penetrate into these bays, ships must negotiate the narrow between Gedser and Darss, which is only 12 miles wide and 12–16 meters deep. In the last war, the Germans placed anti-submarine nets here, later replaced by an anti-submarine boom. Anti-submarine patrols were conducted here. In this war, the Germans have probably established anti-submarine barriers in this area. The shallow depth (16–18 meters) in the southwest reaches of this area limits our submarine operations. The depth increases when moving eastward. The northwest reach of this region flows toward Ore Sund. Shallow depths in the exit from Ore Sund hamper submarine operations.

In the middle sector of this region, the depth of the sea reaches 50 meters. Here a 20-meter depth curve passes 2–3 miles from shore. In the area where transport routes extend from the southern to the northern coast and back, the depth of the sea is somewhat constant—from 30–40 meters. Since the Germans can set their new depth charges to detonate in shallow waters, submarines in this region are constantly at risk. Grounding on the bottom is particularly dangerous. Throughout the entire year, a layer exists at a depth of 12 meters and greater. The significant number of sunken ships makes it undesirable for submarines to proceed submerged near the bottom.

The numerous lighthouses on the Swedish coast, the high shoreline on Bornholm Island, and the high and visible Cape Arkona permit submarines to determine their position accurately. This is especially important for submarines laying anchored mines in this area. With the ability to position the mines precisely and to determine their own location accurately, submarines can readily mine the area.

The constant moderate surface current from the east creates very favorable conditions for submarines to drop long-lasting floating mines.

Since the enemy is able to determine his ships’ location accurately, he can survey precisely the channel’s course and follow it. Therefore, the difficult job of placing floating mines in this area becomes easier. Mines drifting to the west extend the danger to enemy vessels in shallow waters that are difficult for submarines to reach. When laying tethered mines, it is effective to spread them widely in small banks along the channel flanks in the middle of this area, where transports cannot determine their own position precisely and will veer off their course during periods of reduced visibility.
This region is important for submarine operations because it is the hub for the enemy’s most important sea lines of communication. In the last war, submarine strikes here were the most bitterly felt in Germany and Sweden. Now, when the Germans are attempting to convince the world that Baltic Fleet submarines are locked up in Kronstadt, the appearance of our boats and the sinking of transports in the southern portion of the sea makes a powerful impression on the Swedes and the Danes.

Transports sailing from southern Baltic German ports to Sweden initially head toward Arkona and from there to Cape Smygehuk. Transports heading to Sweden from Swinemunde move along Rugen Island and then toward Cape Smygehuk. Ships passing from Ore Sund to German ports in the middle part of the sea are directed from Trelleborg to Arkona. Ferries also use this route between Trelleborg and Sassnitz. Thus, two enemy travel nodes are located near Arkona and Cape Smygehuk.

Since Germany uses the Swedish network for transporting cargo to Finland and Norway, the interruption of ferry lines of communication between Sassnitz and Trelleborg, by which railroad traffic is maintained between Germany and Sweden, is of special interest. Because the distance from the southern to the northern coasts is only 40–50 miles, transports can complete a trip at night. This requires that special attention be given to training for night submarine attacks directed toward this area. It underscores even more the effectiveness of using underwater obstacles. Our mines force the enemy to stay within his surveyed channels at night, which helps us locate the transports in the dark.

Type L submarines are the most suitable for operations in this area. These boats have sufficient range to operate effectively 650 miles from their bases and carry floating and tethered mines and a large supply of torpedoes. Because these boats are not too large, they can evade the enemy pursuit that is expected in this region. The proximity of enemy bases, the abundance of naval airfields, and every kind of training facility permit the enemy to deploy countless patrol vessels and aircraft against submarines.

**Enemy sea lines of communication from Simrishamn to the Aland Sea**

The transport routes across this portion of the enemy sea lines of communication, where navigational conditions are not an obstacle, lie within the limits of Swedish territorial waters. Consequently, our submarines can operate only in isolated sectors, where the enemy is forced to leave Swedish territorial waters.

In the area of Hano Bay, movement along the coast in Swedish waters significantly lengthens the route. The distance from Simrishamn to Utklippen is 52 miles in a straight line, but more than 70 miles if the coastal features are followed, approximately one and one-half times greater. As a result, some transports risk sailing directly from Cape Sandhammaren to Utklippen. Transports use this route more frequently when the risk from our submarines is diminished. Therefore, our submarine operations in this area in the daytime can be effective only in the period when they renew activity after the winter’s lapse. After that, they can control this area only episodically in the daytime. At night, transports move by the shortest route. Hence, nighttime searches for transports in this area are effective. But the enemy will vary his course in this case and sometimes sail not from Cape Hammeren (on Bornholm) but from Sandhammaren to Kalmar Sund. As a result, the region south of Utklippen is more favorable for night searches.

**Area south of the entrance to Kalmar Sund**
Because of the shallow sea depths in this area, transports are forced to depart from Swedish territorial waters. When a submarine threat exists, transports with a loaded draft of up to five meters are sent through Kalmar Sund. Larger transports skirt around the southern tip of Oland and sail farther to the east.

The depth, on the order of 30–35 meters in this area, hinders the submarines’ ability to evade depth charges, but it increases fairly rapidly to the south. The Germans and the Swedes find that transport movement in this area is more difficult because of mines.

Transports sailing north of Oland along its eastern coast are forced once again to depart from territorial waters. To the northeast, relatively close greater depths (50–90 meters) facilitate submarine operations. However, along the coast where the sea gradually deepens, favorable conditions exist for the enemy to establish sound direction-finding stations.

Currents that flow from the north into Kalmar Sund permit us to drop floating mines along the northern entrance and block the strait. This can force the enemy to sail east of Oland where he is more accessible to attack. Another area favorable for submarine operations is Norrkoping Bay, between Hefring and Landsort, where transports have to depart from territorial waters and cross a 20-mile stretch.

Most enemy transports were sunk in this area. Since German bases are distant, light anti-submarine assets cannot be used for securing the area or escorting transports. Therefore, Swedish vessels, which display less zeal than German vessels in attacking our boats, provide anti-submarine defense. At night, searchlights from the Swedish coast and islands illuminate the area. It is believed that the Swedes have sound direction-finding stations here.

On the main shipping route itself, the depth is 25–35 meters, but to the south and southeast, it quickly increases. In the event of German pursuit, this facilitates our submarines’ escape.

Thus, on the enemy sea lines of communication from Simrishamn to the Aland Sea, our submarines can attack enemy ships with torpedoes only in the several sectors mentioned above without violating Swedish neutrality. On these sea lines of communication our submarines deal not only with the German vessels escorting transports but also with Swedish security forces. The Swedes have placed mine obstacles on the approaches to the Stockholm channel and along the channel between Oland and Hefring.

Swedish destroyer escorts, patrol vessels, and cutters patrol along the entire Swedish coastline. Patrolling is especially heavy in the area of Kariskrona, the southern and northern entrances to Kalmar Sund, and Norrkoping Bay. Swedish submarines used for long-range patrolling are positioned south of Utklippen and on the axes of Hobergen–Kappeludden and Landsort–Gotska Sandon. Swedish aircraft search for submarines along the entire length of the transport route. Besides patrol activity, Swedish vessels often escort transports, among them German, as part of the convoys. Thus, even though the Swedish government is violating the generally accepted international convention, it unhesitatingly files a protest whenever our submarines deviate from international laws. This significantly hampers our submarine operations on sea lines of communication that are contiguous with Swedish waters.

The sea lines of communication connecting German with Swedish Gulf of Bothnia ports and Finland with Sweden and Germany extend across the Aland Sea and the Gulf of Bothnia. The Aland Sea is sufficiently accessible from the south form the Baltic Sea and is about 35 miles
long, north to south, and 40 miles wide. In the eastern Aland Sea is a fairly broad area of rocky islands. It is bounded by Swedish coastal waters on the west and it connects through South Kvarken Strait with the Gulf of Bothnia on the north.

Depths in the greater part of the Aland Sea range from 100–300 meters. Consequently, our submarines cannot ground on the bottom or lay anchored mines. However, the enemy is able to place anti-submarine mines. A moderate current of fresh water runs in the upper layers of the sea from the Gulf of Bothnia into the Baltic Sea.

Transports heading toward Turku and Finnish ports in the Gulf of Finland cross the southern part of the Aland Sea, traveling to the east in the area of Arkholm lighthouse. Ships sailing into Finnish ports in the Gulf of Bothnia either go into the Gulf of Bothnia and turn toward Finland, or cross through the South Kvarken Strait. Many of the transports sailing to or from Germany move through the Aland Sea. As a result, the Aland Sea is well suited to our submarine operations.

The Finns and the Swedes provide security in these waters. They have organized patrols of escort vessels and aircraft, and have positioned their submarines on the approaches. Swedish and Finnish vessels strengthen the escort for transports crossing these waters.

The South Kvarken Strait is about 10 miles long, north to south, and 20 miles wide, with a number of islands in it. In some areas it is not deep, and its bottom is rocky. The Swedes and Finns have mined the strait and conduct patrols. Searchlights are positioned on some islands. Since mines in the South Kvarken Strait pose a danger to submarines, preliminary reconnaissance is required. Fear that the enemy would heavily barricade the passage with mines was one reason why our submarines did not operate in the Gulf of Bothnia for a long time.

The East Kvarken Strait divides the Gulf of Bothnia into two parts. The main crossing routes that connect Swedish railroad terminals with Finnish railroads lie in the southern portion of the Gulf of Bothnia. This area of the gulf is 170 miles from north to south and, at its widest point, is 120 miles across. In most areas the gulf is deep enough for boats to ground on the bottom and lay mines. Only in the northwestern sector does the depth exceed 120 meters and, in a few places, more than 200 meters. Reefs exist along the Swedish and Finnish shores. Since there is not a continuous offshore island channel along the Swedish coast, in places ships must sail out away from the shore. This then allows our submarines to intercept transports carrying ore from Lulea to Germany.

For the most part Finnish ports are located in shallow bays. Any underwater approach to them is difficult. The most important Finnish shipping ports are Turku, Uusikaupunki, Rauma, Kristinestad, and Vaasa.

East Kvarken Strait, which is like a rocky dam, divides the Gulf of Bothnia into two parts. Our submarines pass through it with great difficulty. For this reason, systematic submarine operations in the northern part of the Gulf of Bothnia are hardly worthwhile, but it is possible for a boat to pass into this part of the gulf for a brief period of time.

Prior to the appearance of our submarines in the fall of 1942, enemy transports moved in the Gulf of Bothnia as if in peacetime conditions. After the Germans discovered our boats, Swedish military vessels escorted the transports. Also, lighthouses in the area of our submarine operations were extinguished. Thus, our boats’ main difficulty was penetrating into the Gulf of
Bothnia. The enemy’s false sense of security in the gulf called for the rapid dispatch of a group of boats to operate in this area.

Enemy sea lines of communication along the southern and eastern shores of the Baltic Sea lie along the coast of Germany or its occupied territories. Sandy coastlines permit the enemy to travel the entire passage in shallow waters, greatly complicating our submarine operations. Only in the areas of Danzig Bay–Memel, Akmenrags, and Vindava does the 20-meter depth curve approach the shore to less than two miles. Vessels sailing close to shore in these areas are susceptible to submarine attack. In the remaining sectors of the coastline, the 20-meter depth curve does not get closer than five miles to shore. Taking advantage of this, the enemy crosses close to the shore, in ships with shallow draft. This not only impedes our shallow-water torpedo attacks but makes it impossible for our submarines to place mines. When aviation support is available, it would be desirable to obstruct the coastal channels with aircraft-delivered mines.

The enemy transports move in systematically cleared channels along the entire coastline. Minesweeping is conducted daily near bases. Our ability to place mines great distances from the shore forces the enemy to remain in his cleared coastal channels at night as well. This facilitates our submarine operations in the deep regions during daylight and in shallow areas at night, because it is easier to track the enemy. Ship patrols with sound direction-finding equipment and aircraft secure the cleared channels. Patrol cutters systematically search for submarines in heavily trafficked areas.

Danzig Bay, where the enemy conducts combat training of his military vessels, is protected by minefields. We also know about sound direction-finding stations near Riksheft and Brusterort. Obviously, these stations exist at other points along the coast as well. Considering the uniformity of the coastline, it is especially prudent to avoid “popular” lighthouses, which ships routinely use for determining their position. In addition, one must be aware of Iersheft, Pappe, and Akmenrags. Mines may have been placed on the approaches to these points.

Enemy submarines are designated for action against our submarines. German submarines frequent the waters off Rugen Island, the approaches to the Bay of Pomerania, Danzig Bay, and near Memel.

Enemy transports frequently sail alone at night, negotiating the most dangerous regions without any kind of escort. If attacked by one of our submarines, the German captain attempts to ground his ship on the sand, which saves both the vessel and the cargo. Therefore, when attacking the enemy at night, our submarines need to take up positions shoreward. In doing this, the boat will end up on the eastern side relative to the enemy. The night search should be timed for the first half of the night, when this part of the horizon is the darkest.

Destroyer escorts, patrol vessels, and cutters accompany transport convoys. However, a small number of ships provide a large portion of the security.

The most effective submarine on these enemy sea lines of communication is the cruiser submarine, with a brief presence in the most vulnerable sectors. This forces the enemy to disperse his anti-submarine forces and creates the most pressure. It is advisable to make night forays along the coast, working toward the south, and then wait the day out in deep waters.

Northeastern portion of the Baltic Sea and the mouth of the Gulf of Finland
Enemy vessels can travel from Ovisi toward the north either by the Gulf of Riga or the Baltic Sea. Because of the difficult situation that developed in the Gulf of Riga, submarine operations were not conducted there. Therefore, there is no need to examine this sector.

Vessels have to negotiate the route from Ovisi to Ristna in water 30–40 meters deep, quite suitable for submarine operations. Since this poses a credible underwater threat, the enemy will rarely rush toward this route, but instead will sail through Riga Bay or Moonzund.

Sea routes from Moonzund to Tallinn, from Tallinn to Helsinki, and from the Swedish coast to ports in the Gulf of Finland lie in the mouth of the Gulf of Finland. Submarines operating on these routes must ply difficult waters in the navigational sense. The moderate depth hampers a submarine’s escape when being pursued. The numerous interlinked posts at which hydroacoustic stations and searchlights can be established also complicate submarine operations. Boats rarely sail past these posts undetected. The countless number of mines also hampers submarine operations.

The Tallinn–Helsinki route is an extremely active sea line of communication. Because it crosses the gulf, submarine operations are easier in its middle reaches. However, German and Finnish patrol vessels guard this track closely. For the most part, single transports escorted by small military vessels sail this route.

In the northern sector, the approach toward Uto is a principal region of enemy channels sufficiently accessible to submarines. Submarines can also intercept transports sailing from Stockholm between Bogsher and Sekstan Bank. In the eastern portion of the route, the enemy moves in an area of rocky islands.

These are the characteristics of each of the sectors of enemy sea lines of communication in the Baltic Sea. From this overview, it is clear that the following areas are natural for submarine operations:

- The area west of Bornholm.
- Shipping routes along the Swedish coastline as far as the Aland Sea.
- Lines of communication along the eastern coast of the Baltic Sea.
- The mouth of the Gulf of Finland and the northern portion of the Baltic Sea.

3. Black Sea Theater

**General characteristics of the theater and enemy sea lines of communication**

The following are the principal features of the Black Sea theater:

- Great depths in the middle portion of the sea and shallow waters along the western and especially northwestern coastline.
- In the western part of the sea, almost no islands or capes that extend into the sea, which in limited visibility conditions significantly hinders submarines in determining their position while approaching the western coast.
- Weak enemy naval forces.
- The Germans’ lack of interest in naval shipping at the beginning of the war, but a gradual increase as they captured Crimea and the Taman Peninsula.
The presence of a neutral, temporizing Turkey.

Sea routes through the Bosporus connect Romania, our enemy on the Black Sea, with Italy. Italy has been interested in the delivery of oil from Romania. However, since ships sailing to Italy passed through the British-controlled portion of the Mediterranean Sea, oil delivery was totally unreliable. With the capture of Odessa by the Germans and their subsequent advance along the Black Sea coastline, sea routes have been utilized for supplying the enemy army operating on the coastal flank. Thus enemy naval shipping, which was not significant early in the war, gradually has become important as military events have developed.

Nations on the Black Sea had a modest transport fleet. During peacetime, most of the cargo was moved on coastal craft (all manner of sail-driven vessels). When submarines became a threat, this means of transporting cargoes gained prominence. Loss of transports reduced the size of the fleet even more. As a result, when the necessity arose to organize cargo shipping, the Germans had to acquire self-propelled barges from Germany. At the same time, this resolved the issue of sailing in the shallow northwestern area of the sea.

Thus, in the Black Sea more than in other theaters, submarines had to deal with sail-driven ships and barges in shallow waters.

Bulgaria, hostile toward the Soviet Union, helped the Romanians in securing sea lines of communication by offering its military ships and aircraft for escort duty. Therefore, our submarines have become accustomed to seeing the Bulgarian flag.

Turkey’s vacillating position forced us to exercise caution in order not to give it any reasons to act against the Soviet Union. Considering the possibility of prevocational actions by enemy submarines, Turkey sometimes has closed off areas contiguous with its territorial waters to submarine operations, or demanded that submarine captains display their boat’s flag. Such demands greatly complicated our submarine activities.

Because Romania was a dependent of Germany, and Germany was not initially interested in shipping by sea, these two governments had set aside few assets for defending their sea lines of communication.

Two enemy sea lines of communication were important to military operations in this area: from Constanta southward, shipping primarily industrial products and cargo; and from Constanta and, mainly, from the Danube River estuary and Sulina to the north and east, moving cargo to maintain the forces operating on the extreme southern flank of the enemy’s Eastern Front. Obviously, the second type of cargo was exceptionally significant.

The route from Constanta to the Bosporus is 250 miles along the coast or 200 miles directly across the sea. Along this route are the following ports for transports to layover: Mangalia, 25 miles from Constanta; and the Bulgarian ports of Varna, 60 miles farther south; and Burgas, still 55 miles farther south and 110 miles from the Bosporus. Thus, sailing in stages, transports moving at eight knots can sail between each of these ports during periods of darkness, except for the stretch from Burgas to the Bosporus, which requires 14 hours.

The route from Constanta to Odessa is 175 miles long—80 miles from Constanta to Sulina and 95 miles from Sulina to Odessa.

These figures show the extent of enemy sea lines of communication that existed at the beginning of the war and as it progressed. At the same time, our submarines based in Crimea
could move to their operating stations against enemy sea lines of communication in less than 24 hours. After relocating to bases along the Caucasus coast, two days were required to reach their operating areas.

Because of different sea depths and also a number of other conditions affecting submarine operations, enemy sea lines of communication are divided into three sectors:

- Southwestern, from the Bosporus to Cape Kaliakra.
- Northwestern, from Cape Kaliakra to Odessa and from Odessa to Tarkhankut.
- Crimea, from Constanta, Sulina, and Odessa, south of Tarkhankut, and farther east along the Crimean coast.

**Bosphorus–Cape Kaliakra area**

The southwestern sector, which lies along the Bulgarian and Turkish coasts, is relatively deep, with a 300-meter depth curve, permitting the laying of German mines approximately 25 miles from shore. A 200-meter depth curve lies almost alongside it, and the 100-meter depth curve passes 15–17 miles from the coast. Depths of 20 meters run almost right up to the shore. Thus, this sector is good for submarine operations. Enemy minefields probably exist only in the Bulgarian coastal areas, which enable submarines to approach their designated positions safely, significantly lessening the danger from mines. A modest current, constantly influenced by winds, significantly changes in direction and velocity. This is the reason why, during poor visibility, submarines miscalculate their positions and stumble into mine obstacles.

In the winter months, frequent fog also greatly complicates submarine operations in this area. Without the ability to determine their position, boats must withdraw from areas that may be mined.

Anti-submarine defense in this area is difficult for the Germans because of the great distance from Romanian bases. Therefore, small Bulgarian craft conduct most of the anti-submarine defense. In addition, the enemy probably has sound direction-finding stations in the area of Emine and other capes.

From June through October, a good holding layer 15–20 meters deep exists along the entire western shore. Luminescent waters from September through November enable enemy aircraft to conduct searches for submarines at night.

The Bulgarian coastline is blacked out, while lights burn normally on the Turkish coast.

Large numbers of sailing vessels ply the waters between Burgas and the Borporus. Agents report that armed vessels sail in disguise among these schooners.

The ships sail primarily close to shore, but there is also movement seaward. The enemy changes his routes based on his observation of our submarines and the time of crossing (day or night).

**Cape Kaliakra–Odessa–Tarkhankut area**

This northwestern sector differs significantly from the southwestern sector. The depth curve runs northeast from Kaliakra. The farther one moves northward, the farther from shore is the 20-meter depth curve. Broad, shallow reaches are found in the northeastern corner of the Black Sea.
The 20-meter depth curve is three miles offshore in the Constanta area and 6–7 miles offshore in the Sulina area. This significantly complicates submarine operations directly against enemy bases. Sandbars hamper submarine operations for three miles along the coast.

The enemy has placed mines on the approaches to their bases. Our submarines also have laid mines. This forces our boats to focus on the precision of their navigation and knowledge of their position.

Because of the low and uniform coastline, and frequent fog and poor visibility in the autumn and winter months, our boats have difficulty in determining their position while approaching land. In addition, the enemy has mined the waters around Fidonisa Island, located 20 miles off the coast and used by our boats to determine their position. Also, a sound direction-finding station is located on the island. The best means to determine position in this area is to monitor depth changes. The northwestern part of the Black Sea has been surveyed so carefully that, by watching depth closely, captains can determine their positions even with large navigational errors. However, as in the southwestern sector, the changing wind-driven currents can cause significant drift to our boats, which can also lead to great navigational errors. Our submarines then inadvertently drift into enemy minefields and are destroyed.

Since the water is not translucent, a boat submerged at a shallow depth cannot be seen easily from the air.

In the northwestern part of the sea, because of ice, submarine operations become impossible for about one to two months. Transports pass close to shore behind the barriers in shallow waters.

Submarine operations in the northwestern sector of the sea are particularly difficult. The broad, shallow reaches force submarines to operate at depths of 10–20 meters. When a boat moves underwater, silt stirred up by the propellers forms clearly visible tracks on the surface. This forces pursued submarines to lie on the bottom.

**Sea lines of communication between Romanian ports and Crimea**

Enemy Crimean sea lines of communication sharply differ from those in the western portion of the Black Sea. Crossing the northwestern portion of the sea, enemy ships sail on the open sea in depths of about 45 meters. They subsequently pass along the western shore of Crimea to Sevastopol. Rounding Cape Kherson, ships move along the southern coast of Crimea holding as close to shore as the sea depths permit, until they reach their unloading port. The most favorable sector of the route for submarine operations is along the Crimean coastline to Feodosia.

Submarine operations in the open sector require assistance of other fleet forces, because the enemy can easily change his course. But submarines are not threatened by mine obstacles and have to deal only with those forces escorting the transports. The crossing from Fidonisa to Tarkhankut is approximately 100 miles. For 10-knot transports and barges, this requires 10 hours of sailing. Consequently, the ships cannot cross the entire distance during darkness during the summer months.

Along the southern coast of Crimea, our submarines can easily find the enemy. But they also must cope with more enemy security forces (mainly small cutters) and risk detection from shore observation posts. Possibly, the enemy is also protecting the coastal channels with mines, because the 300-meter depth curve passes approximately 10 miles from the coast. The 100-meter
depth curve is located 2–3 miles from the coast. Thus, mine laying by submarines and grounding on the bottom are possible only close to the shore.

A constant current with a velocity of .5–.7 knots flows from east to west along the southern and western shores of Crimea. The water is extremely translucent, and submarines can be detected in depths up to 20 meters. Our submarine operations are extremely difficult in this area because enemy aircraft are constantly searching the sea for our boats. However, the great sea depths of this area permit our submarines to submerge deep during pursuit. Our commanders have an excellent knowledge of the sailing conditions in these regions, which facilitates our operations.

The enemy uses small convoys to protect ships on the Black Sea. Three transports usually make up a convoy—one or two Romania destroyer escorts and one or two patrol cutters.

Because of the enemy’s shortage of military vessels, he often sends transports out without escorts. In such cases, they attempt to cross the most dangerous part of the route at night.
Chapter IV
Submarine Numerical Strength, Their Condition, and Basing

By the beginning of the war, the Northern Fleet had two type K, one type D, six type Shch, and six type M submarines, for a total of nine large and medium and six small boats. Under existing norms, with this quantity of submarines, three boats could be deployed in remote areas and two in areas 200–300 miles from base.

With the heavily traveled sea lines of communication in the north, this was a small number of boats to conduct intensive and continuous operations against enemy shipping. The high command recognized this. In the first two months of the war, eight submarines were sent from the Baltic to reinforce the Northern Fleet’s submarine brigade. Of this number, four type K and two type S entered the Northern Fleet complement from October to December 1941. Two type L were being refitted in Molotovsk and joined the fleet only in the second half of 1942.

Two British type T submarines, displacing 1,090 tons, which subsequently were replaced by two 620-ton type S submarines, arrived in August and were operationally subordinated to the commander of the Northern Fleet. These British submarines operated in the north until January 1943. In the second half of 1942, four type M (series XII) submarines, constructed in shipyards inside the Soviet Union, were delivered to the north by rail. Thanks to these reinforcements, the brigade’s complement, despite losses, was held at 15–20 submarines.

The main fully equipped submarine base was at Polyarnoye and the repair base was at Murmansk. From the beginning of the war, the boats were dispersed to bays along Kola Inlet, where they were protected by antiaircraft batteries. Fishing trawlers and tugboats kept the submarines heated.

In the first months of the war, submarine repairs were fully satisfactory in timeliness and quality. However, spare parts shortages developed quickly as submarines were damaged in battle. This made repairing the boats extremely difficult. Frequent enemy air attacks on Murmansk lowered the productivity of the repair facilities. By early 1942, repair delays had significantly reduced submarine deployments and the quality of the work had dropped markedly.

In early 1942, the submarine brigade received the additional mission to protect Allied convoys, which required the periodic additional deployment of 4–5 boats for 6–7 days. In the end, the number of boats at sea decreased. In 1941, 30 percent of Northern Fleet’s boats were at sea at any one time; by the end of 1942, this figure had fallen to 20 percent.

By the beginning of the war, the Baltic Fleet had 11 type S, one type L, 16 type Shch, 16 type M, three type P, and two former Estonian submarines in its complement, totaling 33 large and medium and 16 small boats.

Under normal conditions, 11 boats were deployed in distant regions and five in nearby areas. The number of submarines available was adequate for the Baltic theater. Of this number, three type P boats, by their characteristics, were of limited use, and six type Shch boats were worn out. But to compensate, the training brigade had available two type K boats, one S, and two Shch (which had already joined the brigade), and 28 boats of various types were being built or repaired.

The Baltic Fleet had only one minelaying submarine (type L). The two former Estonian submarines were mine layers, but there were very few mines for them to lay. The mines that
were available were uncalibrated and required adjustment. Thus, these submarines could not adequately function as mine layers.

Not long before the war, the 1st Submarine Brigade moved from Libava to Ust-Dvinsk. However, the brigade was unable to complete its move. In the first days of the war, our forces abandoned Libava and Ust-Dvinsk and the submarines were transferred to Kronstadt. Also at the beginning of the war, the Malyutki (small, type M boats) based at Hanko were relocated to Tallinn. In connection with the threat from land and to this port, the submarines based here earlier and those moved from Hanko departed with their tenders to Luga Bay. Thus, in the second month of the war, our submarines were based in the eastern portion of the Gulf of Finland. Over the next month, Tallinn was used as an intermediate base where submarines sailing into the Baltic Sea made minor repairs and replenished their supplies. Submarines used shore facilities in Kronstadt, Oranienbaum, and Leningrad and the tenders Irtysh, Smolnyy, Polyarnaya Zvezda, and Oka for their bases.

The dislocation of the submarines to the eastern part of the Gulf of Finland significantly complicated their operations against enemy lines of communication. The boats’ route not only became longer but, more important, became significantly more difficult and dangerous, because the enemy could obstruct our submarine movement throughout the entire length of the Gulf of Finland.

With the withdrawal from western bases and especially in light of the blockade of Leningrad, the ability to repair submarines decreased sharply. Leningrad and Kronstadt shops were unable to repair submarines, so the crews took this burden upon themselves. The shortages of materials, fuel, electricity, and provisions and the frequent bombardments and air raids created severe problems. Despite all these difficulties, submarines were not only repaired but also were rebuilt. Baltic sailors experienced more hardships than any other submariners in the fleet. This should always be considered when evaluating the Baltic Fleet’s submarine operations.

The submarine basing problem led to significant losses in boats, both during their passages to their operational areas and in their bases. These losses could only be replaced by the construction of new boats or by capital repairs, and there was little possibility of accomplishing either. At the same time, the most combat-ready boats were sent to the Northern Fleet. In the final outcome, the number of boats in service dropped, though slowly. Initially, the number of submarines in the Baltic was sufficient for mission accomplishment; however, by 1942 a clear shortage of serviceable boats developed as the situation unfolded.

By the beginning of the war, the Black Sea Fleet had the following submarines at its disposal: four type S, three type D, three type L, 15 type Shch, 17 type M, and five type A, for a total of 25 large and medium and 22 small boats. Consequently, eight submarines could be positioned on distant enemy lines of communication and seven on close-in sea lines of communication simultaneously. This number of submarines was more than adequate on the short Bosporus–Constanta enemy sea lane. In addition, another five medium and large and three small submarines were already in the final stages of construction and could subsequently be used to make up for losses.

The mechanical condition of the submarines was good. The bulk of the Malyutki boats were series XII, launched in 1940–41.
The majority of the boats were based at Sevastopol shore base or at the tenders *Volga* and *Elbrus*; five type A boats were at the Poti shore base; three type *Shch* and four *Malyutki* boats were with the tender *Ochakov* in Novorossiysk. Shipyards in Sevastopol and Nikolaev fully supported the repair of these boats.

Enemy airstrikes on Sevastopol prompted the fleet command to disperse the submarines. The type *Shch* submarines, with the attached transport *Neva* for living quarters, was relocated to Feodosia; five *Malyutki* boats with their assigned tender *Lvov* were sent to Balaklava. This repositioning had no substantive impact on submarine operations against enemy sea lines of communication.

The German capture of Nikolaev deprived the fleet of the shipyard that build and repaired submarines. The approach of German ground units toward Sevastopol, the increased air raids and, finally, the bombardment of the city forced the fleet command to rebase the submarines operating against enemy western sea lines of communication to ports along the Caucasus coast. Submarines and their tenders sailed to Tuapse, Ochemchira, Poti, and Batumi.

This rebasing significantly influenced submarine operations against enemy sea lines of communication. The distance of bases from enemy sea routes grew by a factor greater than two. Correspondingly, the length of submarine voyages to enemy sea lines of communication also increased. The ability to make repairs sharply decreased. Only the shops at Tuapse and Poti were able to conduct repairs. Batumi and Ochemchira handled only small, routine repairs. This greatly extended the duration and lowered the quality of repairs, resulting in a large percentage of boats not being prepared to sortie. The situation grew increasingly worse when boats had to depart from Novorossiysk and Tuapse due to the frequent aerial bombardment of these bases.

The delay in submarine construction and repair, damage due to mines, and total losses greatly reduced the number of submarines operating against enemy lines of communication. At the same time, the length of these shipping routes continually increased as the enemy advanced along the coast of the Black Sea. This subsequently required an increase in the number of operating boats. As a result, submarine shortages began to be felt in the Black Sea as well.
Chapter V

Combat Training of Submarine Crews

The goal of peacetime combat training is to train and educate the enlisted personnel to ensure the conduct of successful submarine operations in wartime, especially at the beginning of hostilities. Wartime combat training should increase and reinforce successes and incorporate new methods gained from recent combat experience.

Our submarine combat operations in the initial period of the war cannot be considered successful. A number of important deficiencies were evident in submarine combat training for operations against enemy sea lines of communication. The inadequacies of peacetime combat training are addressed in order to understand why submarines operated as they did and also because the Pacific Fleet submarines are now conducting peacetime combat training. Consequently, an account of the shortcomings has a great practical significance.

First, submarines of all fleets developed primarily as single operating systems for positional warfare. The Peoples Commissar of VMF had noted this deficiency even in 1940, but in was so deeply instilled in our doctrine that by the beginning of the war, no essential changes had occurred. Therefore, submarines continued to work as an isolated service. No coordination existed for submarines to operate with other fleet assets. War planners did not consider submarine training when developing theater war plans.

Submarine combat training was conducted in designated areas of the sea with moderate depths, even after the boat commanders were permitted by order of the fleet military council to exercise independent command and control of the submarine in surface and submerged running. Commanders, almost always sailing in the immediate vicinity of their bases, studied the theater only as it applied to submarines. The sailing conditions near enemy shores remained unknown to them.

As a result, boat commanders were unfamiliar with the areas where they had to operate. Since most training attacks were conducted against fast ships, our submariners had no experience in attacking slow-moving targets. In fact, operations against enemy sea lines of communication required that submarine captains be able to attack slow-moving transports and have knowledge of their silhouettes and tactical and technical elements. The use of deck guns received scant attention.

Thanks to the situation that developed in this sea in the prewar years, the Black Sea Fleet’s 1st Brigade submarines were an exception. These units had conducted positional duty near the Romanian coast and the Bosporus, and the brigade’s boat commanders were familiar with these areas.

The combat training plan was identical for all submarines irrespective of the kind of missions they were assigned (excluding the mission to emplace mines). As a result, a great deal of time was required to complete an entire course (in practice, more than two cruises), and boats often repeated elementary tasks year after year. Submarines spent almost no time on the use of acoustics.

The shortcomings in submarine crew training that surfaced during the war with Finland were not corrected. In part, the war with Finland showed the false economy of firing single
torpedoes and how important it is for boats to be able to fire torpedoes from shallow depths and with a shallow running depth. Shortcomings of the 45mm deck gun were also revealed.

New versions of several articles of the Regulations for Submarine Combat Operations 1939, which took into account the war experience with the Finns and were suggested in 1940 by the Directorate for Combat Training, were not published before the start of this war nor even in its initial period, though the need existed for these materials.

But the deficiencies of the Regulations were not the reason for the weak performance of submarines at the beginning of the war. On the whole, the instructions contained in them were fully confirmed. But neither the submarine commanders nor higher submarine formation commanders knew the regulations. Peacetime combat training did not prepare commanders at all levels to carry out the instructions recommended in the new manual.

In 1941, the “Course of Submarine Combat Training” was reviewed and reissued. Many deficiencies of the previous course were considered and corrected. But submariners received the new course only 4–6 weeks before the start of the war. Therefore it did not influence the readiness of submarine crews for combat operations.

The combat training course in itself was not simply a recommended method of training submarine commanders and crews, but rather an enumeration of mandatory tasks and brief instructions that crews must complete in a specified sequence. In criminal cases, the “Course” was introduced as a document, on the basis of which someone was declared guilty of a particular violation. This caused a particularly rigid relationship of brigade and division commanders both to the “Course” and to combat training itself. Brigade commanders, irrespective of the individual qualities of a commander and the readiness of his crew, demanded that the entire lengthy task list be accomplished. Because the “Course” was so long, it could not be completed in a single cruise. This whole training method was complicated by the frequent transfer of submarine commanders, which prompted the restarting of the “Course.” As a result, submarine proficiency did not improve.

In this situation, submarine commanders lost interest in combat training and it became formal and bureaucratic.

But the extreme over-supervision of boat commanders and the constant need of brigade commanders to ensure “that nothing would happen” was hardly the most serious deficiency in the submarine peacetime training system. The over-supervision manifested itself when “overseers” to commanders were appointed and when brigade and division commanders interfered in all the actions of submarine commanders.

This inculcated a lack of initiative in commanders, who became conditioned to the notion that in all situations, the leadership would think for them. As a result, during the war radio messages from commanders reporting their situation ended with the statement, “I await your instructions,” instead of stating a decision.

This situation is affirmed by the number of submarines in the fleets that are considered to be first line, that is, capable of accomplishing combat missions in elementary conditions.

There were no first-line boats in Northern Fleet; eight boats were second-line and two were in for repairs.
In the Baltic Fleet, only two type M boats were rated first line; the remaining 46 were second line. Only just before the war began did some of them begin to work on torpedo firing.

In the Black Sea Fleet, 19 boats were considered first line, 11 second line, and two in the organizing period. By the beginning of the war, the boats were finishing the tasks relating to mines, torpedoes, and deck gunnery.

Strictly speaking, no submarines in the Northern and Baltic Fleets could independently accomplish the simplest missions. At the same time, many commanders in both fleets had commanded submarines for more than three years.

Another indicator concerning submarine combat training should be noted: combat successes achieved by submarines during wartime were distributed among submarine brigades inversely proportional to their combat readiness indicators in peacetime. This shows that we were very weak not only in our combat training system but also in our accounting, which had a bookkeeping nature.

The concern of brigade and division commanders that “nothing happen,” and sometimes the desire to be in first place in combat training, led to the simplification of conditions while submarines performed the tasks in the KPL (Kurs podvodnykh lodok) [short for the submarine combat training course]. Thus, for example, the mission “attack with penetration of security” was accomplished when the security was represented by one or two cutters. Because the level of combat readiness was determined by the number of check marks that represented completion of a KPL task, and not by an evaluation of the boats’ actual readiness for combat operations, several ambitious brigade commanders embarrassed themselves and awarded check marks very generously.

As a result of the “protectionism” of the command and the simplification of the training that was conducted, submarine commanders were indecisive and incapable of making independent decisions. This, basically, explains the irresolute, indecisive actions of our submarines in the first months of the war. This is also confirmed by the fact that occasionally, those who achieved successes and showed a high aptitude for leadership were not the commanders who had been commanding boats and conducting combat training in the brigades for three years, but the young commanders who had just assumed command of submarines or the older commanders who were not among the leaders in combat training.

Many combat unit commanders had inadequate sailing records, especially regarding the navigation service. Navigators weren’t taken seriously on a boat. Young officers with insufficient practice in their specialty were appointed to this position. Peacetime submarine sailing conditions gave very little practice to these officers. Consequently, at the beginning of the war, navigation on submarines was substandard.

Training of the submarine seamen and petty officers was at the desired level, which was determined by the high cultural level of the young sailors selected for submarine duty and the well established system of their training in the submarine training detachment. This contributed to minimal accidents in combat sorties and the safe return of boats that had been seriously damaged.

With the beginning of the war, submarine combat training in the fleet was curtailed. For the first time, there was no demand to continue combat training under the direction of the naval staff apparatus in Moscow. Submarine departments of fleet staffs were engaged in operational
efforts and did not have time to organize combat training in new wartime conditions. All attention was focused on those operational tasks required by the military situation. Submarines entering service were limited to working on the most elementary tasks, primarily the steering of the boat.

By the end of 1941, the need to organize submarine combat training in the fleets once again became obvious. A list of tasks that submarines needed to be able to accomplish in wartime was issued. Submarines assigned to fleets were to carry out combat training to enable them to accomplish their immediate missions. Therefore, all submarines were to operate against enemy sea lines of communication. Training emphasized attacking slow-moving transports and surface gunnery. In the Northern Fleet, submarines worked on joint actions conducted by two boats. On the Black Sea, the organization of combat training did not present any particular problem, because the enemy did not interfere with it. They only had to guard targets from possible attack by enemy submarines. But this danger was not great at this time, since the enemy had only a small number of boats in the Black Sea and they displayed no particular zeal. As a rule, the exercise area was protected by our minefields; anti-submarine watches were strengthened during exercises.

In the Northern Fleet, many tasks were practiced in the Kola Inlet. Exercises that required a large expanse of water were conducted in Kildin channel. Because of the threat from enemy aircraft and submarines, the exercise area had to be searched prior to the start of training and fighter aircraft were maintained on alert status.

Particularly difficult conditions for submarine combat training developed in the Baltic. No areas existed where submarines could conduct training without interference from enemy air forces, submarines, and shore batteries. Boats based in Leningrad were forced to undergo testing following repair and to conduct initial tasks on the Neva River, between the Okhtensk and Railroad bridges. Here was found a trench 20 meters deep, where the submarines worked on submerged tasks. The strong current, the presence of sandbanks on the sides, and a large number of ships all created exceptionally difficult conditions for conducting exercises and did not permit the crew to be trained properly in driving the boat, especially the planesmen. The situation was only slightly better in Kronstadt. Here, the boats could use only the large Kronstadt for exercises. There was no place to practice torpedo attacks.

In these conditions, it became necessary to conduct submarine combat training during combat. The issue was particularly critical for submarines that were slated to sail on their first combat sortie. It was not only purposeless but also extremely dangerous for boats to conduct combat torpedo attacks with untrained planesmen. A boat’s planesmen could only be trained while the boat passed from the Gulf of Finland into the Baltic Sea. Thus, boats on their first sortie had to negotiate the Gulf of Finland with inadequately trained crews. Should such a boat encounter enemy vessels in the Gulf of Finland, it would not attack. But then upon entering the Baltic Sea, these boat commanders’ first task was to train their crews to drive their boats well enough to conduct a stealthy attack.

Unfortunately, it was not always done this way. Sometimes the brigade command did not allow sufficient time for crew training. At other times, these same commanders did not attach sufficient importance to crew proficiency and, therefore, gave it little training time. The results of these errors can be seen in the experience of the combat sortie of the submarine S-13, which was at sea from 2 September to 10 October 1942.
This was the boat’s first sortie. Upon arrival in the Baltic Sea, the commander trained his planesmen for one day in controlling the boat for depth, and then headed into the Gulf of Bothnia. This was our first submarine to penetrate into the Gulf of Bothnia in wartime. Here, the commander was greeted by an almost peacetime atmosphere, which naturally facilitated the boat’s actions. While it was in the Gulf of Bothnia, the submarine sank three enemy transports, but it had to break off from 15 other attacks. Of those, six were the fault of the planesmen, seven were due to poor visibility on the surface, and two were because buoyancy was lost.

Clearly, if the commander had spent more time training his crew in the Baltic Sea, he would have been able to attain greater results, even though his boat would have been in its designated operating position for a shorter period of time.

During wartime, the best type of combat training is the combat experience the boat commanders and crews obtain in their sorties. However, many commanders learn from their combat experiences but fail to analyze them critically. Often, for example, some violation of a tactical precept has a fortuitous outcome. An example is the incident involving the submarine K-22 on 19 January 1942. After sinking a transport and one of its escorts with deck gunfire, the surfaced submarine was attacked by an enemy submarine three times during its withdrawal from the engagement area. The commander avoided enemy torpedoes all three times, each time turning the boat in the opposite direction of what existing regulations required. Because the torpedoes missed the submarine all three times, the commander drew the conclusion that our regulation for avoiding torpedoes was incorrect and must be reconsidered.

Obviously, our existing tactical precepts, as well as the instructions of our combat regulation, are correct. In combat, it is better to make an incorrect decision than no decision at all. By his turning away, even though incorrect from the perspective of the best course of action, the commander nonetheless disrupted the enemy’s firing solution. In addition, it cannot be excluded that in determining the submarine’s movement elements, the enemy may also have made errors that would have prevented the strike of his torpedoes. Therefore, in each isolated case, the commander should analyze his experiences critically and compare them with the experience of other submarine commanders.

In a combat situation, the commander has very little time to make a decision. There is no time for an all-encompassing analysis of an issue. The significance of experience enters into such situations, not blind experience but considered, analyzed experience. It is much easier to make a correct decision in quiet times, behind a desk, not hurrying. After each combat episode, the submarine commander should analyze the event in a quiet atmosphere and, first of all, evaluate the correctness of his decision. The division and brigade commanders should assist the commander in this process.

An organized critique of a submarine’s sortie should be conducted to pass that boat’s particular experience along to other commanders. By no means should this be a formal report. Minute details (when the boat departed, by what course and speed, what readiness level, and so on) are unnecessary in this report. This only lengthens the critique, dampens interest, and frequently leaves out valuable facts and issues that deserve attention.

The commander should give a detailed account of the sortie to his immediate superiors. They should determine what episodes should be presented at the critique. The episodes selected should address some issue from a new perspective, exemplify an effective new method of submarine operations, or affirm experience previously gained but not yet totally confirmed.
During the critique, the commander guiding it (brigade or division commander) should present the information so that other commanders can arrive at the correct decision themselves. It is very important that incorrect judgments of individual commanders be examined critically. It must be ensured that the incorrectness of the decision is clear to all the commanders.

Fleet submarine departments and brigade staffs should collate and analyze the experiences of their submarine sorties to discern new methods of submarine operations and the utilization of weapons. Periodically, responsible staff officers should make reports to submarine commanders concerning particular issues that have been resolved on the basis of war experience. Staffs should develop the material that they receive based on the experiences of other fleets.

In our fleets, the aforementioned critiques are detailed in reports prepared by boat commanders. Initially, such critiques served a useful purpose, but now they do not accomplish their goal. The same things are discussed extensively and the commanders have lost interest. Also, commanders frequently believe that it is a bad idea to criticize their fellow commanders in the presence of superiors. Critiques have been conducted with tedious formality, which has benefited commanders little.

The passing on of experience occurs mainly when commanders talk privately among themselves. This form is completely natural, of course, but it should be supplemented by organized critiques. Otherwise, the higher level commander is deprived of the ability to control and direct the discussions of his [subordinate] commanders on particular tactical issues. As a result, there is not a uniformity of understanding of basic issues within the unit, and each commander thinks and acts on his own.

How much the combat training of our submarine crews has improved during wartime can be judged by comparing the successes gained in the initial period of the war with those from recent times. Especially indicative are the numbers from the Baltic Fleet. During the 1941 campaign, a total of 16 enemy ships were sunk. In 1942, even though conditions for submarine operations were significantly more difficult, the boats sunk 63 ships. Such an increase in successful submarine operations must be due to the acquisition by commanders of combat experience and, mainly, by the elimination of the indecisiveness instilled in commanders by peacetime combat training.
Chapter VI
Combat Command and Control

1. Organization of Submarine Large Units at Sea

Submarines designated for actions on a specified operational axis were organized into a submarine brigade. The brigade commander was subordinated directly to the fleet military council. For administrative convenience, the number of submarines in the brigade was not to exceed 25–30.

Submarine formations operating on a particular axis, and not exceeding 10–12 boats, were created by special organizational tables and were designated as separate divisions.

A group of submarines intended for actions on a separate sector of a given operational axis bore the title of submarine division. Consequently, division commanders directed submarine operations in designated sectors of the sea; the brigade commander was in charge of an entire operational axis; and the fleet military council was responsible for the entire theater.

Submarine departments existed in the fleet staffs. They were to regulate the interests of the brigades on the seas, manage issues of combat training, ensure the generalization of the experience of submarine combat operations, and supervise the brigades’ fulfillment of directives and orders of the People’s Commissar [of the VMF] and military council, and circulars from central directorates. The department chiefs answered to both the fleet commander and the chief of the operations department, an officer with whom they could consult on submarine operations. Inasmuch as the submarines in all committed fleets had been combined into single brigades, in the summer of 1942 the submarine departments were disbanded, and the position of fleet chief of submarines was created. In February 1943, in connection with the creation of the Directorate of Submarine Activity in the People’s Commissariat [of the VMF], fleet submarine departments were reestablished. The chief of the department was concurrently the chief of submarine activity and was subordinated directly to the military council. The brigade commander for submarine issues, and the commanders of training divisions in all matters were subordinated to the chief of submarine activity.

In the Northern Fleet, which by the beginning of the war had 15 submarines, a single submarine brigade existed, comprising three divisions. Types K and D submarines were in the 1st Division, type Shch in the 2nd, and type M in the 3rd. The sectors of the sea where these divisions were to operate were determined by the type of submarine assigned to them: 1st Division—the most distant sector of the enemy’s lines of communication; 2nd Division—the middle area; and 3rd—the closest sector. In reality, this did not fully succeed, in part because of too few boats, which was primarily due to delays in their repair.

Subsequently, with the entry into service of four additional type K and two type S submarines, the 1st Division was reformed. Only type K submarines remained in it, and types S, D, and later L comprised still another division.

In addition to the brigade, there was also a training division, which contained boats that were under construction, undergoing sea trials, and working on the initial tasks of the “Course of Combat Submarine Training.” Prior to the end of November 1942, this division was based in Molotovsk and was subordinated to the Belomorsk Naval Flotilla Military Council. With its
transfer to Polyarnoye, it was subordinated to the brigade commander. This division did not participate directly in combat operations.

The British submarines were operationally subordinated directly to the fleet commander.

This organization of Northern Fleet’s submarines was quite durable and suitable and remained unchanged throughout the war.

On the Baltic Sea, by the beginning of the war, there were two operational brigades, a training division with a submarine training detachment, and a training brigade.

Two operational brigades were needed because of the two anticipated operational axes: the southern and middle sectors of the Baltic Sea (1st Brigade) and the northern sector with adjoining gulfs (2nd Brigade).

The 1st Brigade consisted of two divisions of type S submarines, one division of minelaying submarines, and one type M division. The type S were to operate in the southern sector of the sea and the M division on the approaches to Libava, Vindava, and Irben.

The 2nd Brigade consisted of two divisions of type Shch submarines and two divisions of type M. Type Shch submarines were to operate in the northern sector of the Baltic Sea, and type M in the Gulf of Finland. From the very beginning, nothing like this actually occurred. The forecasted two operational axes did not develop. Submarines were not sent to the southern sector of the Baltic Sea (west of Bornholm) nor into the Gulf of Bothnia. Boats of the training division were deployed in the Gulf of Finland and two Malyutki submarines of the 2nd Brigade sortied only to its western part. Thus, the boats of the 1st and 2nd Brigades ended up in positions in the middle and northern parts of the Baltic Sea. The boundary between the brigades, an east–west line through Hoburg, quickly lost its significance. The boats of both brigades were dispatched to positions alternately, regardless of the boundary. The matter became even more confusing when the training brigade began sending boats into the Baltic Sea. In all of this, the brigades operated without good communications between them. As a result, the boats sortied without even the possibility of receiving reports from the other brigades concerning the situation in their areas of operations.

With the rebasing of the entire fleet and all submarines to the eastern part of the Gulf of Finland, it became necessary to organize submarine operations. The decision was made to combine all the Baltic Fleet’s submarines into a single brigade. Thus, beginning in September 1941, and until February 1943, only one submarine brigade existed in the Baltic Fleet. In February 1943, a separate training division was pulled out of the brigade and subordinated directly to the Baltic Fleet’s chief of submarine activity. All the newly constructed submarines entering service were placed in this division. The unification of all the submarines into a single brigade significantly simplified the command and control of submarine combat operations and was fully justified. The withdrawal from the brigade of boats under construction freed the brigade commander of the most tiresome worries and permitted him to concentrate totally on submarine combat operations.

The organization of the brigade into subordinate divisions underwent changes, but the previous operational concept of the division in the Baltic was lost. Boats were dispatched to various positions without regard to any specific pattern. The division commander’s role was reduced to that of a senior housekeeper and overseer commander [a senior officer who accompanied a junior commander on his first sortie] for young boat commanders. This was made
possible because, as in the Northern Fleet, all the submarines were located in one place and the brigade staff performed all the operational functions for the division commanders. Difficulties in repair were the excuse given for the somewhat unorganized employment of submarines. Consequently, the return of boats to service was not subject to the brigade commander’s time schedule.

Just the same, one highly significant shortcoming existed in the organization of submarine employment in the Baltic Fleet: boats did not accumulate the experience of operations in a particular area. Regarding operational issues, division commanders were superfluous.

In the Black Sea Fleet, the organization of submarine units was more instructive. Before the war, there were two operational brigades and one training division on the Black Sea. Types S, L, D, and Shch submarines comprised the 1st Brigade. In the event of war, these boats were to operate against the enemy’s southwestern sea lines of communication. The entire brigade was based in Sevastopol. Minelaying submarines comprised the 1st Division, types S and D the 2nd, and type Shch the 3rd and 4th.

Two divisions of type M submarines and one division of type A made up the 2nd Brigade. These boats, based in Sevastopol and Poti, were designated for operations in the northwestern corner of the Black Sea and along our coastline all the way to the southeastern corner of the Black Sea.

The axes for brigade submarine actions were maintained initially. But the distribution of sectors of the sea between individual divisions was not totally accomplished, especially by the 1st Brigade.

The organization of submarine formations was changed in August 1942. By this time the number of boats in service had been reduced. Boats operated against enemy lines of communication only in the western and northwestern sectors of the Black Sea. It was decided to combine all submarines on the Black Sea into a single brigade.

Type S, D, and L submarines formed the 1st Division. Based in Poti, it was to operate against the enemy’s southwestern sea lines of communication. All type Shch submarines comprised the 2nd Division. Based in Batumi, it was to operate along the middle portion of the western coast. The 3rd Division, which included all type M boats, was based on the Khobi River and was designated for operations in the northwestern corner of the Black Sea. Finally, the 4th Division consisted of type A boats, based in Ochamchira, and it was to operate against enemy sea lines of communication along the Crimean coast.

Thus, each division had its own base, operated in a particular area, and received missions from the brigade commander. A division gained operating experience in its given sector of the sea; the division commander was responsible for submarine operations in a designated sector. The division commander was both an operational and tactical leader.

This organization on the Black Sea resulted because divisions were ported in various bases. This was normal and, in itself, corresponded to those organizational principles that were developed for our submarine formations on the seas before the war.

2. Organization of Submarine Command

Command of submarines operating on lines of communication in various seas was accomplished in different ways.
In the Northern Fleet, command of submarines for a long time rested in the hands of the fleet commander. Through the brigade commander, he assigned missions to the boats and specified their operating locations. The boats were in direct subordination to the fleet commander once they sortied to sea. The chief of the fleet staff submarine department was his submarine operator. Thus, the brigade commander’s limited role was to prepare the boats for sailing. The fleet military council and staff handled all the operational issues. The brigade commander was only an adviser for these issues.

At the beginning of the war, the Northern Fleet submarines were the single viable force, and their mission to disrupt enemy lines of communication was almost the fleet’s sole mission. Considering this and the weak combat readiness of the boats at this time, such a command organization was justified. To a large degree, this system of command and control committed the submariners of the Northern Fleet so that they “got their sea legs” significantly quicker than others, and they began conducting successful operations against sea lines of communication.

However, when the boats were already at full operating tempo, when new air forces and surface ships joined the fleet, and when the fleet received other important missions such as the defense of Allied convoys, the fleet command over-supervised the submarine brigade’s experienced commanders, distracting it from other missions.

On order of the People’s Commissariat of the Naval Fleet, the command system was changed in December 1942. The Northern Fleet Military Council assigned the brigade the mission to disrupt enemy sea lines of communication along the northern Norwegian coast and gave the brigade commander the authority to carry out the mission. From that time on, the brigade commander was completely in charge of submarine operations. The military council gave the required instructions for submarine operations, oversaw their implementation, and designated the necessary forces to support the submarines. This system of submarine command and control exists in Northern Fleet to this day.

It is characteristic that, having given the brigade commander the mission to disrupt enemy lines of communication, the military council did not subordinate any other forces to him and did not make the brigade responsible for organizing the reconnaissance of enemy sea lines of communication. Coordination of submarines with other fleet forces remained in the hands of the military council.

Thus, though the brigade commander was assigned the mission, it was to be accomplished jointly. As a result, the brigade commander did not assume total responsibility for the success of operations against enemy sea lines of communication. He always had the excuse that he didn’t have the necessary intelligence support, and so on. To some degree, the shortage of forces, about which more will be said, serves as an explanation for this situation, particularly in the coordination issue. This situation existed not only in the Northern Fleet but also in the other fleets.

It is particularly necessary to discuss the fact that the division commander was completely absent in the system of submarine command. His role consisted almost entirely of controlling boat preparation for sailing and in overseeing young commanders in their combat commanders at sea. The unconditional efficacy of these sorties must be acknowledged in that the division commanders were able to impart tremendous knowledge and training to the young commanders. The successful sailings of such division commanders as Comrades Kolushin and Gadzhiev testify to this. However, the lack of division commanders’ participation in making
operational decisions is clearly wrong. In actuality, the boats of a single division sailed to various areas, the operational concept underlying the formation of the divisions was forgotten, and the division was viewed as a group of submarines joined together only by organizational and basing matters.

If submarines had been systematically deployed to particular regions, each division commander would have received a specific operational mission—to disrupt (or destroy) enemy lines of communication in such-and-such sector. He would then have carefully studied his assigned area and would have conducted systematic reconnaissance. The division commander’s sorties would have both a tactical and operational purpose. He would be accumulating and analyzing data from his particular area of operations.

The typical explanation for the failure to do this is the shortage of submarines and the delays in repair, resulting in boats having to be dispatched from one position to another.

If each division commander had planned the combat operations of his division, then probably there would have been less shifting of boats between positions. In these cases, when the commander would send a boat into another division’s area, the division commander who was completely familiar with the conditions of the area would be able to help the new commander adapt to his new situation rapidly.

Depending on the situation, the brigade commander could retain overall command of the boats at sea.

On the Baltic Sea, from the beginning of the war, the fleet military council gave directives to the brigades, in which missions were assigned, positions were designated, sailing time and duration of sortie were specified, and the line separating brigades was established. It remained the brigade commanders’ responsibility to draw the boundaries between positions, designate the boats, specify the exact sailing time and return, and establish the length and frequency of reports.

With the rebasing of brigades to the eastern part of the Gulf of Finland, the fleet staff in Tallinn began to assume complete command and control of the submarines. The fleet staff submarine department began to exert greater influence on the brigades through the military council. With the unification of all submarines into a single brigade, command and control became more organized, but just the same, the brigade commander did not acquire independence in resolving his assigned missions. The brigade received significantly greater independence in 1942, when the submarine department in the fleet staff was established and its former chief was named the brigade commander.

In the end, command and control of submarines in the Baltic took the form of issuing detailed directives to the brigade, which specified the brigade’s mission, the positions, and full instructions that, in essence, dictated the tactical methods of accomplishing the mission. The brigade staff took an active role in developing this directive. Eventually, the brigade itself wrote the directive. By stating specific methods of operation in the directive, the military council took part of the responsibility for mission accomplishment away from the brigade. The brigade commander exercised command of the submarines at sea, but the fleet commander approved all repositioning of boats.

This, in the Baltic Sea, command and control of submarines was formally in the hands of the brigade commander, but to a significant degree it was exercised by the fleet commander. Just
as in the north, forces operating in cooperation with submarines were not subordinated to the
brigade commander. The situations in the Baltic and Northern Fleets concerning division
commanders were similar.

In the Black Sea Fleet, military council directives assigned missions and designated
operating areas to the brigades. The brigade commanders were to accomplish their assigned
missions independently. The brigade commanders developed and implemented their decisions in
accordance with the directives. On approval of their plans, the brigade commanders acted
independently and fully commanded their submarines operating against enemy sea lines of
communication. Periodically, mainly when it was necessary to shift submarine positions, the
brigade commander consulted with the fleet staff.

Seemingly, this form of submarine command and control was most effective. However,
the excessive isolation of the submarine brigades was a deficiency in command and control on
the Black Sea. Control over submarine operations was inadequate, and cooperation was not
shown with other fleet forces. This affected the submarines’ performance. As in the other seas,
the brigade commanders had no assets other than their submarines to accomplish their mission,
and they were not persistent in obtaining cooperation from other fleet forces.

When the single brigade was formed, command of submarines approached the desired
model. Since divisions were located at various bases, the brigade commander was not able to
command them personally. Each division was assigned to a specific sector of enemy sea lines of
communication and was given a mission. But the brigade commander was not limited to this. He
also decided which boat would sortie and when it would depart and return, and he presented the
brief tactical situation. The division commander prepared and verified the readiness of the boat
for sailing, assembled the documents required for the sortie, gave oral instructions, and provided
the support for the submarine’s departure and return to base. Each division was apprised of the
complete tactical situation in its own and in other regions (in case a boat from the division was
dispatched to any other region).

The brigade commander exercised command and control of all boats at sea, informing
corresponding division commanders of any additional instructions. Although this system of
command was effective, it was not precise. The brigade commander still interfered with the
functions of the division commanders. Just the same, the organization of command and control
of submarines in the Black Sea most closely approached normal.

In summary, the following principles outline submarine command and control:

- For independent missions and when submarines are the main force to accomplish a
  mission in a given area, the brigade should be assigned the mission. The brigade
  commander or, upon his designation, the division commander should command the
  boats and attached forces at sea.

- To accomplish missions in areas where other fleet forces are operating, the brigade
  should be assigned the mission. The fleet commander should command the
  submarines at sea.

- To accomplish missions with other fleet forces, the submarines should be an
  operationally subordinated force. The operational commander should establish the
  submarines’ (or submarine formation) mission and also command the submarines at
  sea.
One important shortcoming in the organization of command and control of forces operating on enemy sea lines of communication is that the other fleet forces supporting the submarines are not subordinated to the submarine brigade commander.

3. Submarine Reconnaissance of Enemy Sea Lines of Communication

For support of successful submarine operations against enemy lines of communication, reconnaissance must be organized to—

- locate the enemy routes.
- determine the most probably time the enemy will pass through a given area.
- identify the obstacles (nets, floating or tethered mines) covering our approaches to the enemy routes and the ways to pass through them.
- discover the enemy’s system of anti-submarine security (presence of sound direction-finding stations, observation posts and searchlights, anti-submarine patrols, and so on).

If the last task is best assigned to the submarines themselves, then the first three are best accomplished in the shortest time by the fleet’s other forces and means. Since submarines have a small radius of visibility, it requires a significant amount of time for them to accomplish the first three tasks.

The reasons for unsuccessful submarine operations in the initial period of the war in all seas are partly due to submarine forces not being assisted in locating the enemy routes. This also explains the significant losses that submarines suffered from enemy mines, especially in the Black Sea.

The following assets should have been dedicated to collecting intelligence against the enemy: agent reports, radio, aircraft, ships, and submarines.

Agent reports gave our submarines information concerning the presence of enemy ships in specific ports, their departure to sea, enemy losses, and enemy mine obstacles. Because the transmission of agent reports was slow, submarines frequently were unable to use the information concerning the departure of enemy ships from port. Even with this deficiency, the Northern Fleet conducted successful operations. In a number of cases, however, the fleet command had information 1.5–2 hours after it was observed. A weak point of agent intelligence in all theaters was the inaccuracy of agents’ reports.

Submarines frequently assisted in the organizing of agent reconnaissance. Since all the enemy sea lines of communication in our theaters lay along the coast and the enemy move in the coastal channels, we were able to monitor enemy ship movement in several places.

Communications intelligence collection was used quite broadly and successfully. With its assistance we were able to calculate the positions of enemy ships at sea and enemy submarines in the areas of operation and in the locations where our boats charged their batteries. It was also possible to learn of the enemy’s detection and pursuit of our submarines. An advantage to this type of intelligence was that the command could receive it quickly. Its shortcoming was that it depended greatly on the enemy’s use of radio communications.

Air forces aided submarines enormously in determining the enemy movement routes and spotting his ships in port. Since aircraft can cover broad expanses of sea, they are able to detect enemy vessels more rapidly than boats. Unfortunately, our naval air forces supported ground
operations in the initial period of the war, and were frequently unavailable for this mission. Just the same, a series of reports from air forces in the Baltic and the north were useful to our submarines. Later in the war, Northern Fleet aviation was used for missions out to sea. Also, in the summer of 1942, when the enemy ship routes were already known, intelligence gathered by aviation had a more tactical than operational significance. Aircraft informed the command of the locations of enemy transports.

Air reconnaissance was organized in the Black Sea in the summer of 1942 against western enemy lines of communication. But since it was used only several times a month and communications with the brigade were slow, it seldom gave any positive result.

In no theater did surface ships provide useful intelligence to submarines operating against enemy sea lines of communication. This would have been impossible in the Baltic, but such possibilities existed in the Northern and Black Sea Fleets.

Surface ships were able to assist, and should have assisted submarines in determining the enemy’s routes at night, sweeping minefields, and providing intelligence data concerning enemy mines.

As has already been noted in evaluating the Northern and Black Sea theaters, the enemy probably made his night crossings away from the coast outside his own minefields. Therefore, it was necessary to search for the enemy at night along the seaward side of his obstacles. Such operations were not conducted by any fleets.

The fleets did not conduct mine reconnaissance in the area of enemy sea lines of communication, although Black Sea Fleet submarines suffered great losses due to mines. The disdain for this task was great. In fact, in the fall of 1942, when Black Sea Fleet surface ships conducted three operations against enemy sea lines of communication near the western coast, not once did they conduct mine reconnaissance in accordance with the recommendations of the submarine brigade. This was an extremely serious issue that required the fleet commander’s special attention. Frequent reports about submarines scraping against mine tethers (normally inadvertently) created the impression among Black Sea Fleet submariners that the entire western enemy coast was mined. The failure of boats to return from sorties and their loss to mines worsened the situation. It was therefore necessary to relieve the tension among the submariners and rectify the mine situation on the enemy’s western sea lines of communication. It would have been appropriate for fast minesweepers to conduct special operations. It is also incomprehensible that surface ships on the enemy sea lines of communication could have ignored this task.

Thus was the status of the issue concerning the organization of intelligence reports that the submarines received from fleet forces. The brigade itself, however, was unable to resolve the problem internally.

To conduct methodical operations against sea lines of communication, the brigades should have first determined the routes used by enemy ships. Since the beginning of the war, brigade commanders had been ordering submarines to destroy enemy ships, without emphasizing reconnaissance. As a result, Baltic Fleet boats returned from their first sortie (with the exception of S-102) and were unable to report on enemy movements. Consequently, the subsequent submarine employments in the Baltic in 1941 were conducted blindly.

On the third day of the war in the Black Sea, the submarine Sshch-204 was sent to the Sinop–Samsun area with the following mission: “Reconnoiter and attack foreign vessels
(military and transport) of all fleets, with the exception, on special order, of Bulgarian and Turkish.” The remaining boats, deployed at the beginning of the war to the western coast of the Black Sea, had the following mission: “Disrupt enemy sea lines of communication.” Shch-204, in position for eight days, determined the route and nature of Turkish ship movement. The boats near the western coast did not have the reconnaissance mission, so they did not bother to determine enemy routes. At night they withdrew from lights, and upon hearing explosions during the day (apparently depth charges dropped as a preventive measure), they did not attempt to ascertain their origin, withdrawing to the depths for 6–8 hours (Shch-205). Subsequently, when specifically assigned the reconnaissance mission, submarine commanders conducted it properly and achieved positive results. The effort to inflict materiel losses on the enemy as rapidly as possible disrupted the proper routine of missions and frequently contributed to their failure. For a long time, boats were unable to achieve success simply because they could not find the enemy.

If submarine commanders detected enemy ships and could not attack, they simply discontinued observation of the enemy movement. Submarines did not attempt to follow detected enemy ships into channels and through minefield passages.

In the areas of our submarine operations, it was extremely important to determine the boundaries of enemy minefields. This type of observation should have lessened the danger to our boats and shown us where the enemy could sail. But the boat commanders were not directed to do this. Just the same, a number of submarines provided useful information to the command concerning the mine situation. Thus, the submarine M-33, which was sent out to destroy enemy combat vessels and transports in the Constanta area in early August 1941, returned with reports concerning a lane through a minefield near Constanta and the coastal channel defenses. The submarine M-58 delivered similar reports about the Sulina area. However, the lack of attention to reconnaissance issues led to serious problems. For example, the submarine Shch-208, in position in Burgas Bay on 19 September 1941, detected the departure from Burgas of two enemy barges with mines, accompanied by a destroyer escort, two patrol cutters, and two aircraft. Rather than follow to determine which direction this detachment was moving and where it would lay the mines, the submarine commander moved off to recharge his batteries. As a result of such a disregard for intelligence matters, Black Sea Fleet submarines found themselves in a precarious situation. Not knowing where the enemy had sailed or the location of the lanes through his minefields, our submariners changed their boat positions continuously. Operating blindly, they were unable to achieve good successes.

Due to their small radius of observation and relatively low degree of mobility, submarines can reconnoiter only limited areas. Therefore, for our submarines to determine the enemy routes, they required a lot of time to methodically and gradually accomplish their missions. For the most rapid determination of enemy shipping routes, we should have stipulated reconnaissance as the basic task for submarines, forbidding them to attack in most situations. Following behind enemy ships, a submarine would be able to determine the greater part of his lines of communication. Therefore, we implemented this procedure on the Black Sea where, through an entire year of war, it was not clear where enemy ships sailed. Submarines operating in the southwestern sector of the Black Sea were forbidden to attack, but were ordered instead to establish the precise location of enemy routes. When this issue was sufficiently resolved, submarines were again permitted to conduct attacks. To determine the enemy routes more rapidly, submarines operating in groups began observation of broader areas.
The Northern Fleet was the first to recognize the need to conduct systematic reconnaissance. Its boats began to receive both combat and reconnaissance missions. Methodically and systematically working on intelligence collection, the staff compiled useful situation maps for each area, which contributed to more successful submarine operations with lower losses.

The capture by submarines of enemy captains and crews from sinking ships was vitally important in determining enemy routes and the mine situation. A British submarine was the first to capture a captain from a sinking Norwegian vessel in the north. Interrogation of the captain resulted in valuable information, including the location of enemy sea lanes. On 26 January 1942, the submarine Shch-422 detected a motor launch. Having closed with the boat, the submarine surfaced and fired a deck gun salvo. The boat was ordered to come to. The submarine captain instructed his gun crew to open fire if any hostile actions by personnel in the lifeboat ensued. When it came alongside, three Norwegians were taken aboard, and the submarine crew sank it with 45mm cannon fire. The Norwegians gave us information concerning the routes and system of enemy ship movements.

On the Black Sea, the submarine Shch-214, while destroying a schooner with scuttling charges, ordered the captain to board the submarine with his documents. The submarine delivered the captains of two schooners to base. In the Baltic Sea, the submarine S-7, having sunk a transport with deck gun fire on 5 August 1942, captured the captain. Thus, we have multiple examples of obtaining valuable information from captured crews. However, not all submarine commanders took the initiative to capture a crew member of a sunken transport or fishing vessel. The navigational charts captured from sinking vessels were especially valuable.

The organization of operational intelligence collection is not limited just to the acquisition of information about the enemy. Boat commanders should rapidly assimilate information and pass it along. Later, we will examine the degree to which communications supported the rapid transmission of intelligence data. Here, we will mention only that staffs processed the results of reconnaissance and passed their analyses back to boat commanders.

At the beginning of the war, all intelligence collection efforts on the seas were concentrated in the intelligence departments of fleet staffs. The intelligence sections of brigade staffs either did not exist or were inefficient. Brigade commanders and their staffs disregarded the importance of intelligence data or even situation maps. As completely unbelievable as this may appear, in May 1942 the staff of the 1st Black Sea Submarine Brigade did not have a map that showed the areas declared by the enemy to be mined. For a long time, the 2nd Brigade did not know where the 1st Brigade boats had placed mines. In the Baltic, the 2nd Brigade did not know where mines had been laid in the middle and southern sectors of the Baltic Sea. Sometimes, the locations of mine tethers were marked on maps in those deep areas of the sea where the laying of mines was impossible, and so on. Submarine commanders in the 2nd Brigade of the Black Sea Fleet were forbidden to have aboard their boat a situation overlay of their area.

Many more facts could be presented about the extremely cavalier attitude of commanders at all levels toward the systematic study of intelligence data and the general situation. This condition gradually began to change in the summer of 1942. Brigade staffs significantly improved their intelligence collection efforts. Boat commanders did not have to gather reports at the fleet intelligence and operations departments prior to their sorties, and then supplement them
with information from their own brigade headquarters. By the end of 1942, brigade staffs had current situation maps of each area.

Just the same, an attitude of dependence existed in brigade staffs and even at fleet staffs. Thus, on the Black Sea, a brigade asked the fleet staff to provide it with information concerning channels, minefield boundaries, the presence of mine banks, and against whom and how mines were laid by the enemy. The fleet staff, not attempting to respond to these requests by tactical and operational reconnaissance means, turned to the Main Naval Staff in Moscow with these same questions.

Along with operational intelligence, the organization of tactical intelligence—that is, the gathering of information that a submarine needs to accomplish its mission successfully, is important.

When sailing to its designate area, the submarine should determine whether the enemy situation has changed since it received information from its command. It should then gather any additional information required to fulfill its mission. All this is called “pre-reconnaissance.” Thus, our submarines operating in mined enemy coastal channels have first to verify whether their passage lanes are safe. Submarines can observe the passage, verify the existing security, and only gradually penetrate the minefield. This sometimes requires a significant amount of time, especially during the first sorties to a given area. Thus, for example, the submarine S-13, sent in September 1942 (for the first time during the war) into the Gulf of Bothnia, monitored the movement of enemy transports for an entire day before it passed through Kvarken Strait. The boat observed 15 ships. On the following day, it safely negotiated its way into the gulf.

Unfortunately, fleet staffs seldom considered it necessary to give submarines the time for re-reconnaissance, and sometimes they failed to recognize it all. The submarines M-56 and M-34 were ordered to sail to Constanta, passing through a mined region by a coastal channel believed, but not confirmed, to be mined. As a result, neither boat returned from the sortie. Possibly, the boats’ loss was due to their movement through an area that had not been checked for mines. At the same time, the submarine M-33 traveled to the same area but used information gathered in its previous sortie and conducted pre-reconnaissance. It bypassed the dangerous area, accomplished its mission, and returned safely to base.

When the brigade command gives a mission to a submarine, it should allow it time for pre-reconnaissance. At no time should submarine commanders disregard pre-reconnaissance but, rather should use every available opportunity to conduct it.

Other fleet forces should also help the submarines with tactical intelligence collection. Their role in this case includes establishing the location, course, and speed of the enemy and reporting this information to the submarines. As has already been pointed out, it is vitally important that submarines receive this information quickly.

4. Planning Submarine Combat Operations

The systematic planning of submarine combat operations allows submarines to operate uninterrupted in positions on enemy sea lines of communication and to accomplish their wartime tasks.

In fact, submarines on all seas were in their positions irregularly. This shows that our staffs were ineffective in planning submarine combat operations. Brigades lived day to day. Data on submarine days at sea confirm this. The number of regions on enemy sea lines of communication
was not correlated with the number of submarines and base repair capabilities. Also, a submarine reserve was not provided. Hence, the Northern Fleet very quickly found itself unable to service all its designated areas. Since submarines had to return early from their sorties due to damage or exhausted torpedo stocks, two or three areas were left unattended for extended periods. This also occurred in the Black Sea. In the very beginning the brigade in the Baltic Fleet tried to service positions systematically. Having knowingly divided their operational area into more positions than they had submarines, the brigade sent boats first to one area and then to another, depending on the situation. In many cases, boats already in position were ordered to move to other parts of the sea.

At the beginning of the war, heavy enemy pressure on all our land fronts forced fleet commanders to divert all their efforts to assisting the Red Army. As a result, boats operated against enemy sea lines of communication as the situation permitted on a given day. Having already begun this means of submarine utilization, it was impossible to organize the servicing of each region by specific divisions. Because of this, commanders could not acquire the experience of operating in a given area and could not systematically study an area’s prevailing conditions. Particularly disruptive was when submarines were ordered by radio to move from one region to another, as was practiced in the Baltic. The unprepared commander then sailed to a new sector of the sea and was not given the opportunity to study its peculiarities.

Since our submarines operated only in isolated sectors of the enemy sea lines of communication, the enemy concentrated his anti-submarine assets and means in these areas and greatly hindered our submarine combat operations. In order to complicate the enemy’s anti-submarine operations, we had to maintain submarines along the entire enemy sea line of communications. During periods of submarine shortages, areas of submarine operations were enlarged (two areas were combined into one, as often occurred in the north), or submarines cruised along the entire sea line of communications.

In planning for submarine operations, the average duration of a submarine’s sortie must be determined. Despite the fact that the duration of a submarine’s endurance received great attention in all seas in 1935–37 and the experiential data was subsequently discussed at a submariners’ conference in 1937, a consensus on this issue does not exist between the leadership of submarine brigades and various fleets.

Northern Fleet commanders believed submarine crews became exhausted during lengthy sorties, which led to less effective operations. Based on these conclusions, the normal length of a sortie in the north was set at 20 days for large and medium boats and initially 10 but later eight days for small boats. The Northern Fleet brigade maintained this deployment schedule throughout the war, though at times it suffered severely from a shortage of boats.

In the Baltic Sea, while the brigades were sited in western bases, boats were sent out for 20 days. The considerations were the same as in the north. With the relocation of the brigades to Kronstadt, the duration of sorties was increased to reduce the amount of time spent in the enemy-controlled Gulf of Finland. The normal duration of a sortie was increased to 40 days. This extension of sortie time required the use of auxiliary tanks to carry fuel.

On the Black Sea, the duration of a sortie was set at 20 days for types S and Shch boats, at 15 days for types D and L, and at seven days for types M and A. When submarines were relocated to Caucasus bases, they traveled greater distances and had to carry fuel in auxiliary tanks. The duration of sorties, however, remained the same.
Table 5 gives the average and maximum time of sorties of boats of various types in the committed fleets. According to this table, the Baltic submarines significantly exceeded the established norms for the Northern and Black Sea Fleets. In addition, boats that were at sea for the longer periods of time were just as successful at the end of their voyage as at the beginning.

Thus, the submarine \textit{Shch-406}, having been at sea for 53 days, sank enemy transports on the 21st, 22nd, 23rd, 37th, and 40th days of the sortie. The submarine \textit{Lembit}, on a 32-day sortie, sank two enemy transports on the 25th day. The submarine \textit{Shch-309}, on a 53-day sortie, attacked successfully on the 27th day. These examples show the fallacy of the Northern Fleet’s views concerning crew ineffectiveness after more than 20 days at sea. Of course, lengthy sorties were exhausting for the crew. Therefore, if the situation and the number of boats available permitted, it was better to limit sortie time to no more than three weeks. Thus, for example, in the beginning of the war in the Baltic, when many boats were available and they were sited at western bases, there was no need to keep boats at sea for a long time. However, the picture changed sharply later. The increase in the duration of sorties to almost two months in the conditions that developed in the Baltic was completely correct, and the results that were achieved fully justified the decision. Consequently, the theory of the Northern Fleet commanders would have been detrimental for the Baltic. It also had no benefits for the north or for the Black Sea.

When a shortage of submarines for servicing all regions on these seas existed, a method was sought to raise the coefficient of operational potential. On both seas, it was approximately .5 for submarines in service, that is, the time boats spent at sea was about half as much as the time spent in base. The time required for repairs after a 20- or 30-day sortie was about equal. Consequently, to increase the coefficient of operational effort, the time boats spent at sea was increased from 20 to 30 days. Thus, the coefficient of operational effort was increased 1.5 times and, consequently, so was the number of boats at sea increased.

Increasing the time boats spent at sea required taking fuel aboard in auxiliary tanks. Of course, this was undesirable except in dire circumstances. But the experience of Baltic submarines of the first and second echelons show that carrying auxiliary fuel tanks is not particularly dangerous. These submarines passed through the Gulf of Finland in the summer of 1942 almost unscathed and not once were they pursued by the enemy. By their skillful actions, the commanders avoided danger because when a deeply submerged boat moves, its oil slick is significantly behind it. The experience of the submarine \textit{K-21} in the north affirms this.

On 12 November 1941, after sinking two enemy transports, the submarine \textit{K-21} was pursued and depth charged. Seventeen depth charges were dropped on the boat, some of them exploding quite close, during a pursuit that lasted for almost an hour. When the boat surfaced at darkness, the heavy odor of fuel oil was detected, along with a large oil slick. A seam in an auxiliary fuel cell had ruptured. For the next five days, the boat rode out a storm and eliminated the oil leak. On 18 November, the boat again entered a fjord. Fuel oil again began leaking from the cell, leaving another oil slick. This facilitated its detection by an enemy aircraft, which circled above the submarine for 45 minutes. The boat dived deep and, by changing its course, went out to sea. Depth-charge explosions were soon heard behind the boat, for it was not being pursued by cutters apparently summoned by the aircraft. This continued until dark, but the depth-charge explosions were far behind the boat. When the boat surfaced in the dark, a large oil slick was again trailing behind. With the command’s permission, the boat returned to its base.
Although the leaking fuel oil exposed the submarine to dangerous enemy pursuit, the skillful commander managed to evade the pursuers twice. There were several other similar situations. Consequently, if absolutely necessary, auxiliary fuel tanks are a feasible means of increasing the duration of submarine sorties.

If submarines will be traveling in a dangerous area or when more time is required, the sortie should end when submarines run out of torpedoes. The greater the traffic on enemy lines of communication, the shorter should be the time spent in position.

In the Baltic, the submarine S-7, at sea for 42 days; the submarine L-3, at sea for 32 days; and the submarine Shch-317, which reported firing its last torpedoes on the 30th day; expended all their torpedoes. The remaining boats returned, having in many cases fired up to half of their torpedoes. For the most part, the submarines fired single-torpedo salvoes. Therefore, in accordance with existing regulations, the torpedo supply on types S, L, and Shch boats will last 30–40 days on average.

In the north, type M submarines quite often returned to base early because they had fired all of their torpedoes. But inasmuch as type M boats only had two torpedoes, enough for a single attack, it was difficult to specify a normal duration of sortie for them based on torpedo expenditure. Also regarding these boats, it is necessary to have a boat in base prepared for departure as soon as a boat at sea has used all of its torpedoes. In the north, there have been two instances when large and medium boats have returned to base due to the expenditure of torpedoes. In early February 1942, the submarine Shch-421 returned to base because only one torpedo remained, as did the submarine L-20 in February 1943, having expended all of its torpedoes. This comprises one percent of all submarine sorties against enemy lines of communication. Therefore, based on the expenditure of torpedoes, there was a possibility of increasing the duration of sortie time in the north.

On the Black Sea, submarines (except type M) rarely expended more than 25 percent of their torpedo supply. Consequently, here also there was a full possibility to extend the sortie time, thus raising the submarines’ coefficient of operational effort and coefficient of effective actions.

Under the existing system of replacing submarines in position in the north and Black Sea, the increase in sortie time decreased the percentage of time that a position was unoccupied. However, prolonged submarine sorties greatly exhausted their crews. A special medical commission conducted an investigation of the submarines of operating brigades and found a significant decrease in the physical and psychological condition of submarine crews after prolonged sorties.

During this investigation, violations by boats of elementary rules of submarine hygiene and sanitation were discovered. Some violations were the fault of the men themselves, and some were the fault of supporting organizations (insufficient submarine rations, clothing, and so on).

The success of submarine operations depends mainly on the crew. Consequently, maintaining good health for the crew should be given the most serious attention. Division commanders should require that all sanitation rules be obeyed. Living conditions on the boats should be improved in all respects. When submarines return from sorties, the crew must be given the necessary rest and increased rations to regenerate their strength and health. The practice in several brigades of establishing base repair teams is helping. To the degree possible, the crews
should be given leave to visit their families. The combat capabilities of our submarine crews can be maintained by these measures.

On all of our seas, submarine operations were disrupted principally by repairs taking longer than expected. Because it was difficult to estimate repair capabilities accurately, the number of seaworthy submarines dropped and the number awaiting repair grew. Indeed, if two submarines returned from sorties in the space of a week, and only one submarine came out of repair, then the repair facility would have a backlog of unrepaird submarines. Based on these considerations, the first step in planning is to establish the actual repair capability of a facility. In order not to disrupt the plans, it is best to consider the facility’s capabilities as somewhat less than they actually might be, that is, plan with some cushion.

The time required to train the crew should also be taken into consideration. A boat in reserve, ready for sailing, can also be used for crew training. The following planning methods are recommended when organizing and planning submarine operations on enemy sea lines of communication:

- Establish the average duration of submarine repair after a long sortie and the number of boats that can be repaired simultaneously.
- Establish the most effective duration of a sortie based on the activity level on the enemy’s lines of communication and the distances to [position] areas.
- Establish a submarine reserve to accomplish the command’s special missions and to replace submarines going out of service.
- Determine the number of submarines that can be located in positions at sea at any one time. This defines the number of areas that can be serviced by boats at any one time.
- Divide enemy lines of communication into areas by the number of boats capable of going to sea at any one time or set the sequence of departure of boats for cruising.

If the number of boats in a theater radically changes, the submarine utilization plan should be reconsidered. The length of their sorties or the apportionment of areas can be changed. With a reduction in the number of boats, the lesser-traveled areas can be combined into single positions without leaving any areas on enemy sea lines of communication unserviced. Temporary and minor variances in the number of boats operating on enemy lines of communication should be covered by the reserves that were set aside.

The best case is the development of a submarine utilization plan in the form of a chart, filled out in pencil that can be easily corrected. The actual utilization should be indicated in ink, and thus it becomes a reporting document that can be used for subsequent planning. One ought to plan ahead in time, to at least three sorties cycles of a given type of boat.

5. Methods of Submarine Utilization

Even before the war, the positional method of submarine utilization, the main feature of which was a boat waiting in its sector for the enemy to appear, was criticized. On the Baltic Sea and in the north, submarines operating against enemy sea lines of communication were assigned fairly sizeable areas to service.

Figure 4 shows the submarine positions in the Northern Fleet’s theater. As can be seen, six positions in that sector were selected for our initial submarine operations. Obviously, the fleet
command did not intend for boats so service systematically all of the areas. The number of areas to be serviced was determined by the quantity of submarines that could be sent out against enemy lines of communication in the first days of the war.

Initially, lines divided individual positions. When it became clear where enemy ship movement was the most intense, the positions were again divided, thus creating more positions.

The apportionment of positions changed in October 1941. When it had become clear that the enemy moved along coastal routes, the restricted areas near the shore were canceled and only the boundaries on the seaward side of the positions were retained. Thus, the areas designated for submarine operations covered the entire enemy transport route. During attacks against enemy ships, our boats were permitted to move outside their position boundaries. However, on occasion submarine commanders would refuse to attack the enemy because his boat would end up outside its designated position. If a boat entered another submarine’s zone, it would remain submerged during its entire time in that zone. This lessened the danger of attack from its neighboring submarine. Why in these conditions it would hesitate to attack an enemy is without basis. The subsequent changes in the position boundaries did not substantially change the system of distributing submarines.

Table 6 shows the actual time that boats serviced their positions on enemy sea lines of communication. As seen in this table, there was little balance in station times. The most regularly serviced areas were those closest to the base. Thus, not all enemy sea lines of communication in the north were serviced which facilitated the enemy’s defense of his shipping. Because the enemy’s most exposed sector was from Honningsvag to Kirkenes, we intensified submarine operations in this area. But even in the most exposed enemy areas, our submarines were present only 50 percent of the time.

As this same table shows, we continuously serviced three sectors of the lines of communication with the same forces, using cruiser submarines where conditions warranted.

Because of the proximity to our bases of the Kirkenes–Vardo area (100–120 miles), we used small submarines. Using Shch type submarines, we effectively and systematically serviced the area from Vardo to Honningsvag. All the western areas could be joined into a single position and each of these areas could be serviced continuously by a single submarine. Using the capabilities of types S, L, and K boats, the cruising method was employed in the western sector. This employment mode permitted some of our submarines to strike key enemy sectors at the same time that other submarines would be attacking transports in other parts of the enemy sea lines of communication. This prevented the enemy from shifting anti-submarine forces from Vardo and Varangerfjord to improve his defense in the sectors northwest of Vardo.

Thus, in the north, submarines used the “cruising in limited areas” method (metod kreyserstva lodok v ogrаниченнých rayonakh) in 1941 and the positional method in 1942. Since there was a simultaneous decrease in the number of boats operating against enemy sea lines of communication, submarines were dispersed widely and were allowed great latitude in their operations.
In 1943, with the entry into service at the end of 1942 of several new submarines, the command began again to send boats to the western areas, correcting to some degree the mistakes it had committed in 1942.

In the Baltic Sea, submarines on their first deployment were assigned sufficiently broad positions. However, as figure 5 shows, they did not fully cover the enemy sea lines of communication. In part, the area to the west of Bornholm was not serviced. As was indicated in the description of the theater, this is the enemy’s most important sector. The experience of the 1914–17 war also affirms the enemy’s vulnerability in this sector. The area east of Oland, Stolpe Bank, and a number of other areas were not serviced. Thus, submarines on their first deployment on the Baltic also used the positional method of employment.

Just as in the north, boundaries were established between contiguous areas. New submarine operating areas were added in July 1941 (figure 5). Boats were sent west of Bornholm. The number of unserviced enemy lines of communication was reduced, but our submarines could not fully cover all enemy lines of communication on the Baltic Sea. Boundaries were maintained. Since there were enough boats based in the area and other fleet forces in western bases to provide support, this area could have been covered. Undoubtedly, then, our inefficient method of submarine utilization was a reason why, during the first two months of the war, our submarines sank only three transports and the enemy carried out intensive shipping by sea.

In September 1941, with the rebasing of the brigade to the eastern part of the Gulf of Finland and with the submarine breakdowns and repairs, the number of serviceable submarines in the Baltic Sea was reduced. As a result, the number of positions being serviced also dropped. As in the north, submarine activity, instead of expanding, was often curtailed. Thus, for example, the position near southern Oland was significantly reduced (see figure 6). Establishing a position in the southern part of the Baltic was not even considered. The tendency of several commanders to hold to the seaward side of an area prompted the brigade commander to limit the position of boats to a relatively narrow coastal zone. Thus continued the tendency to utilize submarines positionally. During this period there were not more than five boats operating at one time in the Baltic Sea. It was logical to take advantage of the natural length of the enemy sea lines of communication in the sectors and organize submarine cruising west of Bornholm, along the Swedish coastline, along the southeastern coast of the Baltic Sea, in the Gulf of Bothnia and Aland Sea, and in the mouth of the Gulf of Finland.

Submarines used only the positional method in the Gulf of Finland in the 1941 campaign. At this time, this method of submarine utilization was the proper one, although it created some difficulties.

Our main lines of communication between the western bases and Kronstadt passed through the Gulf of Finland, so we organized a reliable defense against enemy submarines. This limited our own submarine operations in that we did not want the enemy too close to our own ship routes. The narrowness of the Gulf of Finland forced us to assign our submarines to quite small positions.

Since passage into the Gulf of Bothnia was considered too risky for submarines, it was not serviced.
In the 1942 campaign, 5–6 submarines were in the Baltic Sea at one time. Therefore, six positions were designated in the central and northern portions of the Baltic Sea. Three positions fully covered the enemy’s western lines of communication from the Hano narrows to the Aland Sea. The boundaries between these positions were eliminated. The enemy’s eastern lines of communication were not fully covered by two positions. One position included enemy lines of communication in the northern part of the sea and in the mouth of the Gulf of Finland. Even though there was no submarine position in the southern portion of the Baltic Sea, individual boats were sent there. Thus, in 1942 on the Baltic, submarines were not totally free from the positional principle.

In response to our successful submarine operations against the enemy’s western sea lines of communication in the Baltic Sea, the Germans organized prevocational attacks by their own submarines against Swedish transports within Swedish territorial waters. As a result of the Swedish government’s subsequent protests against submarine operations, our command shifted submarines along the western coast of the Baltic Sea into other positions.

For the first time in the war, the submarine S-13 was sent into the Gulf of Bothnia in September 1942. During its sortie, this boat was given complete freedom of action in the entire Gulf of Bothnia. Subsequently, a second boat, the S-9 was also sent there. With the arrival of this second boat, the area between southern and northern Kvarken was divided into two parts, with each boat covering an area. Thus, the Baltic brigade used the cruising method against the enemy. The commander of the S-13 broadly exercised the freedom given to him. Since he changed his area of operations after each attack, the enemy felt threatened throughout the entire southern sector of the Gulf of Bothnia. Unfortunately, the boat’s weak combat training reduced its successes. Had it not been for this, its 18 attacks would have led to significantly greater results. Because the boat boldly changed positions often, the enemy could not pursue it.

Submarines operating in the area west of Bornholm were also successful. The submarine L-3, the first to be sent to this area, placed mines (which it is believed sank three transports) and sank five enemy ships during its sortie (including passage to the area and back). Later the submarine D-2 was sent to this same area. This boat conducted seven torpedo attacks (three of which were successful) and had about the same number of encounters without torpedo firings.

These examples show that the enemy moves ships quite intensively in these parts of the Baltic Sea, unvisited or seldom visited by submarines, often without any kind of escort, and as if in totally peacetime conditions in the Gulf of Bothnia.

Thus, the Baltic experience clearly affirms the effectiveness of using submarines in the cruising method, especially now that submarine commanders have attained combat experience and have proven themselves persistent in accomplishing their missions.

Table 7 shows the actual time Baltic positions were serviced by submarines in 1942. From table 7, it can be seen that, in spite of the exceptionally difficult conditions, the percentage of time that several positions were serviced was greater than on other seas. The most systematically serviced positions on the western sea lines of communication was in Aland Sea, and on the eastern routes the Memel–Vindava area.

From this same table, it can be concluded that boats could continuously service four positions. The abandoning of the staggered boat arrivals in the Baltic would be required, but in
return, continuous control of enemy lines of communication would be achieved. It was effective to assign submarines to the following areas:

- west of Bornholm;
- the western lines of communication;
- the eastern lines of communication to Ovizi;
- in the mouth of the Gulf of Finland or the Gulf of Bothnia.

[Table 7 here in original text]

The positional method of submarine utilization was especially evident in the Black Sea. At the beginning of the war, boats were assigned to patrol small positions near the western coast of the Black Sea (figure 7). Positions resembling small squares were scattered about at various distances from the coastline. Submarine positions commonly did not include the nearest approaches to enemy bases. This reflected the experience of German submariners who, because of strongly developed anti-submarine warfare defenses near British bases, had to conduct their operations some distance from British coastal regions.

This mechanistic transfer of German experience to the Black Sea was clearly incorrect. The Romanians were in no way equal to the British as a naval opponent. Therefore, there was less reason in the Black Sea than in any other theater to anticipate strong anti-submarine defenses near enemy bases. If we had included the approaches to bases in our positional areas, we would have easily discovered the enemy shipping routes.

Thus, the initial method of submarine utilization on the Black Sea was exclusively positional, and it had three fundamental deficiencies:

- Positions were extremely small (rectangles with sides of 10 miles by 15 miles), which constrained submarine operations and left a large portion of the enemy sea lines of communication without control.
- Several of the positions were quite far from the coast, resulting in the most likely enemy routes—those closest to the coast—not being patrolled.
- The positions did not cover the approaches to bases.

This positional system was in effect for a little over a month and was the reason why boats were unsuccessful. Basically, we were unable to identify the enemy movement routes.

[Figure 7 here in original text.]

Submarine positions were changed in August 1941 (figure 7). We enlarged two northern positions. As before, they did not cover all the enemy lines of communication. In addition, all positions were moved closer to the coast, which enabled the submarines to operate on enemy coastal shipping routes. The third deficiency noted above was eliminated—positions included the areas of approaches to enemy bases at Sulina and Constanta. The number of positions remained as before. Changing the positions improved submarine utilization, but it did not eliminate the basic defect, namely, the positional method. Characteristically, only the 2nd Brigade (type $M$ submarines) enlarged its positions. Only a dividing zone was left between these two positions. Thus, by this time, the 2nd Brigade’s submarines had already recognized the need to include all the enemy’s lines of communication in the brigade’s sector.
In the second half of October 1942, a fundamental change occurred in the system of designating submarine positions (figure 8). At this time, submarine positions completely covered all enemy lines of communication from the Bulgarian–Turkish border to the Dniester estuary. Five contiguous areas, without any dividing zones, were designated. Each area averaged 50 miles north to south and 75 miles east to west. Thus, boats were able to operate on the coastal enemy shipping routes and, if necessary, farther out to sea. The boundaries of the areas included enemy bases. Two positions were designated near intermediate bases that the enemy could use during his coastal movement. These two positions were interspersed in the areas pointed out above, and were to strengthen the submarines’ control of the passages to these bases.

The concept was fully reasonable. However, the submarines assigned to these positions endured many difficulties. The positions were 20 miles square and were in zones where we expected reinforced anti-submarine defenses. When detected and pursued, the submarine would be forced farther out to sea and, consequently, would enter another submarine’s operating area.

The matter of recharging batteries became more complex. Although a corridor existed for a submarine to enter its position, if it approached from the sea with a navigational error it could easily pass outside the corridor and enter into another boat’s position. Thus, although the idea of reinforcing the observation of these enemy bases was correct, we did not take into account the difficulties that submarines would have in servicing these positions. It would have been better to have divided the areas so the entire width of neighboring areas could be watched. This would have allowed the boats the necessary freedom and significantly simplified their mission.

During the subsequent division of the areas in December 1941, the positions near Varna and Burgas were abolished (figure 8), and the east–west dimension of other areas was reduced somewhat. Boundaries were redrawn away from Romanian bases. During the foregoing plan of positions, a single boat could operate on the approaches to bases from the north and south, which increased our observation of departing ships. But another consideration was that a submarine could find itself in another boat’s zone due to a navigational error.

Our boats not being able to surface near these bases was not a problem. Shifting of the boundaries to the north of the bases gave great freedom of action to the boat in the south, but it reduced observation on the enemy bases. This deficiency was particularly evident during hours of darkness. The base area remained totally unobserved while the southern boat recharged its batteries. This could be avoided using the previous system, depending on the time of recharging.

Interestingly, in other areas (1st Brigade), just exactly the reverse was true—the boundary line was drawn through the bases. If the 2nd Brigade’s experience of drawing the boundary through the bases during the preliminary planning of positions proved to be ineffective, then it is incomprehensible why this exact method was used when the southern areas were reapportioned. This shows that the 2nd Brigade’s shifting of position boundaries in the northern sector of the enemy sea lines of communication was done without careful deliberation. Otherwise, the fleet staff that sanctioned the change of positions would have instructed the 1st Brigade to do the same.

The shifting of the seaward boundary of the area toward the shore, as was done in the Baltic, discouraged several commanders from maintaining positions far from the coast. However, later on, with many boats failing to return from their positions, the fleet command forbade boats
to approach the coast, limiting submarine operations to only the seaward portion of their designated areas.

The planning of positions reached its greatest simplicity in February 1942. A line from the Bosporus to the Tendrovskiy lighthouse defined the eastern boundary of the areas serviced by submarines. The expanse between the coast and this line was divided into eight areas, the boundaries of which were east–west parallels (with the exception of the extreme southern line, which was drawn in accordance with the outline of Turkish territorial waters).

However, this area planning did not determine the system of submarine utilization at that time. Actually, submarines serviced only several southern areas (and principally only the seaward sectors) because the northern areas were closed due to ice, the areas toward the Bosporus due to Turkish protests, and the remainder due to the danger from mines.

Positions were once again changed in the spring of 1942 (figure 9). The size of the areas was reduced in the northern portion of the enemy sea lines of communication. Five, instead of three, positions covered the same area. This was done in response to the increased enemy vessel movement between Sulina and Odessa. Only a single position in the southwestern corner of the Black Sea was preserved, and it was also divided into two smaller positions. Submarines did not service the middle sector of the enemy sea lines of communication at all. The command had finally refused to contest the enemy shipping in the Constanta–Burgas sector due to the danger from mines.

One cannot help but compare how the same problem was resolved on the Baltic Sea. The situation for submarines in the Gulf of Finland was, undoubtedly, much more difficult than on enemy western lines of communication in the Black Sea. The mine threat was significantly greater and the enemy had more aircraft and a much larger escort force attacking our boats. In addition, the Gulf of Finland was not a narrow belt filled with mine obstacles, but it was like a long pipe filled with every kind of anti-submarine asset. More boats were lost in this pipe in 1941 than were lost in the Black Sea. White nights also caused problems in the Baltic. Despite all this, Baltic Fleet submariners did not give in to these difficulties. They coped with them in an outstanding manner until October 1942 and inflicted painful attacks on the enemy in the Baltic Sea and the Gulf of Finland. Some boats were lost, however.

After our withdrawal from Sevastopol, the enemy established new sea lines of communication connecting the Romanian coast with Crimea and Taman Peninsula. Quite logically, this required new planning of our submarine positions. Positions in the Emine–Shabler area on the western sea lines of communication and a number of positions along the Crimean coast were reestablished. The latter covered all coastal routes along Crimea except the Sevastopol area. That submarine operations on the open sea were not considered deserves attention. This indicates that the command did not think that submarines, in coordination with other fleet forces, could intercept enemy transports. It should be recalled that the Germans, in order to reduce submarines losses in the Atlantic, did the opposite: they withdrew their boats from British shores and coordinated with their air forces in the open ocean.

Thus, the submarine command in the Black Sea, having begun to use strictly the position method of submarine employment, should have abandoned it. The Black Sea command should have copied other fleets and used the “cruising in limited areas” method. True, there were fewer areas than in other seas and by their size they were close to box positions.
Black Sea Fleet submarines never fully serviced all assigned areas at a given moment. Consequently, their results do not correspond to the capabilities of the brigade. Table 8, which indicates the time positions were actually serviced by submarines in 1942, also affirms this. [Figure 9, a full page map, appears here in the original text, followed on the next page by Table 8.]

The numbers in table 8 show that submarines actually serviced positions for brief periods of time. The exception is in the Akhtebola area, where submarines spent almost 70 percent of the possible days. This situation is partially explained by the fact that boats were diverted from their regular missions to other missions, for example, ferrying cargo to Sevastopol, patrolling along the Crimean coastline, and so on.

From the numbers on table 8, just two boats could have systematically and continuously maintained positions near the western coast. Consequently, the mission could have been much simpler, without changing positions. The entire western lines of communication should have been divided into two sectors. As was obvious from the overview of the Black Sea theater, the natural dividing line is at Cape Kaliakra. Small submarines could operate north of it and medium and large submarines south of it.

The excessively frequent re-planning of positions in the Black Sea draws attention to itself. Of course, the proper planning of positions is significant and should be based on military–geographic peculiarities of a region and the operational situation. However, simply redrawing the positions would not help; the deficiencies in submarine utilization would have to be corrected.

The fundamental deficiency in submarine utilization on the Black Sea was the poorly organized reconnaissance of enemy lines of communication. Positions were designated without knowledge of where and how the enemy moved, where he had established his obstacles, where the passages were, and so on. Positions were determined without proper investigation. In changing them, the brigades tried to guess their most appropriate disposition.

So, to determine areas for submarine operations correctly, it is necessary to conduct good reconnaissance of enemy lines of communication (determine the enemy’s ship movement and his defenses) and accurately plan submarine combat operations.

In 21 months of war on all our seas, the commands applied the “cruising in limited areas” method of submarine utilization. However, the tendency remained to use the positional method, not because of necessity but because of the reduced effectiveness of submarine operations.

The Baltic Fleet used the cruising method only once, in the Gulf of Bothnia. This method allows the submarine the most freedom of action and, with the commander’s initiative, provides the highest combat effectiveness. German submarines used this method in the past war. From our submarines’ experience in the Great Patriotic War, as pointed out above, the actions of the submarine S-13 in the Gulf of Bothnia provide a well known example. In a brief time, the S-13 created a threat to enemy shipping in the southern half of the Gulf of Bothnia and had more than 20 encounters with enemy transports.

We do not employ this method often due to our excessive fear that two boats will end up in the same area. Because of this fear, we greatly constrain ourselves and lose much more than we gain. These questions arise: What is the advantage of the cruising method, when should this method be utilized, and how can it be organized in the conditions of our theaters?
The following are the advantages of the cruising method. When a submarine changes its location often, it denies the enemy the ability to concentrate his forces in the submarine’s area, avoids heavy enemy pursuit, and facilitates its own successful actions. In addition, the enemy cannot bypass the submarine’s area of operations or pass through it during periods of darkness. When a boat goes out into the supply stream, it increases its opportunities of encountering transports loaded with military materiel.

Consequently, it is advantageous to utilize the cruising method when not enough submarines are available to create a sufficiently high submarine threat along the entire length of the enemy sea lines of communication using any of the other employment methods. Thus, for example, the Northern Fleet resorted to the cruising method when it experienced a great shortage of boats operating against enemy lines of communication. As was already indicated, the most vulnerable enemy areas (east of Honningsvag) had to be designated and within them the cruising method systematically employed. The cruising method was used in the entire sector west of Honningsvag. In doing this, when it was possible, the entire area was divided into two parts and the submarines patrolled these areas at all times. If two boats could not sail at the same time, the area was not divided. The boats sortied one after the other and the command simply designated specific zones through which each boat, moving gradually to the west, should pass at specific dates. Thus, there would always be one boat in the area at any given moment. This uncomplicated system prevented encounters between the two boats.

All our fleets often utilized single submarines. Some say that we have insufficient submarines for employing them in groups. This is not true. Our smallest brigade was in the north, and it had 15 submarines in its complement. Consequently, if we had recognized this type of submarine use as necessary, then we would have implemented it in this brigade, not to mention in the larger Baltic and Black Sea brigades.

Another reason we employed single submarines is because we did not have encrypted communications between boats. Undoubtedly, the lack of such communications interferes with organizing combined attacks and considerably complicates using groups of submarines in general. Submarines operated quite successfully in pairs in the 1914–18 war, even though they did not have an encrypted communications capability between them.

German submarines operated in this way in the Gibraltar area during the last war. In the morning, the boats moved along the coast within the limits of earlier designated parallel zones. The first boat that detected enemy ships attacked and the second submarine, disregarding the boundaries, attacked right behind it, taking advantage of the enemy’s weakened security. In a number of cases, boats operating in this manner managed to sink two ships sailing together; or the second boat finished off a ship attacked by the first submarine. The boats were to meet at a predesignated position at a predetermined time. Obviously, in all of this, submarines operating together should be forbidden to attack other submarines.

We have still not implemented this method of submarine utilization because we did not practice and master it during peacetime combat training. Therefore, its advantages and the possibility of its success have not been recognized. As is known, German boats practice group operations against lines of communications in the open seas, sometimes with a group of more than 20 submarines. To organize the operations of such large groups against coastal sea lines of communication would be impossible and, in fact, unnecessary. It is, however, possible to organize the actions of 2–3 boats in a group.
What is the advantage in operating submarines in groups? Having detected an enemy convoy, a boat operating alone can normally attack only once, sinking one or two ships. Most often, the submarine is unable to repeat the attack because the enemy, having detected the torpedo track near the water’s surface, begins to pursue the submarine. If a second boat is near, then it can attack the remaining targets and finish off the damaged transports. The second boat’s attack should obviously attract the escort vessels’ attention, which then relieves the pressure on the first boat. Having broken contact with the enemy, the first boat can withdraw beyond the enemy’s visibility and launch a new attack. Thus, **group submarine actions inflict greater losses on the enemy, improve the situation for the submarines after the attack, and render the enemy’s pursuit of the submarines more difficult.**

The enemy undoubtedly understands this and has studied our employment of single submarines. Regrettably, this is the experience of Northern and Baltic Fleet submarines. After an attack, knowing that no other boats are in the area and that no new attacks will follow, the enemy can order almost all of his escort ships to pursue our attacking submarines and hunt them for a long time. The Germans would not attempt to do this if they believed our boats were operating in pairs. Because German submarines patrol in groups, our escort ships drop depth charges only once. They then return to their place in the convoy formation. Only the last escort ship or one specially designated by the flagship can pursue the enemy submarine. We operated this way even in peacetime, because we presumed that enemy boats would be operating in pairs.

Consequently, submarines can complicate the enemy’s pursuit after an attack and increase their own effectiveness.

Another reason that we do not use submarines in groups (let alone in pairs) is that when submarines leave their designated positions, they may end up in the same area. Frequently in the north and on the Baltic, one of our submarines and a German submarine have ended up in the same area near each other. Although being close to an enemy boat is significantly more dangerous than being close to a friendly boat, commanders will not depart their designated areas for this reason. This has long been possible for two of our boats, because their actions, governed by regulations, could be worked out ahead of time.

We attempted to coordinate the actions of two submarines in the north. Two type K submarines equipped with Drakon ultrasonic gear were selected for the effort. Thanks to this equipment, the boats could maintain underwater ultrasonic communications with each other out to a distance of 10,000–12,000 yards. Specific instructions were established ahead of time, based on map games and exercises at sea. In February 1943, the submarines K-3 and K-22 performed combined operations against enemy sea lines of communication. The submarines maintained communications with each other for two days. As instructed, the boats were to move by day on a course parallel to the coast not more than three miles from the shoreline, hold to a range of 4,000–5,000 yards, and maintain communications using the Drakon equipment. At night, the boats were to remain within visual range of each other. After torpedo attacks, they expected to fire their deck guns. We devised tables of coded signals for submarines conducting combined operations. Signals were transmitted using the Drakon device during the day, and at night, messages were sent by darkened violet light. Attacks were anticipated to be combined, but not by prior coordination.

On the third night, the lead boat K-3, with the brigade commander aboard, detected two enemy transports escorted by a cutter and an escort vessel. The K-3 turned toward the enemy and
the K-22 followed. Having completed its turn, the K-22 then sharply broke off from the target vessels and quickly disappeared into the darkness. The K-3, to improve its firing position, initially took a course parallel with the enemy, then turned to fire with its bow torpedo tubes. One of the transports breached and went off to the left. A hit was registered on the stern of a transport and it sunk. The K-3 began to turn about to attack with stern tubes on the remaining transport, which at this time had turned on an opposite course. Gunfire from the cutter and the appearance of a destroyer escort forced the boat to submerge.

When the boats linked up later, it was learned that the K-22 had accidentally turned to the left and broke off as the K-3 was beginning its attack. The K-22 saw the explosion of the transport but did not attack the second transport because the K-3 was between the K-22 and the target, and the K-22 feared its torpedo would strike the K-3.

The K-3 torpedo that veered left passed close to the K-22, and the K-22 mistook the cutter’s firing at the K-3 as fire upon itself. The K-22, believing that it was being attacked by torpedo and naval gunfire, also began to withdraw from the enemy.

These two submarines searched for the enemy for one more night; they subsequently separated and continued to operate independently.

The instructions given for this operation indicated that the purpose of conducting consecutive attacks was to facilitate the second submarines’ attack by having the first submarine distract the escort force. However, both submarines simultaneously conducting a night search and attack clearly increased the power of the attack. The tight line formation with an interval of 3,000–4,000 yards and the distribution of targets (the first boat attacks the second or third ship and the second boat attacks the lead) attest to this.

There was also a principal deficiency in the given experience. Before proceeding, we need to answer a question: Was it necessary to increase the power of the torpedo attack of type K submarines? The K-3 had six torpedoes in its bow tubes and it fired only four at two transports. Consequently, it did not even exhaust all of its own torpedo firepower. This same boat attempted a second attack at the second transport with its remaining torpedoes. Therefore, the firepower of the torpedo attack was increased by having trained and motivated commanders attack two or more ships, not by undertaking a complicated combined attack. It is incomparably easier to do this than to train for, let alone accomplish, combined attacks. In the situation that developed, it would have been correct to fire three torpedoes at the lead transport and an equal number at the second. Possibly two transports could have been destroyed.

Using submarine deck guns (even from type K [2 x 100mm, 2 x 45mm]) against convoys, especially in daylight, is quite unrealistic and risky. As war experience shows, for submarines armed with 100mm guns to sink transports requires something like 15 minutes. During this time, the submarine would be forced to fight the escort vessels, risking serious damage to the submarine.

A damaged boat would be in an extremely serious situation. To expose a submarine to such risk in order to facilitate the attack of a second submarine is hardly worthwhile. Practice also shows that escort forces do not seriously interfere with our submarine attacks.

**The main purpose of conducting group submarine operations for today should be to facilitate follow-on submarine attacks and to prevent the enemy from pursuing our**
submarines with his escort vessels. Thus, submarine group operations should increase the effectiveness of our submarine strikes on convoys and make our attacks less dangerous.

Submarine group operations should be organized and conducted in accordance with this goal. During such a mission, two boats should not attack simultaneously but, rather, conduct successive attacks within the same interval of time. The time interval should allow the first attack to be made to affect the escort system and not permit the enemy time to reestablish his security system. If the escort vessels assisting a torpedoed transport will be delayed in its vicinity for 15 minutes, then with two times the superiority in speed, these same escort vessels can overtake the remaining escorted ships in 15 minutes. Thus, the escort will be disrupted for approximately 30 minutes.

The same time intervals will apply when escort vessels try to pursue the first attacking submarine. Consequently, the interval between boats should be the distance that a convoy will travel in 25–30 minutes. If the convoy is traveling at eight knots, the boats should be 6,000–8,000 yards apart. This interval between submarines permits them to have reliable communications using any underwater acoustic means of communication when no enemy ships are nearby and provides complete freedom of maneuver for each boat. As stated before, after the first submarine attacks it should quickly and decisively break off from the enemy so that, if possible, it can surface and move in front of the convoy for a second attack. After approximately 30 minutes, when the distance between the boat and the convoy is about 10,000 yards, and if it is not being pursued, then boat can surface partially. This distance is completely safe for the submarine. It then can conduct subsequent maneuvers surfaced. Since a surfaced submarine can proceed about twice as fast as the convoy, after 90 minutes it should be about 16,000 yards in front of the convoy and be ready to attack again. The convoy should reach the new attack position in about an hour. Thus, the second attack can occur after 3–4 hours. If the enemy is using aircraft as part of his escort force, it is much more difficult for the submarines to conduct a second attack.

[Figure 10 here in original text.]

This type of maneuver has been employed in the north. At 1735 on 10 August 1941, the submarine K-2 detected two transports escorted by two patrol craft near the coast (figure 10). The ships’ angle on the bow exceeded 90 degrees. The commander decided to maneuver around the convoy on the surface and attack the transports with torpedoes. Two hours later, the submarine approached the boundary of its operating area, which required the commander to turn toward the convoy’s course. As the boat continued to maneuver surfaced, an enemy escort vessel detected it and fired four shots from a range of 14,000 yards. The shots were short by 1,000–2,000 yards. The boat submerged at 1945. The enemy continued his movement, pressed close to the shore. The submarine, maneuvering submerged, approached the enemy. The commander placed his boat between the transports and the escort, turned to attack with his stern tubes, and at 2045, from a range of 600–800 yards, fired a salvo of two torpedoes. Unfortunately, the torpedoes did not hit the target.

In this example, the submarine began its approach to the front of the convoy unobserved by the enemy. But if the submarine had exposed itself by its attack, the enemy, lacking aviation, would not have been able to prevent its approach for the subsequent attack. It is also very interesting that the enemy, because he was moving along the coast, could not veer away from the submarines attack. The enemy had detected the submarine to seaward near and in front of the
convoy along its course. The transports would have had to turn back or be at risk. The submarine also had a good firing position (inside the escort, 600–800 yards from the target). If there had been no misses, the enemy would have paid dearly for his risk. The commander took three hours to position himself for a stern attack. This confirms the tentative calculations that we made earlier.

Thus, we conclude that submarines can conduct follow-on attacks during daylight hours. Submarines operating in a group distract the enemy’s attention when more than one boat is attacking.

The possibility of conducting group submarine operations at night is not significantly reduced. As experienced by the Northern Fleet, a boat does not have to get in close, which permits the submarines a certain freedom of action. To reestablish the convoy’s formation after an attack is more difficult at night and requires more time than during the day.

It is easier for a submarine to launch a follow-on attack at night, especially when the enemy is moving in coastal channels. Also at night the submarine does not have to withdraw any great distance from the enemy or move a significant distance in front of the convoy. Consequently, follow-on attacks can frequently be conducted one after another. Each submarine must simply bypass the area of operations of the other boat (for example, after its attack, the first boat maneuvers to the right of the enemy’s course, the second boat to the left). As is well known, the Germans often practice such night group attacks on convoys, taking into account, no doubt, that enemy aviation cannot interfere with follow-on night attacks and that pursuit at night is substantially more difficult. British ships equipped with radar sets have greatly complicated German submarine night attacks. As yet, our submarines have not detected signs that German transports and escort vessels have such equipment.

The above account shows unconditionally the utility and possibility of organizing submarines into groups (though initially in pairs) in our theaters.

If the group method of submarine utilization requires some training in combined maneuvers, then there is a way for submarines to coordinate with each other that does not require special combat training. Submarines located in areas toward which the enemy is moving can report information concerning the enemy to the other submarines.

Slow-moving convoys required significant time to pass through the large areas assigned to submarines. Thanks to this, it was worthwhile for submarines to radio to the command the location and direction of movement of enemy convoys after an attack, regardless of its outcome. The command was then able to retransmit this information along to other interested boats. All boat commanders were to use every possible means to receive those radio messages that were of value to them.

An example of this coordination occurred in the northern theater. At 2210 on 26 January 1942, in position in the area of Tanafjord, the submarine Shch-422 detected a convoy of two transports, an escort destroyer, and two or three patrol vessels moving eastward along the coast. The boat began to maneuver for an attack. Since it was sufficiently dark, the boat surfaced. At 2219, a patrol vessel detected the submarine and turned toward it. The commander decided to submerge and attempt to attack the transport from below. At 2222, however, depth charges began exploding near the boat. At 2239, the submarine ascended to periscope depth. Not
detecting anything nearby, the boat partially surfaced at 2244 and transmitted the \textit{Shch-422}'s report to the other boats at sea.

The submarine \textit{M-171}, located near Persfjord, received this report at around 0030 on 27 January. The boat’s commander calculated the convoy’s movement, headed toward Cape Harbaken and, when 3,000–4,000 yards from it, began to anticipate the convoy. At 0515 (45 minutes later than the commander had estimated he would detect the enemy), the sonar operator reported a noise and its bearing to the commander. Soon, three approaching ships were detected approximately 6,000 yards away. At 0533, the commander approached to within 2,000 yards of the targets, fired torpedoes, and observed a powerful explosion. This example shows the effectiveness of such coordination between submarines.

There were several examples of reports by submarine commanders concerning the movement of convoys, but there should have been significantly more. In the north, where boats were deployed along an extended line of communication and it was clear that the enemy used particular coastal channels for convoy movement, such reports could have been quite useful to other boats. Several commanders abstained from reporting, fearing that their boats would be detected during the transmissions and enemy pursuit would begin once again. The danger of this was considerably exaggerated. Usually, there were no enemy ships near the submarine. Even if a submarine were detected while transmitting a message, the enemy could not dispatch forces to the detected boat’s area quite as quickly as it seemed. The boat always managed to change its location significantly, making it more difficult for pursuing forces to detect. This in full measure is affirmed by our own experience. When in the north and on the Baltic the enemy attempted to pursue a submarine tracked by radio direction finding, as a rule neither the patrol craft nor the aircraft could locate the boat.

The second circumstance that prevents coordination between submarines and also with other fleet forces is that submarines do not receive radio messages during daylight hours. Therefore, radio messages received at night are old news.

Submarines do not receive radio messages during the day because they are submerged, often at significant depths. Since a special system of transmitting radio traffic to boats during the day has not been established, they are unable to receive them. At one time the following system was used on the Black Sea and is now being introduced in the north. The command transmits reports to particular submarines in the day on long-wave frequencies at specified times, for example, in the last five or 10 minutes of every even-numbered hour (any combination of times can be used). Knowing this, depending on the situation, a boat commander can surface during his specified period, expose a portion of the antenna above the water, and receive the transmission.

Of course, such a means of radio communication is imperfect (and our technicians must seriously consider how to improve this situation), but just the same, it can be used. Moreover, the commanders quite genuinely feel that this listening method is useful and actually have begun to attempt to receive needed radio traffic.

Submarines operate almost exclusively independently on all our seas. Cooperation sometimes occurred between boats operating on enemy lines of communication in 1941 and 1942, but this was the exception.

The situation that is now developing in the Baltic makes organized cooperation between submarines and other fleet forces against enemy sea lines of communication almost impossible.
In the north and on the Black Sea, such coordination is possible and should be developed. In the north, incidents of coordination of submarines with other fleet forces were far from isolated. The most frequent form of cooperation occurred when other fleet forces reported to submarines the location and movement elements [course and speed] of enemy ships.

The submarine M-176, positioned in the Varangerfjord area on 9 April 1942, received a radio message at 2300 concerning the departure of a convoy from Kirkenes. At 1403 on 10 April, the sonarman reported approaching noises to the commander. Soon, three enemy transports appeared in the periscope, heavily escorted by three minesweepers, three patrol ships, three motorized boats, and patrol cutters. The commander closed with the convoy and achieved two torpedo strikes on a large enemy transport.

The submarine K-21, positioned in the area of Soroy and Rolvsoy Islands on 5 June 1942, received a radio message from the command informing it that an enemy surface squadron had departed Altafjord to attack a convoy sailing from England to Archangelsk. The commander completed charging his batteries, submerged, and waited for the enemy. After 90 minutes, the sonarman reported the detection of noises. Sometime later, the battleships Tirpitz and Admiral Scheer were detected, sailing with escorts. The K-21 attacked and struck the Tirpitz with a torpedo.

During the day of 23 August 1942, in the area of Varangerfjord, the submarine Shch-422 received a report that two transports were sailing toward Vardo from Makkaur on a 135-degree course. The commander positioned his boat along the enemy’s route at dawn on 24 August. At 1730 on 24 August, two escort vessels were spotted at a range of 5,000–6,000 yards and then two transports escorted by eight other vessels. The Shch-422 sank one of these transports in a successful attack.

Altogether in the north, there were 32 instances when submarines attacked enemy ships after having been informed by the command of their movements. As can be seen from the above examples, it was sufficient to inform the submarines of the enemy’s location at a particular time and in what direction he was moving, because the route of the enemy ships was known and lay in the corridor between the shore and the enemy’s own minefields. Transports could be intercepted even when they moved through a submarine’s area during periods of darkness. Sonarmen were of great value in these conditions.

The Northern Fleet command found out about the enemy’s movement from agents, radio direction-finding stations, shore observation posts, and air reconnaissance. There would have been significantly more coordination between forces if submarines could have received radio messages during daylight hours. In many cases, the possibility of an attack had already been lost because the submarine did not receive the radio message reporting enemy activity until that night.

There were also incidences of vectoring submarines on the Baltic. On 12 October, for example, the fleet chief of staff informed the submarine Shch-323, which had just sailed from the Gulf of Finland into the Baltic Sea and was heading for Norrkoping Bay, about an enemy amphibious landing being conducted on Dago [Hiiumaa, belonging to Estonia] and about the presence of a German cruiser north of the island. The submarine commander was directed toward the cruiser’s location and actually detected it. Unfortunately, incorrect actions by the torpedomen with their equipment disrupted the attack. The submarine plunged deep and was unable to surface for a long time. Meanwhile, the enemy cruiser disappeared.
These examples of coordination have shown the vectoring of submarines to the enemy. This method was used to compensate for the basic inadequacies of submarines: their small range of visibility and relatively low maneuverability while submerged. As can be seen, this method consists of two basic elements: establishing the location of enemy ships and their movement elements, and transmitting the data to a submarine. To determine the enemy’s location requires reconnaissance along the enemy’s shipping route, which air forces can easily accomplish. To transmit information to submarines requires means of communication between the intelligence collectors and submarines. Since communicating between intelligence collectors and submarines was difficult, transmissions had to be passed through the command’s shore-based station. Rapid communications are extremely important, and require good and reliable communications of the command with its reconnaissance assets, the composition of good encryption tables, and finally, the maintenance of communications between the command and submarines both during the day and at night. This, along with coordination between the submarines themselves, requires transmitting radio messages to boats that have surfaced at predetermined time periods during the day.

Coordination can be two-sided, that is, submarines directing other forces to the enemy, especially air forces, which are the most maneuverable. The purpose of this type of coordination is to inflict more destruction on the enemy than a submarine can accomplish by itself. In this case, the boat can compensate for the aircraft’s deficiency of not being able to conduct prolonged, persistent observation of enemy-controlled areas. Such coordination is most effective when it is organized while the enemy convoys are moving in areas relatively close to our airfields. It is very important that messages are transmitted to our aircraft in time for them to strike the enemy before he moves beyond the aircraft’s radius of detection.

There was such an incident, for example, in the Varangerfjord area in the north. Our small submarines normally patrolled in this area, and these boats could ordinarily sink a single transport from a convoy. Because the enemy had significant patrol forces in this area, our boats were subjected to long pursuits after an attack. Therefore, it was practically impossible for these boats to attack and then report about the enemy. A boat could, however, without attacking, surface to the level required to expose its antenna slightly and then, with a brief transmission, report the exact location of the enemy convoy. Based on this information, air strikes and, when possible, also torpedo cutter attacks could be conducted.

Our destroyer escorts’ raiding operations in the north would have been significantly more successful if they had been coordinated with submarines. For example, a submarine positioned in the area of an enemy base or on the route of a convoy could report the enemy ship departures or crossings of a given line and, within its capabilities, observe the enemy force. When our ships arrived, the submarine could provide more specific information concerning the enemy. By organizing destroyer escort raids on enemy lines of communication, encounters with the enemy would be ensured. Based on information provided by the submarines, the destroyer escorts would know ahead of time the composition of the enemy escort force and what kind of countermeasures the enemy may employ.

Unfortunately, we still do not have experience in organizing such operations. The Germans have widely employed coordinated actions of submarines with other fleet forces in their operations on sea lines of communication. This obligates us to devote greater attention to this form of submarine employment.
Another important type of coordination is when other fleet forces assist submarines which are being pursued by the enemy, have suffered serious damage, or find themselves in a critical situation. At the beginning of the way, the command had not fully considered this type of coordination. Northern Fleet experience provides a number of instructive examples.

In December 1942, the fleet command learned from an intercepted enemy radio transmission that one of our boats was being pursued by enemy aircraft and cutters in Varangerfjord. Attack aircraft were sent out to aid the submarine. They drove off the enemy aircraft and then attacked the cutters, forcing them to halt their pursuit. The submarine broke off from the enemy and returned safely to base.

Shore batteries on the Rybachiy Peninsula have also assisted submarines. At 2215 on 15 May 1942, in the Varangerfjord area, the submarine M-172 detected an enemy transport escorted by two patrol vessels and three minesweepers. At 2240, the submarine fired torpedoes at the transport, achieving a hit. Within 3–4 minutes of the torpedo strike, depth charging began. The enemy energetically pursued the submarine for approximately seven hours. The submarine evaded, maneuvering on changing courses, and tried to reach the cover of our shore batteries on Rybachiy Peninsula. At 0800 on 16 May, with its batteries almost exhausted, the submarine surfaced 7,000 yards from Vaytalakhti. Two enemy patrol vessels were 14,000 yards from the submarine and immediately moved toward it, opening fire on it at 0816. The shells just barely missed the boat, but it continued to withdraw toward our batteries, which opened fire on the enemy vessels at 0820. This forced the German vessels to seek cover under a smokescreen and withdraw. Thus, thanks to the assistance rendered from the shore batteries, our submarine was spared from further pursuit by enemy ships. Though significantly damaged, it returned to base safely.

A week later, the submarine M-171, after a successful attack on an enemy transport, escaped pursuit in the same manner. From these examples, we see how essential other fleet forces can be to submarines being pursued by the enemy.

Characteristically, in all these examples, assistance was provided without any prior arrangements. Obviously, this assistance could be more effective if it were organized in advance. Thanks to the enemy’s clear text radio messages, our submarine command was frequently able to learn of submarine detections at the same time as the German command learned of them. Logically, when the German command sends out its forces to pursue our submarines, we, when possible, should send out forces to support the submarines. Unfortunately, help is usually not given to the submarine. At the same time, if a surface ship should fall into a precarious predicament, help would be sent to it without delay because this is always provided for by the organization (supporting forces). This occurs because of the firmly entrenched view that a submarine can easily break away from the enemy by submerging and, therefore, does not require assistance.

Today, this view is already suspect. A boat’s submerging can help it to avoid detection. But if it has already been detected and is being pursued, submerging alone cannot save it. Thanks to the broad development of hydroacoustic gear, a submerged submarine can be pursued energetically and successfully. In many combat operations, our submarines have been pursued for more than 10 hours, have expended almost all of their battery power, and then have been in extremely critical predicaments. We do not know all the reasons why our boats have been lost in combat. Probably several of them have perished in such circumstances.
Consequently, as supporting assets are designated for surface forces, so also should support forces be set aside to assist submarines operating against enemy sea lines of communication. Of course, the composition of these forces should correspond to the conditions of various sectors of enemy sea lines of communication. But it is mandatory that a portion of them be attack aircraft, which can arrive rapidly to assist a boat.

When possible, submarines should be able to transmit brief signals in order to report danger. Assistance to submarines can be mandated not only when they are being pursued by the enemy but also if they have received combat damage or experienced some equipment failure.

On 8 April 1942, on the 20th day of its sortie, the submarine Shch-421 was positioned near the entrance to Porsangerfjord, eight miles from the shore. At 2056, while it was moving submerged, it struck and exploded a mine. Both propeller shafts were damaged and the boat was unable to move. At 2400, the division commander, who was on the boat, reported the situation to the fleet commander. The K-21 was quickly sent to help the Shch-421. At the same time, in an effort to move away from the coastline, the Shch-421 raised two sails from its periscopes. The wind was at force 4 and the boat managed to hold itself out of the current into Porsangerfjord. At 0330 on 9 April, the boat received a report concerning the dispatch of the K-21 to its aid. At 0930, visibility sharply improved and the coastline came into view. The submarine took down the sails and partially submerged. At 1100, the K-21 arrived and at 1140 a towline had been established, which was just as quickly broken by the heavy sea. The K-21 established a towline four times, but all attempts were unsuccessful. Either the lines broke or the bollards tore loose. The submarine captains decided to prepare the anchor chain for towing. While engaged in this preparation, they detected the silhouette of an approaching enemy combat vessels and the appearance of a German aircraft. It was decided to scuttle the Shch-421. At 1334, the aircraft began to circle overhead and drop flares. At 1340, the entire crew of the Shch-421 was taken aboard the K-21 across the cast-off horizontal planes. At 1343, the K-21 sank the Shch-421 with a torpedo. The K-21 then submerged and safely returned to base.\(^\text{12}\)

When another submarine is dispatched to assist a submarine that has lost its capability to move independently, it unavoidably will lead to the loss of a boat and, in the best case, to the rescue of the crew. Even if the K-21 had been able to tow the Shch-421, it is difficult to imagine that, during this long tow, both submarines would remain undetected by the enemy, who had observed the Shch-421 from the shoreline. With the enemy’s appearance, both boats would have fallen into a critical situation. What would the boats have done if they had encountered enemy aircraft and ships while the K-21 was towing the Shch-421? The K-21’s commander would have had to remove any remaining crew members from the Shch-421 (considering that only the minimal necessary crew would be aboard), cut loose the anchor chain, and only then submerge. Because of the time involved, the K-21 would have been at great risk.

There was probably no alternative for the fleet commander except to dispatch another submarine. The fleet command, therefore, was forced to accept the loss of the Shch-421. Had a support group consisting of destroyer escorts and air forces been operating on enemy lines of communication, the situation would have ended differently. The destroyer escorts could have rapidly arrived at the disaster scene, quickly placed a towline on the boat, and then towed the submarine with great speed. Thus, the entire operation would have been accomplished in a shorter time. The destroyer escorts also could have offered greater resistance against an enemy encounter. Air forces would have been able to diver the enemy from the destroyer escorts and, if necessary, support the destroyer escorts in battle.
We have examined this incident not to accuse anyone of not taking appropriate measures (obviously, at this time Northern Fleet did not have the resources to accomplish all of this), but to show the utility and necessity to designate forces to support submarines. The composition of these forces should be determined based on the actual availability of vessels and aircraft and in accordance with the operational situation in theater.

The second similar occurrence also took place in the north, with the submarine *Shch*-402. This submarine sailed on 21 February 1942 to the Porsangerfjord area and, on 27 February, successfully attacked enemy convoys twice. At 1735 on 2 March, the boat successfully attacked one of several enemy minesweepers. However, the boat was immediately subjected to intensive pursuit. When the boat surfaced at dark, a large oil slick was seen trailing behind it. Among the damages to the boat was the penetration of fuel cell number 4. As a result, the commander had the remaining fuel pumped out of this cell. A heavy storm blew from 4 to 8 March. After the weather settled down, it became clear that fuel was also leaking from cell number 3. The remaining fuel was purged from this cell also. On 9 March 1942, the submarine was ordered to a new position. While it moved to its new position, the crew measured the remaining fuel. There were still nine tons aboard, sufficient to spend several days in position and then return to base. But at noon on 10 March, it was discovered that the fuel supply was low, and by 2210, it was all gone. The boat, without fuel, was 22 miles from the enemy shore and 250 miles from its base.

The commander reported his situation to the fleet commander and was told that the submarine *D*-3 was being diverted from a neighboring position to render assistance. The *Shch*-402 was dead in the water until 0647 on 11 March, awaiting the arrival of the *D*-3. Meanwhile, the crew had decided to try to operate a diesel engine with a mixture of oil and kerosene. The engine was started and, after an hour, the cylinders were examined. All were holding up, and the boat continued moving under diesel engine power, working on the oil mixture. With a speed of approximately 1.5–2 knots, the boat continued to move until 0545 on 13 March, when all the oil was also totally spent. The *Shch*-402’s commander did not immediately report his movement; consequently, the *D*-3 did not find the *Shch*-402. At the same time that the *D*-3 was diverted to provide aid, the *K*-21 was sent out from the base also to assist the *Shch*-402. This boat also approached the *Shch*-402’s initial location but did not find it there. The *K*-21 requested the *Shch*-402’s new position. Having received the new location, the *K*-21 found the *Shch*-402 at 1152 on 13 March, and came alongside to transfer fuel and oil. The *Shch*-402 received what it needed in an hour and both boats headed for base, arriving safely some time later.\(^\text{13}\)

Since the *Shch*-402 was capable of submerging, the selection of a submarine to render assistance was completely correct in this case. Not every surface ship would have been able to supply the submarine with fuel. In addition, the dispatch of a surface ship would have required significantly more support. Thus, we see that it is also necessary to have high speed submarines in the support command.

There were incidences of submarines in difficult circumstances in other seas, as well. At the beginning of the war in the Baltic Sea, the submarine *S*-10 was sent to Danzig Bay. On 28 June it sent a radio message: “Am damaged. Being pursued. Going to Libava.” A reply was sent to the boat: “Do not sail to Libava; go to Ust-Dvinsk,” and no assistance was dispatched. On the same day, the 2nd Brigade’s communications center received a coded submarine message: “Have suffered disaster, need assistance.” The call sign of the boat was not received. It was quite clear that this message had come from the *S*-10. This was the last report received from this boat.
The submarine Shch-212 on the Black Sea became involved in a critical incident. On 25 October 1941, the submarine struck and detonated a mine 4–5 nautical miles southwest of Cape Kaliakra in the Varna area. The boat received a great deal of heavy damage but was still able to move. Because of damage to a number of its ballast tanks, the submarine was in a partially submerged state and almost lost its capability to submerge.

The commander reported his situation to the command and received permission to return to base. A destroyer escort was sent out to assist the boat and linked up with it on the second day of its movement toward base. Accompanied by the destroyer escort, the submarine arrived at Sevastopol. On the following day it had to sail unaccompanied to a base along the Caucasus coast in a heavy storm.

The submarine A-5 found itself in dire straits on 25 June 1942 after detonating a mine in the Odessa area. One of the boat’s rudders and the vertical and horizontal planes were jammed. As a result, the boat lost its steering, both surfaced and submerged. Lacking the ability to move out of the minefield, it lay on the bottom for four days. At darkness, the commander surfaced and attempted repairs. Only the persistent and determined efforts of the boat’s entire crew enabled it to return to base on its own, which the boat managed to do only on 4 August.

On the Black Sea as on other seas, a support force has not been organized for the submarines operating against enemy lines of communication. They can count only on themselves should they get into serious trouble.

Methods of utilizing underwater obstacles have a whole series of peculiarities and are always associated with the employment of mines. Therefore, everything connected with the submarine minelaying has been placed in a special chapter that discusses this whole set of issues.

6. Establishment of Submarine Missions

It is particularly important to state the missions correctly for submarines just beginning their combat operations. With this perspective, it is interesting to analyze how missions were established for submarines when they departed for combat sorties in the first days of the way. The Baltic brigades received the following mission from the military council: “Sink all enemy ships. Report detections of battleships and cruisers. Conduct unlimited submarine warfare.”

The commander of the 1st Submarine Brigade stated paragraph 3 of his own order to the brigade, which was issued on 22 June:

3. The 1st Submarine Brigade deploys its submarines in the southern sector of the Baltic Sea and [conducts] unlimited submarine warfare on the approaches to Irben and Soelo Sund to disrupt enemy sea lines of communication of commercial and military vessels.

I order:

a) 1st Division—deploy submarines to position No. 1 . . . in accordance with the position plan and planning table with the mission of unlimited submarine warfare . . .

On 30 June, the same brigade commander gave a “combat directive” to a submarine commander (S-9) in which he wrote, “On 1 July 1941, submarine S-9 is to go to position

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No. 19 . . . in complete autonomy, with the mission [to conduct] unlimited submarine warfare. Sink all cargo and military vessels, except Swedish military vessels."

The posited missions can briefly be summarized as follows:

- The fleet commander ordered the brigade to sink all ships and conduct unlimited submarine warfare.
- The brigade commander assigned the brigade the mission to disrupt enemy lines of communication for cargo and military vessels.
- The brigade commander also stated the mission for submarine commanders was to conduct unlimited submarine warfare and sink all commercial and military vessels.

Comparing these missions, we see that the first and third formulations coincide and do not address the issue of what the command wishes to achieve, that is, the destruction of enemy ships. Rather, they address the mode of operations. The mission is indeed expressed in the second formulation: disrupt enemy lines of communication.

The mistake made in the first and third statements—that is, stating the mode of operation in lieu of a mission—was repeated many times in the Baltic and in both of our other seas.

If the noted mode of operation—the destruction of all ships ("conduct unlimited submarine warfare" only develops the mode of operations and does not actually impart anything new)—would would be the sole means of accomplishing the mission that the command implied, then this incorrect formulation would not have any significance. However, the mission "prevent enemy passage by sea" permits other modes of operation, such as, for example, restricting enemy movements, creating the threat of sinking his ship by demonstrating submarine actions and by emplacing false periscopes along the convoy routes prior to departing the position, interfering with ship movements by placing mines, and so on.

It must be acknowledged that by sinking 13 transports in 1941, Baltic Fleet submarines reduced enemy shipping less than those measures the enemy himself would have taken (movement in convoys, shipping cargo only on small vessels, sailing only at night, and so on) had he been forced to react to a heightened submarine threat.

Understanding his mission correctly, the commander of the submarine S-6 did not attack a single enemy ship on his first sortie southeast of Bornholm. Rather, he was very much concerned about his own security in the area and, using the deck gun, attacked two transports that he saw shortly before departing from the position. These and similar examples are instructive. In all these cases, the commanders interpreted the mission literally and did not even contemplate how they could make the enemy’s movement by sea more difficult by simply revealing their presence in the area.

This is why the boat’s first combat mission was incorrectly formulated. In the mission statement, the commander should have been given a specific function, not just a directive to go to sea. The ultimate goal of the brigade operations on the sea lines of communication, as the brigade commander himself stated, was to disrupt enemy naval shipping. This final objective should have been spelled out in the commander’s sailing
order as the mission of the next higher commander. The submarine’s mission, obviously, should be to interfere with enemy shipping in its designated sector. To accomplish this mission, the commander, already as an idea of a solution (mode of operations), should be ordered to “sink and suppress the movement of enemy ships while conducting unlimited submarine warfare.”

It is useful to look at how reconnaissance and attack were combined in the mission. On 24 June 1941, the 2nd Brigade commander formulated this mission for the submarine *M-90*: “Conduct observation of the approaches to the Gulf of Finland and the exits from Abo–Aland skerries, attack and destroy enemy ships.” A number of other boats received similarly worded missions.

“Conduct observation” is a means of accomplishing reconnaissance. It is necessary to specify what is to be discerned. How to combine reconnaissance with attack is completely unclear. With such a formulation, the boat commanders themselves were to decide which is more important in a given situation—observation or attack.

On 28 June 1941, the chief of staff of the 2nd Brigade stated in a “directive” the submarine *M-102*’s mission in the following manner: “Report detection and attack enemy battleships and cruisers.” Such a formulation is often repeated. How a commander would accomplish this mission is difficult to imagine. Obviously, if he detected a battleship and began to report it, then without doubt he would be unable to attack it. The established mission is thus unfulfilled. In addition, “directives” should be written by the brigade commander himself and not his chief of staff.

Similar mistakes and imprecision in the statement of the mission can be found in other fleets. Unfortunately, they remain to this day.

When a submarine executes a particular type of mission for a long time, the specificity and precision of the mission statement does not have such practical significance. The mission has already been clarified for the commander during his immediate superiors’ analyses of his actions at sea. But it must be considered that the formulation of the mission always has great instructional significance.

7. Documents Issued for Sailing
Commanders often regard documents issued for sailing as a tiresome and totally unimportant formality. Such an attitude attests to these commanders’ lack of organization. An internally disciplined and organized person requires precise documents that specify what he should do and how it should be done.

In its turn, an imprecise and superficial document not only does not instruct the commander but even discourages him. This is why documents issued for sailing should be precise and clear, in both form and content.

Unfortunately, this is not always the case. Each fleet assembles documents by its own methods, and even the document names are different in the various fleets. Originally, departing boats received a combat order, an overlay of their position (with or without situation), communications instructions, and signal codes. The commander was not given instructions for the sortie.
The combat order contained a general description of the theater situation and the brigade’s and boat’s mission. In some fleets, the contents of the order were so formalized and stereotyped that the order actually became extraneous. The commanders already knew it by heart. The combat order was unnecessary. This was the case, for example, in the 1st Brigade on the Black Sea and in several other brigades.

Rather than issue a boat commander instructions for the sortie in written form, the brigade commanders were limited to oral instructions. Frequently, boat commanders were instructed to operate in accordance with “Regulations for Submarine Combat.” Commanders did not study these regulations during combat training and were forbidden to take them to sea. Consequently, each commander was allowed to operate as he saw fit. The results were indifferent. The need to issue submarine commanders “Instructions for Sailing” began to be felt.

Baltic commanders attempted to write a general document, “Instructions for Submarines Operating on Sea Lines of Communication,” but the effort led to nothing. All this created a sense of dissatisfaction with their documentation. Rather than philosophize on how to implement the “Regulations for Submarine Combat” and the “Regulations for Staff Service,” the commanders began to develop new documents. The precision of documentation sacrificed a very arguable quality—convenience of handling.

A document new to us emerged in the north—“Combat Instructions.” However, a unified document was never produced, since for sailing, in addition to its combat instructions, the boat received communications instructions and a position overlay. This was quickly acknowledged in the Baltic. Here also the boat commanders began to receive “combat instructions,” with appendixes: position overlay, planning table, communications plan, and TUS (tablitsa uslovnykh signalov—table of coded signals). Thus, the Baltic brigade was unable to combine all this into a single document. Consequently, the idea that gave birth to “Combat Instructions” was not achieved.

What kind of document was “Combat Instructions”? Signed by the brigade chief of staff, it contained the following:

- Information concerning the enemy and his activities.
- The submarine’s mission.
- Information concerning submarines in nearby positions.
- Situation status in the area of the position.
- Methods of operation recommended to the submarine.
- Instructions concerning reconnaissance.
- Special instructions.

Normally, the term “instructions” was used to describe the sequential actions carried out by a person executing a particular task or servicing some piece of equipment. These actions were mandatory and deviance from them was a violation of the established order. Basically, the contents of the “Combat Instructions” laid out above were not a list of totally mandatory actions that a submarine commander was to follow on a combat
mission. From this the name itself, “Combat Instructions,” is unfortunate. This is the formal aspect.

The principal aspect of this issue includes the following. The commander departing on a sortie should be told precisely why he is being sent to sea and what he is supposed to accomplish. For us, this comes in the understanding of an “order.” Then, the commander should have recommendations as to how he is to accomplish the mission and operate in various situations. Since he receives only recommendations, he is not under an unconditional obligation. Depending on the situation, with sufficient reason, the commander can deviate from the methods of operation recommended to him. We have named such a form of document “instructions.” Therefore, the existence of “orders for sailing” (or, as we like to call it, “combat order”) and “instructions for sailing” is entirely logical and natural.

The boat commander’s immediate superior, that is, the division or brigade commander, should sign a combat order. In this documentation, everything should be laid out to clarify fully what the boat commander is required to do. “Sailing instructions,” signed by the brigade chief of staff or by the division commander in divisions, is an appendix to the order.

On the Black Sea, a new document has received the title of “combat directive.” An overlay of the situation in the area, an overlay of the complete route, and a communications plan are included in the directive. The “combat directive” designates the departure times from base, occupation of and departure from position, return to base, the situation in the theater, the mission, actions of neighboring boats, communications, reports, routes, and additional instructions. The division commander signs the “combat directive.”

Those who assembled this document considered a “directive” less binding than an “order.” Therefore it took on a somewhat “voluntary” form. It rearranged the sequence of the contents of the “combat order,” and additional instructions replaced instructional paragraphs. Thus, the documentation used in the north and in the Baltic also pertains to the Black Sea.

As was pointed out above, the reason for discarding “combat orders” was because they became stereotyped. This occurred because fleet and brigade staffs did not understand what actually needed to be in them. What should “combat orders” issued to submarines operating against enemy sea lines of communication contain?

A combat order should contain:

- The actions of the enemy (the types of enemy, with emphasis on what is most significant (troops sailing to the east on large transports, tankers, and so on); the location of day and night convoy routes; and the system of movement of ships (convoy, single troop transports, heavily escorted).

- Information concerning friendly forces (the submarine Shch X is operating on enemy lines of communication west of meridian ___, and the submarine Shch XX is east of meridian ___. Our aircraft are conducting reconnaissance along routes at such and such a time).
The mission of the major command (division) (to intercept enemy shipping in such and such an area, destroying his transports and military vessels with all types of weapons; minimizing his movement by placing mines, threatening submarine attacks, and conducting demonstrative actions; in the same manner, a reconnaissance mission on enemy routes can be postulated if, at that particular time, it is the boat’s primary task.

Also in a combat order, under the heading of “I order,” the following items should be specified:

- Time of the boat’s departure, to what region the boat is to sail for operations, and its arrival time.
- To sink with torpedoes, mines, and deck guns what types of vessels by priority.
- To take under fire prior to departure from position such and such observation post.
- To determine the location of navigable channels in such and such area.
- To report, without attacking, the detection of such and such type vessels.
- Time of departure from position, rendezvous point, and time of arrival there.

Finally, a combat order should specify the time when communications should be made and the location of the command post.

As can be seen from this list of issues that should be covered in the order, it cannot be standard for all sorties. The instructions should emphasize the issues that are important to the commander on how he is to accomplish the assigned mission. In addition, the boat commander must receive separate intelligence collection tasks, which should include a list of requirements that must be met in the boat’s area of operations.

Thus, the combat documentation required by our regulations must fully meet the conditions of systematic submarine servicing of enemy sea lines of communication. There is no reason to invent anything new; rather, we must completely master what we have, learn how to assemble the documents, and know how to use them.

Special attention should be given to issuing instructions for the destruction of documents on a boat so that under no circumstances could they fall into enemy hands. This is crucial, since submarines operating on enemy sea lines of communication frequently are positioned close to enemy shores. It is necessary to acknowledge that a submarine may be sunk in an area where the enemy could recover it. It is well known that the British have salvaged German submarines in the present war. Therefore, in the event of the loss of a submarine, its documents must automatically be destroyed. To ensure this, the Germans write their most important submarine documents on water-soluble paper. It would be quite advantageous for us to take similar measures.

8. Instructing Commanders Prior to Sailing

Instructions to the commander prior to his departure to sea should have the following goals:
• To establish the correct understanding by the boat commander of the mission assigned to him.

• To give necessary additional instructions concerning methods of operation for the accomplishment of the boat commander’s mission.

• To resolve any questions that a boat commander might have.

The boat commander’s immediate superior, the division commander, should present these oral instructions. In all our fleets, instructions are actually delivered by the brigade commanders, and only when the boat is based in another port does the division commander deliver them.

To exclude the division commander from his direct responsibilities is fundamentally incorrect. What is more, this diminishes his role. The combat order for sailing should be delivered to the boat commander in sufficient time for him to study the situation in the area and consider how he will accomplish his mission. Oral instructions should be provided about two hours before the boat’s departure to sea. In delivering them, the division commander should ensure that the boat commander fully understands the mission, provide clear instructions, and answer all questions that might arise. Both commanders should agree on the conduct of the mission.

To a large degree, failure to observe this rule explains the haphazard employment of our boats. If the servicing of battle positions in particular sectors of the sea were assigned to specific divisions, then naturally the division commander would pass along instructions pertaining to that particular area. But even when areas are not service by specific divisions, the division commanders should still give the instructions, since they know their subordinate submarine commanders’ strengths and weaknesses and are the most capable of effectively delivering the instructions. Brigade commanders should ensure that the division commanders fully understand the missions assigned to boats of their divisions and should periodically check the quality of the instructions.

During a boat’s initial sorties, oral instructions are important for the accomplishment of new missions. At the same time, instructions for our boats’ first sorties have been conducted very poorly. On the Baltic, for example, boat commanders did not understand their assigned missions and did not focus on how they were to accomplish them. As a result, with the exception of two submarines (the S-5 and the S-102), all boats positioned themselves on the seaward side of their assigned positions, that is, far from the enemy movement routes, where they spent a significant amount of the time submerged and grounded on the bottom. This was also observed in the other seas. Issues of establishing the route of movement of enemy ships were ignored. This was one of the principal reasons for the poor results of our submarine operations in the initial period of the war.

Special care must be given to ensure that division and brigade commanders are completely aware of the courses their boats are to follow to reach positions, at what depth they will negotiate minefields, and how they intend to evade enemy pursuit. In the event a boat fails to return from a mission, the command will take appropriate preventive measures to safeguard other boats departing for their missions. The command will also be
helpful in providing for the generalization of submarine operations experience in a given area and in analyzing the methods of dealing with enemy anti-submarine defenses.

9. Communications with Submarines at Sea

Communications with submarines at sea permit the command to exercise command and control of its boats. In turn, for the submarines, communications are the sole means by which they can receive supplementary information from the command concerning the enemy, changes in the situation, changes in their mission, and so on. Thus, both have an interest in maintaining mutual communications.

Security issues complicate the organization of mutual communications. Transmitting messages to submarines by radio enables the enemy to establish the location of the boat. No matter how complex the cipher, sometimes the enemy will be able to break it. Finally, should a boat go down near enemy shores, its communications documents for the sortie may fall into enemy hands.

On all seas, to maintain the security of submarines in given areas, the command used a transmit-only method of communications with its boats and the boats reduced their communications to the minimum of transmissions. The transmit-only method fully justified itself. To test the reliability of radio message reception by the submarine, the traffic was transmitted at an agreed-upon time of day. Almost all brigade commands transmitted messages three times for three consecutive nights at various times, and three times in each transmission. On average, boats received greater than 90 percent of the messages.

Below are shown the final data for communications with Baltic Fleet submarines in the summer of 1942.

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<thead>
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<th>Message attempt</th>
<th>Percent received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1, 1st attempt</td>
<td>55</td>
</tr>
<tr>
<td>2nd attempt</td>
<td>13</td>
</tr>
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<td>6</td>
</tr>
<tr>
<td>Day 2, 1st attempt</td>
<td>6.5</td>
</tr>
<tr>
<td>2nd attempt</td>
<td>4</td>
</tr>
<tr>
<td>3rd attempt</td>
<td>1</td>
</tr>
<tr>
<td>Day 3, 1st attempt</td>
<td>3</td>
</tr>
<tr>
<td>2nd attempt</td>
<td>2.5</td>
</tr>
<tr>
<td>3rd attempt</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>92</strong></td>
</tr>
</tbody>
</table>

As these numbers show, submarines received the overwhelming majority of radio messages on the first night. This same picture emerges in the other fleets as well. Thus, the transmit-only method of communications with submarines was quite reliable. The commands subsequently limited the transmission of messages to submarines to two times per day.

Despite this, in especially important situations and also when the command needed to confirm the safety of a boat, the fleet or brigade command required the boat to transmit an acknowledgment in the text of their message. It cannot be denied that, in some situations, it would be necessary to be completely sure that a submarine had received a particular directive. This happened on the Baltic when submarines moved into positions, when one boat replaced
another boat in a position, or when our surface ships were to pass through a submarine’s position.

However, such situations should be avoided at all costs. Because the command does not know the situation in a submarine’s area, and since an acknowledgment is required from a boat, it is possible that the boat would be put in an unfavorable or dangerous situation. In no case is it proper to require an acknowledgment to confirm the safety of the boat. This is also practiced in the fleets. The command should transmit a special inquiry to the boat, with instructions as to how soon a reply is required. This then gives the boat the opportunity to choose the most favorable time to respond concerning its safety. Boat commanders should be trained to know when the requirement to give an acknowledgment or to disclose their position is absolutely necessary. As with any directive, they should respond to it in the required time. Unfortunately, our commanders have not been trained this way. Sometimes they doubt the appropriateness of the interrogation and the necessity to respond. There has even been a case when the boat commander had to receive an explanation over the radio as to why a response was required. Such cases attest to the lack of discipline of the submarine commanders who fail to satisfy requirements. At the same time, this type of situation reflects poorly on the questioner, when his question can evoke doubt in the boat commander.

As has already been pointed out earlier, we have shown little concern for the maintenance of communications during daylight hours, which is a very large problem in the organization of the commands’ communications with submarines. Although we plan for communications during the day, with few exceptions the boats received all radio messages during periods of darkness. The reason is that receiving messages at night when the boat is surfaced is not particularly difficult. During the day, the boat is submerged, which complicates the receipt of messages.

From these considerations, communications periods were designated principally during periods of darkness. Normally, submarine commanders did not attempt to receive messages during the day. However, the necessity may arise for an urgent message to be sent to a boat during the day, concerning the movement of enemy ships, for example. This happened on occasion. Aviation conducted daylight reconnaissance and detected enemy ships headed toward a particular submarine’s position. These reports had to be transmitted to the boats quickly, but they were not listening. As a result, the boats might receive the information at night, when it could no longer be used, and therefore had lost its initial value. There were numerous examples of this in all the fleets. If all the attacks that submarines could have made on enemy ships through such means were added up across all fleets, the total would be nearly 100!

To correct this deficiency, the system of transmitting reports to submarines concerning the enemy must be changed. In addition to maintaining the established nighttime periods for scheduled transmissions, we must also transmit urgent messages concerning the enemy by powerful long-wave stations at stipulated times of the day. For example, the last ten minutes of each hour can be designated for transmissions from submarines. Knowing this, and if the situation permits, the submarine commander will surface during this period, expose an antenna, and thus be able to receive radio traffic. Of course, boats with whip antennas that can be extended up out of the water would be able to receive radio traffic during the day. But in the conditions that exist at this time, this issue cannot be considered insurmountable. We simply must educate our boat commanders to pull out of the ether useful radio traffic concerning the enemy. Of course, all this has a purpose if, on a given sea, a well-established system of aerial and agent intelligence collection exists and if transmission of information concerning the enemy is
frequent. Otherwise, it will turn out as it did in the Black Sea in 1942. The command planned to provide communications with submarines but it did not have air reconnaissance or a powerful radio transmitter. Although commanders initially surfaced and listened, they quickly abandoned this method because they did not receive any information about the enemy.

Submarine radio traffic was received around the clock. Usually, a transmission from a boat, except in particularly urgent cases, was accomplished at night at a designated hour. The boat would move away from the area of its immediate combat activities. As a rule, boats were to report upon crossing particular lines (though this might give the enemy an indication of a boat’s course). They also reported accidents, important information concerning the situation, and the detection of large enemy formations.

During the summer of 1942 on the Baltic, 65 percent of the radio messages transmitted by submarines were received with the first transmission, 19 percent with the second, and 12 percent with the third. Altogether, 96 percent of the messages were received. Thus, the percentage of messages not received from submarines was small.

The greatest single cause for losing communications was error on the part of the crew. Thus, the submarine Shch-320 was without communications for 20 days of a sortie in September 1941 because the deputy commander failed to pass along the new communications instructions to the radioman. Because the command failed to receive scheduled reports from the submarine concerning its passage into the Baltic Sea, the departure of three other submarines was delayed.

The practice of our direction-finding stations locating enemy submarines shows that it is possible to determine the position of a submarine by its radio traffic. By knowing the tone of the station and the idiosyncrasies of its radio operator, and by noting the renumbering of its coded signals, the boat can be identified and its movements followed. From these considerations, the transmission of radio messages by submarines should be limited to the minimum, that is, commanders should use the radio only when necessary.

There is no need, however, to jump to the extreme and totally forbid submarine commanders to use the radio. It is also a mistake to think that submarines should not send any radio messages from the sea. If in doing this they are failing to report on enemy forces which other fleet assets could attack, then this is bad, not good. This is why one should not act simply on the number of radio messages sent by submarines. It is not generally wise to exaggerate the significance of secrecy concerning the presence of boats in an area if they have been stationed there for a long time. In such conditions, the enemy is fully capable of determining where our submarines might be. Consequently, one must take into account how detrimental it would be if the enemy should now become aware of the exact location of a boat. It is important that the boat be able to transmit the necessary reports with a short radio message. From this, the significance of a well and thoughtfully prepared table of coded signals (TUS) is clear. In the beginning of the war, boats used ciphers and codes, which lengthened the transmission time. Only later did they change to coded signals. Unfortunately, boats still frequently use ciphers (on average, 40 percent). The command at times has given a boat unbelievably long and sometimes very crucial (regarding the boat’s course) radio message in cipher. The reliability of such a transmission is entirely doubtful.

The fear that, if a submarine is lost, the enemy might capture communications documents and decipher all our radio transmissions has led to a situation on the Black and Baltic Seas where each boat has individual communications documents. Thus the boats can communicate with the
command, but not with each other. When the boats are operating far apart, such a system does not cause any particular difficulty. However, when boats are positioned relatively close to each other and tactical coordination between them is possible, such a method of communication is unsatisfactory. Boats can communicate with each other only through the command, which has to decipher and recipher the traffic. This significantly delays the entire process of reporting from one boat to another. When it is necessary to give a common signal to all boats, it has to be repeated for each boat separately. To avoid all these deficiencies, it is appropriate to have two ciphers: one for individual communications with each separate boat and another common cipher for communications of boats between themselves and with the command. The second cipher should be utilized only in exceptional situations, and it should be able to be remembered easily by all without reference to the submarines’ cipher key documentation. The most appropriate solution is to have a common cipher for all boats printed on water-soluble paper.

10. Information Passed to Submarine Commanders at Sea

Timely information for submarine commanders at sea is particularly important. Submarines are at sea for extremely long periods. On the Baltic Sea, there have been cases when a boat was at sea for almost two months. During such a long period of time, the situation in the theater and the submarine’s area of operations might change significantly. If a commander does not know about changes in the theater, or even in his own area, he could make an incorrect decision and suffer serious consequences. For example, in the beginning of the war, the damaged submarine M-83, unaware that our forces had abandoned the port of Libava, pulled in to its pier on 26 June [1941]. The enemy fired on the submarine and subsequently it was scuttled by its crew.

Here is another example of faulty information. In the Black Sea, the submarine M-111, returning from sea on 23 September 1941, encountered one of our transports. Because the boat had not been warned about the possibility of encountering a transport, the submarine attacked it by firing a torpedo. Luckily, the commander missed it, which was in our favor. It would be possible to present quite a number of similar situations. But these are sufficient to show at a glance what can happen when submarine commanders are poorly informed.

On the other hand, the reporting to submarines of extraneous information that does not directly concern them is also unwise. This overburdens all communications systems. When a commander receives a message that does not pertain to his boat, he will ponder why it was transmitted to him. Consequently, the boat commander at sea should be informed of only those things that could be useful to him on his sortie.

Summarizing, submarine commanders should be informed of the following:

- Changes in the situation in theater (for example, repositioning of the coastal flank of ground forces, appearance in theater of new enemy ships, changes in the intensity of enemy naval shipping, operations being prepared by the enemy connected with the concentration of ships in particular ports, and so on).

- Changes in the situation in the area of the submarine’s operations (changes of the enemy’s movement routes, the detection of new enemy mine obstacles on the path of the submarine’s movement, changes in the enemy’s system of anti-submarine defense in the submarine’s area and on its movement routes).

- New methods of enemy anti-submarine activity.
- [In-position] exchanges of neighboring submarines.
- Repositioning of our own ships (if they might encounter a submarine, given the possibility of simultaneous navigational errors of the submarine and the ships).

Particularly serious attention should be given to providing submarines precise information concerning the movement of our own ships in areas where they may encounter submarines. On the Black Sea in September 1941, a number of our own surface ships unexpectedly encountered our own submarines. As a result, submarines were forbidden to attack surface ships east of Cape Tarkhankut, except when there was no doubt that the transport or ship was the enemy. Establishing such policies indicates to the boat commander his superiors’ inability to deliver timely information to our submarines at sea. Of course, denying the submarines the ability to sink ships in a particular area can only be helpful to the enemy.

11. Exchanges of Submarines in Position

In the beginning of the war in the Baltic and the north, a system was adopted for exchanging submarines in position. The replacement submarine departed the base when the boat it was replacing arrived. Under this system, the submarine going out to the position could receive from the previous boat the most detailed and thorough information concerning the situation in the area. The shortcoming of this system was that the area remained unserviced by submarines during the time it took for the departing submarine to reach the base and during the transfer of necessary reports to the replacement submarine and its passage to the position. When the position was not too distant from the base, the interruption in service was not great, and the advantages of this system outweighed the disadvantages. The Northern Fleet maintained this system throughout the period covered by this report. For the closest positions, the average time during which the position remained unserviced did not exceed 1–2 days. For more distant positions, the interruption in service was significantly longer. Since the command was unable to achieve continuous service of positions by submarines due to other causes, interruptions due to the exchange of boats had no practical significance.

In the Baltic Sea, because of the peculiarities of the situation with the transfer of submarines to eastern bases, the command did not make it a mission to organize uninterrupted service of any areas by submarines. As a result, no particular system of exchanging submarines in positions existed after September 1941, and there were significant breaks between submarines in positions. Thus, the submarine arriving at its new position had relatively stale information concerning the situation because of the period of time since the preceding boat’s departure from the position. In addition, as has already been pointed out, the brigade command sometimes reassigned a boat already at sea from one position to another. When this occurred, the submarine commander generally knew nothing of the situation in the new area and had to occupy the position without any preliminary study. This was the result of having no plan for submarine utilization.

Up until 15 December 1941, submarines in the Black Sea were replaced without handing over the position. A holding area was established near the main position. The boat coming into the position took up this holding area as night fell and awaited a special signal from the brigade commander. The boat being replaced departed the main position at nightfall and, after crossing a specified meridian, reported by coded its departure from the position. On receipt of this report, the brigade staff directed the replacement boat to occupy the position. Everything was planned
and executed so that the new submarine would be in position by dawn. Thus, there was a break of only one night in the servicing of the position. New data concerning the situation was delivered to the replacement submarine by radio. During its departure to sea, the boat was given preliminary data that were later confirmed by radio.

The sole shortcoming of this system was that the new commander did not have the opportunity to speak personally with the captain of the departing boat to find out how he maneuvered in the area and to receive the most current information on the situation. When necessary, the brigade commander would keep a boat in the holding area until instructions from the boat being replaced and supplementary information on the situation could be transmitted to it.

At the end of November 1941, the submarine S-34 was lost in a position between Varna and Burgas. The loss of this boat was not known to the brigade commander, and he sent the submarine Shch-204 to replace it. The method of exchange indicated above was not utilized. The new boat occupied the position even though no signal had been received from the S-34 concerning its departure from the area. When the brigade commander became aware of the loss of the S-34, he warned the Shch-204 that the S-34 had not returned from the position. The Shch-204 also did not return from this sortie.

After these events, it was decided to implement a system in which boats exchanged positions at the base. It must be recognized that there really was not a sufficient basis to change this system until the problems of the S-34 and the Shch-204 occurred.

Because the passage from a position to base took three days (by this time, boats were based in ports along the Caucasus coast), positions could be without service for six days under the new system. It also had the deficiency of incoming and outgoing commanders not being able to engage in personal discussions. The dispersal of submarine bases mandated that information on the situation for departing boats frequently be transmitted by radio or telegraph. Thus the new system, which did not alleviate earlier existing deficiencies, created a new shortcoming—a significantly lower coefficient of servicing of positions.

This system existed in the Black Sea until June 1942, when another system was introduced that combined aspects of the prior two systems. The replacing boat departed base before the return of the replaced boat and sometimes even before it left its position. Both boats passed each other somewhere at sea so that information concerning the situation could be passed between the two boats. This significantly reduced the time over which the position was left unserviced.

Obviously, regarding the transfer of information regarding the situation in the area, this exchange system of boats suffers the same deficiencies as the initial system. In addition, there are longer breaks in the servicing of positions.

In the end, in the situation that has developed on the Black Sea, the most effective system was the initial method of exchanging boats in positions. This system should be used on the other seas where positions are located a great distance from our submarine bases. For close-in positions (passage not greater than 24 hours), the exchange of boats in port is effective.
Chapter VII
Searching for the Enemy

Because our submarines operate against enemy sea lines of communication in significantly large areas, they cannot sit and wait for the enemy but must go out and find him. Many commanders who trained in peacetime to use the positional method did not understand their mission at first. In fact, they occupied a position in their designated area and waited passively for the enemy to come into their sights. Thus, many returned from their first sorties without seeing the enemy or even attempting to find him.

However, some commanders understood their mission immediately and began searching for the enemy in places where he was likely to be found.

In the north, the submarine Shch-401, with division commander Captain Third Rank Kolyshkin (later Hero of the Soviet Union and captain first rank) aboard, was sent to the Vardo area on 22 June 1941. Not detecting the enemy at sea, the division commander decided to look for him in the Vardo harbor. On 27 June, the boat entered the channel through the northern entrance and spotted a transport standing in the harbor. A torpedo was fired from a range of 3,600 yards, but it missed. Possibly, the running depth of the torpedo was set too deep. The boat slipped out of the harbor and lay on the bottom not far from the island in order to reduce the depth setting on the remaining torpedoes. When this had been accomplished, the boat once again set course for Vardo, but now, no transports were detected in the harbor.

The decision in the first days of the war to begin searching for the enemy in his ports was completely correct. At the beginning of the war, base anti-submarine defenses were not very organized. Consequently, penetration into a base was relatively less risky than it was later on in the war.

Two weeks later, the submarine Shch-402, commanded by Captain-Lieutenant Stolbov, found the enemy in a similar manner. On 14 July, the boat penetrated into the harbor at Honningsvag and attacked an anchored transport with two torpedoes. After the salvo, the submarine slipped away to deep water and some seconds later heard two explosions.

On 18 August 1941, the submarine M-172, under the command of Senior Lieutenant Fisanovich, who later became a Hero of the Soviet Union, moved into position in the Petsamo area. Having loitered for two days near the entrance to Petsamofjord, on 21 August the commander decided to penetrate deep into the fjord into Liinakhamari harbor. At 1345, moving submerged by dead reckoning and utilizing hydroacoustic equipment to monitor the movement of enemy patrol cutters, the boat penetrated into the harbor and observed a transport unloading at the dock. At 1400, at a position of 1,400–1,500 yards from the transport and at an angle on the bow of 60–70 degrees, the commander fired one torpedo. A minute later, the submarine’s crew heard a loud explosion in the boat’s compartments. At 1415, the commander raised the periscope during the departure from the harbor. The dock, however, was already obscured by a cape, and he could not see the results of the attack. Slipping out of the fjord, the boat once again used its sonar to locate enemy vessels. On the following day, successfully employing its sonar, the boat managed to sink a steamer.

After this penetration into Liinakhamari harbor, other submarines conducted a whole series of similar actions. The submarine M-171, commanded by V.G. Starikov, later Hero of the Soviet Union, slipped into Liinakhamari harbor on 13 September 1941. There were no
transports in the port. The submarine touched the bottom and then came up to four meters. Reversing course, the boat began to withdraw, turning toward the fjord’s entrance. But the enemy had already detected the boat and dropped 12 depth charges on it in the narrow passage. The boat, however, did not suffer serious damage.

The absence in this operation of the simplest coordination between the submarines and aviation was lamentable. The commander searched the enemy port on his own initiative. Obviously, it would have been worthwhile to have had air reconnaissance reports passed to the boat before it entered the fjord. However, fleet aviation did not have the opportunity to organize and carry out this effort. Without it, a courageous, risky operation yielded nothing.

A week later, on 26 September, the submarine *M-174*, commanded by Captain-Lieutenant Yegorov, penetrated into Liinakhamari port and this time found three transports at the docks. Having selected the two most valuable targets, the commander fired two torpedoes while turning his boat. The bow of the submarine breached the surface during this process and the enemy opened machine gun and rifle fire on it. While the boat passed through the fjord, the enemy began to drop depth charges. Nearby explosions jammed the rudder, disabled the sonar, made the propeller shaft squeal, and caused other damage. Just the same, the submarine made it out of the fjord and returned safely to base.

On 2 October, the submarine *M-171* again penetrated into Liinakhamari, where two transports were docked. Moving in a slow circle, holding the submarine on the middle of the target, the commander fired two torpedoes at a range of 2,400 yards. The submarine breached and exposed itself during the firing. Pursuit and depth charging began just as the boat headed for the exit. The submarine became entangled in an anti-submarine net and, over the course of an hour, attempted to free itself, all the while receiving 29 depth charges from the enemy. Finally, a surge of motors full astern managed to free the boat from the net. The boat came up to six meters, passed over the top of the net, exited the fjord, and safely returned to base.

As these examples show, when the most energetic submarine commanders were unable to find the enemy at sea, they searched for him in ports. However, the enemy responded to this type of activity by strengthening his anti-submarine defenses. This was graphically demonstrated when our boats penetrated into Liinakhamari harbor. The first boat slipped in and out without any pursuit; the second was weakly pursued; the third was subjected to a significant of depth charging; and the fourth submarine was energetically pursued and an anti-submarine net had been installed.

All these visits to enemy harbors were undertaken by submarine commanders on their personal initiative. Thus, the *K-21* slipped into Hammerfest on 10 November 1941, but found no enemy ships. On the Baltic, the submarine *M-97* penetrated into Tallinn harbor on 24 October 1941 and sank a transport; the submarine *M-35* sank a transport near the entrance to Sulina port on the Black Sea on 27 November 1941, and so on. However, these searches for the enemy were quite risky, and submarines could not continuously utilize this method.

Many commanders, correctly evaluating the situation and figuring that the enemy would most likely move close along the coast, conducted persistent searches for transports in coastal channels on their first sorties. The Baltic Fleet command dispatched the submarine *S-102* into the Gulf of Riga on 27 June 1941.
Initially, the boat did not detect anything in its designated position. On the night of 8 July, the fleet chief of staff radioed it to move to a new position. This same radio message reported that the enemy was sailing along coastal channels. Two hours later, the boat received a second radio message instructing it to attack an enemy cruiser near Ust-Dvinsk. The boat arrived at the specified location but did not observe anything. The commander examined Ust-Dvinsk harbor and saw nothing. At 1421 on 10 July, the boat detected two destroyer escorts, a minesweeper, and up to 17 small vessels in the area of Kolkasrags sailing toward Riga. It was unable to attack the destroyer escorts because they were passing through shallow waters. At 1515, the boat reported to the fleet chief of staff and then followed the convoy until it entered into Ust-Dvinsk, which the submarine also reported to the command.

Subsequently, the submarine followed the coastal channel, observed the enemy sweeping the channel near Kolkasrags, and attempted to attack the minesweeper. During this effort, the boat detected the marking of the swept channel and an enemy troop encampment on the coast. On 12 July, the boat once again detected an enemy convoy, consisting of one destroyer, seven cutters, eight tugboats, and 17 barges, moving toward Riga. It again failed in its attempt to attack. Just like the first time, the boat reported its observation of enemy forces to the fleet chief of staff. On 13 July, the boat was ordered to withdraw from the position.

This energetically conducted search for the enemy met with success. Twice the submarine detected and reported the movement of large enemy convoys to the command. In addition, the boat collected valuable intelligence reports.

The search for the enemy from 2–10 October 1941 by the submarine Shch-421, commanded by later Hero of the Soviet Union Captain Third Rank Lunin²¹, is quite instructive. The boat was assigned an area of operations in Lopphavet. On 2 November, during bad weather, the boat slipped submerged through Fugloysund into the enemy’s coastal channel (figure 11). Moving submerged along the western part of the fjord, the boat inspected the coastline of the islands and the harbor on Karlsoy Island, but it detected nothing. Moving to the eastern part of the fjord in poor visibility conditions, the commander detected a transport leaving the strait at a range of 2,000–4,000 yards. The boat attacked the transport with torpedoes and sank it. Having confirmed the sinking of the transport, the commander moved to another fjord because the enemy now knew of the boat’s presence.

[Figure 11 here in original text.]

Sailing into the eastern part of Lopphavet, the commander again penetrated into the enemy’s coastal channel. On 9 November 1941, proceeding submerged and inspecting the winding coastline, he noticed a large steamer (10,000–12,000 tons) in Nordre Bergsfjord, accompanied by a destroyer escort and moving toward Soroy Sund. The submarine also sank this tanker. Operating the same as after his first attack, the commander moved to a third fjord where his boat had not yet been.

On 10 November, while entering Kvaenangenfjord in extremely poor visibility conditions, the submarine detected a transport headed toward the fjord’s exit. Despite the difficult conditions, the submarine attacked and sank this transport as well.

During this search for the enemy, the commander utilized not only visual but also acoustic means of observation, which were of great assistance. Keenly interpreting and energetically carrying out his decision, the commander achieved excellent results.
The search for the enemy at night takes on special significance. Low visibility and the necessity to charge batteries at night significantly complicates this issue. Therefore, the enemy crosses the areas where our submarines patrol mainly at night. At first, our effort to search for the enemy at night went poorly. Commander not only failed to search for the enemy at night but also avoided closing with him even during engagements. The explanation for this was that our submarine crews had not been trained in night operations during peacetime. However, the situation did not continue for long. As our submarine commanders gained experience, they began to operate more aggressively at night.

In the north, since the enemy hugged the coastline at night, our commanders began to hold close to the coast during battery charging. The high, precipitous shoreline camouflaged them. Upon completion of battery charging, in conditions of low visibility and windy weather, when it had become impossible to use sound direction-finding equipment while surfaced, the commander proceeded submerged. This improved conditions for sound detection, but the ability to conduct visual observation was lost. Similar actions were justified in a number of cases. Commanders searched for the enemy along the coast when night visibility conditions were adequate.

Our commanders went even further on the Black Sea. Operating in an area of enemy mine obstacles, the commanders were especially interested in the preciseness of their navigation. Changing currents at night greatly exacerbated the boats’ circumstances in this regard. In addition, night movement greatly increased the danger of a boat encountering a floating mine. These considerations led to a situation where the boats began to anchor in coastal channels. When the weather was calm, an anchored boat could listen and thus protect itself from the sudden appearance of a nearby enemy. This ability was lost in stormy weather. If the submarine detected the enemy at close range, it had to raise the anchor to gain the freedom to maneuver. The fear of floating mines has a basis, of course. But it was unlikely that the enemy, who himself plied these coastal waters at night, would place mines that would be dangerous for surface movement. On the strength of these considerations, such a method of operations would be advised only as an extreme measure.

We could expect to encounter the enemy only if he used the coastal channels for night movement. A reasonably intelligent enemy will not do this because he knows that we could be waiting for him. Therefore, at night we must search for the enemy farther out to sea beyond his mine obstacles.

But in such a broad expanse, we cannot wait for the enemy; we must seek him. The best method to use is to move on a zigzag course, covering a zone within which enemy ship movement is possible or probable. The general course of the boat should be selected to meet the traffic flow, which increases the chances of encountering loaded enemy transports. In the same manner, the submarine’s daytime positions should be changed daily. During cruising in a limited area, these searches can be conducted several times while the boat is in the area.

However, it might be considered that the appearance of radar might radically alter the question of night searches for the enemy, especially in coastal areas. The enemy’s timely detection of a boat might prevent it from attacking, and even cause it to be attacked itself. Once again, the boat must maintain the lowest possible silhouette and fully utilize its sonar.

Searching for the enemy should be based on each submarine commander’s excellent knowledge of the theater in general, his own area in particular, and the operational situation.
Protests that some commanders are “lucky” in finding the enemy, while others are not, are naïve. He who seeks the enemy will find him. In the north, for example, the submarine M-173 had not encountered or attacked the enemy in five completed sorties. The commander was replaced, and a young, energetic Captain-Lieutenant Terekhin was appointed. This same submarine did not return from the same areas without sinking an enemy transport. Thus, this is not a matter of “luck,” but of thoughtful and persistent searching for the enemy.
Chapter VIII
Submarine Utilization of Weapons

1. Significance of Various Types of Submarine Armaments

The utilization of weapons is the principal means for accomplishing the mission assigned to submarines operating against sea lines of communication. Sinking enemy ships disrupts enemy shipping quicker than any other means, because the shipping assets themselves are destroyed and the most genuine threat to shipping is thus realized.

Table 9 shows the number of ships destroyed with various weapons by submarines of the individual fleets. This table shows the significance of various submarine weapon systems during operations on enemy sea lines of communication in various periods of the war.

![Table 9 here in original text.]

This table shows that throughout the war, submarine torpedoes had overwhelming significance. On the average, in all fleets, torpedoes sank 81 percent of the total number of destroyed enemy ships. Deck guns and mines are in second and third places at nine percent, and the use of scuttling charges [podvynny patron] is last. It must be noted that the number of ships destroyed by submarine-placed mines cannot be fully determined yet, and obviously it is greater than the numbers indicated in the table. In addition, concerning the significance of mine weapons, one must consider the enormous restricting influence that they have on the enemy. Therefore, the significance of mine weapons should undoubtedly be higher, possibly elevating it to second place.

The table shows that torpedoes were the most universally employed weapon against large ships, and they were on an equal level with mines. Deck guns were used against transports, schooners, and weakly armed patrol craft. Scuttling charges were utilized by only one boat, and therefore their use in contemporary conditions must be acknowledged as a rare occurrence.

The use of mines by submarines is discussed in a separate chapter in conjunction with all the issues associated with the placement of mines by submarines.

2. Torpedo Employment

The advantages for using submarine-borne torpedo weapons include the following:

- A submarine can utilize torpedoes while submerged and, therefore, they are less dangerous than deck guns and scuttling charges.
- A torpedo can be used against any enemy vessel that has sufficient draft.
- The most rapid destruction of ships is achieved by torpedoes, which gives torpedoes a significant superiority over deck guns, especially when enemy sea lines of communication are located close to his airfields and patrol force bases (as in the case in all of our seas).
- Compared to mines, the destruction of ships by torpedoes is the most economical.

All of these advantages are so significant that in all cases when the opportunity presents itself, submarines use torpedoes to destroy enemy ships. The total number of submarine attacks conducted solely with torpedoes up to 1 March 1943 was 322. In addition, a significant number
of attacks did not end up with the firing of a torpedo, either because the boat was unable to close for the attack or it was unable to fire torpedoes due to an error committed by the commander in his attack preparations.

Conditions for attacks were extremely varied. Submarines had to attack enemy ships that were sailing in confined navigational conditions and in the open sea, sailing without escort and with strong escorts, and standing at anchor in undefended harbors and with penetrations into enemy bases, day and night. Table 10 shows the number of attacks that were conducted in various conditions.

Table 10 shows that, for the most part, submarines had to attack escorted ships. A total of 56 percent of all attacks, day and night, were against escorted ships. This indicates that conditions for submarine attacks were complex. The percentage of attacks on escorted ships was particularly high in the north (71 percent); in the Baltic, the percentage was not so great (34 percent).

On average, across all fleets, night attacks comprised 25 percent of the total number of attacks. In this respect, the positions of the fleets noted above are reversed. The proportion of night attacks in the Baltic was 42 percent, and in the north 14 percent. These numbers are somewhat surprising, considering the presence of polar nights in the north and the absence of shipping in the winter months in the Baltic.

The percentage of attacks on ships in harbors and bays is relatively great (five percent), considering the difficulty for submarines to conduct such attacks in contemporary conditions. The highest percentage of such attacks was in the north (10 percent).

Below we will dwell on the causes for this percentage distribution of attacks. Here we simply present them in order to analyze the success of torpedo firing by various fleets.

It is also interesting to note the average number of torpedo attacks calculated for a single submarine by fleet: Northern fleet—eight attacks; Baltic—three; Black Sea—two. These numbers permit assessment of the method various fleet submarine commanders used in their combat attacks, which is necessary when examining the submarine successes.

Success and methods of torpedo firing

Table 11 shows the success of torpedo firing by submarines by a particular period of the war.

Table 11 indicates how the success of torpedo firing changed during the war. In the initial period of the war, our submarine commanders fired torpedoes principally in single shots and only rarely in pairs, firing them in volley one after another. In the table, this method of firing corresponds to the first months of the war, set apart by the first horizontal line. As the table indicates, the success of attacks was relatively low. True, it was significantly higher than the firing success achieved by Russian and British submarines in World War I. The explanation is that the technical aspects of submarine torpedo weapons are significantly higher now than during that war. Our commanders are significantly better prepared for conducting torpedo attacks, both in the theoretical sense and in practice. In addition, in the last war submarines in the Baltic were forced to operate principally against enemy combat vessels, which were fast and equipped for better observation of submarines. Because of this, the enemy ships managed to avoid the slow-
moving torpedoes. Our boats now are attacking mostly slower-moving transports, with torpedoes moving 1–1.5 times faster than before.

It must be noted that, even in peacetime, especially after the Finnish War, another submarine firing method was stipulated—namely, the firing of torpedoes by volleys, with a calculation of their movement on diverging courses (a spread). This was to be achieved by the maladjustment of the setting of the Obri instruments on the torpedoes. By the beginning of the war, the ability to reset rapidly the Obri instrument while the torpedo was in the tube was not yet supported. The Obri instrument was to have been adjusted at a specific spread angle when the torpedo was prepared for firing. This required the submarine commander to adjust the lead angle, depending on how many torpedoes he was firing. Because commanders had attempted to simplify everything during combat training, they fired principally with air, and if with a torpedo, then a single. In such a circumstance, the firing of a spread was poorly supported from a material perspective and in general was not supported by the crew’s level of training.

Even before the war, the British, German, and Swedish firing methods were known. Clearly, the British firing method was by far not the best, but it was without doubt better than firing single torpedoes. When British submarines arrived in the north in the fall of 1941, our submarine commanders confirmed that the British firing several torpedoes achieved higher results than our boats firing single torpedoes. All this, of course, was completely obvious without the British experience. The submarine department of the Northern Fleet staff received torpedo firing tables from the British.

The first boat to utilize the British firing method was the submarine D-3. All four of its attacks using this method resulted in hits. At this time, the submarine Shch-422 returned from a sortie and reported that only one of its seven attacks resulted in a target hit when firing single torpedoes. This comparison of the results of firing single torpedoes as opposed to firing several clearly revealed the superiority of the latter method. From this time forward, Northern Fleet submarines began using the British firing method. A great tribute to the submariners of the north is that they showed in practice the high results of firing several torpedoes. Interestingly, Baltic submariners knew about the English method of torpedo firing before the war, that is, earlier than the northerners. Just the same, even though the results of firing single torpedoes were mediocre, some commanders have stubbornly held on to this method (many of them to this day).

The essence of the English method of firing includes the following: by launching torpedoes successively, one after another, the British fire for the period of time it takes the target vessel to travel the distance equal to one, two, or three times its length. There are three variants of firing. The first bears the name “concentrated firing,” the second “dispersion A,” and the third “dispersion B.”

If the elements of enemy movement [course and speed] have been determined correctly, during “concentrated firing,” all torpedoes launched should strike the target. If there are errors in determining the movement elements, then only one torpedo will strike the target if the error will project the displacement of the target to one side or the other a distance not exceeding half of its length during the period of the torpedo’s run. The aiming point is the ship’s bow. Consequently, the middle torpedo should strike in the middle of the ship. This variant of firing is for use when the attack is conducted from a close range and when the commander has precisely determined the movement elements.
If the target’s movement elements have been determined precisely, during “dispersion A firing 50 percent of all fired torpedoes should strike the target. If errors exist, a hit will occur only if the displacement of the target caused thereby during the torpedoes’ run does not exceed the length of the ship (to one direction or the other). The aim point should be moved forward from the ship’s bow half the length of the ship. This variant should be used when the enemy’s movement elements could not be determined precisely.

If the target’s movement elements have been correctly determined, 33 percent of the torpedoes fired should strike the target when “dispersion B” is used. There will be a target hit if there is a mistake in determining the target’s movement elements that will not displace the target more than 1–1-1/2 times its length. The aiming point should be moved forward of the bow one ship’s length. This variant of firing should be used during a long-range attack, when large errors in determining the movement elements of the target may occur.

There is a minimum number of torpedoes that should be fired for all these variants: not less than two for the “concentrated firing” variant, not less than three for “dispersion A,” and not less than four for “dispersion B.” According to the British computation, these norms will guarantee the strike of one torpedo. Depending on the situation in each separate case, the commander determines how many torpedoes to fire.

Firing calculations are made in accordance with three tables. The first table determines which variant of firing should be used in a given situation, the second permits the calculation of the size of the interval that would be required when firing a specific number of torpedoes at targets of various lengths, and the third table permits the determination of the time intervals between fired torpedoes based on the interval size and target speed.

As this explanation shows, the British have calculated a fairly primitive principle that compensates for errors of one-half, one, and one and one-half times the length of the target. This calculation is figured mechanically, because in making errors in determining the target’s movement elements, deviation depends to a large degree of the range of firing. Incidentally, for the British, the range of firing may vary markedly, because they sometimes fire torpedoes at a range of up to 6,000 yards.

The length of targets varies and, therefore, if one were to select a given firing range at various ships using the same firing method, various errors would be compounded. In particular, a destroyer escort is not as long as a battleship. One should anticipate significantly greater errors in determining the movement elements of a destroyer escort than those of a battleship.

Though the British significantly simplified the basis for calculations, the firing calculation equipment itself and aiming were cumbersome and inconvenient on a submarine (three tables and aiming at an empty space). Our Northern Fleet submarine commanders who had already employed the British method expressed the desire to avoid, when possible, using three different tables and to return to aiming at the target itself, instead of at the empty space in front of the target.

It also should be noted that, although the British achieved good firing results, they expended a large quantity of torpedoes. Thus, a submarine of the Tigris class (employed in the north), which had 10 torpedo tubes and fired directly at a ship’s bow, sometimes fired all ten torpedoes at a transport, an exercise requiring up to 1.5 minutes. One cannot call such firing “expert”; rather, it is more correctly labeled “crude.” The British are not interested in conserving...
torpedoes or in remaining at sea longer. Having fired all of its torpedoes, the submarine often returned to base significantly earlier than planned. One can imagine how our Baltic submariners would greet suggestions of using such a firing method!

The northerners’ requests concerning the simplification of the calculation equipment for boat commanders and the use of the British method for firing torpedoes served as grounds for our return to using our own firing tables and firing a spread.

The principle to ensure a hit on a ship by one torpedo when there were errors in the determination of a target not exceeding plus or minus two knots in speed and plus or minus 10 degrees in angle on the bow became the foundation of the computations for the new firing method.

The computation process was simple. The significance of lead angle was determined for various sailing speeds and torpedo impact angles for situations when the errors stated above were made to one direction or the other (both elements greater or less than actual). When firing torpedoes with these lead angles, we would have a hit on a target if we made the maximum possible errors in determining its movement elements (figure 12). Consequently, if we would launch a series of torpedoes in the limits of sector $LS_1S_2$, then the target would be covered. But sector $LS_1S_2$ is nothing more than the difference between the lead angles indicated above. On average, the magnitude of this sector is 6–9 degrees. For a point not only to be covered but also to be hit, it is necessary to fire sufficient torpedoes and with such computations that the interval between them does not exceed the length of the ship during the intersection of the torpedo’s course with the target’s course.

Knowing the target’s length and the firing range, we can compute how many torpedoes are required for this. Actually, the firing is conduct not in a spread, but by the successive launching of torpedoes in rapid fire. The first torpedo is fired on the axis $LS_0$ and should move on the axis $LS_1$, that is, it should hit the target if the target’s movement elements are greater than believed. Consequently, the lead angle for making the first shot should be increased by some value, and the first shot will be made when the ship is located not at point $K_0$, but at $K_1$. The strike of the torpedo will occur at point $S_3$ when the ship is on the course $KS$ and with a speed of two knots greater than presumed, or at point $S_0$ if the ship is moving with a speed approaching four knots greater than presumed.

[Figure 12 here in original text.]

The next torpedo should intersect the ship’s course at point $S_3$ at a distance $S_1S_3$ from the point of course intersection of the first torpedo. Instead of firing along the axis $LS_3$, we can fire a torpedo on the axis $LS_0$ during the intervening time interval, which cannot miss the ship during its movement in the sector $S_1S_3$.

The firing time of all subsequent torpedoes is determined in the same precise manner. Consequently, to fire, one must do the following:

- Determine the number of torpedoes required in order to ensure that one torpedo will strike the target.
- Determine the time interval between torpedoes.
- Determine the increase in lead angle in order to fire the first torpedo at the correct time.
We use a special table to make these computations.

The number of torpedoes that must be fired depends on the firing range and the length and speed of the target. When the table was computed, the dispersion that could exist while firing torpedoes and the reduced projection of the target’s length with acute and obtuse impact angles were considered. For this purpose, the length of the target was figured as less than actual. It was taken as less, because the commander could make an error in its determination. Since the second error will probably significantly prevail over the first, and the ship’s length will be proportional, during the computation for length the target is figured at only .7 of its believed length. The required number of torpedoes is thus limited to six, because our submarines cannot fire more than this number.

The time interval has been calculated so that torpedoes fill the sector of coverage at equal intervals. In some cases, this increases the probability of hit of two torpedoes. As a result, the time interval between torpedo firings depends on the speed, not the length, of the target, as in the British method, and on the firing range and the number of torpedoes fired.

The increase to the lead angle is also determined based on equal spacing by the torpedoes in the sector of coverage. Because its magnitude varies little, for simplification it was understood that this increase depends only on the number of torpedoes fired.

Appendixes to the tables explained how to utilize the table when the number of torpedoes on the submarine is fewer than required by the table, when firing is being conducted at ships that have greater survivability, and when there are greater errors in the enemy’s movement elements than accounted for in the table.

Thus, one table has been developed that should, in our opinion, provide for great firing success. Northern Fleet submarine commanders participated directly in developing this method. The Northern Fleet commander examined this method in detail, and on his order his submarines switched to this firing method. Thus, from October 1941 through January 1942, the Northern Fleet employed the British method, but it used our own new method beginning in February.

The northerners’ firing results did not betray expectations. As Table 11 shows, firing success in the Northern Fleet was maintained at near 100 percent for more than a year. Of course, such a high degree of success cannot be explained simply by a more successful method; without doubt, it depends also on the commanders’ training in firing.

On 10 March 1942, the People’s Commissar of the Navy mandated this firing method. The Black Sea Fleet began to use this new firing method in May and it did not meet with as much acceptance as in the north. The brigade staff regarded it quite hesitantly and did not provide the commanders any special training in it. Submarine commanders adopted the same attitude. Some fired everything just as before and some used the new method. But since those using the new method lacked sufficient training in attacking and firing, they did not achieve the same effects as the commanders in the north. The tables below show this quite clearly. In the end, though the success rate of firing in the Black Sea doubled (from 37 percent to 75 percent), it still was significantly lower than in the Northern Fleet.

The whole issue was significantly more complicated in the Baltic. At first glance, the impression is that the new firing method significantly increased torpedo expenditure. This is correct in absolute numbers and if the expenditure of torpedoes is examined relative to the total number of submarine attacks conducted. The number of torpedoes expended for one submarine
attack indeed increased. But the mission of a submarine is not to conduct attacks but to destroy or damage enemy ships. Here, if we apply this standard to the issue, the situation changes sharply. Table 12 shows the expenditure of torpedoes for one enemy ship destroyed by torpedoes using various methods of attack.

[Table 12 here in original text.]

As Table 12 shows, in the Baltic, the expenditure of torpedoes to destroy one enemy vessel using the old firing method is 3, and using the new firing method is 2.4; in the north and on the Black Sea, a slightly larger combined expenditure of torpedoes yields a rate per damaged or destroyed ship of between 2.2 and 2.7 torpedoes. Consequently, the new method can by no means be considered uneconomical.

Baltic submariners did not take this circumstance into account. Forced to negotiate the extremely dangerous Gulf of Finland, the commanders attempted to expend their torpedoes the most economically and with the greatest effect. They yielded to their first impulse, and many of them continued to fire single torpedoes. As a result, many attacks were unsuccessful due to misses in torpedo firing.

In July and the beginning of August, the submarine S-7 fired torpedoes eight times—one four occasions two were fired, and four times one torpedo was fired. Two hits were achieved while firing two torpedoes and one hit while firing one. In both cases when there were misses firing two torpedoes, under existing firing conditions the commander should have fired three torpedoes with a time interval of 12 seconds, not 18 seconds, in accordance with the firing table for the new method. Having nominally saved two torpedoes, he unproductively wasted four. Rather than firing single torpedoes, he should have fired two torpedoes during the first episode (during which he did achieve a hit), three during the second, three during the third, and two during the fourth. The commander expended 12 torpedoes, gaining three hits.

In circumstances matching those that occurred, the commander could have conducted five attacks with the same 12 torpedoes. In actuality, the S-7 had to expend four torpedoes for one hit. If a hit had been achieved during all five firings in accordance with the rules, the torpedo expenditure rate would have been 2.4; and had there been one miss, then the expenditure rate would have been 3. In either case, the number of torpedoes expended for one destroyed ship would have been less.

Other considerations are also significant. The commander arrived at his position on 9 July and carried out his last attack on 5 August. Thus, the boat was in position almost a month, and during this time it sank three transports. Firing by the new method, the commander, as has already been pointed out, had significant opportunities to sink five ships by 14 July. Thus, he could have achieved greater results in a shorter time. In the Baltic conditions in 1942, this did not have special significance. In other areas, the submarine, having expended its torpedoes, could have returned to base. A new boat would have arrived in its place, which could have destroyed those transports that the S-7 attacked, and perhaps an additional two or three others. The based S-7 could then have prepared more quickly for a new sortie.

From this incident, it by no means follows that all torpedoes should be expended as quickly as possible. Rather all attacks should be conducted without misses. The way to achieve this is to fire the number of torpedoes required by the situation. Attempts to economize
torpedoes, that is, firing fewer of them than is required by the tables, leads to a totally opposite result.

The submarine *S-13* provides another example. In September 1942, the commander conducted eight firings during the sortie and also had only three hits. Seven firings were single torpedoes and one firing was a pair (with an impact angle of 135 degrees). Thus, nine torpedoes were used. The submarine conducted all of its attacks at night when, even at close range, the success of firing is significantly lower than in the day. On the strength of this, firing single torpedoes was unreliable, despite the fact that all attacks were conducted from ranges of 600–800 yards. If the commander had fired pairs of torpedoes, he could have conducted six attacks with 12 torpedoes. True, he would not have returned to base with three torpedoes, but probably would have sunk more ships, expended fewer torpedoes for each ship sunk, and sunk the encountered ships in a shorter period of time. In this case, conserving torpedoes turned out to be totally unjustified. The commander returned to base with three torpedoes. However, the last two torpedoes expended were fired prior to departure from position (station time had expired) almost without any likelihood of success (the impact angle exceeded 120 degrees). Clearly, at another time, the commander would not have fired under these conditions. Thus, the “economy” was certainly not what it seemed.

The submarine *S-12*, at sea in October 1942, also conducted eight torpedo firings, with only two hits. Six firings were conducted with single torpedoes, one with two torpedoes fired as a salvo, and one with two torpedoes fired with time intervals, that is, in accordance with the new rules. Ten torpedoes were expended in all. The boat returned to base with two torpedoes. One hit was achieved when firing the single torpedoes and one when the boat fired in accordance with the new rules (it is characteristic that this was its last attack, that is, after the commander had missed in six out of seven firings). According to the conditions in which the attacks occurred, the commander could have conducted six attacks using the new firing method. It is clear that he would have had significantly better results, and the number of torpedoes expended for a destroyed ship would have been significantly fewer than five.

The submarine *Shch-310*, which was at sea in September 1942, achieved the worst results of all. This boat also conducted eight torpedo firings, and had only one hit. The submarine conducted its first attack at night using the new method (true, the time interval was set at eight seconds instead of 15). All torpedoes missed. The commander turned the boat around and fired from the stern tubes, also without success. Only by closing to 400 yards from the enemy did he achieve a hit. Not analyzing the cause of the misses, the commander subsequently refrained from firing by the new method and fired only single torpedoes. In addition, when he fired with the new method, in nighttime conditions at a range of 1,600 yards, he should have fired three torpedoes, not two, at 15-second intervals. The commander himself notes in his report that the torpedoes ran poorly—they breached. Consequently, misses could have been a result of an incorrectly reached firing solution and because of poor running torpedoes. If the commander had considered the conditions of his firing, he would not have had reason to refrain from firing by the new method. Had he utilized it, he may have had successes in subsequent attacks.

These examples clearly show how unsupported the reasoning was in the Baltic concerning the unacceptability of the new method in order to conserve torpedoes. Cumulative data for this same period supports this. Firing with the new method in 23 instances, Baltic Fleet submarines expended 53 torpedoes, hitting 22 ships. Thus, firing by the new method resulted in expending 2.4 torpedoes for each enemy ship sunk. Firing by single torpedoes or salvos of two,
boats expended 81 torpedoes and achieved hits on 25 occasions in 1942, a ratio of 3.2 torpedoes for each hit. Consequently, firing by the new method reduced, rather than increased, the expenditure of torpedoes.

Looking at the success of submarine torpedo firings, we can be even still more convinced of the utility of the new firing method. Table 13 indicates the success of submarines firing by various methods.

Table 13 shows that firing single torpedoes gave modest success in all fleets—44 percent. Firing two and three torpedoes in salvos resulted in significantly greater success—67 percent. Still higher was the success gained by firing two torpedoes with a time interval—83 percent. Finally, firing three and four torpedoes yielded no misses. Firing by the old method yielded a success rate of 50 percent; the new method—90 percent. Thus, the new method and its utilization by these same Baltic submariners gave results two times better than the old method, and on average across all fleets almost 1.5 times better. Unfortunately, as this same table shows, three-fourths of all firings in the Baltic were conducted by the old method.

It is interesting to examine the reasons for unsuccessful new-method firings in five instances that occurred in the Baltic.

- On 9 July, the submarine S-7 fired two torpedoes with a time interval of 18 seconds at a 7,000-ton transport from a range of 2,400 yards. Using a target length of 125 meters, we see that three torpedoes should have been fired at a time interval of 15 seconds.

- On the night of 28 September, the submarine Shch-310 fired two torpedoes from a range of 1,600 yards with a time interval of eight seconds at a 10,000-ton transport. Accounting for the possibility of large errors in determining the target’s movement elements at night, three torpedoes should have been fired and the time interval should have been 15 seconds, which is in accordance with the rules for firing two torpedoes. The success of the firing was further reduced by poor running torpedoes.

- The submarine Shch-406, conducting a second attack on an already torpedoed 12,000-ton transport on the night of 26 October, fired two torpedoes from a range of 1,000 yards with a time interval of 10 seconds. The commander did not account for the transport’s reduced speed after the first hit. In addition, when firing two torpedoes at night, he should have increased the time interval. This would have broadened the sector of coverage and the transport, with its large size and low speed, would not have slipped through between the torpedoes.

- On the night of 28 October, from a range of 1,200 yards, the same submarine fired two torpedoes at a transport with a time interval of 16 seconds. The first torpedo immediately veered to the left; the second glided near the transport and passed behind the hull.

- During the day of 21 October, the submarine Shch-307 fired two torpedoes at a transport with a time interval of 10 seconds from a range of 1,400 yards. The boat breached during firing. Having detected the boat, the transport turned and the torpedoes passed alongside it. The commander had used a correct firing solution.
Consequently, for all misses experienced by submarines using the new method, the commander made an error in the firing solution, the torpedoes ran poorly, or the enemy detected the submarine, enabling him to avoid the torpedoes. Clearly, the enemy would have experienced more difficulty in taking evasive action if the torpedoes had been fired in a spread. Thus, except for the last case, these misses did not occur because of deficiencies in the firing method but could have occurred when firing single torpedoes or when firing two torpedoes in a salvo.

We have analyzed the torpedo firings of Baltic submarines in 1942 in great detail because the issues of torpedo conservation and utilization of the new firing method have become important. Clearly, in the 1943 campaign, the enemy is taking all the measures within his power to reduce the success of our Baltic submarines. In addition, the 1942 Baltic experience of submarine torpedo firings has permitted us to analyze fully the use of both old and new firing methods. Since the firings were conducted in the same period by the same commanders, we can disregard the argument that these commanders had gained combat experience, trained in determining enemy movement elements, and operated in the conditions of the situation, and so on.

Thus, we can confidently say that the new firing method gives by far better results than the method previously practiced by our submarines. However, in those cases when a submarine could not fire the required number of torpedoes, when there was a possibility of large errors in determining the target’s movement elements, or when its speed required an increase in the number of torpedoes, reaching a firing solution using the tables became complicated.

It is possible to make Table 14 simpler for use and, at the same time, provide great precision in computations.

In utilizing this table, the time interval and increase to the lead angle are selected in accordance with the actual number of torpedoes fired. Only if the number of torpedoes is increased for the purpose of hitting a ship with not one, but several, torpedoes should the time interval be reduced on account of these additional torpedoes, maintaining unchanged the total elapsed time off firing.

When firing two torpedoes at a visible ship, no correction need be added to the lead angle, but the first shot should be made when the ship’s bow crosses the reticle line; the second torpedo is fired after a time interval selected from the table. Correction to the lead angle when firing two torpedoes must be made only when torpedoes are being fired without the periscope and using data obtained from acoustic direction finding.

Making computations using this table is about the same as before. Now, however, it is only simplified and made somewhat more accurate. Therefore, when using this table, there is no basis to fear a reduction in firing effectiveness; conversely, it is possible to count on a subsequent increase in success.

In addition, we were forced to resort to the method of firing successive torpedoes only because our peacetime firing method could not be supported by our torpedo weapon systems and the combat training of our submarine crews.

The following are the deficiencies of the new firing method when compared with the spread firing method. If the enemy detects the firing (the submarine periscope, an air bubble, a breaching torpedo, or the torpedo’s track), he can more easily avoid the torpedoes because it is
almost the same as when a single torpedo is fired. Such a case occurred with the submarine *Shch-307* on 21 October 1942 [cited above].

The second deficiency is the duration of firing. When submarines are attacking slow-moving transports, the time between firings can be a minute or longer. When attacking heavily escorted convoys, the possibility exists that the escort vessels will interfere with the attack. An example that supports this deficiency occurred with the submarine *S-102* on 14 January 1942. At 1015, the sonarman heard a weak noise and reported it to the commander. Initially, there was no sighting in the periscope on the azimuth indicated by the sonar operator. Ten minutes later, the commander detected three transports, accompanied by a destroyer escort and four escort cutters. The transports were moving echeloned. At 1039, the commander closed with the target ships and began firing four torpedoes at the lead transport with a time interval of 13 seconds.

Just before the firing began, the sonarman had reported the noise of propellers to port. All enemy transports were to starboard of the submarine’s bow. There was no time to inspect the horizon and firing was begun on time. The propeller noise was quickly closing on the submarine. After firing the second torpedo, the commander ordered “right rudder” and then “cease fire.” Just the same, when the boat began to turn, the third torpedo was fired. As it turned out, the enemy cutter that was attacking the submarine was unable to assist its ships and even caused them harm. All three torpedoes hit, the third one striking a transport moving behind the lead. Meanwhile, the submarine broke off the engagement. The pursuing vessel closest to the submarine dropped its first depth charge very accurately and inflicted some damage.

Although the new firing method has given very positive results, on the strength of the above-mentioned deficiencies and as rapidly as possible we must enable submarines to fire with a spread salvo. The deficiency of firing by successive torpedo launchings is especially felt when attacking vessels with shallow draft. The track of the shallow-running torpedo is detected early enough for the ship to take evasive action. In fact, this has occurred on the Black Sea during attacks on self-propelled barges. Therefore, Black Sea submariners are especially interested in the most rapid transition to firing spreads.

A new table will permit the calculation of firing solutions for this method. The number of torpedoes required in the salvo is determined the same as in firing with time interval. The setting on the *Obri* instrument for inducing spread is determined from the table of additions to the lead angle. When firing two torpedoes, each is set (one to the right, one to the left) at an angle equal to the added lead angle specified for two torpedoes. For firing three torpedoes, the middle is set at 0 degrees and the outer two at the added lead angle specified for three torpedoes. During the firing of four torpedoes, two torpedoes are set at an angle equal to the added lead angle for the firing of four torpedoes, and two torpedoes are set at the added lead angle specified for two torpedoes. When five torpedoes are fired, the settings should be as follows: the middle—0 degrees; two at the added lead angle for firing three torpedoes; and the outer two at the added lead angle for firing five torpedoes. The settings of the *Obri* instruments are established similarly to fire six torpedoes. The periscope is set on the normal lead angle. The outside torpedo opposite the enemy hull is fired first, at the moment the middle of the target reaches the sight line.

Firing is conducted by salvo with minimal intervals. When the boat has torpedoes with *MO-3* devices, firing can be accomplished by setting the required angles ahead of time (we do not yet have ports on the devices for adapting *Obri* instruments).
This same table, as will be seen later, permits us to conduct firing using acoustic direction finding. Thus, the new table is more universal.

Attacks on escorted vessels

Table 11 shows that submarines principally attack escorted ships. In the north, attacks on unescorted vessels are a rare occurrence; while up until recently, submarines in the Baltic often have had the opportunity to attack an unescorted vessel. Clearly, an explanation for this in the north is that impounded Norwegian fishing vessels are widely used for escort. On the Baltic, the Germans only have a few of their own light craft to escort ships. The escort vessels the Germans do have must be divided between the Baltic Sea and the far north. An unanticipated circumstance that has occurred on the Baltic is that successful attacks on escorted vessels have been greater than those on unescorted ships. This is because when commanders attack unescorted transports, especially those sailing alone, they usually fire a single torpedo believing that should they miss, they can attack again. Indeed, during the 1942 campaign on the Baltic, there were 18 follow-on attacks on unescorted transports. In several cases, firing was repeated three and even four times (on the night of 6 October, the S-12 fired four single torpedoes at a transport and did not hit it).

As a result, the expenditure of torpedoes for a destroyed transport moving without escort was greater than for an escorted transport. This is a manifest absurdity, all the more so because the submarines in this case were firing by the less effective method.

Since submarines in the north have recently been attacking escorted ships exclusively and have achieved a very high percentage of successful attacks, it is possible to conclude that the presence of escorts has little influence on firing success rate.

Escort ships make their presence felt in two ways. Commanders are forced to fire from greater ranges, which in itself leads to more torpedoes being fired to achieve a hit. Thus, the normal expenditure of torpedoes should be greater when attacking escorted ships. This is why, in the Baltic, when a larger percentage of the attacked ships are unescorted, the expenditure of torpedoes fired using the new method should be less than in the north.

The second influence of using escort ships is that it significantly improves the enemy’s observation capability for submarines. Because of this, boats have more difficulty maintaining stealth and a greater percentage of attacks are exposed by the enemy’s untimely detection of the boat. However, there are a number of examples when our submarines have attacked heavily guarded enemy ships.

Quite instructive in this regard is the attack on 5 July 1942 of the submarine K-21, commanded by Hero of the Soviet Union Captain Second Rank Lunin, on the German LK Tirpitz. The circumstances that preceded the submarine’s detection of the enemy have already been mentioned. At 1633, the sonarman reported the detection of noises to the watch commander. Initially, nothing was observed in the periscope on the bearing indicated by the sonar operator. During a subsequent raising of the periscope, a surfaced submarine, it at first seemed, was noted at a range of 8,000–10,000 yards. The commander began to maneuver for an attack on the submarine. A while later, at 1712, it became clear that this was not a submarine but rather a destroyer escort. A second destroyer escort was behind the first, and both were moving at high speed. The commander decided to attack the second destroyer escort, moving in echelon behind the first. At 1718 he detected the mastheads of large ships. Soon he was able to identify two large ships moving in a line formation, escorted by an additional six destroyer escorts. The two destroyer escorts first detected were perhaps the outer security. These destroyer escorts
turned back and sailed toward the squadron but did not approach closer than 3,000–4,000 yards. The commander lay on an intersecting course for an attack on the left ship (figure 13). At 1733, he recognized the large ships as the *LK Tirpitz* and the smaller *LK Admiral Scheer*. Destroyer escorts of the *Karl Galster* class were moving on a zigzag course in groups of four in escort of each of the large ships. One *Arado* type aircraft was flying escort overhead.

At 1736, the enemy ships abruptly turned to 90–100 degrees to port and took up a formation astern. The distance between the battleships was 4,000–6,000 yards. The submarine was on an almost opposite course. The commander, observing the enemy on the new tack with a large angle on the bow, turned on a new closing course. At 1750, the enemy again abruptly turned, this time to starboard. Now the submarine was between the courses of the battleships, with an angle on the bow of the *LK Tirpitz* of 5–7 degrees to port.

The commander decided to attack this ship, firing from his stern tubes. Four destroyer escorts zigzagged between the courses of the battleships. Fearing that the enemy would detect his submarine before it fired and his attack would be disrupted, the commander was compelled to increase the firing range, which caused the boat to move away from the course of the *LK Tirpitz* at a speed of six knots. At 1801, from a range of 3,200 yards, the commander fired all torpedoes available in the stern tubes with time intervals. Before firing, the commander noted that the lead destroyer had sharply reversed course. As so often happens when a destroyer escort turns toward a submarine, the submarine commander feared his boat had been detected and would be attacked. The commander lowered his periscope after the first shot and, when all torpedoes were away, he dived steeply and increased his speed to full ahead.

After 2 minutes 15 seconds, two explosions were heard. The noises of the destroyer escorts approached and then faded, but the anticipated explosions of depth charges did not occur. At 1831—that is, 30 minutes after the torpedo firings—with the noise of the enemy’s ships gradually fading, a rolling explosion that lasted 20 seconds was heard outside the submarine. At 1832 and 1838, two additional explosions followed, unlike the explosions of individual depth charges. At 1909, the commander inspected the horizon. To the southeast he could see enemy ships sailing toward the direction from which they had come. Partially surfacing, the commander later reported the attack and the course of the enemy’s withdrawal to the fleet commander. Later, it became known that one torpedo had struck the *LK Tirpitz* and a second one hit a destroyer escort. As a result of the damage to the *Tirpitz*, the entire detachment of German ships was forced to return to base. The destroyer escort that had been torpedoed sank. Possibly, the heavy explosions heard by the submarine crew 30 minutes after the attack were the destroyer escort’s depth charges exploding as it sank.

Even though the weather conditions favored the secrecy of the attack (dense clouds, sea at force 2–3), the attack on the battleships attests to the real possibility of attacking heavily guarded combat ships in contemporary conditions and to the excellent stealth by which the commander accomplished his mission. As for the enemy, he should have maintained better observation for submarines on the *Tirpitz* than on any other kind of ships (and the same applies to the eight accompanying destroyer escorts).

The commander’s decision to attack the battleship from a great range deserves particular attention. Positioned initially with the enemy at a small angle on the bow, the commander was fully able to fire at close range. But if he had attacked from close range using the periscope, he
would probably have been detected. Therefore, the commander’s decision in this situation to fire from a great range must be acknowledged as correct. The strike was weakened but it was genuine. A heavier strike from close range was doubtful. We note, incidentally, that since the sonarman on the submarine did his work well, the conditions he created presented the opportunity to conduct a blind attack [without the periscope] from close range, firing six torpedoes from the bow tubes. But, since submarines as yet did not fire torpedoes based on sonar readings alone, the commander cannot be criticized for not conducting such an attack.

Such cases of submarines penetrating a strong enemy escort and destroying an escort vessel have occurred more than once. Foremost of all is the example of an attack carried out by the same commander (Captain Second Rank Lunin) on the Shch-421 on 5 February 1942. At 1345, proceeding surfaced well into Porsangerfjord, the commander detected a convoy moving from the strait between Mageroy Island and the mainland, heading west. A 6,000-ton commercial passenger transport was being escorted by five vessels of the motorboat type and one military patrol vessel. Quickly submerging to periscope depth, the commander began his attack. Passing under two motorboats, the submarine penetrated inside the escort screen. The commander fired three torpedoes with a time interval of eight seconds from a range of 600–800 yards. Two torpedoes hit the target. After the firing, a large wave impulse pushed the boat as much as seven meters; the periscope was not lowered because the circuit breakers blew. Before submerging deep, the commander saw the transport begin to heel over heavily and rapidly. After this, the enemy pursued the submarine for 90 minutes, but the boat did not suffer serious damage.

On 22 April 1942, the submarine M-173, commanded by a young officer, Captain-Lieutenant Terekhin, detected a 10,000-ton transport escorted by two patrol vessels and three minesweepers. The commander began his attack. Penetrating the escort screen, he fired two torpedoes with a time interval of five seconds from a distance of 800 yards. After 45–50 seconds, two explosions were heard. The enemy pursued the submarine for three hours, during which the boat received only insignificant damage.

On 16 May 1942, the submarine M-172, under the command of Hero of the Soviet Union Captain Third Rank Fisanovich, detected a 6,000-ton transport escorted by two German patrol vessels and three minesweepers. After penetrating the escort screen, the commander fired torpedoes from a range of 600 yards. Because a mechanism for bubble-less firing did not work, the submarine lost trim after the first shot and was unable to fire the second torpedo. After 25 seconds, the torpedo detonated and soon after, the depth charges were heard exploding. The submarine was pursued for four and one-half hours. The enemy dropped many depth charges on it but it was not seriously damaged.

On the Black Sea, the submarine A-3 attacked after penetrating a heavy escort screen. At 0948 on 25 May 1942, in total calm, two tankers of 8,000–10,000 tons were detected, sailing under the escort of seven patrol vessels. At 1023, the submarine commander penetrated the escort screen and, from a range of 700 yards, fired two torpedoes at the second tanker with a time interval of eight seconds. After 30 seconds, a heavy explosion was heard. The submarine lay on the bottom after the salvo and was not subjected to any pursuit. Despite the total calm and heavy escort, the boat was able to penetrate the escort screen undetected and conduct a successful attack.

On the Baltic, the submarine D-2 attacked heavily escorted ships on 19 October 1942. At 1728, positioned on the Trelleborg–Sassnitz line, the boat detected two large ferries sailing...
echeloned and escorted by an auxiliary cruiser and five patrol vessels. At 1755, having closed to 1,200 yards, the commander fired two torpedoes with a time interval of 19 seconds. Two powerful explosions were heard on the boat. Later, the crew managed to establish that the German ferry Deutschland had been struck. The severely damaged ferry was towed to Trelleborg. The submarine was not pursued after the attack.

We have presented these examples of attacks on heavily escorted enemy ships in order to show that, despite heavy escort and unfavorable weather conditions for submarines, successful attacks are fully possible.

Obviously, a submarine commander must exercise great caution when attacking escorted ships and take appropriate measures to avoid danger. No one can criticize the commander for taking such measures. A submarine commander must assume that often purely by chance he can be deceived into thinking his boat has been observed. As a rule, when escorting other vessels, enemy escort ships proceed in small zigzags, that is, they frequently and arbitrarily change their courses. In many cases, during one of these turns, an escort ship has ended up on a course close to the bearing of a submarine. Naturally, the submarine commander has assumed that the escort vessel has turned because it has detected the submarine. In some cases, the boat commander has broken off from the attack and begun to maneuver for escape. Subsequently, as it turned out, the enemy did not drop depth charges and the boat was not pursued. Therefore, breaking off from the attack was not warranted.

As we see from the example given above, Captain Second Rank Lunin had such an impression. True, this did not prevent him from conducting a successful firing, but it prompted to hasten his departure to the depths. Since the enemy did not drop any depth charges even far from the submarine, one must think that this was one of the minesweeper’s sequential turns observed earlier by the commander. The commander was unable to determine whether the escort vessel was arbitrarily changing its course or whether it had spotted the submarine. Therefore, having detected the turn, the boat commander had to take precautionary measures.

But does this mean that he must immediately break off from the attack? It does not, and he did not! The more so as there is no necessity to do this. The boat should submerge deeply. This, however, does prevent it from attacking on the same combat course on which it had already positioned itself. To preserve the possibility of attack, it must buy time. This can and should be done by turning toward the enemy movement (reducing the impact angle). If there is no pursuit, the commander can quietly finish the attack. Even if there is pursuit, he can attack when the enemy has lost the boat’s position. The attack of the submarine Shch-421, conducted by Hero of the Soviet Union Captain Second Rank Lunin, serves as an excellent example of this.

On 9 November 1942, positioned in Lopphavet and searching for the enemy in the fjords, the commander, moving along the coast, detected a large transport accompanied by a destroyer escort in the depth of Nordre Bergsfjord, sailing toward the exit (figure 14). It obviously was proceeding toward Soroysund. The commander began his attack on the transport. At 1604, when the submarine was positioned 2,000 yards from the destroyer escort, almost abeam of him, the destroyer began to turn sharply toward the submarine. Considering himself detected, the commander dived to a depth of 40 meters. At 1606, there was a powerful explosion on the port side amidship. The submarine transitioned to manual steering and slowly moved forward. Just the same, the commander decided not to abandon the possibility of attacking this transport. At 1609, there was a powerful explosion astern and, at 1613, another explosion ahead of the bow.
The commander evaded by changing course, but to be able to attack the transport, still held to the general course established earlier. At 1621, there was another powerful explosion astern, after which the noises of the destroyer escort began to face and the explosions of the depth charges grew fainter. Taking advantage of this, at 1642 the commander ascended to periscope depth and saw the transport in the exit from Nordre Bergsford. Perhaps wishing to escape the danger area, it had changed its course to port and was proceeding northward on a course almost parallel to the submarine.

[Figure 14 here in original text.]

The destroyer escort was positioned astern of the submarine and was heading somewhere to the flank, obviously still searching for the boat. The commander turned to attack the transport. At 1653, when the destroyer escort was still moving behind the submarine, the commander fired two torpedoes at the transport from a range of 1,600 yards. Two explosions were heard a minute later, both observed on the transport through the periscope. During firing, the boat was pushed in the water as much as 5.5 meters. The submarine dived deep and began to break off from the enemy. At 1658, two depth charges exploded to the port side of the boat. After this, two more explosions were heard behind the boat, and with this the pursuit of the boat ended.

Even though the boat had indeed been detected by the enemy and the explosions of depth charges were close, the commander resolutely carried out his decision and achieved total success.

It should also be noted that the enemy sometimes utilizes preventive depth charging, that is, he periodically drops depth charges to create the impression that the submarine has been detected and to put psychological pressure on the commander. Our submarine commanders caught on to this method relatively quickly and it has not caused any attacks to be broken off recently.

On 5 December 1941 at 1203, a submarine detected an enemy transport at a range of 6,000 yards. The commander began to maneuver for an attack, but he soon detected a significantly larger second transport behind the first ship. A destroyer escort was guarding the transports on the submarine’s approach. Deciding to attack the transport, the commander changed course. During subsequent periscope inspection, the commander discovered that the destroyer escort had turned and was heading straight toward his boat. Considering himself detected, the commander dived but, in order not to abandon the attack, simultaneously lay on a course approximately parallel to the ships’ course and ordered full speed ahead. No depth charging or pursuit of the submarine ensued. At 1237, the commander ascended to periscope depth and saw that the destroyer escort had taken up a position in front of the transports. Using this, the commander came about to a combat course and, at 1243, fired four torpedoes with a time interval of 10 seconds from a range of 1,600–2,000 yards. A minute later, two successive explosions were heard. Not satisfied with just hearing the explosions, the commander began searching for the attacked transports. At 1315, he was a sinking transport and the destroyer escort headed in his boat’s direction. The commander dived, but 10 minutes later he again surfaced to periscope depth. Again, he was unable to find the transport. At 1352, he found it, and at 1355 he watched it disappear beneath the water. The destroyer escort and the first transport were already far away and moving toward Cape Nordkin.

All the examples of attacks given above and all the experience of countless attacks by our submarines against escorted enemy ships permit us firmly to conclude that the German ships
used up to this time for mobile antisubmarine defense are not equipped with any detection devices other than visual (such as a raised periscope). The attack of the submarine K-21 on the LK Tirpitz and other attacks on ships guarded by destroyer escorts indicate that German naval ships also do not have sophisticated detection devices. This does not mean, however, that all these ships do not have acoustic devices. Such devices are on these ships, but they do not provide reliable information in mobile escort conditions, that is, when moving at a speed of 10 knots and greater and in the presence of noises of other nearby moving ships.

Up to this time, we are relatively certain that the Germans have not utilized towed mines, which somewhat simplifies our fight against mobile enemy anti-submarine escorts.

Although the 7 September 1941 attack of the submarine S-34, commanded by Captain Third Rank Khmelnitskiy, was unsuccessful, it is quite instructive. At 1119, in position near the Romanian coast, during total calm and good visibility, the submarine detected three destroyer escorts (Marasti, Regele Ferdinand, and Naluca), two Stihi class gunboats, and a small armed tugboat, all Romanian. Two aircraft accompanied the ships. When detected, at a range of approximately 12,000 yards, the ships were moving in a complicated irregular zigzag.

The commander began maneuvering for an attack on the destroyer escort Marasti. The calm weather conditions and good visibility, both unfavorable for the submarine’s attack, permitted the submarine to be detected quickly. At 1140, the Marasti came about and moved at full ahead toward the submarine. When the destroyer escort was within 1,000 yards of the boat, the commander submerged deeply, but came up to periscope depth nine minutes later. The commander decided to attack the closest gunboat but was unable to complete this attack either. All the enemy ships dispersed in various directions and were busily searching for the submarine.

At 1330, the submarine dived to avoid being rammed by the destroyer escort Regele Ferdinand. At 1340, the commander attempted to attack the tugboat. At 1354, he once again was forced deep to avoid being rammed. During another attempt to attack the tugboat, the tugboat spotted the submarine, turned away from it, and evaded the attack. After this, the commander turned on the Regele Ferdinand. At 1437, the destroyer escort was 2,300 yards from the boat and should have quickly arrived at the lead angle. At this time, the submarine commander noted that, to starboard at 2,000 yards, the Marasti was moving toward him at full speed. Having decided not to break off but to finish the attack, he continued maneuvering.

At 1441, upon the target’s arrival at the lead angle, he fired one torpedo from a range of 1,400 yards with a running depth setting of one meter. The commander saw that the torpedo was running well. By now, the Marasti was so close that it was possible to see sailors on the bow of the ship pointed excitedly at the submariner and at the torpedo. The attacked destroyer escort turned sharply toward the submarine and, by this maneuver, apparently evaded the torpedo strike. To avoid being rammed, the submarine submerged and immediately heard the noise of the destroyer escort passing overhead and, shortly thereafter, depth charge explosions. The submarine’s batteries were already exhausted, so the commander decided to stop his attack and break away from the enemy. Zigzagging at depth, the submarine avoided pursuit and left the area where the enemy was searching.

Thus, the submarine and enemy ships had hunted each other for about three hours. Regrettably, the commander fired only one torpedo. The firing of two or three torpedoes would have made the destroyer escort’s evasive maneuver more difficult, and possibly the commander would have earned a reward for conducting a successful attack.
This example shows how difficult it is for the enemy to attack a submarine and how, in turn, the submarine commander, acting with the necessary patience, can attack not only an escorted ship but also the destroyer escorts that are searching for him.

The attack related above, as well as a whole host of others, shows that when submarines attack formations of several transports or combat ships, pursuit of the submarine is weaker than when a single transport is successfully attacked (as was the case with the attacks of the Shch-421, M-173, and M-172). It is not difficult to explain this. When several transports are attacked, and even more so with combat vessels, escort vessels must continue accompanying the remaining target ships and at the same time must render assistance to the damaged ship. In these conditions, the escorts fall upon the submarine mainly to prevent it from attacking again. Often, depth charges are dropped quite far from the boat, if only to psychologically affect the commander.

The matter is quite different when a single transport is moving under heavy escort. When an attack is successful, perhaps two or three escorts remain to assist the damaged transport, while the others are totally free to pursue the submarine. By superficially considering the issues, commanders assume that it is more dangerous for a submarine to attack a large convoy. The fallacy of this impression, proven by examples and discussion, must be considered when we speak of the possibility and impossibility of follow-on attacks.

Since the enemy broadly uses the convoy movement system, follow-on attacks and repeated firing of torpedoes are especially significant for our submarines. We have already partially addressed this issue when we spoke of grouped submarine operations. But follow-on attacks can and should be conducted by single submarines.

There is a difference between a follow-on attack and firing at several ships. When engaging several ships, the submarine fires torpedoes at various ships during a single raising of the periscope. A follow-on attack is conducted sequentially, that is, torpedoes are fired with an interval of time between engagements, during which the commander may reload his tubes or reposition his boat. A follow-on attack can be conducted against the same ship or against other ships.

Table 15 gives a summary of follow-on attacks conducted by our submarines. It shows that follow-on attacks occurred 16 times during daylight hours across all fleets, of which 11 were successful. In 10 cases, they were conducted against escort vessels, of which seven were successful. These numbers speak to the practicability and effectiveness of follow-on attacks. Presented below are several examples of such attacks carried out by our submarines.

At 1655 on 21 October 1942, the submarine S-12, commanded by Captain Third Rank Turaev, positioned in the Pappe area, detected smoke which, as it later was revealed, belonged to three transports escorted by a minesweeper, a patrol vessel, and two patrol cutters. The commander decided to attack the lead transport. The submarine was heavy, and during the entire attack the commander had to cope with trimming the boat. At 1754, already laying on a combat course, the commander reduced speed before firing. The planesman was unable to maintain the boat at depth, and it slid down to fourteen meters. Only at 1800, having increased the speed to four knots, was the boat again at periscope depth. The moment to fire at the lead transport had already been lost, but it was still possible to attack the second transport. At 1808, the commander fired a torpedo at the transport at a range of 2,600–3,000 yards. After two minutes and 28
seconds, the commander observed an explosion between the bridge and the stern, after which it was wrapped in black smoke and began to go down by the stern.

The commander decided to fire at the third transport. For this attack, he reduced the impact angle to 10 degrees and, at 1812, fired a torpedo at the transport, which was moving in echelon, from a range of 3,200 yards. At the moment of firing, the commander noted a patrol vessel turning toward the submarine. Having decided that his boat had been detected, the commander increased speed and quickly submerged deep. The torpedo missed the target. Actually, no pursuit of the submarine ensued. The enemy dropped depth charges 18 and 35 minutes after the attack.

Although a good example of a follow-on attack, this attack presents a number of negative examples of previously mentioned problems: a missed first attack because of the boat’s trim problem and misses due to firing single torpedoes (true, the boat did not have more torpedoes in its stern tubes). From the perspective of firing at several ships, the deficiency is that the boat had to reduce the impact angle. It would have been better to attack the lead ship at a more obtuse angle and fire at the following ships by sharpening the impact angle. This would have accelerated the whole process of follow-on firing, and chances would have been greater that the ships would not yet have begun evasive maneuvers from the torpedoes.

At 1405 on 27 October 1942, this same submarine detected the smoke of five transports escorted by two minesweepers, two patrol cutters, and one patrol vessel (figure 15). At 1435, the commander fired one torpedo at the lead transport at an impact angle of 100 degrees from a range of 800 yards. After one minute eight seconds, he fired a single torpedo at the second transport, which was moving in echelon. The boat breached after the second firing but quickly dived again. Two explosions were heard. Pursuit of the submarine began after the explosions and lasted one hour (40 depth charges). When the pursuit ended, the boat commander inspected the attack area and saw the target steamer run aground in a half-destroyed condition; nearby lay still another ship on its side. On 7 November 1942, the submarine once again confirmed the sinking of these two transports: one of them lay on the rocks on its side and the other was showing only its masts.

In this case, the commander’s attack was calculated correctly. An impact angle of 100 degrees permitted him to sharpen it for firing at the second transport. The commander did not succeed in doing this because the second transport, moving in echelon, very quickly turned up in his sights. Thanks to the close range of the firing, the negative aspect of firing single torpedoes had no effect.

[Figure 15 here in original text.]

At 1700 on 1 September 1942, the submarine L-3, under the command of Captain Third Rank Grishchenko, detected a convoy of eight transports accompanied by a destroyer escort and an aircraft. The destroyer escort was proceeding 4,000–5,000 yards in front of the transports. The commander began maneuvering for an attack on the destroyer escort. At 1710 he fired two torpedoes from a range of 2,000 yards. An explosion was heard after some time. At 1725, when the commander again inspected the horizon through his periscope, there was no destroyer escort.

The commander began maneuvering to attack a 10,000-ton transport. At 1732 he fired four torpedoes at it. At 1744, the submarine commander inspected the horizon and detected a portion of the transport’s bow above the surface. Another transport stood near the same spot, not
moving; the remaining ships were departing on a reverse course. The aircraft was circling overhead at an altitude of 300 meters. Unfortunately, the commander was unable to repeat the attack on the transport standing dead in the water; he had no more torpedoes. Conditions for such an attack were optimized. The boat departed from the attack area without being pursued. Perhaps it would have been worthwhile for the submarine to remain in the area in case the opportunity to sink the transport with deck gunfire presented itself.

This case is interesting in that it shows how the submarine created the opportunity for a follow-on attack by first sinking the destroyer escort accompanying the transports. If the submarine had had more torpedoes in its tubes, it surely would have been able to destroy another transport.

On 12 November 1941, the submarine K-21 conducted a very precise attack (figure 16). At 1220, the submarine, positioned in the area of Bust Strait, detected a ship’s masts. Turning to a closing course the commander began the attack, but the masts quickly disappeared. The commander broke off his attack. After some time, he detected a low-flying enemy aircraft obviously searching for submarines. At 1255, smoke and a second aircraft were detected in the same approximate location. The commander turned toward the smoke, but after some time, he saw that this was a motorized boat. The submarine broke off the attack and returned to its previous course.

At 1350, it again detected the masts and stacks of transports, escorted by patrol vessels. The commander again began to attack the transports. Maneuvering in full accordance with standing procedures, at 1420 the commander fired three torpedoes from a range of 4,000 yards. Two loud explosions were heard after three minutes. The second transport began to move away from the attacked transport. The commander decided to take advantage of this and attack. At 1429, having adjusted the boat’s course relative to the second transport, the commander fired two torpedoes from a range of 3,200 yards. By this time, the first transport was no longer visible on the surface. The boatswain dived the boat, but approximately a minute later, an explosion was heard. At that moment, when the boat ascended to periscope depth, a powerful explosion went off nearby. Depth charging continued for 15 minutes; the enemy dropped 17 charges. A nearby explosion caused a tank in the free-flooding space between the hulls to rupture. Consequently, the boat was leaving a large oil slick on the surface. It is believed that the submarine sank both transports.

These examples show the full possibility of carrying out follow-on attacks. In doing this, the boats attacked—

- the accompanying destroyer escorts first, and then the transports (L-3).
- transports moving in column.
- transports in different columns.

As was pointed out above, follow-on attacks were possible by breaking off from the enemy after the first attack and repositioning for the subsequent attack. Though such an attack method was also fully possible for high-speed submarines, it was simpler to conduct these attacks as they were described in the examples. Clearly, follow-on attacks will have a better likelihood of success when the time interval between the first and second attacks is minimized. When this
interval is reduced to a minimum, the attacks blend together and firing at several ships is the result. Table 16 shows a summary of such engagements.

Table 16 shows that, on all seas, we had multiple cases of firing at several ships. In some cases, these engagements were involuntary. Many were achieved without changing the submarine’s course; the interval between torpedo firings was simply increased. The possibility of such firing is often a result of the enemy’s practice of moving ships in echelon. It is quite difficult to explain the enemy’s reasons for such formation, but he creates quite favorable conditions for our submarines to fire at several transports. In a number of our submarine attacks, due to this formation the stern of the ship sailing in front is aligned with the bow of the trailing ship. Thus, both ships constitute one continuous target. Obviously, by increasing the number of torpedoes fired and the duration of firing, we can hit both ships.

The first such submarine attack on the Black Sea resulted in the sinking of two enemy transports. At 1613 on 15 August 1941, the submarine Shch-211, in the area of Cape Emine, detected two large Romanian transports moving on a zigzag course without escort. The commander began a torpedo attack and closed to a range of 600 yards. Before firing, he projected the position of the transports, which were moving on the same tack in echelon, with a modest interval between them. The commander fired two torpedoes in salvo. As it later became clear, the torpedoes hit both transports. One of them sank immediately and the other went aground on the coast, but later came off and also sank.

In this case, the hits on two transports were purely by chance, because the commander fired the torpedoes in salvo. He quite clearly did not recognize the possibility of firing rapidly at two vessels.

On 27 February 1942, the submarine Shch-402, under the command of Captain Third Rank Stolbov, attacked six transports accompanied by four minesweepers and two patrol vessels. The convoy was sailing in three groups of two transports each. When the second transport, passing ahead to assume the lead, came on line with the first transport, the commander fired two torpedoes with a time interval of seven seconds from a range of 3,000 yards. Two minutes later, two explosions were heard.

The submarine L-20, commanded by Captain Third Rank Tamman, conducted a similar attack on 1 February 1943. He fired six torpedoes from a range of 1,800 yards at a 12,000-ton transport escorted by two patrol vessels. The transport and a patrol vessel were sunk.

On 19 September 1942, the submarine D-2, under the command of Captain Third Rank Lindenberg, attacked two commercial passenger transports moving in echelon formation and accompanied by an auxiliary cruiser and five patrol vessels. At the moment of firing, the transports had blended into a single, long target. The submarine commander fired two torpedoes at each transport with an interval of 19 seconds from a range of 1,200 yards. Two powerful explosions were heard. Diving deep, the submarine did not observe the results of firing, though it was not pursued. According to agent reports, only the lead ferry Deutschland was hit. The second transport managed to avoid the torpedo.

At 1120 on 14 September 1942, the submarine Lembit, commanded by Captain Third Rank Matiyasevich, detected a convoy consisting of two groups. In the first group, three transports sailed in echelon formation, accompanied by a patrol vessel and a cutter. Two
transports and three escort vessels were in the second group, which was traveling approximately 4,000 yards behind the first group. At 1207, from a range of 1,400–1,600 yards, he fired two torpedoes with a time interval of seven seconds. After some time, two explosions were heard. The commander then decided to attack the transports following in the second group. When the periscope came up, the commander discovered that the torpedoes had struck two transports. One of them stood covered by smoke, listing heavily to starboard; the second was down at the bow. The escort ships that had sailed ahead were coming about on a reverse course.

The commander began maneuvering for an attack on the transports of the second group. At 1216, during a periodic periscope inspection, the commander saw that the transport standing down at the bow had disappeared, and the other sat in the water with the decks awash. At this same time, the commander noted that one of the escort vessels was coming toward his boat at full speed, with a flag raised on the port boom. Believing himself detected, the commander dived deep. Depth-charge explosions began two minutes later, and almost simultaneously a storage battery exploded. This forced the submarine to desist from further attacks.

It is noteworthy that two transports totaling nearly 8,000 tons sank from the strike of one torpedo each. This, as do a number of other observations of submarine commanders, speaks very highly of our torpedoes’ destructiveness.

All the examples presented above demonstrate the possibility and utility of a submarine firing at two ships moving echeloned, without any change in its course. In all these cases, the submarines found themselves in such favorable conditions by chance. We must encourage our submarine commanders consciously to take advantage of the enemy’s mistake of moving in an echeloned formation. During the submarine’s closing with the target, a course must be selected so that the bow of one ship is aligned with the stern of another. Perhaps this cannot be achieved fully, but it must be attempted so that the opening between the ships will be smaller, thus accelerating the firing procedure. The first transport must be engaged normally and with an agreed upon number of torpedoes, doubling that number to account for the second transport. A simple stretching of the time intervals may not gain the desired result, because by this we only lengthen, as it were, the size of the target. Consequently, the strike of one torpedo on this entire long target is possible. The time interval should be established as before, but the number of torpedoes must be increased, that is, continue firing with additional torpedoes for the second target.

The weakness of this firing method is that torpedoes run in single file one behind the other. It happens that the damaged first transport might fall behind the second and absorb the following torpedoes. If the second ship is performing its duties properly, it sometimes can evade a torpedo during the explosion on the lead transport. If agent reports are correct, this occurred during the attack of the submarine D-2 on 19 October 1942. The second transport managed to evade a torpedo.

Firing by this method at two ships is possible only when enemy ships are sailing in an echelon formation or in several columns astern, with the columns on line.

A more universal of the above-mentioned shortcomings is firing from a rotating boat. The first boats to fire in this manner were the Northern Fleet submarines M-174 (Captain Third Rank Yegorov) and M-171 (Captain Third Rank Starikov), which penetrated into Liinakhamari. The submarine S-102 involuntarily fired in this manner on 14 January 1942. As was pointed out, the boat struck two ships with torpedoes.
Captain-Lieutenant Momot, commanding the submarine *Shch-307*, intentionally engaged with this method on 2 October 1942. At 1407, he detected three transports accompanied by a minesweeper. The range to the escort vessel was 4,000 yards. The transports were proceeding in an echelon formation. At 1414, the commander fired a torpedo at the lead transport from a range of 3,000 yards and then, rotating the boat to match the enemy’s movement, he fired at the second transport 15 seconds later when the boat had rotated six degrees. The minesweeper, now 1,000 yards away, turned toward the submarine, which forced the submarine commander to dive deep and begin maneuvering to break off from the enemy. Two explosions were heard in the submarine two minutes after the shot. Depth charging and pursuit of the submarine began 10 minutes later. Eleven depth charges were dropped. The commander figured that he had sunk both transports.

These attacks demonstrate the possibility of firing torpedoes from a slowly rotating boat and the effectiveness of such firing. Since our submarines must increase the intensity of their strikes against the enemy by destroying several ships sailing in a convoy, this firing method should be fully developed. First, we must organize experimental exercises for our submarines to acquire the necessary confirmation as to what speed of rotation permits such firing for various submarine classes.

The issue of follow-on attacks and repeated firing is inextricably linked with the issue of periscope observation after firing. In addition to follow-on attacks, such observation is necessary to determine the results of an attack.

Unfortunately, many commanders exaggerated the danger created for a submarine after an engagement and immediately submerge deep. Logically, a submarine commander figures that after an attack, his boat will be detected by the torpedo track and the enemy will begin pursuit with escort vessels. Therefore, after firing, the urge to depart rapidly to deep water is natural. This urge is especially understandable among the boat’s crew, which is often completely unaware of the situation on the water’s surface. Hence, the submarine often submerges deep not because the commander wants to, but because the planesman becomes nervous. Taking this into consideration, the planesman must be warned before the shot as to the importance of keeping the submarine from diving deep after firing.

If the commander can observe the situation on the surface, he can correctly evaluate any danger threatening the submarine and the necessity to dive deep quickly. In addition, in many cases the boat would dive deep immediately after firing at an unescorted ship or when engaging from a range of 3,000–4,000 yards, when it was more than 1,000 yards and sometimes 2,000 yards to the nearest escort vessel. Submarine commanders often do not realize that an escort vessel, having detected the boat, cannot immediately come about and rush toward it at full speed. After the enemy escort vessel detects a boat, it will lose some time in reporting the situation, in transmitting and relaying orders, in turning toward the submarine, and in developing full speed. All this will take 1–2 minutes, even on a well-run ship. During the time of firing from short and medium ranges, the torpedo will already have reached its target.

At greater firing ranges, the escort ship must traverse an even greater distance to the submarine. By partially lowering the periscope and observing the activities of the escort ships nearest the submarine, the commander can always determine in a timely manner the threatening danger and take measures to avoid it. If the commander lowers the periscope beneath the surface immediately after firing, he is deprived of observing the escort ships’ activities. Re-raising the
periscope can put the boat in danger because when the periscope appears above the surface again, an attacking escort ship may be close enough to the boat to conduct precise depth charging.

Consequently, it is incorrect to lower the periscope completely immediately after firing. It should, however, be lowered just far enough so that the targeted ship cannot see it but the submarine commander can [still] use it to observe the immediate surface area and the escort ships’ activities. During the explosion of the torpedoes or when the required time for the torpedoes to run their course to the attacked ship has expired, the periscope should be quickly raised to determine the results of the attack.

How unreliable are reports that the submarine heard explosions can be derived from the following facts. During an attack on 15 August 1941, the submarine Shch-211 heard only one explosion, but in fact two torpedoes struck two enemy transports. The submarine L-3 also heard only one explosion during a follow-on attack on 1 September 1942. The commander’s observation at the last possible moment enabled him to suggest that two transports were struck.

During its attack on 19 October 1942, the submarine D-2 heard two powerful explosions in the boat. But according to agent reports, the second transport evaded a fired torpedo. Not having observed the results of the attack (the boat was not pursued), the commander was deprived of the ability to strike again the damaged ferry Deutschland which, obviously, was dead in the water for some time before it was towed to Trelleborg. This case indicates how important it is for the boat captain to establish the results of his attack.

It is also important for the fleet commands to know the results of attacks in order to make possible an accurate accounting of the enemy’s losses that result from the various types of operational decisions. Reports that “we heard explosions,” which the boats frequently submit (there were also times when the commander himself did not hear the explosions, but crew members in their compartments did), are of no value. In the first place, the explosions of depth charges dropped by the enemy (to imitate torpedo strikes) could be taken for torpedoes; second, the explosion of a torpedo does not in itself indicate the sinking of a ship. It is well known that even small ships have withstood a torpedo strike and, conversely, large ships in the 10,000–12,000-ton range have been sunk by a single torpedo. It is known that the British (and perhaps the Germans) routinely drop a large depth charge when a torpedo track is spotted to deceive the submarine commander concerning the attack results. Our submarine commanders always try to ensure that a similar error cannot occur. But this is very unconvincing, especially when the commander himself did not hear the explosion.

An incident on the Black Sea shows that it is fully possible to confuse the explosion of a torpedo with that of a depth charge. On 4 November 1942, the submarines M-31 and M-62 were in the same approximate area. When the M-31 conducted a torpedo attack on a transport, the M-62 lay on the bottom. After firing two torpedoes, the M-31 heard an explosion. At that time, the M-62 pinpointed noises that it heard, including the explosion, but figured that the explosion was from a depth charge (and this is totally understandable). The nature of the explosion is one and the same. When an explosion occurs nearby, it is possible to discern the differences that are created by various explosive components in our torpedo and the German depth charge. But at great distances, it is less evident. Therefore, each commander relates to the explosion based on his expectations at that moment. This is why a commander cannot rely on an audible explosion but must confirm its source by observation in the periscope.
Along with unwarranted failures to observe through the periscope, we have already presented a series of examples when the commander persistently confirmed the results of attacks. Particularly noteworthy in this regard is the commander of the submarine D-3, Captain Third Rank Bibeev, who on 5 December 1942, and during the two remaining attacks he made in this same sortie, observed the results of torpedo strikes right up to the moment the attacked ships went down. Other excellent examples are the commander of the Lembit, Captain Third Rank Matiyasevich, after an attack on 14 September 1942; the captain of the S-J2, Captain Third Rank Turaev, after an attack on 27 October 1942; and a number of others.

Table 17 shows the success of torpedo engagements at various ranges. An analysis of the data in this table permits us to draw a number of interesting conclusions. First, it is notable that, at close engagement ranges (up to 2,000 yards), an increase in range has no particular significance. In the north and on the Baltic, the success of engagements from 1,000–2,000 yards is greater than engagements from ranges up to 1,000 yards. This is reflected particularly acutely in the north, where the success rate jumps from 40 to 90 percent.

An examination of the circumstances of the attacks themselves yields no explanation for this. A possible explanation is that when the submarine is so close to the target, the commander cannot hold the periscope raised very long, not long enough to position it at the lead angle; the target takes up so much of the field of view that it would seem impossible to miss. As a result, commanders fire when the aiming point is not positioned exactly at the lead angle but when it is slightly off the firing angle. The commander’s state of nerves plays a large role in this. One cannot ignore the commander’s concern for his own survival at this moment. As the instant of firing approaches, the boat commander’s nerves can become so strained that, when looking into the periscope prior to the shot, even the most self-possessed commander sometimes begins to tremble. He shakes hardly from cowardice but form the colossal pressure that his nerves have put on him.

The conditions of “battle” in a submarine have nothing in common with those that exist on land, in the air, and on a surface vessel. There can be no passion for the heat of battle. A submarine creeps up to its target with agonizing slowness. Only the commander sees what is happening on the surface. The success of the attack depends entirely on him. The closer the enemy, the more rapidly the submarine commander must make a decision. He knows this quite well. This is why such pressure exists when the boat is so near the target prior to the firing of torpedoes. This is why theory, created in a calm situation behind a desk, sometimes sharply deviates from practice; and this is why it is necessary now to verify theory in an actual combat situation when the attributes of human nature are added to it.

This, it seems, explains why the northerners, whose average firing range always exceeds 2,000 yards (see table 12), enjoy greater successes than Baltic or Black Sea submariners who conduct many attacks from very close ranges. From this, one can practically conclude that there is no need for commanders to fire from extremely close ranges. The best range seems to be between 1,000 and 2,000 yards. A high percentage of success with a modest expenditure of torpedoes is achieved at this range.

When firing single torpedoes, the rate of success fell sharply (from 63 to 28 percent) as range increased, and the number of torpedoes fired for one successful attack grew simultaneously. It was another matter when torpedoes were fired successively. The success rate
of engagements showed a tendency to increase, while the rate of torpedo expenditure grew slowly. This is explained in that, during engagements at long ranges, the number of torpedoes in a salvo was increased. Thus, for example, most of the time four or six torpedoes were fired during an engagement at a range greater than 3,000 yards. This raised the success rate from 85 to 90 percent and, as a result, there was no noticeable increase in torpedo expenditure.

Table 18 shows the influence of firing angles on the success of firing. In examining this table, one is struck by the fact that engagement with acute firing angles (50 and 60 degrees) occurred only twice on the Black Sea. Engagements were conducted primarily with firing angles of 90 and 100 degrees. There were eight instances of engagements at firing angles greater than 120 degrees, and all of them were successful. This fully confirms the futility of such torpedo firings without noncontact fuses.

On all seas, the highest rate of success was achieved with a 100-degree firing angle. This corresponds to an angle on the bow of a slow-moving enemy target of 90 degrees. Thus, in this case, the theory comes from the practice. As table 18 shows, we engage principally with a firing angle of 90 degrees. For the most part, this is explained by the convenience of calculating the maneuver (from a navigational perspective).

In summation, the most favorable case for a torpedo engagement is a position 1,000–2,000 yards from the target with a firing angle of 100 degrees. Such a position is good also because, most of the time, it is already behind the escort vessels.

Night attacks. Since the enemy moves transports at night to reduce the success of our submarine operations, the importance of night attacks has grown significantly greater. In the north in the winter, there is almost no daylight remaining for the conduct of day attacks.

Table 19 shows daylight and night attacks in our various theaters. These numbers clearly show that the greatest percentage of night attacks occurred in the Baltic, and strangely, a relatively modest percentage occurred in the north. This can only be explained in that in the north in 1942, almost no submarine attacks on enemy ships occurred during the darkest winter months (November and December). Possibly, the enemy did not move his ships at night through the coastal channels as he did during the winter of 1941–42, but instead set his course at sea outside his own mine obstacles. Unquestionably, such a movement system makes sense for the enemy. At the same time, our submarines, lying in wait close to the coast, did not detect his ships.

It is extremely difficult to find an enemy at night who has freely laid his course on the open sea. Such a circumstance can also occur on the Black Sea. Conditions for both the enemy and our boats are different on the Baltic. Along the western coast, the enemy crosses within Swedish skerries and territorial waters. Only in separate sectors does the route of enemy ships permit our submarines to attack his vessels in clear water and outside territorial waters. The enemy attempts to cross these same stretches of water at night. Since transports want to cross the danger zone as quickly as possible, they go by the shortest route, that is, on the same approximate trace. For our Baltic submariners, this simplifies locating the enemy at night along the western coast. Near the eastern coast, the enemy hinders our submarine operations by moving in shallow waters. He sweeps the coastal waters of mines for this same purpose. Ships are not permitted to move out away from the coast at night on an uncleared course in shallow seas;
rather, they continue night movement along coastal channels. This facilitates our submarines’ encounters with them.

This notion requires examination. Surface vessels dispatched at night could patrol possible enemy transport routes outside enemy minefields. If enemy movement is confirmed, then the surface vessels could systematically strike. The enemy would then be forced to move either by the sea lanes, where our surface ships patrol, or by coastal waters, where our submarines could attack.

[Table 19 here in original text.]

Table 19 indicates the success rates of submarine night attacks. These numbers clearly suggest that the success of attacks at night is significantly lower than attacks during the day. There are several reasons for this. First, we underestimated the significant of night attacks during peacetime. Submarines seldom conduct the required training for night attacks at sea. There is no trainer that can approximate the actual conditions of a night engagement. This is underscored by the fact that almost all initial submarine night attacks were unsuccessful, and the success of subsequent attacks sharply improved. It was impossible to compensate for the deficiencies in combat training in the Baltic, because night training attacks at sea could not be conducted in the winter or summer in 1941 and 1942.

The night sight on our submarines is unsuitable in a heavy sea. The sight does not have tie-down straps. Therefore, when aiming in a pitching sea, the sight must be held in the horizontal aspect by hand while simultaneously affixing a linear scale to it. It is almost impossible to do this. Because of this, during heavy seas, several commanders have attempted aim with the aid of a tightly tied down sight, while others refrained from using it altogether. Both cases are bad and have led to misses and to the senseless waste of torpedoes. More enterprising commanders, not waiting for help, have placed the sights in suspension harnesses.

At night, precisely determining the movement elements of the target vessel is significantly more difficult than in the day. Therefore, at night the quantity of torpedoes fired should be greater. Engagements with a single torpedo being fired have an extremely small likelihood of success. The data in table 20, which show the success of engagements with various numbers of torpedoes, fully confirms this.

[Table 20 here in original text.]

As table 20 shows, the extremely low success rate with single torpedo firings (on average 19 percent) sharply increases with an increase in the number of torpedoes fired. The superiority of the new firing method, even at night (success rate almost three times greater than with the old) is clear from this table. Here also the data from table 19 that is unclear at first glance is explained. Across all seas, the success rate of firing at escorted vessels is higher than against unescorted vessels. Table 21 aids in this explanation.

[Table 21 here in original text.]

Table 21 clearly shows that in an overwhelming number of cases, engagements were conducted against unescorted ships with several torpedoes (although from long ranges), while in many other cases single torpedoes were fired against unescorted vessels. Often, in bad weather, single torpedo firings were repeated several times against unescorted transports. All this, when taken together, has led to the situation in which the number of fruitless engagements during attacks against single transports has grown very large.
Still another circumstance which was not considered earlier has contributed to the lowering of firing success at night. Often, torpedoes fired by a surface submarine in heavy seas have run poorly.

On 17 September 1942, a torpedo fired by the S-13 veered off and passed by the bow of a transport; on 28 September, a torpedo fired by the Shch-310 ran skipping along the surface; on 30 September, a torpedo fired by the same submarine circled around near the boat; on 26 October, a torpedo fired by the Shch-406 sank near the submarine; on 28 October, the first torpedo fired by this same submarine immediately veered off to the left, and the second one veered off and did not reach the transport but passed behind it; and on 6 October, a torpedo fired by the S-12 sank near the submarine.

A large percentage of torpedoes ran poorly or did not even run at all when fired from a surfaced submarine, while during this same time torpedoes ran well when fired under water. This leads one to conclude that the problem results from unfavorable conditions that exist when torpedoes are fired from surfaced boats and in heavy seas. Having presented a detailed investigation of the causes of this phenomenon to the Mine–Torpedo Directorate, we currently have concluded that during night engagements, we must attempt to approximate submerged conditions when firing torpedoes. To accomplish this, the commander must fire when the boat is at the deepest possible draft, fire from the lower tubes, maintain (to the degree possible) a course for the submarine to lessen the magnitude of the keel motion, and conduct firing when the trim of the boat is close to zero and when the boat’s bow is falling.

For greater confidence in following these instructions correctly, it is necessary to conduct sea trials in firing torpedoes from surfaced submarines.

Along with these problems, night attacks create some advantages for submarines. Since the enemy cannot see the shot or the track of a torpedo, he cannot avoid it. Also, the enemy has more difficulty in organizing anti-submarine defenses. If the enemy neglects to escort the ships along their flanks, a submarine could be mistaken for one of the escort vessels and then could freely attack an escorted ship. If the enemy chooses to escort along the flanks, he also facilitates the submarine’s attack. As soon as the submarine commander establishes that the escort is on the flanks, he will attack the convoy at the lead or trail.

If the enemy detects a boat during its attack approach or after the shot, it is easier for the boat to evade the enemy at night than during the day by submerging. It is extremely difficult to organize pursuit at night.

Thanks to the ability to maneuver surfaced, it is easier for the boat to fire at several ships and conduct follow-on attacks at night. In fact, in peacetime in the Baltic Sea during the winter, they rigorously trained at night. When the German boats began suffering large losses from British anti-submarine forces, they converted to night attacks. Having significantly reduced their own losses in submarines, they continue to inflict telling losses on British convoys.

Our lack of night training has made many of our most courageous and daring commanders skeptical regarding night attacks. They believe that, at night, it is totally impossible to determine a detected ship’s course and speed. They also fear that they will be rammed by target or escort vessels or detected and fired upon before they fire their torpedoes.
Because of such an attitude toward night attacks, all our commanders in all our fleets avoided conducting them. If any commanders detected a light at night, they used various pretenses to avoid closing with it.

In his first sortie, the commander of the Shch-311 detected a light and silhouette at night many times but not once did he attempt to close for an attack. In their first sorties at night, the commanders of the Shch-309, Shch-310, Shch-205, and M-172 acted similarly. As was mentioned earlier, unpreparedness for night torpedo attacks was reflected in unsuccessful initial attacks.

At 2319 on 18 December 1941, the submarine Shch-404 detected a transport accompanied by a destroyer escort, a patrol vessel, and a minesweeper on a moonlit, cloudy night. The position of the ships at 2321 was as follows (figure 17): the transport was 1,000 yards to port at an angle on the bow of 10 degrees; the minesweeper was also to port, closer to the submarine; the patrol vessel was behind the transport; and the destroyer escort was to starboard at a range of 1,200 yards, at an angle on the bow of 20 degrees. Having decided to attack with bow tubes (in view of the small distance abeam), the commander began to rotate the boat. Before the boat had come about for the shot (at 2330), the minesweeper spotted it, fired an illumination round and opened machine gun fire on it. The destroyer escort also fired illumination rounds and commenced naval gunfire. Having come under extremely close range enemy cross fire, the submarine did an emergency dive, submerged under the minesweeper, and went deep. The enemy dropped six large depth charges, which exploded close to the submarine. There was no further pursuit and the submarine received no damage.

The commander’s decision to attack with bow tubes was incorrect in this particular case, and it contradicted existing regulations. By turning toward the target’s movement, the commander was forced to overcome a quickly changing azimuth and thrust his tubes to the lead angle on the opposite. This prolonged the attack and made its accomplishment very doubtful. During the rotation in accordance with regulations, the starboard bow firing tubes would turn to meet the enemy, which would ensure the possibility of attack and hasten its conduct. Using this attack method, the boat had still not fired after nine minutes. The fact that the boat was so close to the ships for such a long period and was not detected deserves special attention. Also significant is the fact that even though the boat was in a very difficult position when it was detected (range to the destroyer escort and minesweeper had been reduced to 400 yards), it was still able to escape without any damage, thanks to its preparedness for rapid diving.

The decision to dive under the minesweeper cannot be endorsed. The commander surely expected the ships to drop depth charges. Therefore, the boat should have set a course farther behind the minesweeper; in fact, the best position would have been closer to the transport, which would have made the enemy’s pursuit of the boat more difficult.

At 1900 on 29 December 1941, while charging batteries, this same boat detected the silhouette of a ship nearly abeam to starboard (approximately to the southwest) at 4,000–5,000 yards. The visibility conditions at the time were as follows: 4,000–5,000 yards to the south, 3,000 yards to the west, and 1,600–2,000 yards to the north. The boat was positioned in the darkest part of the horizon relative to the ship.
Having decided to attack, at 1903 the commander turned toward the enemy to determine the direction of his movement (figure 18). Having established that the enemy was sailing toward the northwest, the commander set a course to intercept him near the cape. At 1913, the enemy turned to starboard, which the submarine matched. Battery charging was completed at 1914. By this time, it was possible to examine the vessels. A 5,000-ton transport was being escorted by three patrol vessels. Two of them were positioned between the submarine and the transport. At 1937, the commander, remaining on course, fired two torpedoes with a time interval of four seconds from a range of 2,000–2,400 yards. After firing, the diesel engines were stopped. A muffled explosion was heard 1.5 minutes later. The enemy’s formation was broken and the transport was no longer visible. At 1941, the boat conducted an emergency dive, and while deeply submerged and moving at changing speeds began to withdraw from the attack scene. Only 43 minutes later were the first depth charge explosions heard far astern.

The attack had lasted 37 minutes. During all this time and even after the engagement, the submarine had maneuvered without any kind of enemy interference. It had continued battery charging almost until the moment of firing. It would have been more correct to cease charging and change over to electric motors. This would have made the boat quieter, would have avoided the risk of possible detection from sparks flying from the diesel exhaust, and would have increased its preparedness for diving. Although the boat achieved a hit, just the same a greater number of torpedoes should have been fired from such a range in nighttime conditions.

On the same day, the submarine Shch-401, while surfaced, detected a whole line of lights. The boat came about to close with the lights, but when the commander saw the silhouette of a large ship and the lights of possibly as many as 12 small vessels, he decided to dive and fire submerged, even though he knew that his periscope was malfunctioning. Of course the commander saw nothing in the periscope. He surfaced the boat more than an hour later but no lights were visible. The commander’s irresoluteness is explained by the novelty of the situation to him.

During battery charging one hour and 40 minutes later on the same evening, the boat detected the silhouettes of three ships to starboard and almost abeam sailing on a course parallel to the submarine. The commander ceased charging batteries and began maneuvering for the attack. The first two ships were 3,000-ton transports; the third could not be distinguished against the dark sky. After 18 minutes, the boat fired four torpedoes with a time interval of 10 seconds from a range of 2,200–2,400 yards. The submarine submerged after firing the third torpedo because it noted that the trailing ship had turned toward the submarine. Simultaneously, an alarm siren was heard. After 1.5 minutes, two explosions were heard 10 seconds apart. Five minutes later, the noise of propellers was heard above the boat, followed minutes later by the explosion of the first depth charge. Altogether eight depth charges were dropped. The submarine slipped away submerged and on changing courses without suffering any damage.

On 7 January 1942, this submarine conducted still another successful night attack on this same sortie. Near midnight, two large transports accompanied by a patrol vessel and two cutters were detected at an angle on the bow of 140 degrees to starboard at a range of about 4,000 yards. The sea was moderate and the night was clear and moonless. The commander came about for an attack with an impact angle of 70 degrees and, eight minutes from the initiation of the attack, fired three torpedoes (the fourth did not launch because the torpedo firing valve did not function).
from a range of 2,000 yards. When the boat completed firing, it dived immediately. There was no pursuit. A powerful explosion was heard after 1.5 minutes. After one hour 30 minutes, the boat surfaced and observed two small silhouettes moving astern of it on changing courses.

If the commander acted indecisively during his first night attack, then he conducted the two subsequent engagements confidently and completely correctly. The commander utilized the night sight in both cases. During the last attack, it seems there was no reason for him to submerge quickly. No one attempted to pursue the boat. Remaining surfaced, the commander could have determined the results of the attack better and, perhaps, attacked a second ship, firing the torpedoes still remaining in the bow tubes or those in his stern tubes.

At 1913 on 18 December 1941, the submarine Shch-403, positioned close to the coast and charging its batteries, detected the silhouette of a ship at a range of 5,000–6,000 yards. The commander terminated the recharging and began his attack. At 1916, he could see a transport escorted by a patrol vessel and two minesweepers. At 1919, the boat fired four torpedoes with a time interval of six seconds from a range of 1,200 yards. The commander did not utilize the night scope but was guided by a nearby earlier selected alignment of the break of the periscope standard with the antenna strut. All the torpedoes passed close by the target. Having then decided to re-attack with stern tubes, the commander began to come about on a reverse course.

At 1924, it was noted that a patrol vessel had turned toward the submarine. However, the commander did not break off his attack. At 1927 he fired two torpedoes from the stern tubes from a range of 3,000 yards. But these torpedoes, also fired without the use of the night sight, missed as well. At 1934, the enemy ships disappeared into the darkness.

Because of the commander’s contempt for the night sight and firing “off-hand,” six torpedoes were squandered and the commander’s display of perseverance was wasted. It must be noted that the commander did not believe that the patrol vessel was coming at him for an attack. Subsequently, it turned out that the patrol vessel’s coming about toward the submarine was coincidental. Despite conducting two attacks, the submarine was not detected by the enemy ships, though the submarine commander observed them from a range of approximately 6,000 yards. After these unsuccessful attacks, the commander ordered the night sight to be mounted on the bridge.

On this same sortie at 1629 on 22 December, a light was detected at an angle on the bow of 20 degrees to starboard (figure 19). At 1700, the commander determined that it was a transport with an undarkened light, escorted by what was initially believed to be four ships. Attempting to take a position in front of the enemy ships, the commander came about to a parallel course, gave full speed ahead with both diesels, and alerted the deck gun crew. At 1746, two cutters were detected, and at 1742 a cutter was detected dead ahead. In addition to this cutter, six patrol vessels and cutters were seen around the submarine, the range to the nearest one being all of 400–600 yards. Thus, the submarine was inside the heavy enemy escort. At 1802, the transport turned to starboard and thus permitted a more rapid attack by the submarine. The range from the submarine to the transport at this moment was 1,000–2,000 yards. The commander brought the boat around to an impact angle of 180 degrees. At 1808, a patrol vessel overtaking the transport emerged past its bow. The commander hurried the firing of the first torpedo, thinking that if it went past the bow of the transport, it would hit the escort vessel. He fired two torpedoes with a time interval of 10 seconds from a range of 600 yards. At the moment of firing, the submarine
was positioned in the densest enemy escort, with patrol cutters abeam to starboard and astern, 100 yards from the boat.

[Figure 19 here in original text.]

After firing, the commander gave full ahead, passed astern of the escort vessel he had just fired at, and headed toward the coastline, intending to take cover against the dark background of the cliffs. Two explosions were quickly heard. One torpedo had struck the escort vessel and the second hit the transport. The escorts guarding the transport rushed toward it and as many as 10 escort ships and cutters quickly gathered around.

At 1821, the submarine reached the coastline and observed the scene around the transport from a range of 3,000–4,000 yards. At 1831, the enemy ships fired illumination flares. The explosions of depth charges and naval gunfire were heard. The transport sank quickly. At 1835 the submarine withdrew from the shore, headed into the fjord, and safely avoided any kind of pursuit.

At a glance, this example shows the opportunities a submarine has while operating at night. The boat freely observed the actions of the enemy escort forces, right down to the cutters that surrounded the boat from all directions. Despite the insignificant ranges, the submarine was not detected. Perhaps because the submarine was maneuvering amid a large number of escort vessels, the enemy mistook it for one of its own cutters.

The commander boldly conducted the attack to a successful conclusion despite interference from countless enemy cutters and patrol vessels that were maneuvering around him.

However, the firing of just two torpedoes at two ships cannot be considered correct in this situation. Having taken up a firing position, the submarine had to sink it no matter what the cost. In these conditions, it was utterly wrong to conserve torpedoes. If one torpedo had deviated just a bit, the enemy would have gotten away unscathed and undamaged. The submarine had four torpedoes prepared for firing and should have fired all of them.

Concerning the commander’s overestimation of the significance of the deck guns of the type Shch submarine during the first and particularly the second attack, it is patently obvious that the submarine could not have achieved any practical result with its 45mm cannon. Preparation for firing the deck gun required 14 personnel above deck. Had there been a requirement for a crash dive (for example, a ramming threat), the boat would have been in desperate straits, especially if it came under enemy fire itself.

During night attacks, the only correct approach is to keep the boat in a position to be able to submerge as rapidly as possible. The deck gun should be readied for firing only when the boat cannot submerge.22

At 0329 on 27 August 1942, the submarine Shch-407, located in the Baltic with a sea at force 2, detected the silhouette of a transport at a range of 8,000 yards. The commander began to maneuver for an attack and, at 0340, having come about to fire with stern tubes, fired one torpedo from a range of 1,600 yards. The torpedo left the tube but the commander did not see its track and decided to repeat the attack, firing from the bow tubes. At 0356, while the boat was coming about for its second firing, the attacked transport, which was in face a minesweeper, opened fire on the submarine with an automatic cannon (approximately 100mm). Shells landed all around the submarine. Nonetheless, the commander continued his attack and, placing the minesweeper at the lead angle, again fired a single torpedo from a range of 600 yards. The
torpedo missed. The submarine moved away from the enemy at full ahead and rapidly dived at 0355. At 0357, the first depth charges were heard far astern. The search for the submarine and the dropping of depth charges continued until 0850. The enemy dropped 40 depth charges in all, but obviously had been unable to determine the boat’s position, because all of them exploded far away.

This case emphasizes the necessity of exercising caution during a night attack even against a transport sailing alone. There could easily be an error in the identification of the silhouette at night. It is worth noting that even though the boat was positioned a short distance from the enemy for some time and came under cannon and gun fire, it was able to complete its attack and break off without any damage. This does not necessarily mean that the danger posed by firing at a submarine at night can be freely ignored, but that the danger should not be exaggerated.

It is extremely annoying that because the commander fired single torpedoes, he was not rewarded for his decisiveness by the sinking of an enemy ship.

At 0010 on 30 September 1942, the submarine Shch-310 detected a single transport near Stolpe Bank. Changing over to electric motors, the commander began maneuvering for the attack. At 0028 he fired a torpedo with an impact angle of 70 degrees from a range of 1,200 yards. The torpedo missed the target. Having detected the submarine, the transport began to turn away from it. Five minutes later, a second torpedo was fired, four minutes later a third, and then still a fourth. The first three torpedoes passed close to the target and the fourth circled around near the submarine. The commander’s attempt to overtake the transport and attack it with his deck gun was unsuccessful. Having superiority in speed, the transport disappeared.

Firing single torpedoes, the commander expended four torpedoes without success. The results would been completely different if all the torpedoes had been fired at the same time with time intervals. Firing at the evading transport was pointless.

The commander of the S-12 made the same error on 6 October 1942 in the Memel area. He also engaged a transport at night, firing four torpedoes one at a time. All torpedoes passed close by the target.

At 2320 on 10 October 1942, the submarine D-2 detected a transport west of Bornholm with illuminated running lights in a force 5 sea. The submarine intersected the transports course and, standing off at a range of 600 yards, awaited its approach. Apparently the transport detected the submarine and began to turn toward it. The submarine commander was forced to turn away from the transport. The transport, taking advantage of this, came up to full speed, turned, and began to pull away from the boat. The submarine, changing over to diesel power, began to pursue. Soon the lights of minesweepers were detected ahead on the transport’s course. To accelerate his attack, the submarine commander decided to fire hurriedly with an impact angle of about 120 degrees. The fired torpedo passed behind the stern of the ship; the commander then ceased pursuit.

This example shows the futility of occupying a firing position in front of and close to the enemy’s course at night. This makes it easier to ram the submarines. In addition, it must be considered that observation on ships is always better toward the bow. It follows then that when possible, submarine commanders should select firing positions with impact angles on the order of 90–120 degrees.
In the conditions, it was hardly worthwhile for the boat to fire even one torpedo. Since the transport was moving away from the boat and only showing its stern, firing a torpedo would not have had a likelihood of success.

At 2234 on 17 October 1942, the submarine Shch-303, commanded by Captain Third Rank Travkin\textsuperscript{23}, detected a white light on the horizon in the area of Norrkoping Bay. The sea was calm, the moonlit sky was clear, and visibility was about 5,000 yards. Continuing to charge batteries, the commander began maneuvering to close with the light. At 2350 he determined that there were three transports, with two patrol vessels alongside the leading large ship. To place the enemy ships in the moon’s path, the commander began to maneuver for an attack from the dark side of the horizon. At 2353 the commander stopped charging batteries and switched over to electric motors. At 0002 the commander fired two torpedoes from the bow tubes with a time interval of 10 seconds at a range of 2,800 yards. Those manning the bridge observed an explosion in the lead transport one minute 36 seconds later.

One patrol vessel turned toward the submarine. At the same time, a cannon muzzle flash was seen on the ship. The boat quickly submerged. While the hatches were being secured, the explosion of the second torpedo was clearly heard. Deeply submerged, the submarine withdrew from the attack scene. For some time, the noise of the screws of the patrol vessels approached the submarine, but then subsided. There were no other indications of pursuit effort. The sonar operator reported to the commander that he was hearing the noises of three ships moving away. The commander considered it possible that two enemy transports had been sunk.

In this attack, the commander correctly evaluated and exploited the existing light conditions. Having taken up a position in the dark portion of the horizon, the submarine, remaining unseen, was able quietly to observe the enemy ships. But this necessitated a preliminary decision and preparation for firing. The submarine could conduct such firing preparations relatively while surfaced. The coming about and firing of the escort vessel (if indeed this should happen) at a significant (for night) range would not interfere with the submarine’s completion of its firing. That the commander himself recognized this possibility can be seen from his subsequent night attack. The impression that the escort vessel had fired from a cannon could have been mistaken, because the enemy would hardly have fired just one shot. Further support of this is that the enemy did not drop depth charges, a practice the Germans normally follow when they spot a submarine at night.

The submarine had a second night engagement on this same sortie on 4 November. At 2330, during battery charging, a convoy of two transports and two patrol vessels was detected at a range of 4,000 yards. The angle on the bow of the transport exceeded 100 degrees. The commander began maneuvering for the attack. At 2342, he was in position at a range of 2,000 yards with an impact angle of 90 degrees. The commander fired the first torpedo when the patrol vessel reached the aiming point. After this, the boat turned five degrees and fired two torpedoes at the 15,000-ton lead transport with a time interval of 10 seconds. One torpedo struck the patrol vessel and a second hit the transport. The second patrol vessel turned toward the submarine, forcing it to dive deep rapidly and to begin to withdraw from the attack site. At 2351, the patrol vessel passed over the submarine but did not drop depth charges and subsequently did not pursue the submarine.
Thus, firing at two ships was crowned with success, which also confirms this method’s utility for nighttime conditions. Regrettably, the commander chose an escort vessel as one of his targets and not the second transport.

We have intentionally examined in detail a large number of submarine night attacks to demonstrate that we have not yet mastered them and also to show commanders who are inexperienced in conducting night attacks (of whom there are many) some possible variables. In these examples, we have also tried to show commanders how to utilize the advantages that a submarine may have at night.

The placing of radar on enemy ships may considerably interfere with submarine night attacks. Radar will enable the enemy not only to take evasive action but also to attack our boats without warning. To date, we do not have information about enemy ships operating in our theaters having such equipment, but we must consider it. We also must consider the possibility of such equipment being placed on capes along coastal transport routes.

Possibly, we can make radar detection of our submarines more difficult by reducing our boats’ presence on the surface even at night and by using the sonar operator for observation as much as possible. This will permit surfacing for firing close to the enemy. When the submarine is surfaced, the portion of the boat’s hull that extends above the surface must be reduced as much as possible. Radar equipment on our submarines will significantly facilitate their actions in poor visibility conditions.

From the examples that have been presented and from other submarine experiences, the following conclusions can be drawn concerning the employment of torpedoes:

- During detections of the enemy at close ranges, which lead to torpedo firings, the existing regulations must be strictly observed; designate for firing the tubes that require rotation toward the enemy’s movement route.

- During detection of the enemy at significant ranges, do not rush things too much. Visibility conditions must be considered and an effort must be made to take a position in the dark portion of the horizon. When it is impossible to improve the position, the attack must be conducted in the shortest possible time, keeping in mind that any delay can lead to detection of the boat and spoiling of the attack.

- During initiation of the attack, the ability to get away submerged in the most rapid manner must be preserved. Caution should not be weakened during an attack against a lone ship, bearing in mind that it is easy to mistake an enemy patrol vessel for a small transport at night. The firing position does not have to be selected close to the target’s course.

- For maintenance of correct torpedo running, the boat should be held in the lowest possible position that the sea condition permits (this is also good for concealment), and lower tubes should be designated for firing.

- For compensating for possible large errors in determining the target’s movement elements, the number of torpedoes fired should be increased. As a rule, all tubes should be prepared for firing.

- During attacks on convoys, firing at several ships should be planned ahead of time and then executed. To accelerate this process, after completion of firing at the first
ship, the submarine must turn to meet the second, arriving at the lead angle before the target, and then conduct the second attack. If ships are moving so that they are almost aligned with each other, one must fire on the first ship according to normal regulations and then, holding on the same course, fire at the second.

- On completion of firing, it is not necessary to submerge too quickly. The track of a torpedo is not visible at night. Therefore, the firing of a torpedo at night does not expose the submarine to detection. It is quite probable that it will not be detected until the torpedo explodes. Remaining on the surface, the submarine can fire at another ship (this is why all tubes should be prepared for firing) and the commander can determine the results of the attack more easily.

- The possibility of maneuvering surfaced significantly facilitates the conduct of follow-on attacks by submarines. When the enemy is moving along the coast, his inability to alter his course radically contributes to this.

- The firing of torpedoes at a ship that has already detected the submarine and is taking evasive actions is pointless.

3. Utilization of Sonar Equipment for Torpedo Attacks

Sonar equipment can be used during torpedo attacks to:

- detect enemy vessels in poor visibility conditions (day and night).
- close with attacked ships in poor visibility and at night.
- fire torpedoes without the use of a periscope.

During this war, sonar operators in all fleets have detected enemy ships before they have appeared in the periscope. In certain conditions, in every case, an attack against the enemy using torpedoes or other weapons is possible. In 15 cases in the Northern Fleet, torpedo attacks ensured after sonar operators had detected enemy targets. Only several such cases have been reported in the remaining fleets. From this, we can conclude that in those fleets where sufficient attention is paid to the sonar operator when he detects targets (Northern Fleet), the percentage of attacks is fairly significant (11 percent). The percentage grows still greater for visibility conditions below 8,000 yards (approximately 20 percent).

In isolated cases, sonar operators have managed to detect ship noises at ranges exceeding 20,000 yards. In the overwhelming majority of cases, the range of detecting ship noises does not exceed 6,000–8,000 yards. Consequently, the detection of ships by the sonar operator is significant when visibility is less than 8,000 yards.

The range of detection depends on sea conditions and the position of the boat. When the boat is surfaced, the strikes of the waves against its hull create significant interference with listening. This must be taken into account at night. When anticipating the appearance of the enemy in darkness, in windy weather, or during low visibility, it can be more advantageous for the commander to refrain from visual observation, submerge, and organize better sonar observation. The commander of the M-171 did exactly this. On the night of 27 January 1942, based on the report of the Schh-422, he occupied a night position in the path of an enemy convoy. This method proved itself. The submarine was indeed able to detect the approach of the convoy before it could be observed visually.
However, to implement such a method successfully, one must know what information the sonar operator can provide during given conditions. Comparing his information with the range of actual visibility, it is possible to make a correct decision.

As has been pointed out above, such an observation method at night has now become significant due to the appearance of radar equipment on ships and at shore posts. During the day, when a submarine is submerged at periscope depth with a visibility of less than 8,000 yards, the sonar specialist must conduct acoustic watch. As a rule, sonar operators should train for acoustic watches during high visibility conditions.

Bearings provided by the sonar operator fully permit submarines to close with the enemy. From our boats’ practice on all seas, the average precision of bearing established is 2–2.5 degrees, which is quite sufficient to determine the submarine’s closing course and speed. For determining the enemy’s bearing (based on three soundings), such precision is small but sufficient enough to gain at least an approximate reading. In the north, we have close with the enemy using sonar-acquired bearings four times. The most pertinent of these follow.

At 0605 on 14 April 1942, the submarine \(M-173\), under the command of Captain-Lieutenant Terekhin, detected noises. Haze or fog hindered visibility through the periscope. Despite having a bearing from the sonar operator, the boat could not see the enemy. Using the sonar operator’s bearing, the commander determined the target’s direction of movement and lay on a closing course. To receive a sonar bearing, the commander periodically reduced his speed and maneuvered blind for 48 minutes. Finally, at 0653, the commander detected a 10,000-ton tanker and two patrol vessels through the periscope. The range to the enemy was still approximately 9,000 yards. Continuing subsequent maneuvering according to his periscope observations, the commander closed to within 2,300 yards of the tanker and, at 0722, fired two torpedoes. After one and one-half minutes, two explosions were heard. Ten minutes later, having raised periscope, the commander saw a dark column of smoke at the tanker’s position.

At 0645 on 11 May 1942, the submarine \(M-172\), commanded by Hero of the Soviet Union Fisanovich, detected propeller noises. Visibility was close to 2,000 yards, and snow squalls prevented detection of the enemy through the periscope. At 0713, having determined the ships’ direction of movement by acoustic bearing, the commander began to close with them. When he reached the deflection angle according to the sonar bearing, he still could not see the ships. To reduce the range to the target ship and to fire using the periscope, the commander reduced the impact angle to 20 degrees. Finally, at 0719, through the periscope he detected a steamship escorted by three patrol vessels at a range of 2,000 yards. The enemy’s course determined by the commander in the periscope was only five degrees different from that computed according to sonar bearings. At 0722, the commander fired two torpedoes from a range of 1,600 yards. Two explosions were heard, after which the steamship’s propeller noises ceased. Five minutes later, two depth charges exploded not far from the submarine, which was the extent of the pursuit.

Thus, the submarine executed all the maneuvers to occupy a firing position while blind. The commander used sonar bearings alone to determine the target’s course accurately enough to establish a combat course. The commander’s correct decision to reduce the impact angle in order to observe the enemy through the periscope prior to firing deserves attention. In addition, since he made a minor effort in determining the target’s movement elements and fired torpedoes with a
time interval, he most likely would have achieved a hit even if he had not detected the enemy through the periscope.

This example clearly affirms the ability of submarines to conduct a blind attack. This is important in poor visibility conditions (when the enemy cannot be seen in the periscope), when the enemy ship is heavily escorted, and in calm seas when stealth is imperative. It is important that periscopes not be used in such conditions. While still sufficiently distant from the enemy, the commander can confirm the degree of accuracy of his sonar operator’s bearing. When the commander has closed to a distance at which enemy escort ships or aircraft can notice the periscope, he should limit the number of periscope raisings. He must observe any changes in the sonar bearing of the target and the magnitude of the angle on his own boat’s bow. He will thus be alerted to the enemy ship’s radical change in course or speed and will be able to monitor the approach of the moment of torpedo firing (a function of angle on the bow).

Our submarines have not reported any actual instances of torpedo firing based on sonar bearings alone. However, it cannot be considered that such firing is impossible.

Many attacks on all seas have been interrupted because the submarine was forced to dive before firing the commander was unable to raise the periscope above the water’s surface to aim. Not recounting all of them, we will mention the worst case, which occurred with the submarine Shch-323 during an attack on an enemy cruiser near Dago Island on 13 October 1941. The torpedo tubes were not prepared for firing in a timely manner. The crew flooded the tubes during their preparation for firing. The boat went out of trim, submerged deeper, and for some time was unable to come up to periscope depth. Finally, when the boat could surface, the cruiser was already distant and pulling away from the submarine.

Cases of submarines sailing with tubes unprepared for firing have now largely been eliminated. However, instances of boats diving prior to firing because of poor maintenance of trim and control by planesmen are all too frequent, especially in the Baltic, where this is explained by the conditions of combat training of the boat and crew. In these cases in the north, blind firing is conducted according to time calculations. The boat is brought to an even keel and, by using maneuvering tables and sometimes the eye, it fires with an increased number of torpedoes.

The submarine Shch-422 conducted such an engagement on 23 August 1942. At 0411, three enemy transports escorted by three patrol vessels were spotted against the horizon’s lighted backdrop. The range to the enemy was about 10,000 yards. The commander began closing for the attack, but after 20 minutes the vessels dropped from view. The commander came about to a course parallel to the coast and, 20 minutes later, again detected the enemy ships by the twinkling of the patrol vessels’ bridge lights. The transports were sailing in echelon and appeared as a continuous target. The commander made his calculations for an attack on the lead transport. At four degrees prior to the target’s arrival at the deflection angle, the horizontal planes jammed and the boat dived. Not attempting to surface under periscope, the commander leveled the boat and, 30–35 seconds from the moment the periscope dropped below the surface at 0 degrees trim from a depth of 12 meters, he fired four torpedoes with a time interval of seven seconds. The firing range was approximately 2,200 yards. After 1.5 minutes, three explosions with small intervals were heard on the boat.

On 1 February 1943, the submarine L-20, conducting an attack on a 12,000-ton transport escorted by two patrol vessels, closed to within 1,800 yards of the target. Not long before the target reached the deflection angle, the helmsman dived the boat. The commander leveled the
boat after 50 seconds and fired six torpedoes. Two torpedo explosions were heard after one minute. A transport and an escort vessel were believed sunk.

As can be seen in both cases, the commanders, operating blind, fired all the torpedoes in their bow tubes based on time calculations. Both attacks were successful. From this, of course, it does not necessarily follow that a submarine commander can always fire blind, because the probability of hitting the target naturally falls and the expenditure of torpedoes significantly increases. But such firing is possible as a way out of a bad situation while the boat is diving.

The calculation of the time prior to firing is not particularly accurate and, of course, is completely approximate. When only several seconds remain before firing, the error in the time to commence firing cannot be much greater. But this method of engagement cannot be recommended if there is a considerable amount of time prior to the target’s arrival at the deflection angle. In this case, it is far more important to utilize a sonar bearing.

In doing this, commanders must remember that a sonar bearing gives the direction to the ship’s propellers, that is, to the stern. One must not forget to add a correction to this for the deflection angle. This is not at all complicated and, depending on the firing range and the size of the target, requires only an increase in the deflection angle by the number of degrees selected from the firing table.

This correction can be chosen from the new firing table (table 14) as a supplement during the firing of three torpedoes (parallax .7 times the length of the target). For obtaining the total acoustic deflection angle, one must add to the received sum still an additional amount based on the number of torpedoes actually fired.

During all attacks, so that the sonar operator cannot be deceived, he must be required to provide continuous bearings to the attacked ship.

The number of torpedoes in a salvo in this case should be greater in order to compensate for the possible errors in the acoustic bearing of the target.

Besides cases of diving, the boat may be forced into this kind of engagement by pursuit by enemy escort vessels or even simply by their great numbers when the submarine is at a close range to the target ship.

As can be seen from a number of these examples, acoustic observation may sometimes permit a commander to estimate the results of an attack by comparing the number of ships that emit noises after an attack with the number detected earlier. But such observation can only be supplementary, when visual observation is impossible.

4. Attacks on Enemy Vessels in Their Harbors and Bays
Cases of attacks by our submarines on enemy vessels in their harbors and bays are fairly frequent.

[Table 22 here in original text.]

Table 22 shows that attacks in enemy harbors and bays were especially frequent in the north, where 14 such attacks were conducted. This comprises 10 percent of all torpedo attacks conducted by Northern Fleet submarines. However, the success rate of these attacks was lower than those in the open sea.
The most difficult aspects of conducting these attacks were the submarine’s penetration into an enemy harbor and then its escape after the attacks. The firing of torpedoes was significantly easier, since the targets were principally anchored ships. The occupation of a suitable firing position was difficult in the confined conditions.

Our submarines’ penetrations into the harbors at Liinakhamari and Hammerfest have already been examined. Here, our examination will be limited to the attack on 27 October 1941 of the M-35, commanded by Senior Lieutenant Greshilov, on an enemy transport near Sulina, Romania.24

At 1710, approaching Sulina, the commander detected a transport anchored near the entrance to the port. The commander decided to attack, and began to maneuver close enough to the target to fire a torpedo. The shallow depth in this area greatly complicated the boat’s approach. The boat closed for one and one-half hours, moving submerged at a slow speed. Dusk arrived and the target was no longer visible in the periscope. It was not possible to surface, because the submarine could be seen easily from either the transport or the shore. The commander continued to move submerged by dead reckoning and, intending to surface close to the transport in order to attack it rapidly. The submarine moved until 1931, frequently touching bottom. From 1931 until 1951, it had to crawl along the bottom; the depth reading was four and one-half, three, and two and one-half meters. At 1951, the submarine crawled across a sandbar; the depth increased. The submarine submerged to seven meters. At 2000, considering himself already at firing range, the commander surfaced, blowing the midship ballast tank. The weather was rainy with visibility at about 600 yards. The transport was not visible. Again, the boat submerged to a depth of eight meters and continued closing. At 2015 it partially surfaced. The transport was visible at a range of 800–1,000 yards. At 2020, the commander fired a two-torpedo salvo and immediately submerged the boat. An explosion was heard a minute later. At 2024, the boat surfaced. A large column of smoke was visible above the transport. Searchlights signaled the transport from shore. Having blown his main ballast, the commander headed toward the exit to the sea. At 2055, the silhouette of a destroyer escort departing from Sulina was spotted near the shore.

All in all, the attack lasted three hours 10 minutes. Such a lengthy period is normal for this type of attack, because the boat must move at slow speeds to conserve battery power. The submarine crept across the bottom in unfavorable conditions for 20 minutes. Part of the submarine’s hull extended above water. At the same time, the submarine itself had no observation of the surrounding situation. It would have been worthwhile for the commander to surface just enough to permit the opening of a conning tower hatch. He then could have steered the boat from the bridge, crossing this area at an increased speed.

Although firing at an anchored ship presents no difficulty in normal conditions, the firing of torpedoes in harbors (as table 22 shows) yields relatively reduced success because commanders cannot hold their periscopes raised very long when in an enemy harbor. They have to aim by bringing the boat about, which, of course, is not a simple task when the helmsman himself cannot see the point to which he is turning the boat. Usually, commanders do not take this difficulty into consideration and begin to aim at the last moment, which results in misses. If the situation permits, aiming must begin earlier, adjusting the course during each raising of the periscope.
Because a follow-on attack can normally not be counted on in these conditions, two torpedoes must be fired; if something happens to one torpedo, then the other will hit. Obviously, firing with a time interval has no place in this type of situation; firing must be done in salvo.

5. Utilization of Submarine Deck Guns

During operations on lines of communication, submarines utilize deck guns against enemy transports and against patrol forces. Anti-aircraft armament is employed against aircraft in individual cases.25

Table 23 shows cases of submarine utilization of deck guns against enemy ships during daylight hours. As this table indicates, deck guns were relatively infrequently used against transports. As a rule, even single unescorted transports were attacked with torpedoes. The following are the commanders’ reasons for this decision:

- The rapidity of the destruction of ships with a torpedo and the enemy’s difficulty in interfering with the submarine’s mission.
- The weakness of deck guns on submarine types Shch and M.
- The absence of need for submarines in the Northern and Black Sea Fleets to conserve torpedoes, since large and medium submarines almost always returned to base with unexpended torpedoes.

[Table 23 here in original text.]

However, the commanders’ neglect of deck gunnery was totally inexcusable in those cases where it was impossible to fire torpedoes at unescorted ships. Many unescorted transports were passed over because they were detected with a large angle on the bow. In these situation, submarines were supposed to use deck guns to halt the transports so that torpedoes could then be used to sink them.

The normal explanation for this is that the commander did not want to reveal his boat’s presence in a given area. However, such an explanation is not justified, since a submarine’s presence in a particular area remains unknown to the enemy only until its first attack, whether it be with a torpedo or a deck gun. If a transport can be destroyed by firing deck guns alone or in combination with a torpedo, then it should be attacked. Commanders should not wait for more advantageous engagements that may or may not occur.

In many cases, when a submarine conducted an unsuccessful torpedo attack on unescorted transports, it did not even attempt to use its deck guns. Inadequate training in the use of deck guns has caused this weapon to be ineffective in combat actions. The practice of the war has shown the utility of the usefulness of deck guns against unescorted transports.

We will present several examples that illustrate the conditions in which our submarines have conducted surface attacks using deck guns.

At 1004 on 12 September 1941, the submarine K-2, under the command of Captain Third Rank Utkin, detected a 6,000-ton mail–passenger transport at a range of 9,000 yards. The angle on the bow was about 75 degrees. Just the same, the commander initially attempted to attack the transport with a torpedo. As soon as he discovered that it was impossible to fire torpedoes, he prepared the gun crew to fire the bow weapon. At 1031, the submarine surfaced for a deck gun attack and from a range of 9,000 yards immediately opened fire with a 100mm gun. Having been

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convinced in the preceding attack that firing from long range was ineffective, the commander, trying to close rapidly with the target, gradually increased his speed to 21 knots. Thanks to this decision, the range to the transport was noticeably reduced. The crew fired high-explosive shells, several of which struck the transport. The transport then turned, apparently to ground itself on the coast. At 1039, seven minutes after fire began, an enemy aircraft was detected flying from the shore toward the submarine at an altitude of 200–300 meters. The submarine ceased firing, dived rapidly, and slide beneath the surface. When the boat was 20 meters deep, two depth charges exploded not far from it. The commander maneuvered to depart the area. At 1054, a powerful distant explosion was heard on the boat. The commander figured that the transport had sunk due to damage from the shell strikes, and what they heard was the boilers exploding. A single gun expended 26 rounds during seven minutes of firing from the submarine.

This example describes a typical situation in which using submarine deck gunnery is conceivable in contemporary conditions: an unsuccessful torpedo attack, a brief gun fight during which the transport attempted to ground itself, the forced cessation of the engagement due to the appearance of an enemy aircraft. Such a rapid appearance of the aircraft can be explained either by its presence in nearby airspace before the transport called for assistance or the enemy’s readiness to dispatch aircraft along the shipping routes. However, the latter supposition, as we will see from subsequent examples, is not supported. Despite the brief battle and the significant range, the submarine succeeded in inflicting enough damage to force the transport’s captain to ground his vessel on the coast.

At 1105 on 19 January 1942, the submarine K-23 detected a heavily laden transport (approximately 4,000 tons), sailing on an opposite course from the submarine. The commander decided to sink it with deck gunfire. The commander brought the boat about 180 degrees, prepared the gun crew, and surfaced. During this time, the transport began to skirt around Cape Svaertholtklub and quickly disappeared behind it. The commander proceeded at full ahead to catch up with the transport. Rounding the cape, the commander spotted the transport standing near the entrance to Svaertholt Cove. Two launches with crews left the ship and headed toward shore. At 1130, the submarine closed to 1,200–2,000 yards, stopped diesels, and opened fire on the transport with a 100mm gun. Direct hits were achieved beginning with the third shot. A fire broke out on the transport and it began to list and take on water. The submarine commander decided to torpedo the ship to hasten its destruction. He fired two torpedoes at 1139, but both missed. One torpedo passed behind the transport’s stern and exploded near a dock, and the second, zigzagging, passed by the stern and exploded in rocks along the shore. Seeing that the transport was sinking, the commander broke off the engagement, submerged, and headed toward the cove’s exit. Thirty-one high-explosive shells were fired over an eight-minute period, of which 23 struck the transport.

Thus, the submarine was positioned near the shore close to an enemy populated area for 14 minutes and destroyed a transport without any kind of interference. Two circumstances that attest to the commander’s insufficient caution during this attack must be noted. It was not necessary for him to close immediately with 1,600–2,000 yards of the transport. The ship could have been armed or even been a decoy, because its actions were similar to those of a decoy. At such a close range, the submarine exposed itself to great risk had the enemy ship itself had armament. The commander again displayed a lack of caution when he stopped the motors. At this moment, the submarine would have been an excellent target for an enemy submarine. It is particularly during gunnery attacks against the enemy that anti-submarine measures must be
strengthened. The method of pairing decoys with submarines has been known for some time, and in a number of cases in the present war our commanders have observed single transports and submarines in proximity. There is circumstantial evidence that our submarine S-7 perished in such a circumstance in the Aland Sea.

This example shows that it cannot be assumed that an enemy transport being attacked by submarine deck guns will always receive assistance. Even though the transport was near an enemy-populated area and its destruction took some time, it still did not receive any assistance.

Thus, since there is a possibility that the enemy might receive help, the attack should be finished as rapidly as possible. The danger of this, however, should not be overestimated. In general, the destruction of transports by surface gunnery attacks should not be abandoned because of this.

To confirm this, we present still another example. On the same day as the K-23 incident [19 January 1942], another submarine, the K-22, commanded by Captain Third Rank Kotelnikov, had an artillery engagement in the area of Cape Helnes. At 1450, as the commander was moving along the coast inspecting inlets, he detected a transport anchored in Strusteynbukht in a totally calm sea. The commander headed toward the transport submerged, intending to destroy it with torpedoes. The shore turned out to be sandy and, when the range to the transport was still 1,600–2,000 yards, the depth of the sea was only 15 meters. At 1503 the commander fired three torpedoes, but they all grounded. Coming about to use the stern tubes and withdrawing somewhat to sea, the commander fired a single torpedo at 1514, when the draft under the keel was 5–8 meters. But there was no subsequent explosion. Withdrawing to sea a bit more, the commander turned again to bring the bow tubes into action and, at 1525, fired two torpedoes. The tracks of both torpedoes were clearly visible in the periscope. But there were no explosions this time either, just a report from the sonar operator that he had heard the explosion of torpedoes. The commander decided to suspend the torpedo attack and headed out to sea.

At 1535, he detected a 700-ton escort vessel of the fishing trawler type in the periscope, heading from Cape Helnes to Strusteynbukht. The commander decided to destroy the escort vessel and then the transport with deck gunfire. Having prepared the gun crew to go topside, the commander surfaced and immediately opened fire on the escort vessel with the 100mm gun from a range of about 4,000 yards. A hit was achieved with the second shot. A fire started on the ship and it began to settle into the water by the stern.

The commander ordered the gun crew to shift fire to the transport. When they laid the gun, the gunner saw in the sight not one, but two transports standing near the shore, overlapping each other (displacement approximately 5,000 and 8,000 tons). The closest transport was sinking, listing to starboard, apparently from a torpedo hit. The crew began firing at the second transport. A battery, apparently antiaircraft, opened fire on the submarine from the shore. Eight muzzle flashes were seen, but the shells fell way short. While the submarine engaged the transport, the first patrol vessel fought its shipboard fire. At the same time, a second patrol vessel appeared from behind Cape Helnes. Fire from the bow gun was shifted once again to the damaged patrol vessel. A hit was achieved in the initial shots and the ship sank. Seeing this, the second patrol vessel turned around and took cover behind the cape. The bow gun again shifted fire to the transport. At 1554, the transport began to sink with a list to starboard. The submarine ceased firing, submerged, and departed the bay. Later, the commander once again surfaced and
confirmed that both transports had sunk. In a 15-minute engagement, the submarine had fired 48 100mm shells and had destroyed two ships. The firing range to the transport was 3,000 yards.

This example shows that even in the presence of weak interference from the enemy, submarines with heavy armament can achieve success. The excellent gunnery of the submarine’s gun crew, which achieved hits on the patrol vessel with first shots, must be noted.

The boats in these examples were K submarines, which have two 100mm guns. But as was pointed out, they intermittently utilized only one of their guns and achieved the desired result. Thus, to a significant degree, the experience of these boats can be passed along to type L, D, and S submarines.

We will now present examples of submarines using 45mm cannons during daylight hours. At 1738 on 18 May 1942, the submarine Shch-205 noticed a 1,500-ton transport moving along the coast at a range of 1,200 yards. The commander decided to attack the transport with the deck gun. Taking a course parallel to the transport, he came abreast of it. At the moment when the commander intended to open fire on the transport, the transport detected the submarine. Turning sharply, it ran aground. A schooner came alongside the transport and dropped anchor.

At 2049, the submarine began firing armor-piercing incendiary shells at the transport and schooner from a range of 2,400 yards. At 2056, fires broke out on both the transport and schooner. The gunfire was ceased at 2102. Altogether, 136 45mm shells were fired, of which 99 were armor-piercing.

The large quantity of shells expended is noteworthy. But it must be taken into account that the transport was already on a sandbank. Consequently, it had only to be forced over on its side to sink it, which required several hits below the waterline. This was extremely difficult to do with the 45mm cannon. After seven minutes of gunfire, fires broke out on the transport and the schooner. The commander was correct in not approaching any closer to the transport. Besides the threat of the enemy opening fire on the submarine, the commander had to consider that the shallow water would cause difficulty for his own boat. Had the submarine needed to submerge quickly, it would not have been able to do so.

At 0845 on 9 December 1941, the submarine K-22 detected the silhouette of a ship at a range of 8,000 yards. The surfaced submarine began closing with the ship. The silhouette turned out to be a small cargo vessel of 300–400 tons. The submarine fired a torpedo that passed under the ship’s keel. The commander, deciding to sink it with gunfire, opened fire with two 45mm cannons. Coverage of the target was achieved on the fourth salvo. A fire soon broke out on the ship and it sank. Altogether, 24 high-explosive shells were fired.

Thus, although the 45mm cannon has significantly less target effect than the 100mm gun, with good marksmanship it can sink a small ship.

In summation, the following can be said concerning daytime deck gun attacks against transports. Deck gun employment is acceptable when a ship cannot be sunk with a torpedo. The firing range should not exceed 9,000 yards, because deck gunfire from greater ranges is ineffective (Northern Fleet, attacks of the K-2 on 9 August and 14 August 1942). On the other hand, the range should not be less than 3,000 yards so as not to put the submarine in great danger in case the transport is armed. During the entire engagement period, the commander should be ready to submerge rapidly.
On the average, 30–40 high-explosive shells of 100mm caliber are required to sink a transport of modest tonnage.

A few words need to be said about using deck guns against enemy patrol forces. In the north were several cases when submarines engaged enemy escort vessels and cutters. We have already described one of these episodes (K-22 on 19 January 1942). We will present yet another.

At 1311 on 3 December 1941, the submarine K-3, positioned not far from Hammerfest, detected a transport escorted by a fishing trawler-type vessel and two patrol cutters. At 1328, the submarine, having fired four torpedoes from a range of 3,200 yards, sank the transport. After firing, the submarine rapidly came up to a depth of six meters. During its steep dive, two explosions were heard. The sea depth in the boat’s position was 115 meters on its navigational chart. The commander decided to increase the depth of his course. At 60 meters the boat struck the bottom at full ahead. After three subsequent bounces, it lay at a depth of 83 meters. As it later became clear, the fuel cells had begun to leak diesel oil and an oil slick was forming above the submarine.

Seeing this, the patrol vessel and cutter began to drop depth charges that exploded quite near the submarine. Considering the proximity of Hammerfest, from which the enemy could receive reinforcements, Division Commander Captain Second Rank Gadzhiev suggested that the submarine commander surface and try to make it to the fjord’s exit by using his powerful deck guns and surface speed.

A gun crew was readied to go topside and, at 1507, the submarine quickly surfaced. From the bridge, the commander saw a patrol vessel and two anti-submarine cutters at a range of 5,000–6,000 yards moving from the fjord’s exit toward the submarine and blocking the fjord’s exit. A minute after surfacing, the submarine opened fire on the patrol vessel with a 100mm gun. At the same time, the cutters began firing tracer rounds at the submarine with heavy machine guns; the patrol vessel fired its two 75mm guns. The submarine’s first shots landed under the bow of the patrol vessel. The fifth shot fired hit the patrol vessel. Either fuel or depth charges exploded and it quickly sank. The cutter nearest to it moved to assist the stricken patrol vessel, and quickly received a hit and also sank. The second patrol cutter began to withdraw on a zigzag course toward Rolvsøy Island. Though the cutter was also fired on, it managed to gain shelter. Altogether, 42 100mm shells and 42 45mm shells were expended. These shells were fired principally at the second withdrawing cutter. The boat had more than 10 holes in its outer hull and conning tower, but no crew members were injured.

Inasmuch as the submarine was in a precarious situation due to the diesel fuel leak and the closeness of an enemy light forces base, the division commander’s decision to break out using the submarine’s powerful deck guns must be considered correct. The boat’s success affirms the appropriateness of the decision.

However, it would be incorrect to conclude that submarines with heavy guns can feely spar with enemy patrol vessels. A chance hit on the pressure hull can deprive a submarine of all its tactical advantages over surface vessels. Therefore, a submarine should engage patrol vessels only when the situation warrants or when it can destroy a transport guarded by weak escort forces.

This view is reinforced through review of the available data of the submarine K-2, which perished as a consequence of an artillery duel with enemy patrol ships. The submarine reported
to the command that it had destroyed an enemy transport and two patrol vessels but that it could not submerge because of damage. By evening of that same day, it was learned from enemy radio intercepts that the K-2 was being pursued by aircraft and cutters. Just the same, the submarine managed to break away from the enemy that evening. But on the following day, aircraft again detected the submarine and summoned assistance for its pursuit. Later, German radio reported the sinking of a “large Soviet submarine.” Anti-submarine patrol boats sank the K-2.26

From these examples and the data in table 23, the conclusion can be drawn that the engagement range for daylight attacks should not be less than 3,000–4,000 yards. In this case, the submarine should be positioned outside the actual firing range of large-caliber machine guns.

**Utilization of Deck Guns against Enemy Ships at Night**

Table 24 presents a summary of night deck gun attacks. As this table shows, there were several instances of night artillery attacks. For the most part, commanders readily used deck guns if they were unsuccessful with torpedoes. Having already surfaced, commanders decided more easily to utilize deck guns against transports proceeding singly. In addition, the surfaced submarine was in less danger from enemy aircraft and submarines at night.

To a large degree, the initial deck gun attacks indicated that crews were ill-trained for night gunnery. Muzzle flashes blinded the gunners and they either fired shots at great intervals or fired many shells wildly. Thus, on 23 February 1942, the submarine Shch-213, having conducted an unsuccessful torpedo attack on a schooner, decided to sink it with artillery and fired only 55 45mm shells in 33 minutes.

At 1550 on 16 October, the submarine M-35 detected three tugboats with six barges. The submarine began to maneuver for a torpedo attack but, seeing the shallow draft of the barges, did not fire torpedoes. Instead, the commander decided to destroy the barges with artillery fire. The commander, however, was unable to surface immediately because enemy aircraft were flying above the barges. With the onset of darkness at 1848, the submarine surfaced, caught up with the barges, and engaged them from a range of 600 yards with 45mm cannon and machine gun fire. A tugboat responded with sporadic rifle fire. In view of his lack of gunnery success, the commander ceased fire at 1915. In 27 minutes, the submarine had fired 110 shells and 500 rounds, and only four shell strikes had been observed on the barge. On completion of firing, two long machine gun bursts passed across the tugboat. An explanation of such a low success of firing from a range of only 600 yards is that the gunners, not having been trained in night firing, were blinded by the muzzle flashes and could not see their target. The rolling and pitching of the boat caused even more difficulty for the gunners.

The night attacks conducted in the fall of 1942 in the Gulf of Bothnia by the submarine S-13 deserve attention. At 2220 on 11 September, the submarine detected a light which turned out to be a transport (figure 20). The commander came about to close with it. A torpedo fired without the use of the night sight passed in front of the transport’s bow. Having detected the submarine, the transport extinguished its light and turned around. The submarine commander decided to attack it with artillery and came about on a parallel course. At 2325, positioned a bit ahead and abeam of the transport, the boat opened fire with its 45mm cannon from a range of 1,200–1,600 yards. The deputy commander controlled the fire because the gunner officer was in the first compartment preparing torpedo tubes for firing. Thirty shells were fired in a five-minute
period. Several hits were observed, but the transport, not losing any speed, attempted to get away from the submarine.

[Figure 20 here in original text.]

Ceasing fire from its 45mm cannon at 2330, the submarine began firing range-fused fragmentation shells and high-explosive shells from its 100mm gun. At 2333, when 13 rounds had been fired from the 100mm gun, the transport, having received several hits, stopped and signaled in international code, “I wish to talk with you.” At this time, a torpedo that had already been fired stuck the transport; it capsized and quickly sank. This submarine’s second attack using artillery occurred on 17 September (figure 21). At 2020, when it was still light, the submarine detected a transport through the periscope. Since it was impossible to close for a torpedo attack, the commander decided to follow the transport submerged until the onset of darkness, then surface, overtake it, and destroy it. At 2130, the submarine surfaced and began to track the transport. The sea was at force 4–5. At 2209, the submarine occupied a position for torpedo firing and fired a single torpedo. It missed and passed in front of the ship. A second torpedo attack was conducted at 2346, but with no hits this time either.

[Figure 21 here in original text.]

The transport spotted the submarine, opened fire, and began to withdraw, leaving the submarine behind. The commander now decided to sink the transport with artillery. At 0021, the submarine took up a position 600–800 yards from the transport at an angle on its bow of 135–140 degrees and opened fire with its 100mm gun. This time, the gunnery officer directed the engagement. The strike of the first round started a fire on the transport and small flames rose up. This circumstance facilitated aiming of the gun. After several hits the transport, apparently with a jammed rudder, began to move in a circular pattern. One of the next hits struck the bridge. The transport stopped and the submarine ceased firing. At 0041, the submarine once again fired a torpedo at the transport, which also missed. The transport began to move again.

Visibility became significantly worse, even at 200–300 yards. At times, the transport disappeared from view. The submarine passed within 20–25 meters of the circling transport in the darkness. At 0051, the submarine again opened fire with the 100mm gun from a range of 200–300 yards. A fire quickly broke out on the transport, which then became clearly visible. This facilitated firing. Altogether, 24 100mm rounds were fired. The gun crew had to work in water up to their knees, as the waves washed over the deck.

In both attacks, the commander hastened to utilize the deck gun after unsuccessful firings of single torpedoes. The example of the first attack shows how effective the 100mm shells were in comparison with those of the 45mm cannon. Thirteen 100mm rounds forced the transport to surrender, while 30 45mm rounds had almost no effect. In the second case, 24 100mm rounds destroyed a transport in even more difficult firing conditions. The duration of the attacks is worth noting. In the first case, the attack lasted one hour 15 minutes; in the second, two hours. This is partially explained in that the commander utilized artillery first, then torpedoes. To occupy a position for a torpedo attack sometimes requires a significant amount of time. When a deck gun is used, it must be fired until the transport is destroyed or dead in the water.

Particular attention should be given to the extremely close distance to which the submarine closed with the attacked ship at night. In other examples, submarines closed to within 200 yards of an attacked vessel to conduct firing. In the Black Sea, there have been cases of even
closer ranges. There is no need to emphasize how dangerous it is for a submarine to get so close to an enemy ship in contemporary conditions, no matter how innocent it may appear. We have had proof since even before the war of the enemy’s use of entrapment. Our submarines have confirmed this more than once during combat operations. Even though we have successful cases of submarines closing with the enemy to very close distances, in no way should this serve as a basis to conclude that this ought to be done. We do not yet know the reasons for losing several of our submarines and have not excluded the possibility that they displayed a lack of caution. Night visibility conditions demand that engagements be conducted from significantly lesser ranges than those in daylight.

This also leads to fewer successes at night. Thus, submarines have to fire from close ranges, but not be extremely close (less than 600 yards). Selecting a position during low-visibility conditions takes on special significance. The submarine has far more possibilities in selecting a firing position at night than it does during the day. It should always remain in the dark portion of the horizon during firing and should hold as low a position in the water as sea conditions and the requirement of servicing the gun permit.

Interestingly, in spite of the difficulty of night firing, a decrease of the range has contributed to an increase in the number of successes and a reduction in the number of shells being fired. Approximately 20 100mm rounds have been required to sink a transport, even a large one.

All the above examples show that in many cases, artillery is the sole weapon that can ensure the destruction of an enemy ship; in some cases, artillery can permit submarines with heavy deck guns to avoid pursuit by light vessels. This is also an indicator of the importance of deck guns on submarines.

It is necessary to dwell briefly on the utilization by submarines of scuttling charges for the destruction of enemy ships. In 1942, scuttling charges were used on the Black Sea. The submarine Shch-214, under the command of Captain Third Rank Vlasov, detected an enemy ship at a range of 6,000 yards. At 0518, the surfaced submarine approached the schooner and ordered the crew to disembark into small boats and the captain to bring his documents to the submarine. When the captain arrived, a scuttling party from the submarine went to the schooner on its captain’s launch. At 0525, the scuttling party reached the schooner and at 0530 blew it up with two seven-pound charges. The schooner sank rather quickly.

A submarine detected a schooner at a range of 18,000 yards. After several days, this submarine closed with the schooner, surfaced, and acting in exactly the same manner as in the first case, sank the schooner with scuttling charges. This time, the scuttling party was aboard the schooner six minutes, during which time documents were found and taken. A third schooner was destroyed in the same manner.

While giving due testimony to the bravery of the submarine’s captain and crew, who had resurrected the submarines’ “classic” method of destroying merchant ships practiced at the beginning of the last world war, we cannot recommend similar operational methods to other boats. Obviously, the scuttling party and submarine are exposed to great risk. One of the schooners could have been a decoy. In fact, the Black Sea Fleet’s intelligence department has reported that the enemy has such a ship—a schooner. There, the risk is the possibility of an enemy aircraft appearing. Taking enemy personnel aboard the submarine, even in the best of circumstances (the submarine alongside the schooner) would take more time than required by an
aircraft to reach the submarine. The commander would be forced to leave his scuttling party at
the mercy of fate if he submerged or risk the submarine if he remained surfaced. In the given
situation, the risk was unnecessary. The commander was able to capture the captain with his
documents and sink the schooner by fire. If it is necessary to inspect a schooner in order to find
useful documents, it may be worthwhile to take such a risk one time, but this should not be
incorporated into our standing operating procedures.

Thus, the destruction of enemy ships with scuttling charges can be accomplished in areas
with relatively weak enemy air activity and, as an exception, only when the dispatching of
personnel to the ship is associated with the submarine’s mission.
Chapter IX

Use of Submarines for Obstacle Emplacement

Mines placed on enemy sea lines of communication inflict materiel losses through the destruction and damage of ships on mines and also severely inhibit the enemy’s activities. Minelaying submarines are capable of covertly placing mines in any sector of the enemy sea lines of communication, at any time of the day or night, and even laying them directly on the course of moving ships or in zones already cleared by minesweepers. Mines, therefore, are a significant weapon to use against enemy shipping.

Submarines have a number of capabilities that make them especially suitable for conducting mine warfare on enemy sea lines of communication. Minelaying submarines can independently penetrate into enemy shipping lanes and even into his base exits without being discovered. Because of this, submarines can create a mine threat along the enemy’s entire shipping routes. This significantly increases the effectiveness of minefields emplaced by submarines.

By observing the enemy’s shipping patterns, submarines can precisely determine the routes used by the enemy and place mines in the most constrictive places. This forces the enemy not only to conduct minesweeping but also to use minesweepers to accompany transports.

By watching an area and periodically laying mines, a submarine can reseed a minefield that has been swept by the enemy. This creates a prolonged mine danger in the area, using a small reserve of mines. By monitoring an area where mines have been laid, submarines control the results of their placement. This facilitates a more effective use of mines. A submarine can finish off with torpedoes a ship that has detonated a mine, but not been sunk by it.

Finally, and this is very important, a submarine can precisely locate the mines it has placed. This circumstance fundamentally differentiates the placement of mines by submarine from their placement by aircraft. Aircraft, as is well known, are very imprecise in locating the mines they have placed. Additionally, this is significant for submarines operating in a given area. Not knowing the exact location of our mines in a particular area presents a much greater threat for our ships than it does for those of the enemy. If the mines remain unknown to the enemy, then he can be made aware of them gradually. For our ships in this area, the constraining influence of knowing that mines are in the area but not knowing their exact location begins to be felt the moment of their placement, and can continue much longer than the actual existence of the mines. Such a situation existed on the Black Sea, where a large area along the western coastline was closed for movement of our submarines after several mines were dropped by our aircraft. Mines placed by our submarines minimally constrain our ship movements.

The widespread use of submarine-laid mines against the sea lines of communication during World War I is evident in the fact that the Germans placed more than 11,000 mines just in the waters around England. More than 250 transports perished on these mines. At the beginning of this war with England, the Germans have also placed many mines along its shores, including those placed by submarines. The British have again suffered significant losses on these mines.

Since we have accepted into our submarine service the new PLT-3 mines, which are delivered from torpedo tubes, and the PLT-2, a floating mine for type L minelaying submarines, the question of using mines against enemy sea lines of communication has become acutely significant.
The utilization of submarine-delivered mines on enemy sea lines of communication has a specific nature in each of our theaters, conditioned sometimes by the geographical peculiarities of a theater (north) and sometimes by the existing views of the command toward minelaying submarines (Black Sea).

In the Northern Fleet, by there were two type K minelaying submarines the beginning of the war. However, the minelaying apparatus had not yet been placed into service on submarines of this type. Therefore, in the first days of the war, these submarines could not be considered minelaying submarines. From August to November 1941, an additional four type K submarines were activated in the Northern Fleet. By this time, the minelaying apparatus had been approved for these boats and the fleet had received a modest supply of type EP mines for these boats. Thus, in September 1941, the Northern Fleet acquired the ability to begin laying minefields with six type K submarines.

Type K submarines were constructed mainly as torpedo-firing submarines, and at no time before the war were they considered a special minelaying submarine. Mines appeared on them almost as a “free supplement.” It cost very little to place the minelaying system on them—an insignificant increase in the boat’s displacement. Depending on the situation, it was thought to be worthwhile to have submarines place mines on remote sea lines of communication where the enemy would not expect them. In addition, it was assumed that under certain conditions, mines would be placed on convoy movement routes. The submarines received 20 specially constructed type EP mines, which were placed aboard through two mine hatches. These mines have the following basic characteristics: 300 kilograms of explosive; length of tether, 160 meters; time of arrival at specified depth in an armed condition, 2–4 minutes; and a Chayka [seagull] anti-sweeping device.

The large dimension of the submarines with relatively short tethers made minelaying operations in the north quite difficult. The depths that permitted the laying of mines with this tether length existed only inside fjords, in straits between islands, and along the coasts. In addition, the placement of mines was acutely complicated by the changing depth of the sea. Sometimes, before dropping a mine, the depth of the sea had to be checked with sonar. The large incoming and outgoing tides also created some difficulty. Since the depth settings on mines were imposed during their loading aboard the submarines, they could not be altered. Therefore, the mines had to be laid at a specified hour of the incoming tide so that at low tide they would be at the desired depth. Additionally, although the minelaying apparatuses were tested in base before minelaying operations, they were still not fully developed, and stormy weather would cause unexpected “surprises.” Nonetheless, in a number of cases, commanders and crews of these submarines coped with all of the difficulties and conducted successful minelaying operations in difficult and complex conditions.

In the second half of 1942, when the Northern Fleet received two type L minelaying submarines and a supply of mines, it appeared that mine warfare against enemy sea lines of communication would accelerate.

Type L minelaying submarines could use 20 type PLT mines in special mine tubes. These mines have the following basic characteristics: 300 kilograms of explosive; a tether 130 meters long; a time of arrival of the mine at a specified depth in an armed condition of 5–15 minutes; and no anti-sweeping device.
Type L submarines themselves displace one and one-half times less water than type K submarines, which facilitates the Ls’ actions in narrow straits. Their mine delivery apparatus has already experienced “childhood illnesses” and therefore operates almost without stoppages. In the northern conditions, the utilization of type PLT mines is somewhat more restricted because their tether is shorter.

To provide an understanding of minelaying conditions, we will discuss several cases, along with the typical methods used and the errors that were made.

On 7 September 1941, the first submarine was sent out to place mines in the Vardo area was the K-2, commanded by Captain-Lieutenant Utkin. The boat was “to place mines near Vardo and sink enemy transports.” By this time in the war, we knew the enemy shipping routes in the Vardo area. A passage between a sandbank and the coast was designated as the minefield site.

The submarine arrived in the area on the morning of 10 September and, at 0808, began laying mines. Mines were placed in banks of four mines each, in the channel, 400–600 yards from the danger of the sandbank and 800–1,000 yards from enemy shore batteries.

Therefore, the submarine only laid 14 mines and six were taken back to base. Mines were placed in the banks with a minimal delivery interval (60 meters). The depth of the mines was set at 14 feet. The time of placement was set so that the emplaced mines had neutral buoyancy at a depth of six feet.

The results of this minelaying operation are unknown. We know that the enemy swept the waterways near his own bases most often. In addition, he obviously sent minesweepers out ahead of ship departures. In such conditions, it was not particularly difficult for the enemy to render himself unharmed from our mines, which did not have anti-sweeping devices.

This is why we did not count on the destruction of ships on mines in this situation. The mission statement regarding mines, “lay a minefield,” was not good at all. It was extremely passive and lacked thought. The purpose for which the mines were placed remains unknown. The impression given by the above example is that the location of the minefield was designated to the submarine. This leads one to think that the primary purpose was to make entering and exiting Vardo difficult for enemy ships and, if possible, to inflict materiel losses on ships by detonations. The placement of mines in banks was logical for such a purpose. However, the interval between mines should have been greater in order to make sweeping them more difficult.

Obviously, this first placement of mines was conducted before a general plan of mine warfare on enemy sea lines of communication had been established. Equally obvious is that one such placement of mines could not substantially constrain enemy transport movement. From the point of view of inflicting materiel losses on the enemy, it was unsatisfactory.

The enemy’s first detection of our submarine-laid mines should have warned him to take precautionary measures on other sectors of his sea lines of communication. Therefore, when establishing a new minefield (accomplished for the first time or after a long break), we need to select enemy movement routes that are far from his bases. This way he will not be able to sweep the minefield frequently or easily provide minesweepers to accompany his ships. Many such sectors existed in the north and submarines subsequently laid many mines in them. As far as can be judged at this time, the distant minefields have yielded greater successes than those placed near bases. Thus, the purpose of this first placement of mines was to constrain enemy ship movement in the Vardo area and inflict materiel losses on transports by blowing them up.
The next minefield was laid more than six weeks later. This time, it was accomplished by the K-1, under the command of Captain Third Rank Augustinovich. The submarine sortied from its base on 21 October 1941, with the mission of conducting “actions against enemy transports and placement of three mine banks.” The laying of mines was to be carried out in accordance with an overlay provided to the commander.

A force 8–9 storm arose on 24 October and lasted three days. The submarine experienced 53 degrees of list and electrolyte flowed out of the batteries. Loud knocking noises were heard in the mine storage chamber. On 27 October, positioned at its specified site in Mageroysund, the submarine began to lay the mines. The sonar operator monitored the entire mine-placing process, right up to their separation from the anchor. After dropping five mines, the elevator apparatus cable came loose and two mines became stuck in the hatches, jamming the drop mechanism. Later, both stuck mines dropped free of the hatches. When the chamber was opened, it was discovered that as a result of the storm, mines had become dislodged from the rails and turned over. The mines in the starboard were put in place; five mines in the port chamber had to be disarmed and secured.

On 29 October, the submarine laid an additional two banks of five and two mines in a designated site in Breidsund. One mine, as it was revealed alter at the pier, again became stuck in the hatch. Mines were place with large intervals—400 yards. Some five and one-half hours after laying the mines, at dusk, the submarine, which was surfaced with empty ballast tanks, observed a large explosion and heavily burning flames in the area of the mine bank. Soon, a large fire broke out on the water and several additional explosions were heard. The commander observed all this for two hours, after which he departed the area. It is believed that an enemy tanker exploded on the mines while attempting to cross an area that was most dangerous from submarines. Subsequently, the captured captain from the sunk transport confirmed this and reported that on 9 November, a loaded German transport displacing 9,200 tons also sank in this same area.

This example supports the principle regarding the utility of submarines placing mines in known enemy shipping lanes far from his bases. The spreading out of the banks and the dispersed laying of the mines in the banks were justified. After the enemy ship’s first detonation of a mine, the enemy apparently swept and removed the mines from the channel; however, some mines still remained. A transport moving in the channel but not exactly in the shipping lane might easily strike one of these mines.

The submarine K-23 was simultaneously placing mines in the Kirkenes area. This mission was being carried out in extremely difficult navigational conditions and its results were unknown.

The next placement of a minefield was carried out by the K-21, under the command of Captain Third Rank Zhukov. The division commander, Captain Second Rank Gadzhiev, was also on this submarine. The boat departed base on 7 November. It arrived at the designated area on the morning of 9 November and headed toward Bust Strait, where it was to place mines. The captain decided to reconnoiter the area in order to determine the precise movement route of enemy ships. With the onset of darkness, the submarine surfaced and quickly noted a ship’s running lights at 10,000 yards, moving in the strait from east to west. Remaining surfaced, the submarine began maneuvering for a torpedo attack, simultaneously noting the course of the enemy ship. Exactly an hour after beginning the attack, the submarine fired two torpedoes at the
transport from a range of 1,600 yards. There were no hits; in fact, the transport did not know that it was being attacked. Believing that the vessel had shallow draft and that the torpedoes ran underneath it into the strait, the commander did not fire again. Finding itself in shallow water, the submarine entered the strait and laid mines on a heading crossing the transport’s course. Ten minutes after laying the mines, the submarine went out to sea to recharge its batteries. On the same night, a large mass of flames blazed up in the direction of the minefield; it subsided three minutes later. It is believed that an enemy transport struck the mines laid by the submarine and then sank.

The submarine proceeded to Hammerfest the next day. Only one minesweeper was anchored in the harbor. After determining its location, the submarine began clearing mines. The dispensing device jammed after six mines had been dropped. The submarine attempted to attack the minesweeper with a torpedo, but a snow squall interfered. An enemy motor launch spotted the submarine and fired flares. By this time, having corrected the fault, the submarine had laid the remaining mines. At the time the motor launch was dropping depth charges in one passage lane, the submarine was departing Hammerfest through the other. According to available information, one enemy transport perished on the mines laid by this submarine.

The laying of mines in Bust Strait is an instructive case of mine utilization by a submarine. Having observed enemy movement, the submarine attempted to destroy a ship and then laid mines across the shipping lane that had been revealed. The second minelaying merits attention on account of its boldness. In both cases, the reward to the crew was the death of German transports. The submarine sank an additional two transports with torpedoes on this same sortie.

Submarines K-22 and K-1, remaining in the area where they had placed mines, also were able to confirm the results of their minelaying. The K-22 observed an explosion in the area of a mine bank on the night of 11 December 1941, and the K-1 observed the explosion of a single enemy destroyer escort on one of its mines on 18 December 1941.

Of the remaining sorties, the minelaying of the submarine K-23 on 6 January 1942 should be mentioned. The submarine was to lay mines inside Porsangerfjord. Departing base on 3 January, the submarine reached Porsangerfjord on 6 January and immediately headed deep into the fjord. While proceeding to the designated position at periscope depth, the submarine began laying mines at intervals of 400 yards. After laying 11 mines, the cable of the mine drive broke. So the commander would not have to return to base, he decided to repair the drive right there in the fjord. It was a moonlit night with good visibility. The commander headed toward the darkened eastern shore and stopped in the shadow of high cliffs. Holding the boat in place on the surface, with gun crews at their stations, the submariners proceeded to repair the faulty mechanism. The boat remained in this position from 1816 until 2300. Sitting right up against the shore, the boat observed motor vehicles on a road along the coast. The damage was finally repaired, and proceeding at 0025 to a new position, the submarine once again began to lay mines, moving partially submerged under the power of an auxiliary diesel engine. After laying seven mines, the mine apparatus jammed again. Two mines were left. Wanting to place every last mine, the commander moved to the western side of the fjord, which was now dark. Remaining, as before, on the surface, the submarine made repairs a second time. Soon, the silhouette of an enemy combat ship was observed moving toward the fjord’s exit, against the background of the opposite shore at a distance of 2,000–2,400 yards from the submarine. The ship passed by
without detecting the submarine. This time, the repair took approximately two hours. The last two mines were laid and the submarine moved toward the fjord’s exit.

Thanks to the courage and resoluteness of the commander, all the mines were laid by the submarine. This example shows the kind of difficulties that the crews of type K submarines have overcome in repairing minelaying equipment on combat sorties.

Table 25 provides a general summary of mine placements conducted by Northern Fleet submarines through 21 months of war. As this table shows, the command initially sent submarines near enemy bases to lay mines. We have already provided our impressions concerning this issue—it is not effective to begin mine placement with the approaches to bases. Subsequent minelaying was accomplished along the enemy’s shipping channel west of Honningsvag.

[Table 25 (two pages) here in original text.]

In this period, the Northern Fleet command pursued the goal of placing mines in passages inside fjords to force the enemy to shift his movement to external routes. This should have significantly facilitated operations of submarines and other fleet forces against enemy transports. But this required that submarines continuously and energetically place mines as their main wartime mission. As a result, they would not be in positions to conduct torpedo attacks. The small number of submarines in the north and the constant shortage of mines made it impossible to accomplish this type of minelaying. The enemy easily coped with the modest quantity of mines that our submarines were able to place. Although he suffered some losses to the mines laid by our submarines, the enemy continued to move transports inside fjords, knowing that shifting to external routes would bring him still greater losses.

It was absolutely correct for our submarines to place mines along the entire trace of the enemy sea lines of communication. This created a genuine universal mine threat and forced him to sweep everywhere he moved his ships and to disperse his minesweeping assets.

As far as can be determined, the greatest impact of minelaying in this period was in inflicting materiel losses on the enemy.

From the beginning of 1942, submarines laid minefields to the east from Honningsvag. This is partly explained in that the most accessible places for submarines to lay mines had already been utilized. Placing mines in this area broadened still more the zone that was dangerous to the enemy from mines. For the most part, minelaying was conducted inside fjords, so as not to constrain our own submarine operations.

At the end of 1942, when the type L minelaying submarine entered service and when a significant supply of mines was received during the last two months of the year, submarine mining operations were significantly stepped up. In this period, our submarines placed mines along the entire portion of the sea lines of communication that we serviced, as well as in straits and fjords. The purpose remained the same—to force enemy transports into external movement routes. However, this goal was not achieved, because our type PLT-1 mines (the principal mine used during this period) did not have anti-sweeping devices and their removal was not particularly difficult for the enemy. The Germans, having mobilized the Norwegian fishing fleet, were able to devote a large number of vessels to minesweeping. However, without doubt our submarine minelaying operations greatly complicated the organization of shipping along the entire extent of the enemy sea lines of communication in this period.
Minelaying submarines actually accomplished the missions of disrupting enemy naval shipping and attacking ships with torpedoes through this entire period. Thus, submarines were not only minelayers but also attack boats. When minelaying was limited not by the number of minelaying submarines available but the quantity of mines on hand, such utilization of minelaying submarines was justified. This situation was even more correct in the north for type K submarines, which had very powerful torpedo armaments. When there was a shortage of submarines, the withholding of type K submarines from torpedo attacks was not warranted.

It was appropriate that the submarine commander was normally granted permission to adjust the site of mine placement on the basis of his own reconnaissance. When there was sufficient precise data about enemy routes, the submarine was given an overlay that specified where the mines were to be laid. This method of stating the mission, as is obvious from the above examples, justified itself.

As table 25 shows, almost all minefields were emplaced in banks of from one to 10 mines. The intervals between mines were greater, principally on the order of 400 yards. This placement greatly complicated the enemy’s effort in dealing with the mines. Minesweepers were easily able to miss a mine when they were so dispersed. Transports, of which there were sometimes a considerable number in a convoy, likewise could collide with one of the mines and detonate it. The enemy had great difficulty in searching for all of these widely dispersed mines. Another complication for the enemy was that mines were often placed in bypasses, not on a direct course. Two sweeps of the mined area did not reveal the trace of their placement; therefore, each mine had to be located individually.

Since submarines remained in the mined area for some time, they could determine the results of their minelaying operations and also the most effective method of mine placement.

The effort not to inhibit our own submarine operations with these mines was appropriate. However, it must be noted that in early 1943, submarines began to place mines outside of fjords within the boundaries of the corridor established between the coast and the German-placed mines. In this case, we used the constrained situation in which the enemy had placed himself. Stepping up the placement of mines in this zone could force the enemy to sail more seaward of his own minefields. It is questionable whether it would be advisable to force the enemy from the routes that he constantly used and that were fully defined and known to us. If the enemy would shift movement to the open sea, then our submarines would always have to locate his ships in broad regions. He could easily change the location of his movement routes in the open sea. Consequently, from this perspective, pressuring the enemy from the coastal routes (not from within fjords) was not quite so rational. The second negative consequence of placing mines on open reaches (primarily near capes) was that our submarines sometimes would make large navigational errors when approaching from the sea and then strike our own mines. Submarines did not place many minefields in this manner and once again returned to the laying of mines inside fjords.

Mines were made safe in the event they came to the surface. Such a measure was dictated by the following considerations. A mine floating adrift on the surface was dangerous to our submarines servicing areas close to the minefield site. In addition, many mines that came adrift from their mooring cables were carried toward our shores and bases. Thus, they were a great danger in our own waters. If these considerations were appropriate for areas located close to our bases (Varangerfjord, Vardo), then it was logical that the mines remain armed in case they

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surfaced from the depth at which they were placed for remote positions seldom serviced by submarines.

The experiences from submarines laying mines in the Baltic Sea are quite interesting and instructive. The shallow depths in this theater made widespread utilization of mine warfare possible. However, the extremely insignificant complement of minelaying submarines in the Baltic Fleet brigades limited the employment of submarine-laid mines. There was only one type $L$ minelaying submarine and two Lembit type submarines in service throughout the war to date, of which one was lost in the fall of 1941.

*Lembit* type minelaying submarines (formerly Estonian) could hold 20 mines of the *Motala* type in vertical shafts located in the ballast tanks. These mines had the following basic characteristics: an explosive weight of 200 kilograms and a 120-meter long tether. There were only 60 of these mines, which were received from the Estonian Navy. This limited the number of minelaying sorties that these submarines could make to three.

The submarine $L$-3, commanded by Captain Third Rank Grishchenko, conducted the first minelaying sortie at the beginning of the war. The $L$-3 was in Libava when the war began. The base chief of staff sent the boat out on the very first day toward Steynort to conduct a base patrol. The boat lost communications with the command on the second day of its sortie. At the same time, the submarine commander received a radio message from the brigade commander with orders to proceed to Memel and place mine banks between two specified points. The time between 26 and 28 June was set aside for laying the mines. The radio message indicated that the submarine $S$-4, located in this area at the time, would move to the west.

On the following day, while approaching the minefield site submerged, and based on a report from the sonar operator, the commander detected a transport four miles from a buoy, proceeding west from Memel. An attempt to attack it was unsuccessful. Before reaching the buoy, the transport turned south, rendering an attack impossible. Almost simultaneously, a transport was detected moving along the same route toward Memel. It became obvious to the submarine commander that the shipping lane was some distance from the site in which he had been ordered to place mines. The commander knew that the site of mine placement was in the $S$-4’s operational area, and the concept of command (which had precisely determined this site) was not clear to him. Therefore, since the commander did not think it possible to deviate from his orders, he began to place mines in the designated site.

During the minelaying, two more transports sailed from Memel along the same course as the first two. In accordance with instructions, the mines were placed in four banks with five mines in each, away from the enemy’s shipping lane. When the submarine completed the minelaying, it immediately departed the area and headed to its position toward Steynort. Withdrawing 20 miles to the west, the submarine surfaced, turned toward the north, and then continued moving surfaced. Soon the periscope of another submarine (the $S$-4) was detected. The $S$-4 had detected the $L$-3 under way, had taken it for an enemy submarine, and was now attempting to engage it. Recognizing the $L$-3 not long before firing, the $S$-4 broke off its attack.

The brigade commander was able to draw a number of useful conclusions from this sortie. First, the incorrectness of the submarine’s mission statement was obvious. Having specified the site of mine placement, the brigade commander overlooked some of the valuable capabilities of submarine minelayers—their ability to determine the routes used by the enemy and to select the minefield location accordingly. Having ordered mines to be laid in a precisely
designated site, the brigade commander turned the submarine into a simple mine carrier. Also, when the brigade commander did not give the submarine commander the concept of this decision, he made the boat commander a blind executor of the decision.

This conclusion was considered in subsequent submarine minelaying operations on the Baltic Sea, which significantly increased the successes.

The mistake made in designating the minefield location in another submarine’s area of operations is clear. This constrained the submarine that was placing the mines, led to a situation where it could have been attacked by the other submarine and, finally, created a threat where the other submarine could have stuck one of the mines. The danger was increased when the mines were placed in an area where enemy traffic would be most dense, that is, in the area where the S-4 would normally operate.

The organization of this complicated operation also cannot be considered correct, since it was necessary to coordinate the actions of two submarines over the radio. The results of this were told in the chance encounter of the two submarines and in the L-3 commander’s concerns when he was deciding where to place the mines, not knowing how much the S-4’s commander knew about the minelaying.

On 15 July, the submarine again set out with the same objective, this time to the Bay of Danzig. How much was learned from the experience of the first sortie can be seen from how the brigade commander formulated his mission statement:

For the purpose of hampering enemy shipping, I order—
1) The L-3 on 15 July 1941 to depart Tallinn to Danzig Bay to place a minefield in the earlier reconnoitered movement routes of enemy ships. The right of selection of minefield location is left up to you.
2) Place the minefield in banks of 3–5 mines per bank with an interval of 200 feet between mines, at a depth of 12 feet.
3) On completion of the minelaying, remain in position with the mission of conducting unlimited submarine warfare.
4) Leave the position upon receipt of special signal . . .

The submarine arrived at the designated area on 19 July. At 0744, two traces of smoke were detected. At 0800, two minesweepers were recognized conducting a sweeping operation, and the submarine happened to be on their course. At 0850, the minesweepers, proceeding almost to the submarine’s location, reversed their course. The submarine followed in their wake and began laying mines in the area they had just swept. During the minelaying operation, the submarine proceeded under periscope and attentively observed after each mine was dropped. None of them came to the surface. At 1330, the submarine finished laying mines. At 1850, when the submarine was positioned 6–7 miles from the minefield, an explosion was heard. Large columns of water and smoke were observed in the periscope toward the minefield. At 1930, depth-charge explosions could be heard not far from the submarine. These explosions ceased at 2000. The submarine was in the same area the following day and, several times during the day, heard periodic explosions of depth charges. The next day the submarine moved to another area. The submarine Shch-405, sent to this area several days later, observed a powerful explosion in the minefield laid by the L-3. Apparently, another single transport was blown up on the mines.
This example is of great interest. Granting the commander freedom in selecting the minefield location is a clear advantage. This enabled the commander to lay the mines directly behind the minesweepers. Also obvious is the effectiveness of observation over the minefield area. That observation was conducted not only by the submarine that placed the mines but also by an attack submarine sent to this area to replace it deserves attention. Since the Baltic Fleet had only one minelaying submarine, such a method was undoubtedly correct, because the minelayer’s turnaround time could be reduced and more mines could be laid.

On 8 August, the submarine Kalev departed Talinn to lay a minefield and for “actions on enemy routes,” A square through which enemy shipping lanes passed, reconnoitered prior to this sortie by the submarine S-8, was selected for the minefield. After laying the mines, the submarine was to remain in the same area until it received a special order or exhausted its supplies. The submarine was instructed to reconnoiter the enemy shipping channels prior to laying mines.

The submarine arrived in the area at day’s end on 11 August. No enemy ship movement was observed on the following day. In the evening, the commander decided to place the mines. Believing that the channels observed by the S-8 lay too close to the coast, the commander, though he had not personally observed enemy movement, laid the mines farther out to sea. Subsequently, having detected a spar buoy and observed minesweeping in the area, the commander confirmed for himself that the shipping channel lay significantly closer to shore than where he had laid his mines.

This example shows it is not enough just to state the mission correctly. The commander must correctly understand what is required of him and what his options are. In addition, it is clear that he did not have to rush to place the mines. This commander was not restricted by time. Instead of placing the mines where he believed the channel to be (he had no basis for his belief), he should have established the location of the enemy channel by observing the minesweeping (which he subsequently was able to do), and then lay the mines. Unfortunately, this commander and others have rushed to get rid of their mines.

On 26 July 1941, the submarine K-3 was sent out with the mission “to lay mines west of Bornholm.” The submarine was ordered to conduct reconnaissance of the enemy sea lines of communication in this area and place mines in banks of 3–5 mines each on enemy ship routes. After placing the mines, the submarine was to leave the area and transmit by radio “Yes,” which meant that the mines had been laid. This submarine had just entered into service and its minelaying apparatus had not been tested. Approaching Bornholm Island, the submarine encountered enemy transports. Believing that an attack on the transports would expose his boat and thus lead to the disclosure of its minelaying operation, the commander refrained from attack.

The commander proceeded to the designated area and on the first night there detected eight transports moving with clearly distinguishable lights and absolutely no escort. The submarine did not attack even one of these transports. Having determined the location of the shipping lane, the commander decided to confirm it by moving in the transports’ wake. The submarine was unable to lay mines because the minelaying apparatus jammed. Not a single mine left the submarine. An attempt to clear the malfunction was unsuccessful. Lacking the ability to accomplish what he believed was his primary mission, the commander decided to return to base.

The commander detected two enemy transports on the following night (already after he knew he could not lay the mines) and did not attack them either. This time, he reasoned that his
attacks might compromise the follow-on submarine’s ability to accomplish the minelaying mission.

This example once again emphasizes the importance of providing a well-reasoned and precisely formulated mission statement to submarine commanders, particularly when it is associated with the placement of mines. An unfortunate wording of the mission gave the commander formal grounds not to attack enemy ships. Minelaying became a mission unto itself. In essence, minelaying has the same purpose as a torpedo attack: the destruction of enemy ships and curtailment of his shipping. Practice shows that the destruction of ships is easier to achieve by torpedo attack, and mines do not have a greater constraining influence on the enemy. Obviously, it is usually better to destroy a ship rather than simply to discourage its use; the destruction of the ship also has an inhibiting influence on the enemy. From this it can be concluded that there is no basis to refrain from sinking an enemy ship with a torpedo in order for some other ship to perish on mines. In the first place, one can never be sure that the latter will occur, and in the second place, the destruction of a ship with a torpedo is more economical than with mines.

From all of the mission statements to minelaying submarines presented above, it can be seen that the wording “place mines and destroy enemy ships” was used in all our fleets quite often. The following formulation must be acknowledged as being more correct: “disrupt enemy shipping in the area by sinking ships with attacks (torpedo and artillery) and placement of mines.” With such a mission statement, the commander does not have a basis to refrain from attacking detected transports.

The submarine *Lembit* was sent to replace the *K-3* and was to lay mines in banks of 3–5 mines each on the enemy transport routes reconnoitered by the *K-3*. After laying the mines, the submarine was to remain in the area to attack the enemy with torpedoes.

The submarine departed Tallinn on 10 August. After arriving in the designated area on 17 August, the commander detected two small transports heading south. Having established their course, the commander decided to place mines on the intersecting routes that the *K-3* had established earlier. Five banks of four mines each, with an interval between the banks of 1,700–2,100 yards, were laid at angles that intersected the shipping lanes. Having completed the minelaying task and since the submarine’s station time had expired, the commander headed back to base. At night, the commander sent a report to the brigade commander concerning the minelaying and his return to base.

It subsequently was learned that a 14,800-ton loaded Swedish transport detonated a mine and sank in this area on 10 November 1941. The same happened to an 8,000-ton Swedish transport on 23 February 1942.

This example is interesting in that the results of this minelaying operation occurred only after much delay. The first transport perished three months after the mines had been placed and the second after six months. This can be explained in that the enemy did not detect the widely dispersed banks, some of which were off to the side of the channel. Possibly, the enemy had swept only the channel, and the transports that were blown up on the mines had deviated slightly from the swept lane. Thus, it is worthwhile to place separate banks not only in the channel itself but also some distance from it.
In August 1942, the $L$-$3$ was again sent out to the area west of Bornholm. This time, the submarine’s mission was stated in the following manner: “Destroy enemy ships and on disclosure of enemy shipping lanes, place in them two banks of 10 mines each.” This type of mission statement already approximated the norm indicated above. Some question arises as to why the submarine commander should place two banks of 10 mines each, instead of some other combination which could be more effective in the situation.

The submarine departed on 9 August 1942 and arrived at the designated area on 24 August. On the night of 25 August, the submarine observed transports moving with lights. Because this submarine was the first in the area in 1942, the enemy perhaps believed that he was not in any danger. The submarine began laying mines in the obvious enemy channel during the day. After laying six mines, the equipment jammed. A mine anchor became stuck while leaving the tube; the mine separated from it and was dragged behind the submarine by its anchor cable for half an hour. The mine was finally freed from the cable and on 26 August, the submarine laid an additional two banks of four and nine mines. On the same night, it attacked an enemy transport.

The submarine sank five transports with torpedoes on this sortie, among them one 15,000-ton tanker, which was sunk en route to the operational area. According to available information, a destroyer escort and two enemy transports were sunk in the minefield laid by this boat. This was the most effective of all the submarine minelaying sorties.

The specific wording of the mission statement led to a situation where the commander was actually unable to carry out the order. Instead of the specified two banks, he laid three. As the results of this minelaying operation show, there were no negative consequences.

The mission statement for the sortie of the $L$-$3$ at the end of October 1942 was as follows: Occupy a position in the Uto area, and after two days of reconnaissance lay a mine bank in the Uto channel. After laying the mines, move to an area bounded by the latitude of Vindava–Nidden and the meridian 20 degrees 30 minutes, where you will lay a mine bank on the approach to Memel in the established enemy shipping lane. On completion of the minelaying, remain in this area to destroy enemy transports and military vessels.”

As seen from this wording, the rule of carrying out minefield placement on the basis of reconnaissance conducted by the submarine was fully established in the Baltic. Unfortunately, the submarine commander in this particular sortie deviated from this rule and his orders. During the day on 2 November, without conducting any preliminary reconnaissance, the submarine laid 10 mines in a line with an interval of approximately 60 meters. On the following day, the commander observed six minesweepers clearing the area. If he had waited one day, he probably would have been able to lay his mines with great success.

On 5 November, already in his second area, the commander observed the work of eight minesweeping cutters, after which he laid seven mines. On 13 November during an attack on a convoy, the submarine was rammed by one of the ships, putting both periscopes out of commission. Deprived of its periscopes, the submarine could not conduct reconnaissance or subsequent combat operations. Therefore, the commander quite correctly decided to lay the mines using the convoy’s course as a guide. Having received permission, the boat returned safely to base.
Table 26 gives a general summary of the utilization of minelaying submarines in the Baltic Sea. This table shows that almost all minelaying was accomplished by a single submarine, the L-3. Therefore, significantly fewer mines were laid in the Baltic than on other seas during the period, but the sites of placement are quite instructive. Thanks to a more efficient method of employing minelaying submarines and the submarine commanders’ understanding of their missions, the results from submarines laying mines in the Baltic were the highest. Obviously, the examples that were presented show that individual episodes of minelaying had great success (second and third minelaying sorties of the L-3, first sortie of the Lembit): two and even three ships perished on 20 laid mines. This was achieved in those minelaying sorties that were supported by good preliminary reconnaissance by the submarine and when mines were laid in banks. The organization of observation in the mined areas enabled the command, in a number of cases, to determine the results of the minelaying effort.

The Black Sea Fleet had three type L minelaying submarines. This gave that fleet the ability to lay minefields fairly broadly even in 1941, when submarine minelaying operations were begun in August. The command established the following goal for the placing of mines on enemy sea lines of communications: to force the enemy to refrain from moving along coastal shipping channels and to intersect the movement route of ships at sea with a line of mine obstacles. It was believed that this would facilitate submarine operations against sea lines of communication and avoid the necessity of our boats passing through minefields laid by the enemy. Three sectors of coastal channels between the shore and suspected enemy minefields were designated: the areas of Cape Olinka, Mangalia, and Varna. By systematically laying mines in these sectors, submarines were to create a great threat to enemy ships.

This also determined the method of employing the available minelaying submarines. The submarines were to lay their mines on lines in the designated sectors. Thus, the submarines were transformed into mine carriers, which were to deliver mines to a designated site and there lay them mechanically. Only one of the capabilities of submarines as minelayers was used: the ability to penetrate deep into the enemy’s defenses. The submarines did not conduct any special preliminary reconnaissance to ensure the success of their minelaying, and with rare exceptions, the mines were placed in a line.

On 5 October 1941, the submarine L-4, proceeding to the area to be mined, detected the destroyer escort Regele Ferdinand. The commander attacked the destroyer escort with two torpedoes, but they missed. Even though the commander had observed the route on which the destroyer escort was sailing, he still considered it an obligation to lay the mines in the area designated in his written orders.

Almost the same thing occurred as happened with the L-3 on its first sortie. However, the command did not draw the same conclusions as were drawn in the Baltic, and the method of employing minelaying submarines remained unchanged. Since minelaying submarines were used as mine carriers, their other sorties do not offer anything instructive.

Table 27 shows the laying of mines that has occurred on the Black Sea in the past 18 months.

[Table 27 here in original text.]
Submarines laid 222 mines on western Black Sea lines of communication from August through November 1941. However, although the enemy suffered some materiel losses (it is believed five transports have perished), he was not forced to stop moving in the coastal channels. On average, submarines laid mines once every 10 days. Naturally, even with the enemy’s limited minesweeping assets on the Black Sea, he was able to cope with this threat, especially since the mines were placed in a line in one general sector. It was not particularly difficult for the enemy to determine the minefield boundaries and sweep the channel. Of course, as in the north, he preferred to be engaged in minesweeping rather than to be subject to the wishes of our command, making himself vulnerable to the attacks of our submarines awaiting him outside the obstacles.

The command undertook a second such effort in September 1942. In carrying it out, the lessons from the previous experience were totally ignored, since it was planned to place three lines of 20 mines each at depths of 11–14 meters in order to accomplish the above stated mission. Actually, only two lines were laid. Though it is believed that a transport and a gunboat blew up on the first line of mines, this did not prompt any change in the way the enemy moved his ships. Thus, the purpose for which the mines were laid was not fulfilled, though the enemy suffered some materiel losses.

The submarine commanders designated for laying mines in the Mangalia area normally received the emission statement in the following form: “Lay a line of 20 mines in such and such place (the coordinates of the start and end points were named). The interval between mines is 55 meters. Before and after placement of the mines, sink any enemy ships encountered.” With this interval between mines, the length of the entire minefield was approximately 1,200 yards. When the enemy detected such a “line,” he had no difficulty bypassing it. Not having supported the minelaying by conducting preliminary reconnaissance of the enemy routes, it was difficult, sitting in Sevastopol, to overlay these miniscule lines precisely on the enemy’s route.

The greatest quantity of mines was placed in the Mangalia area. Altogether seven lines (122 mines) were laid in this sector, and some were up to eight miles, and others 2–3 miles, from the shore. On average there were 15 mines per mile or one mine every 120 meters. Obviously, such a mine obstacle could not create a serious complication. In fact, the enemy had no difficulty in gathering up one bank, laid as they were in a close, short line. The mines laid in the other two sectors were in mixed lines and banks, 40 mines in one and 60 mines in the other. Obviously, these could not be counted on to interrupt enemy movement along the routes when they were laid in such quantity. It could only be hoped that individual ships would accidently strike a mine, and this did not happen.

Submarines laying mines remained in the area for several hours. Thus, they did not observe the results of their minelaying efforts. The impression is given that when a submarine is in position for such a brief time, its main purpose is to carry as many mines to the area as possible. But this is not supported, because following a brief sortie, the submarines remained in base a week and sometimes longer. Thus, for example, the L-5, after each of five four-day sorties, remained in base nine, eight, 11, 12, and 52 days, which totals 20 days at sea and 92 in base. The L-4 spent 26 days at sea and 89 days in base. As this shows, the intensity of effort by submarines was not particularly high. If it was impossible to turn the boats around more rapidly, then instead of holding them at base with no purpose, it would have been better to maintain them in position. It would have been sufficient to reverse the numbers for the days spent at base and at sea. It they would have been possible to organize continuous observation over the area to obtain
the results of the minelaying. The mines would have not been laid blindly and, in addition, the submarines could have used their torpedo armament.

In the example of the L-4 in early October 1941, the submarine loitered only several hours in the immediate area of the minefield and, during this time, had two opportunities to observe enemy ships. It follows then that submarines should have remained in the minefield area longer to conduct reconnaissance before placing the mines. Such primitive minelaying operations on this sea yielded the lowest success rate of mine utilization: 52 mines were placed for each enemy ship that was blown up.

It is also worth noting that within the sectors where submarines placed mines were areas where other friendly submarines operated. These friendly submarines often made navigational errors and then passed through the minefields laid by our own submarines.

In the conditions of the Black Sea, it would have been incorrect to create a mine threat throughout the enemy’s entire sea lines of communication. Doing so would have greatly constrained our own submarine operations, particularly in autumn and winter, when frequent stormy weather, changing currents, and poor visibility made precise navigation extremely difficult. It would have been better to set aside a special area for submarine minelaying operations, perhaps midway between enemy bases. This would have forced the enemy to send minesweepers into areas far from bases, thus complicating their operations and requiring a lot of time. In addition, favorable circumstances would have existed for attacks on them by our sight surface forces.

During the assignment of special operating areas to minelaying submarines, it would have been worthwhile to give the entire mission to the commander of this division. Concentrating only on the operations of his own minelaying submarines in a specified area, he would have been able, better than anyone else, to perfect the methods of their most rational use. The brigade commander should retain control of submarine operations. In structuring this, the mission to the division commander should be placed in the following context: “Disrupt enemy lines of communication in such and such area by placing submarine-laid mines and by destroying enemy ships with torpedoes and artillery.” This would enable the division commander himself to determine the most effective means for his submarines to use their available weapons.

Table 28 shows the final results for the employment of submarine-laid mines by the various fleets. Though the results of minefield placement are by far not fully known, these figures show that Baltic Fleet mine utilization had the greatest impact.

An outstanding feature of minefield placement in the Baltic was the conduct of preliminary reconnaissance. It follows then that this principle should become the basis of employing minelaying submarines in other fleets.

Submarine utilization of new types of mines
The acceptance into service of two new types of mines raises this question: In what conditions is their utilization recommended?

The PLT-3 mine is delivered from the torpedo tubes and therefore can be used by all submarines (except type AG). One mine can be carried in the torpedo tube and two mines can be
stowed in place of each stowed torpedo. Thus, the total number of mines that can be carried in place of torpedoes by our submarines of various types is as follows:

<table>
<thead>
<tr>
<th>Submarine type</th>
<th>Number of mines</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>2</td>
</tr>
<tr>
<td>Shchilka</td>
<td>14</td>
</tr>
<tr>
<td>L, Series III</td>
<td>18</td>
</tr>
<tr>
<td>L, Series XIV</td>
<td>20</td>
</tr>
<tr>
<td>D, Series XIV</td>
<td>20</td>
</tr>
<tr>
<td>S, Series XIV</td>
<td>18</td>
</tr>
<tr>
<td>K, Series XIV</td>
<td>30</td>
</tr>
<tr>
<td>P, Series XIV</td>
<td>20</td>
</tr>
</tbody>
</table>

These mines have the following basic tactical characteristics: 100 kilograms of explosives; anchoring tether 130 meters long; time of arrival of mine at specified depth and in armed configuration ranging from three minutes for shallow seas to 12 minutes for maximum depth at which the mine can be delivered; no anti-sweeping devices. The mine is shaped like a cylinder, which should be considered during its delivery in currents, because it leads to greater deflection and, consequently, greater sinking of the mine.

The low explosive weight of this mine makes it more useful for constraining enemy actions than for destroying or heavily damaging enemy ships. Because the mine is used in place of a torpedo, it is necessary to determine when such a substitution is warranted.

As was already pointed out, on the basis of those numbers which we presented, three torpedoes are expended for one exploded ship, while 48 mines are required for one exploded ship. Thus, even a type K submarine, loading mines in place of torpedoes, would not be able to count on blowing up (relatively weakly), on average, even a single ship. However, with its normal load of 20 torpedoes, it could possibly sink up to six enemy ships. In addition, torpedoes are a much more active weapon on a submarine than mines. Therefore, when a submarine has the mission to destroy enemy ships, it is not warranted to use mines in place of torpedoes.

Supposedly, the use of these mines may be required to put greater pressure on enemy minesweeping efforts, given the shortage of minelaying submarines, or when massive employment of mines is required in a short period of time in order to constrain enemy operations in this or that sector of the sea.

It should be noted that the delivery of mines is normally less dangerous for submarines than torpedo attacks. The submarine can choose a time to lay its mines when enemy anti-submarine defenses in a given area are weakened. Conversely, a torpedo attack always occurs at a time when enemy anti-submarine defenses in a given area are the strongest. This explains why, in 1939 the Germans, having suffered great submarine losses near British shores while carrying out torpedo attacks on ships in the coastal channels, subsequently switched over to employing submarines in minelaying operations, that is, delivering magnetic mines from torpedo tubes. As is known, this initially reduced German submarine losses and increased British shipping losses, thanks to the utilization of a type of mine with which the British were not prepared to contend. However later, when the British found ways and means to cope with the new mine, the Germans were forced to cease submarine operations in general near the British coast. They shifted their area of operations far out into the open ocean, where they organized coordination between their
submarine and air forces. Thus, though it was fearsome in its unexpectedness and massive employment, the Germans used their torpedo-tube mine relatively briefly.

On the basis of these considerations, we should not entirely exclude the possibility of submarines using PLT-3 mines. However, the instances of their employment will be more rar and might be limited to areas of intense enemy anti-submarine patrol. Also these mines might be used if there is a significant increase in enemy escorts accompanying transports.

**Floating PLT-2 mines** are of significant interest. These mines, which can be used by type L submarines in place of PLT-1 mines, have the following tactical characteristics: explosive weight of 300 kilograms; minimum depth of sea that permits their use at 15 meters; time of arrival of mine at given depth in an armed status of 3–4 minutes; and floats freely, maintaining set depth for a preset period of time not exceeding 10 days.\(^32\)

This mine has already attracted interest because, as far as we know, there are no means to deal with it at the present time. To date, sweeping with nets exists only on paper. If this type of minesweeping becomes a reality, it will still be difficult, especially when leading a convoy. The utility of this mine is particularly great for submarine operations against sea lines of communication.

Attacks on convoys are a standard method of employing these mines. All the time we are directing submarine commanders to concentrate on destroying not one, but several of the ships moving in convoys. The concept of ships moving in convoys relies on the supposition that a submarine cannot sink them all, and therefore the percentage of losses is reduced. The introduction of these mines into service provides a means for type L submarine commanders to reduce significantly the effect gained by ships traveling in convoys. Submarine mine attacks using PLT-2 mines are extremely significant.

If a submarine detects a convoy and the conditions permit (small angle on the bow of the enemy), the boat can lay floating mines by intersecting the convoy’s course. After this, the submarine can assume a suitable position and attack the ships with torpedoes.

Given that the time required for a mine to come to the surface and arm itself is about four minutes, we figure that the last mine should be dropped 1,600 yards in front of the lead ship of a convoy moving at a speed of 12 knots. It is not difficult to compute what kind of initial conditions will permit such a laying of this mine. Figuring that the submarine will have an average speed of seven knots during maneuvering and that it will lay the last mine while positioned at an angle on the bow of three degrees after crossing the enemy’s course (the side of the enemy opposite the initial detection), we arrive at the following values of greatest angle on the bow which permit the conduct of a mine attack for various distances in front of the lead ship of the attacked convoy.

<table>
<thead>
<tr>
<th>Distance to attacked ship (in yards)</th>
<th>2,000</th>
<th>1,600</th>
<th>1,200</th>
<th>800</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greatest angle on the bow that will permit an attack (in degrees)</td>
<td>32</td>
<td>32</td>
<td>31</td>
<td>29</td>
<td>22</td>
</tr>
</tbody>
</table>
For these same conditions, the magnitude of the critical angle is 35 degrees. From an analysis of these numbers, we see that in comparison with a torpedo attack, the possibility of executing a mine attack is not significantly different.

To have time to complete the minelaying, a submarine should begin laying mines from a range of not less than 2,000 yards. Figuring that the submarine will cover the sector from an angle on the bow of three degrees in one direction to three degrees in the other direction, the length of the required line of mines is 200 yards. With 20 mines, the mine interval would be 10 yards. However, in laying mines so close, the submarine is risking detection the moment it raises its periscope prior to laying mines. The attack will then be disrupted when the enemy ships reverse course. Therefore, if possible, it is better to initiate the minelaying from a range of 4,000 yards. In this case, the length of the line of mines must be 400 yards and the interval between mines is 20 yards, that is, about equal to the beam of an average transport. But if the mines actually are placed too close together, then the explosion of a single mine would disable other nearby mines.

Because of this problem, it is better to set the submarine’s course during minelaying so that it has a projection equal to 20 meters on an axis perpendicular to the course of the attacked ships (figure 22). With a mine interval of 50 yards, the angle formed by the submarine’s course with the attacked ships’ course is 114 degrees or, rounded off, 115 degrees. The laying of mines with an acute angle to the course of the enemy is advantageous in that after the explosion of one of the ships leading the enemy column, the remainder begin to disperse to either side. If the ships (as in figure 22) turn to starboard, the possibility of their striking one of the mines placed along the line is increased.

During the movement of three columns, for example, with an interval between them of about 1,000 yards, minelaying should begin 6,000 yards from the lead ships of the closest column. This will permit completion of the laying when the lead ship of the column farthest from the submarine is approximately 1,600 yards away. The length of the entire line is 2,400 yards. If the distribution of mines is regular, the interval between them will be 120 yards. The probability that one of the lead ships will detonate a mine is 50 percent.

This problem can be solved in a different way, namely by conducting minelaying against the third column with assurance of detonating a mine on the lead vessel. Because the placement relative to the third column can be initiated from a range of 2,000 yards, it is necessary to lay mines over a distance of only 200 yards to cover a sector of six degrees. With a ship width of 20 yards, ten mines are required. The remaining 10 mines should be laid covering the movement zone of the first two columns, that is, over a distance of 1,400 yards. The intervals between mines will be approximately 150 yards. The probability that one of the lead ships of these two columns will detonate a mine is approximately 40 percent. To this should be added almost a full guarantee that the lead ship of the third column will strike a mine. Undoubtedly, accomplishment of such an attack is more difficult than the first variant. Raising the periscope at a range of 2,000 yards from the lead ship before laying mines against the third column can lead to the detection of the submarine. This can disrupt the submarine’s minelaying task but, on the other hand, it leads to assured disorder in the movement of the ships of the first two columns, which can cause these ships to strike the mines already laid.
The submarine should conduct a torpedo attack immediately when the lead ships deviate from the line of mines already laid. The submarine’s torpedo attack will increase the probability of the enemy ships’ detonation of the mines. Type Leninets submarines, which have stern torpedo tubes, have no difficulty in carrying out such torpedo attacks after laying mines. Submarines that do not have stern tubes must rotate 180 degrees. A submarine will need about six minutes for this maneuver and, consequently, it can always accomplish it during an attack on ships moving at eight knots and on ships moving at 10 and 12 knots only if the last mine was laid correspondingly at 2,000 or 2,400 yards from the lead ship.

Floating mines give submarines the ability to attack ships in those areas where torpedo attacks are undesirable (proximity to neutral waters). Attacks with mines can be conducted with considerably more stealth, because air does not escape during release, there are no torpedo tracks, and the boat will not suddenly surface as sometimes occurs during torpedo attacks.

When currents are favorable, submarines can use these mines to block enemy coastal channels. Since their employment is not limited by deep seas, the possibility of their employment is significantly broader in theaters such as in the north. Thus, PLT-2 type mines present a number of new opportunities for submarines. Their utilization will have a significant impact when they become available in sufficiently large quantities and before the enemy becomes accustomed to dealing with them.
Chapter X

Submarine Combat with Enemy Anti-submarine Forces

1. Combat with Enemy Anti-submarine Security

Almost every battle is fought by using force and stealth. The stronger force wages warfare principally utilizing its strength; the weaker force uses stealth. Perhaps no other force has to rely on stealth more than submarines do in their battle with enemy anti-submarine defenses. It is almost their sole weapon.

Stealth is the direct opposite of routine. Success goes to the commander who can use the conditions of the situation for himself. But from this, it does not follow that a commander can operate as he pleases in combat with enemy anti-submarine defenses and that there are no rules for this activity. For example, for all situations it can be said that a submarine cannot move by periscope in an area where the enemy has laid a minefield (though there have been cases when submarines were advised to do this). Also, it can be said that to proceed into a position surfaced in daylight hours is also impossible if enemy aviation is active in the area; and the examples can continue. Some regulations apply to the general case, but sometimes it is advisable to deviate from them. It is important that deviations from the rules be done consciously, be based on the situation, and not be conducted mechanically or without knowledge. For example, a submarine should change course as quickly as possible after it fires, and withdraw from the engagement area. But because the enemy knows this principle, sometimes (when firing in shallow waters) it may be advantageous for the submarine to lie on the bottom on the axis of the torpedo, knowing that the enemy will search for it off to the flank. These reflections must be considered during the reading of this chapter.

The losses the enemy has suffered from our submarines have forced him to concentrate on the defense of his shipping. The methods and assets he has employed in combat with our submarines are nothing new. Almost all of them date from World War I.

Where it has been possible (in the Baltic theater), the enemy has tried to block our submarines from base exits or prevent our submarines from reaching this sea lines of communication. To accomplish this, he has placed mines in the channel between Leningrad and Kronstadt, on the exits from Kronstadt into the Gulf of Finland, and in the Gulf of Finland itself. The enemy also maintains submarines near our bases in the north and on the Black Sea and uses submarines and aviation to intercept our submarines en route to his sea lines of communication in the middle of the Black Sea and the Barents Sea.

The enemy has organized a security system for his sea lines of communication in all theaters. The following are included in this system:

- Escorting transports at sea singly and in convoys.
- Placing mines and net obstacles along coastal shipping routes.
- Establishing observation posts, sound direction-finding stations, and shore batteries on the coasts where transports move.
- Using patrol vessels and air forces to patrol and systematically search along sea lines of communication.
Having his submarines on continuous alert in our submarine operating areas. The enemy has escorted transports on given lines of communication depending on the threat our submarines have created.

To give an impression of the degree to which the enemy has escorted transports and moved them in convoys in our theaters, we have utilized the reports that are most accessible to us now—observations of our submarine commanders during their conduct of torpedo attacks against enemy transports. The compilation of these reports is in tables 29, 30, and 31.

[Tables 29, 30, and 31 here in original text.]

These tables show that escorts were used most often in the north, where only seven percent of the transports moved unescorted. In the Baltic, 70 percent of all transports encountered were escorted, and on the Black Sea slightly more than half, 54 percent, were escorted.

In all theaters, primarily one or two transports moved under escort. Convoys of three or more ships were rarely encountered. In the north, the greatest number of transports in a convoy was six; on the Baltic there were single encounters with convoys of 16 and 17 transports with very weak escorts (two and four ships). This shows that the enemy has experienced difficulty with convoying ships on the Baltic Sea.

The enemy has assigned heavy escorts to particularly valuable ships. Thus, there have been cases in the north where one transport was escorted by seven ships; two and three transports have received up to 10 escort ships.

Initially, the enemy, sailing along the coast, practiced unidirectional escort of transports on the seaward flank (figure 23), but now he rarely uses this formation for escort because of our submarines’ attacks from the shoreward flank.

[Figure 23 here in original text.]

The enemy fairly often uses an echeloned formation for movement (figures 24 and 25). As has been pointed out above, this facilitates our boats’ engagement of several targets at one time.

[Figures 24 and 25 here in original text.]

As is well known, the earlier system of convoys served a dual purpose—it made a submarine’s search for the convoy more difficult; and upon encounter with a convoy, a submarine could sink one or two transports, which is a relatively small percentage of the total number of ships in a convoy. In the present war, the Germans have responded to the convoy system in the West by using aviation, operating in conjunction with submarines, to search for ships; by deploying their submarines in a screen; by having several submarines simultaneously attack the convoys; and by having each submarine fire at several ships.

In our theaters, since the enemy transport movement routes have a more or less limited nature, finding them is easier for submarines, especially if cooperation in even its most primitive form can be accomplished between submarines and aircraft. Consequently, it is easier to designate a quantity of ships to provide all-round security to a group of transports than it is to provide security for each separately sailing transport. The intent is that during an attack, our submarines would be limited to sinking just one transport out of an entire group.
The modest number of transports in German convoys is explained, on the one hand, by the effort to decrease the turnaround time of transports and, on the other hand, by the difficulties experienced in designating patrol forces for escort duty. In the north, the poor cargo-handling capabilities at destination ports, combined with the large size of the arriving convoys, would significantly delay transports in these ports, in which case they would be exposed to our air strikes for some time. From these considerations, large convoys sailing to the east are not advisable. This also determines the size of the returning convoys, since it is clearly disadvantageous for transports to wait in these ports while ships of the next convoy are being unloaded. In addition, since all convoys must pass through narrows in the north and on the Baltic (along the western coast), large convoys would be significantly more dispersed, which would weaken their escort and force them to reduce speed greatly. This would increase the danger posed by submarines and could negate the advantages of convoying.

From this it is clearly obvious that the Germans are using small convoys not because they consider them more efficient, but because they are forced into it by the conditions of the theater. This is good for us because when separate groups of enemy transports move more frequently in the shipping lanes, we can inflict greater losses on the enemy.

The enemy’s utilization of the convoy system forces us to:

- organize coordination between submarines and air forces to facilitate the submarines’ search for enemy convoys.
- attack more powerfully on the convoy by having submarines fire at several ships and conduct follow-on attacks.

Since enemy convoy daytime movement routes have been clearly revealed in the north and on the Baltic, the second requirement takes on special significance for us. Among the measures that complicate our submarine and air operations against enemy convoys is the enemy’s movement along coastal channels. Where possible, he moves in shallow waters (eastern coast of the Baltic Sea, western and northwestern coastline of the Black Sea) and utilizes routes in and around islands (western coast of the Baltic Sea, Gulf of Finland, Norwegian coastal waters). In areas where the coastal terrain is steep, he presses close to the shore (Crimean coastline, northeastern Norwegian coastline).

Movement in shallow waters significantly hinders—and sometimes prevents entirely—our submarine operations. The difficulties that our submarines have to overcome when operating in shallow areas can be seen from the following example.

On 7 August 1942, the submarine M-118, positioned in the northwest portion of the Black Sea, detected a transport and a self-propelled barge, escorted by a single destroyer and seven patrol cutters at a range of 14,000 yards, moving on a zigzag course. The depth of the sea in this area was 13–15 meters. The commander began the attack. Because the depth of the sea was gradually decreasing, the submarine often grounded on the bottom. The commander had to shift command and control from the conning tower to the control room to reduce the draft of the boat at periscope depth. Just the same, after coming about to a combat course the boat grounded in sand. The commander had to reverse engines to free it from the sand without surfacing. After bypassing the grounding site, the submarine continued the attack, despite continued incidents of touching bottom. One hour and 13 minutes after initiating the attack, the submarine managed to
take a position for firing, with a sea depth of nine meters at 1,600 yards from the last transport. The commander fired two torpedoes and two consecutive explosions were noted.

Submarines *M-31* on 17 August and *M-36* on 23 August 1942 conducted successful attacks in equally difficult conditions. In both cases, the submarines destroyed transports escorted by patrol cutters.

But the difficulty is not limited only to launching attacks. Still greater problems for the commander arise after the attack, when the submarine’s presence has been revealed to the enemy and the track of the torpedo points to the submarine’s location. Often, the submarine has to remain still (ignoring normal procedures for evading pursuit) because the wash from the propeller raises silt off the bottom, which forms a clearly visible track on the water’s surface. While lying on the bottom, another unpleasantness awaits the submarine: nearby explosions could literally force it to the surface. The negative buoyancy of the submarine has to be increased as much as possible in order to press it more heavily into the bottom soil and lessen its response to the shock wave.

It is not surprising that submarines sometimes received heavy damage during depth-charge attacks. But in this case, our young *M*-class commanders displayed courage and resourcefulness.

Thus, after the attack mentioned above and the sinking of a transport in the Burgas area, the submarine *M-35* was forced to lie at a depth of 8–10 meters. A depth-charge explosion broke the latches of the submarine’s stern hatch. The sixth compartment quickly began to fill with water. Water flooded the main electric motor and began to enter the fifth compartment. The sixth compartment was abandoned; overpressure was created in the submarine. Water continued to flow in and began to flood the turbopump. The danger was that the submarine might not be able to surface. At this time, the propeller noise began to subside. The commander came up to periscope depth and, after confirming that no one was nearby, brought the boat to the surface.

The following damage was ascertained: the electric motor, bilge pump, compressor, main electric control panel, stern horizontal planes, and all machinery in the sixth compartment were disabled. The blade of the vertical rudder was bent and a propeller blade was holed. The submarine had to cross 600 mile of sea to its base in this condition, but the crew managed! Torpedo bombers attacked the boat several times during its passage. Since submerging the submarine would have been extremely difficult because of the damage it had received (which had been only partially prepared), the commander defended himself from the aircraft and evaded the attacks by maneuver. Finally, however, he was forced to submerge to periscope depth to avoid subsequent enemy attacks.

The case of the submarine *M-32* (commanded by Senior Lieutenant Koltypin) is even more interesting. At 1301 on 14 October 1942, positioned in the northwestern portion of the Black Sea, the submarine detected a *Regele Ferdinand*-class destroyer escorted by a tugboat, a patrol cutter, and an aircraft. The commander closed with the destroyer and fired two torpedoes. Two explosions were heard 45 seconds later. The boat came up to six meters after firing, after which it lay on the bottom at a depth of 13 meters. All machinery was stopped except the gyrocompass. Eighteen depth charges were dropped on the boat. The first explosion broke the latches on the upper conning tower hatch. The conning tower quickly began to fill with water, which then flowed through the periscope housing into the control room. Diesel fuel was coming into the fifth compartment. The turbopump and bilge pump were disabled. The crew managed to
stop the flow of water into the control room. When the noises quieted, the turbopump and bilge
pump were repaired.

At 1715, that is, three and one-half hours after the attack, propeller noises were heard
once again. A ship stopped above the submarine and began to emit sonar signals. Then, two
metallic knocks sounded on the submarine’s hull. At 1800, the propeller noises began to fade. By
the time the turbopump had been repaired, the third compartment was three-fourths full of water.
During the subsequent drying out of the third and fifth compartments, the turbopump had to be
turned on every 10 minutes. At 1940, the submarine began to surface. The trim reached 40
degrees down by the bow. Just the same, the maneuver was safely completed. It turned out that a
plywood box of flags, a pea jacket, and a number of other items had floated to the surface from
the conning tower hatch. In addition, two tons of diesel fuel and one-half ton of oil had leaked
out of the submarine, creating a large slick on the surface. All this together had obviously given
the enemy grounds to conclude that they had destroyed the submarine. The following damages
were established: the bow and stern horizontal planes, periscope, and radio were inoperative;
tanks 2 and 4 were cracked; and diesel fuel that had been carried by the bilge from the fifth
compartment had contaminated the food storage locker and ammunition magazine.

The submarine withdrew from the attack site using its electric motor and lay at a depth of
25 meters to repair its equipment. The boat headed to base at 2055 on 15 October, having
corrected the major deficiencies (except for the periscopes and radio), but still unable to steer
submerged. Completing the crossing in a force 6 storm, the submarine arrived safely at its base.

Baltic Fleet submarines operating in the Vindava–Memel area found themselves in
similar conditions. A further complication in the Baltic was that small submarines could not
operate in these shallow areas, and large-displacement submarines had to be sent out.

Weapons employment was very complicated in shallow waters. Our torpedoes drop
significantly on leaving the tubes. Consequently, when there is little reserve of draft from the
tube to the bottom of the sea, a danger exists that the torpedoes will bury themselves in the
bottom soil. The matter was complicated still further since the magnitude of the drop remained
unknown to the boat commanders. This did not give the boat commanders a clear impression as
to what sea depth permitted torpedo firing or when it was impossible.

Now, it can be said with sufficient certainty that the drop of the torpedo does not exceed
four meters when it is fired from a submarine at even keel. Therefore, the reserve of draft from
the keel to the bottom soil should not be less than three meters. When firing in shallow waters, if
not all the tubes in a given end of the boat are being employed, the torpedoes of the uppermost
tubes should be fired.

In addition to moving in shallow waters, the enemy routinely uses vessels that have
shallow draft (self-propelled barges, lighters, schooners, and so on) for shipping. This creates
significant difficulties for our submarines in using torpedoes. The setting of torpedoes at shallow
running depth (1–1.5 meters) in windy weather leads to their skipping through the surface waves
and running off course. Torpedoes that have proven themselves best in these are the 45-
centimeter models. Because their explosive effect is so high, it is more effective to use them in
shallow regions. Acceptance into service of noncontact fuses will also facilitate the destruction
of shallow-draft steel-hulled ships by submarines.
Movement by coastal channel enables the enemy to use small, less seaworthy vessels for escorts. However, some disadvantages exist for the enemy moving by coastal channels. It facilitates our submarines’ search for enemy transports because we do not have to seek them out at sea during the daytime. If the depth of the sea on the enemy’s movement route is greater than 15 meters but less than 120 meters, submarines can use not only torpedoes and artillery but also mines against transports.

In such regions, the enemy is forced to proceed along cleared channels and is constrained to movement by changing courses. This explains how in the north, for a large portion of his route, the enemy sails on a course that constantly changes with the configuration of the coastline. Only on reaching the broad expanse of Varangerfjord does he move by variable courses.

Submarine attacks are also made easier for us in that even if a convoy is proceeding on a changing course, it is not particularly difficult to determine its general course based on the configuration of the coastline. Consequently, closing with the targeted transports is made easier.

During escort of convoys at sea and particularly during support of their departure from bases, the Germans sometimes carry out prophylactic depth charging, that is, the dropping of depth charges without having detected any submarine. This is practiced especially often on the Black Sea.

Our submarine commanders quickly identified this enemy practice. From that time on, when our commanders hear isolated explosions, particularly near enemy bases, they expect enemy ships to appear. Thus, by this measure, the Germans hurt, more than helped, themselves. Apparently the enemy has also recognized this, because recently he has rarely conducted this preventive depth charging. However, the possibility of using such depth charging must be kept in mind. The explosion of a single depth charge dropped far from a submarine cannot be an indicator that the enemy has detected the boat. Rather, the faraway explosion of a depth charge indicates that the enemy did not see the submarine; if the submarine had been detected, the escort ships would have rushed toward its location and dropped the depth charges closer to it.

Since the enemy normally reports by radio when he sinks one of our submarines, and he would know if he destroyed one of our submarines during an attack on his ships, we are almost certain that the majority of our submarines have not been lost while attacking enemy ships. Only in rare cases do we learn with total certainty the reasons for losing a submarine. More often, we can suggest a cause with some degree of certainty. But the causes for losing many of our submarines remain unknown to us now, and quite possibly it will not be any more clear when the war ends. This applies even more to submarines that perished on mines.

Because the loss of this or that quantity of submarines to a given asset is an indicator of the effectiveness of the asset itself, the methods of its employment, and methods used by our submarine against it, it is necessary to establish how many of our submarines were lost due to various enemy forces and means. Table 32 provides tentative data.

Table 32 shows that the greatest percentage of lost submarines was due to mines, followed by enemy submarines, surface ships, and aviation. The highest percentage of submarines has been lost in the Baltic. This is explained by the harrowing conditions in which submarines have to operate in this theater.
2. Overcoming Mine and Net Obstacles

In the north and on the Black Sea, submarines have had to confront mine and net obstacles directly on the enemy sea lines of communication and, in the Baltic, primarily on the passages to the sea lines of communication. Mine obstacles placed in the Gulf of Finland (see figure 3) have been particularly threatening. Mine obstacles have been supplemented by a system of patrolling, shore batteries, sound direction-finding stations, searchlight posts, and so on.

The enemy has reinforced his anti-submarine defenses based on the success of our submarines. However, in examining mine losses by period, they were highest in the initial period of the war, which is natural. Well known methods of dealing with mines that have caused a reduction in submarine losses have been developed over a period of time.

In the early days of the way, the enemy established minefields near the water’s surface, which were dangerous to submarines moving on the surface or at periscope depth. The Germans placed these obstacles in the mouth of the Gulf of Finland and in the western portion of the Black Sea to cover the approaches to their bases. In addition, the enemy placed magnetic mines in our departure channels.

Submarines were able to pass safely under obstacles placed at modest depths. Brushing against a mine tether, if it remained intact, posed no danger to a submarine. If it was broken or if the tension of the cable was weakened for some other reason, the mine exploded. Submarines \textit{Shch}-205 and \textit{Shch}-212 detonated mines in positions near the western coast of the Black Sea under these circumstances. Since the mine was some distance from the submarine at the moment the tension on its tether was reduced, the explosions did not sink the submarines. They returned safely to their bases, though with great difficulty.

The danger posed to submarines by mines on the Black Sea was underestimated. In addition, to establish safe passage for entering coastal channels, the submarines sometimes had to cross under (“force”) mine obstacles. This required coming up to periscope depth every 15 minutes. Stormy autumn weather complicated submarine navigation. On the Black Sea, \textit{Shch} type submarines had difficulty determining their position when close to the coast because they lacked acoustic depth finders. Since these submarines made significant errors in determining their position, they proceeded surfaced and then would submerge when they reached enemy minefields whose position had been officially reported. This resulted in great losses of submarines to mines on the Black Sea. Thus, the enemy has been successful not because of any kind of special deception measures, but because of our own miscalculations, our underestimation of the significance of mines, and the low level of navigational skills on our submarines.

On the Baltic Sea, the enemy was able to achieve success with mines in the first days of the war (average losses 8.5 percent per month) thanks to the unpreparedness of our submarines and minesweeping assets for dealing with magnetic mines. Our submarines sortied to sea not degaussed and with insufficient minesweepers. This caused the loss of several of our submarines.

In September 1941, our submarines had to pass through the enemy-controlled Gulf of Finland in order to reach the Baltic Sea. At this time we saw signs of the enemy’s use of antenna mines. Even though the 1939 instructions for submarine combat operations recommended the best method of passage through an obstacle of this type, commanders acted in accordance with their own personal discretion. It was exceptionally important for submarine commanders to develop methods for negotiating dangerous minefields. However, no one at brigade level sought
a solution to this issue or developed a methodical decision, and no one collected the experience gained in this field. It was not known, for example, how those submarines that were believed to have been lost to mines had been advised to negotiate dangerous mined areas.

Despite these deficiencies, the number of average losses per month was reduced to 4.7 percent. If fleet and brigade headquarters had approached the problem of mines with all seriousness and methodically resolved it, possibly losses to mines could have been reduced even further.

In 1942, the enemy was also placing mines in the north; minefields in the Baltic and, it appears, on the Black Sea were strengthened. Antenna mines have become the enemy’s main asset.

In the north, passages through minefields were identified fairly quickly and methods of negotiating the mined areas were noted. However, submarines here also encountered the same difficulties as had been encountered on the Black Sea. Imprecise navigation while approaching the coast from the sea led to submarines sailing right into enemy mine obstacles. The Northern Fleet had not suffered losses to mines prior to this, but now it began to.

Despite the extremely difficult conditions of the 1942 campaign, Baltic Fleet submarines suffered minimal losses up to October (on average two percent per month), while at the same time they inflicted significant damage on the enemy sea lines of communication. However, several boats did not return to base from the last sortie. By this time, the enemy had sufficiently discerned our submarines’ passage route through the Gulf of Finland, had placed mine and net obstacles along it, and had strengthened patrol forces in these areas. Our submarines’ frequent detonation of mines while departing on or returning from sorties in the early fall attest to this. At the end of August, the Shch-323 detonated a mine in the southern Hogland passage, and at some time later the L-3 struck and detonated three mines moving submerged. At the end of September, the D-2 and S-12 became entangled in nets. Submarines frequently scraped mine tethers and detonated the mines, but they did not sustain substantial damage.

Instances of submarines detonating mines and getting hung up on mine tethers were especially more frequent on the Hogland–Tyutersa route. Without question, the creation of an anti-submarine line so close to our bases was a serious error on the part of the enemy. It permitted us to observe the area continuously and interfere with the enemy’s maintenance of the line. However, this was not done, and our submarines had to negotiate this line by trial and error, which resulted in the loss of boats. At the end of the 1942 campaign, the enemy had achieved visible results by maintaining obstacles on our submarine routes without any interference from us; the percentage of submarines that did not return from their sorties in the last month increased sharply (on average, the lost of boats for the month was 5.5 percent).

On the Black Sea, the mine situation near the western coast remained as before. The enemy, lacing significant assets in this theater, modestly strengthened those obstacles that he had emplaced earlier. The loss of submarines to mines remained at the previous level.

In summarizing our effort to maintain our submarines’ passage through dangerously mined areas, we can group all the measures in the following categories:

- Observation over areas where the placement of mines against our submarines was most likely was not accomplished anywhere. Reconnaissance by air forces in the area of the Hogland line was conducted episodically on the Baltic. Before the 1942
campaign began, type M submarines were sent to the western Hogland reach twice. The failure of the M-95 to return from the sortie stopped this practice. Since nothing was sent out to replace these two boats, no observation of the area was conducted from this time forward.

On the Black Sea, submarines were not tasked to observe areas to determine where the enemy had placed mine and net obstacles. This failing made possible the case noted above of the Shch-208, whose commander showed disdain for determining the location of the enemy-placed mines.

- Interference with the enemy’s maintenance of anti-submarine lines was undertaken to some degree only in the Baltic. In the spring of 1942, Baltic Fleet air forces flew several sorties to the Hogland line area, where they destroyed several enemy patrol ships and barges that were to emplace mines and nets. Since for the most part this activity was conducted at night, the assistance of the surface fleet would have been a priority in this matter. But such assistance was not rendered to submarines in any theater.

- Discovery of passages in enemy obstacles can be achieved by observing enemy ships sailing in these areas. In the first place, aviation should have done this by conducting operational reconnaissance in the theater or by being tasked especially to monitor enemy-mined areas. By photographing a detected ship and determining its location using the nearest reference point, aviation could give submarines valuable estimates concerning existing passage lanes in minefields.

Surface ships did not conduct special operations for this purpose. In some cases, when our surface ships were raiding enemy sea lines of communication, they were not given this additional task. True, the fact that a ship had passed safely through a particular lane indicated its safety for submarines. On this issue, agent intelligence reports should have been of assistance to submarines. The agent network gave some information, but its data always had to be verified by conventional intelligence assets. If agent intelligence reports indicated that the enemy had placed mines in a particular location, the submarine commanders were to consider this area dangerous. But when the agent net gave information concerning cleared lanes in minefields, the submarine commander could not consider these lanes safe. He could only regard them as the most likely locations for safe passage, and then verify them by his own reconnaissance after observing the area.

Submarine observations were the best means of revealing passage lanes through enemy obstacles. The best case was when a boat was able to observe the movement of enemy transports or minesweepers clearing channels. Unfortunately, submarines rarely followed behind ships or minesweepers passing through a dangerous zone. This is the most reliable, precise, and absolute method of establishing the existence of a safe passage lane through a minefield. It was alright to refrain from conducting an attack in poorly illuminated areas, because the determination of the precise route utilized by the enemy paid off a hundredfold in the future for the untouched passage of one or two of his transports now.

- Measures taken by the submarine itself during the sortie were the most effective for reducing the mine danger. The most immediate measure is for the boat to ensure that its navigation is precise. Whatever extraordinary means and methods we invent to combat enemy mines are worthless if we wander into minefields because we do not know our own position. The 82 instances when our submarines ended up in enemy
minefields due to navigational errors do not tell the full story. We have become accustomed to this, and it is not considered an especially important event. If the incident ends safely, we say, “Well, that’s over.” These incidents occurred on all seas but particularly often on the Black Sea. True, this is explained by the difficulties that confronted the navigators on this sea in the autumn and winter months.

We know about the sailing into minefields form those who were experienced in this and lived to report it. Those for whom this trial ended in misfortune were not able to tell us about it. If one accepts the probability of a submarine detonating amine at eight percent (the relationship of the submarine’s four-meter beam to a mine interval of 50 meters\(^{34}\)), then we can figure that perhaps six (eight percent of 82) of our submarines were lost because of poor navigation. Already this shows that a mine inflicts such losses not because it is indeed more dangerous than all other assets and forces but because of our own shortcomings. We are even more convinced of this. From this, it has become clear why Black Sea submarines suffered such great losses, even though immeasurably fewer mines were emplaced against them than in the Baltic. Though general navigational conditions are more difficult on the Baltic Sea and in the Gulf of Finland, submarines have the opportunity to conduct more precise course plotting and can more frequently determine their position by using shore features and depth readings.

While we are on this subject, we must discuss recognizable depth features. If submarine commanders cannot take a bearing on the coastline or sky, they naturally try to determine their position by taking distinguishable depth readings. The enemy also recognizes this and places every type of mine he has in areas with distinguishable depth features, including magnetic bottom charges. Submarine commander should consider this, though it complicates their navigators’ task all the more. Approaches to especially “popular” lighthouses, markers, and particular islands located in the open sea (Fidonisa in the Black Sea, Bogsher and others in the Baltic) are also dangerous. Thus, navigational service on submarines should receive special attention. This pertains foremost of all to the Main Hydrographic Directorate, which should seek precise ways for submarines to determine their position when they approach the coast from the sea. Manning submarines with navigators and commanders who have adequate navigational qualifications and experience is also very important. It is necessary to improve navigational training for both command personnel on submarines in service as well as for those in training detachments (KUOPP [Krasnoznamennyy uchebnyy otryad podvodnogo plavaniya—Red Banner submarine training detachment in the name of S.M. Kirov, Leningrad] and UOPP TOF [uchebnyy otryad podvodnogo plavaniya Tikhoekeanskogo flota—Pacific Fleet submarine training detachment]).

The selection of a submarine’s running depth during its passage through a dangerous zone is very important. No general rule applies to every situation. Surmising possible variants of our submarines’ movements, the enemy can employ deception and, obviously, diversify his methods of emplacing mines. Therefore, we can present only general conclusions and reflections on the basis of our submarines’ experience.

Unquestionably, the movement of submarines through dangerous areas at periscope depth is unwise. Submarines frequently are faced with this option; therefore, we must expect the enemy to place mines so that this layer or level will be dangerous for the submarine.

As incidents of mine strikes have confirmed, the most dangerous detonation for a submarine is the explosion that occurs beneath it, not above it. Therefore, generally submarines
should run at greater depth. However, during movement in areas where the depth of the sea does not exceed the operational limit of submarines (100 meters), the possibility of the enemy’s emplacement of bottom magnetic charges must be considered. For degaussed submarines, this requires leaving 10–15 meters under the keel.

In selecting a running depth when the enemy is using antenna mines, commanders should know the basic tactical elements of this type of German mine. These mines have an explosive charge of up to 300 kilograms, which makes the explosion of the mine particularly dangerous when it is approximately 10–15 meters above the submarine and 20 meters beneath it. The length of the antenna of these mines is not less than five meters. Consequently, if the enemy places out mines with lowered antennas, it is better for the submarine to choose a running depth that does not exceed its operational limit and proceed at 10–15 meters from the bottom. Then the mine itself cannot be closer than 25 meters to the hull of the submarine. At depths greater than 100 meters, the enemy, aware of our submarines’ efforts to navigate obstacle areas at maximum depths, can place mines at depths of this order. Therefore, a submarine should proceed 20–25 meters above this level and, even better for large submarines, at depths 15–20 meters beneath it, utilizing the hull’s reserve of strength.

The Drakon equipment, which permits a submarine to detect a mine in front of it and avoid colliding with it, is useful in combating mines. The experience of Northern Fleet submarines fully confirms this.  This requires us to take every possible measure for the most rapid placement of this equipment on submarines.

Without doubt, it is undesirable for a submarine to change its running depth when it is already in a dangerous zone. During movement through a dangerous zone, the submarine’s most important task is to negotiate the enemy obstacle safely. Therefore, ascending to periscope depth before departing from the dangerous area should be forbidden, even when the submarine hears ship noises. The submarine’s running depth should also not be changed when it scrapes mine tethers, but the depth should be slowly increased to 20 meters when a metallic knock is experienced (the body of the mine).

The submarines that scraped mine tethers stopped the electric motors on the two shafts on the side of the boat scraping the mine tether and then gave rudder to the side of the scraping, which steered the hull away from the tether.

It is very important that submarines remain prepared for emergency surfacing while passing through mined areas. The detonation of a mine by the submarine does not signify the boat’s death. Submariners quickly taking appropriate measures can save the boat and the crew. Therefore, those commanders who fail to bring their boats to appropriate levels of readiness so as not to unnerve and fatigue their crew are completely incorrect.

We have now presented several cases of our submarines falling victim to mines, which show how the energetic actions of the crew saved the boat. We will present several more examples that confirm the position stated above.

On 24 September 1942, the submarine Shch-407, commanded by Captain Third Rank Afanasev, returning from the Baltic Sea through the Gulf of Finland, encountered a mine tether at a depth of 35 meters. Immediately thereafter, an explosion occurred directly above the boat. The submarine received a powerful downward thrust. Water began to enter through a fractured longitudinal seam. In addition, a welded joint also came apart and rivets popped out, the
horizontal planes were jammed, and there were dents in the pressure hull. The leaks were stopped and the damage partially repaired. The submarine continued to move at the same depth. There was an additional scraping on a mine tether, but no explosion followed. The submarine returned safely to base.

It would seem that since the commander knew the explosion had occurred above, he should have increased his depth by 5–10 meters, which would have weakened the effect of the explosion had he encountered another antenna mine.

On 11 November 1942, also while passing though the Gulf of Finland, the submarine S-12, commanded by Captain Third Rank Turev, detonated a mine. At 1421, while the submarine was proceeding at a depth of 55–65 meters, with 5–10 meters under the keel, a powerful explosion occurred above it. The submarine was hurled several meters downward. Pieces of the mine and the cable fell from above. The hatches were letting in water, water was coming in through various places in the hull, the hull and some components were deformed, and a number of instruments and mechanical components were disabled.

The submarine continued movement to a depth of 65 meters. Two minutes later, a second mine tether scraping was heard, but no explosion followed. At 1547, the submarine lay on the bottom to repair the gyrocompass and survey other damage. The following significant damage was registered during the inspection of the boat:

- In the first compartment, the removable decking was deformed and three rivets had given way; there was much light damage to equipment and fixtures.
- In the second compartment, there was a leak in the removable flapper, the hatch was warped, and there was much light damage.
- In the third compartment, the conning tower hatch had given way, was passing water, and was deformed; the optics of the magnetic compass were broken; the periscope cable was stretched; and there was much light damage.
- In the fourth compartment, the hatch was leaking.
- In the fifth compartment, many valves had been opened, through which water had begun to enter the bilge.
- In addition, electrical equipment and other machinery were damaged in all compartments.

With a repaired gyrocompass, the boat continued to move 5–7 meters from the bottom and returned safely to base. Since the commander figured that the explosion came from above, he increased his depth as much as possible after the first explosion. This weakened the effect on the submarine of the subsequent explosion of a mine.

On 25 July 1942, the submarine A-5 detonated a mine in the Odessa area. The submarine was at a depth of 9.5 meters. It appears the mine was a magnetic–acoustic mine. The explosion occurred to starboard. The horizontal and vertical planes and starboard steering shaft were jammed; the stern ballast tank was flooded, as a result of which the submarine was forced to lie on the bottom at a depth of 21 meters. After inspecting the damage within the submarine, the commander surfaced. The rudder could not be repaired. It was impossible to steer the boat with one engine in this condition. A portion of the vertical rudder had to be cut off so that it might be
used a little bit. Having gained the ability to work with both shafts, for one day the commander practiced in steering the submarine submerged without the stern horizontal and vertical rudders and, after this, steering by fluctuation in buoyancy and trim. The submarine departed the minefield through a channel and returned to base on the fifth day after the explosion. Thanks to the perseverance of the crew, the submarine safely came out of an extremely dangerous situation.

Enemy anti-submarine nets have been used sparingly up to this time. There have been two indisputable cases registered of submarines being caught in stationary anti-submarine nets. Both occurred in the Baltic. In addition, there was the case of the submarine M-171 being caught in a boom net in the north during its breakout of Petsamofjord after attacking enemy ships in Liinakhamari harbor.

The submarine D-2 was the first to be caught in an anti-submarine net while negotiating the Hogland line on 24 September 1942. At 1652, during the boat’s movement at a depth of 30 meters, it went down by the bow, the trim rapidly increasing to 15 degrees. Simultaneously, the submerged depth of the submarine began to increase. At 39 meters the submarine struck the bottom hard. The scratching of metallic lines was heard at various locations on the hull. Both electric motors were stopped and then reversed. The trim evened out. Crackling noises along the hull confirmed that they had come into a net. An attempt was made to come off the bottom at 1739, but it was unsuccessful. The submarine acted as if it had tremendous negative buoyancy or something was holding it. With every movement, a gnashing noise was heard along the submarine’s entire hull. A stream of air was blown into the deck tank at 1735. However, the submarine still did not surface.

At 1741, blowing the deck tank managed to free the boat from the bottom. Both electric motors were given full ahead. A heavy gnashing was heard in the stern portion of the submarine. At 1745, the horizontal planes were jammed and the vertical rudder stuck at five degrees to port. While the horizontal planes quickly began to work, the vertical rudder did not function either electrically or manually. The submarine again began to submerge and touched the bottom at 35 meters, but it continued moving. At 1828, the trim began to increase by the stern and reached 10 degrees. The crew blew main ballast tank number 8 and leveled the boat. At 1835, the submarine lay on the bottom to repair the vertical rudder and determine the cause of the loss of buoyancy. However, the crew was unable to do either.

At 2024, having blown deck tanks, the boat began to surface. The trim was down at the stern as much as 14 degrees. The crew managed to level the boat by blowing ballast tank number 8. The submarine was dragging something behind it, creating negative buoyancy and trim by the stern. From time to time muffled blows were heard in the hull, similar to striking bottom. The honking noise of a buoy, apparently being dragged by the submarine, could be heard. At 2107, the submarine stopped at a depth of 25 meters. It was again down by the stern as much as 14 degrees. Both electric motors were given full ahead. The scraping noise could be heard at the stern. The submerged depth began to decrease, at first slowly, then sharply.

At 2114 the boat surfaced. The sea was at force 5, the moon was cloud-covered, and no enemy ships were close. Searchlight beams, at time reaching out to the submarine, shone from towers at Luppa and Hogland. The entire internal portion of the conning tower, periscope standard, and bridge deck were awash in diesel fuel. The boat had not received any damaged and the rudder gears began to work. The submarine continued movement to its position.
It seems that the submarine had become entangled in a signal net and dragged a signal buoy behind it. Enemy observation of the net was weakly organized, since there was no pursuit, despite the prolonged towing of the buoy (four hours and 15 minutes). The submarine was able to free itself from the net and buoy by a sharp burst of full speed ahead.

The submarine S-12 became entangled in a wire obstacle on 22 November 1942. At 1335, during submerged movement, the submarine went down by the bow. Simultaneously, an automatic switch turned off the main electric motor. Figuring that the submarine had become entangled in a net, the commander gave full reverse, trying to hold the boat on its previous course and level the trim. At 1340 an explosion rang out above the submarine. The scraping of a net and blows similar to striking bottom were heard in the bow of the boat. At 1343 a second detonation occurred. At 1405, having taken additional ballast into the equalizing tank, the submarine lay on the bottom. Scraping on the upper deck was heard in the first compartment at 1425. Having pumped out extra ballast, the submarine began to withdraw from the net’s location in reverse, trying to hold its previous course, but the boat’s bow involuntarily turned to port. At 1445 a third explosion was set off above the submarine, and yet another five minutes later. The submarine crawled along the bottom in reverse. The depth of the sea was 25–28 meters. At 1505 the submarine came up to 20 meters. Blows of some type of metallic object and the breaking of cables were discerned. At 1542 the submarine again began to crawl along the bottom at depths of 30–40 meters. The submarine got free of the net at 1543. Three small explosions were felt during this process (perhaps this was the cable snapping).

The submarine found a depth of 60 meters nearby and began to level off. At 1645 two powerful explosions occurred above the boat. The submarine moved away at a depth of 60 meters. Five minutes later, another three powerful explosions were felt. The sonar operator reported the noises of ships’ propellers. The commander held the boat at 60 meters and stopped all noises except the gyrocompass. The depth around this location was significantly less. In the quiet that ensured, the noises of enemy ship propellers were clearly heard, along with the splash and noise of depth charges and, occasionally, the impact of shrapnel on the submarine’s hull. During the explosions, the submarine experienced powerful shudders, the sheets of flooring surged upward and clanged, the paneling cracked, and the cork insulation fell. During this period, 32 depth charges were dropped. At 1907, apparently having dropped all their depth charges, the enemy ships began to withdraw and their propeller noises faded away. At 2130 the submarine broke free of the bottom and began to move. The boat received much light damage. Apparently the submarine had become entangled in a stationary net. The commander correctly freed his boat from the net by reversing motors. By doing this, he also avoided the nearby explosions of the net’s shells. Freeing his boat from the net took almost two hours. Perhaps in this situation, more speed would have accelerated the process. Upon getting free of the net, he did not linger in the area and moved away from it as quickly as possible, after which he conducted trimming of the boat.

In both cases, the submarines crawled along the bottom to free themselves from the net. In contemporary conditions, a similar course of action is hardly recommended to submarines. The enemy can place magnetic bottom mines in the area of nets. In such cases, crawling along the bottom could lead to the loss of the submarine.

In summation, it can be said that enemy mine and net obstacles are a serious threat to submarines. However, if submarine commanders maintain an attentive and thoughtful attitude
toward this issue and if needed support is provided by other fleet assets, this threat can be significantly reduced.

### 3. Combat with Enemy Submarines

As has already been mentioned, the enemy very broadly uses his own submarines to contend with ours. The enemy systematically maintains his submarines in several of our submarine positions in the north. Their sole mission is to operate against our submarines.

To the degree that the movement routes used by our submarines are known, enemy submarine patrols have appeared constantly at the busiest points. Thus, in the north, German boats have attacked our submarines at the main nodes of our movement routes.

Enemy submarines also lie in wait for our submarines in areas where they charge batteries. The enemy has practiced this method in the Gulf of Finland and in the Baltic Sea. According to our commanders’ observations, enemy submarines engage our boats primarily with two or three torpedoes, fired with a spread. The interval between torpedoes sometimes significantly exceeds our submarines’ length. Attacks are often conducted at very obtuse or very acute angles. Thus, submarines *M-176* and *Shch-403* observed torpedoes fired at them at an angle on the bow of 160–70 degrees. On 19 January 1942, the *K-22* observed torpedoes fired at it at angles on the bow of 160 and 40 degrees. This causes us to believe that the enemy is firing torpedoes with noncontact fuses when engaging our submarines. Consequently, observation must be maintained for submarines and torpedoes not only in bow sectors but also far abeam. In addition, considering that German torpedoes run at a depth setting of up to 20 meters, our submarines must withdraw to a depth of not less than 30–40 meters when evading enemy submarine attacks. It is necessary to withdraw to such depths also in cases when both boats are submerged, considering the possibility of the enemy firing at our boat by acoustic bearing.

The possibility of such firing is confirmed by a number of incidents, including one involving the *M-176* on 27 May 1942. At 1822, our surfaced submarine detected a surfaced enemy submarine. The *M-176* submerged and began maneuvering for an attack. But the enemy submarine also submerged. Propeller noises were heard at 1834 and a periscope wake was noted in our periscope at a range of 3,000–3,600 yards. The *M-176* went to a depth of 45 meters and left the enemy astern. At 1951, the *M-176* fired two torpedoes at it with an interval of six seconds from a range of 1,600 yards. One explosion was clearly heard at 2202. The noises of the enemy submarine’s propellers stopped and a metallic cracking noise was heard.

This incident also tells us that German submarines are not as quiet as we have been led to believe. As seen from this example, this circumstance can be used with success to evade a German attack, as well as to launch our own attacks on them.

Analyzing the cases of enemy submarines sunk by our submarines, we see that in four of them, the enemy submarine was sunk when it was stopped in the water after surfacing. This underscores the danger to a submarine at this moment. Based on this, we must take measures after surfacing so as not to remain stationary on a direct course. Some speed, even a little, must
be maintained after surfacing, and there must be some rudder to one side or the other so that the boat is turning. This significantly complicates the enemy’s firing at our submarine.

When located in position on the surface, the submarine should proceed only by varying courses, both during the day and at night, and especially during battery charging. The time on tack should be 3–4 minutes, then a turn of 30–45 degrees. If it is possible for the submarine to determine its precise position, it can proceed by irregular zigzag and, still better, remain in a circular movement the entire time to one flank or the other. When it is impossible to determine the position and there is significant mine danger, movement should be conducted by regular, simple zigzag.

The requirement for the submarine to observe these rules during battery charging must be emphasized once again, especially on moonlit and light nights. Because of diesel exhaust traces, a submarine can be detected at a significant distance and attacked by an enemy submarine.

Special attention should be given to looking for submarines and torpedoes and to maneuvering on curved and irregular courses when employing deck guns against enemy transports. As has already been mentioned, there is a basis to believe that an enemy submarine sank the S-7 when it was trying to destroy a transport with artillery fire. Since enemy boats regularly patrol in those areas where our submarines operate, it is to be expected that enemy transports and submarines organize and coordinate their actions ahead of time. When our submarines are surfaced, an enemy submarine can take advantage of the favorable attack situation. Enemy submarines also take advantage of our submarine commanders’ blunders, such as proceeding at reduced speeds, maintaining a steady course, and giving all of their attention to the transport they are engaging.

The large percentage of our submarines’ successful evasions from enemy submarine attacks indicates that the danger of attack by enemy submarines can be significantly reduced with tightly organized watches on our submarines.

4. Combat with Enemy Aircraft

The enemy uses his aircraft quite broadly in combating our submarines. Enemy aircraft search for and attack our submarines during their departure from bases, on their sea passages, and in their operational areas.

Incidents of air attacks on submarines departing from or returning to their bases are particularly frequent in the north. Here, the proximity of enemy airfields to our bases permits the enemy to dispatch air forces rapidly when the departures of our submarines are detected.

Incidents of air attacks on submarines crossing to and returning from their positions are fairly frequent in all of our theaters. The method practiced by the enemy in the Black Sea must be particularly noted. Here, the enemy has successfully employed amphibious torpedo bombers to attack our submarines. Knowing our submarines’ routes, the torpedo bombers land on the water and wait for them. When the submarine approaches the aircraft, it takes off, and before the submarine can submerge the aircraft attacks it with torpedoes. It is believed that two or our Black Sea submarines have been lost to attacks by these enemy aircraft. The possibility exists that the enemy aircraft are using sonar instruments to detect our submarines. Attempts to use such instruments in aircraft were made in World War I.
In the north, there have been cases where fighter aircraft have attacked our submarines. High-speed aircraft flying at low altitude would attack a submarine before it can submerge.

Aircraft searching for submarines normally flew at low altitudes—from 50 to 400 meters but most often at 100 meters. In the overwhelming majority of cases, our submarines, proceeding surfaced at maximum readiness to dive, managed to slip under the water just before the enemy dropped his bombs. The enemy’s bombing accuracy, either while the submarine was diving or evading on the surface, was not at all high. Just the same, isolated incidents of bombs striking our submarines have occurred and, therefore, the air threat to our submarines cannot be ignored. Machine gun strafing, which aircraft have carried out in conjunction with bombing, has caused significant trouble for our submarines, mainly in wounding crew members on boats that were unable to submerge quickly enough.

Four cases have been confirmed cases antiaircraft fire from our submarines shot down enemy aircraft. However, this does not speak to the utility of submarines combating with aircraft.

On the basis of extensive combat experience with enemy aircraft, this rule has been developed: While a submarine is surfaced during daylight hours, everything should be done to ensure that the boat can dive rapidly. A depth of 40–50 meters can be considered safe from aircraft bombing. Only in those cases when the submarine cannot submerge should its antiaircraft weapons be prepared for fending off air attacks.

Aircraft searches for our submarines in their operational areas (that is, directly in proximity to the enemy’s sea lines of communication) create great difficulties for our submarines. Aircraft detection of a submarine during these searches is unwelcome, not so much because the aircraft itself can destroy the submarine but because it discloses the presence of the submarine in a given area. Enemy ships can avoid the dangerous zone or strengthen their anti-submarine escort and interfere with the submarine’s attacks. This forces our submarines to remain submerged in their designated areas during daylight hours, reducing the submarines’ maneuvering attributes and the range of the visible horizon. When a submerged submarine is not conducting observation in the periscope, it should remain at a depth at which it cannot be detected by an aircraft at the given time of year in that theater.

An oil slick appearing on the water’s surface as a result of a penetration of the diesel fuel tanks or pumping the bilges indicates the presence of a submarine in a given area. Because of this, all measures should be taken to eliminate the discharge of fuel from tanks.

5. Evading Enemy Pursuit

We can confidently speak now of what enemy ships have at their disposal for combating our submarines. The enemy has not employed anything unanticipated by us.

All enemy anti-submarine vessels are equipped with sonar instruments for monitoring our submerged submarines. Sound direction-finding devices have been installed on the majority of patrol cutters, mobilized patrol vessels, and old standard-type patrol ships. Ultrasonic equipment S, which operates on the principle of horizontal echo sounding, has been installed on the latest combat vessels (destroyers and patrol ships).

German equipment has not delivered the remarkable results that the Germans boasted about before the war began. The range of audibility by German sound direction-finding
Ultrasonic equipment used by the enemy is still being tested and mastered. Their equipment is probably technically similar to our Drakon device, with a detection range not exceeding 2,000–2,200 yards.

**Based on classified German documents, we know that the effectiveness of these sonar devices is reduced with an increase in the depth of the submerged submarine, especially if it manages to go below a thermal layer.** Ultrasonic devices yield poor results when the submarine turns its bow toward the direction of search or is at a very small angle on the bow. This is explained by the reduced reflective surface of the boat’s hull. The stern of the submarine does not possess these characteristics when under way because the volume of disturbed water formed behind the boat deflects the ultrasonic waves.

When submarines lie on the bottom, the enemy has been known to use metal detectors. The enemy has employed large and small depth charges to attack submarines. As far as is known, the explosive weight of these charges is 40 and 130 kilograms respectively. Depth charges are preset to detonate at depths of 35, 60, 90, and 120 meters.  

Ships normally drop depth charges sequentially. Series of 3–4 charges have been dropped, along with single depth charges. Ships have a large supply of depth charges on board: small vessels carry 8–12; mobilized and old patrol ships and destroyer escorts carry up to 30; and new patrol vessels and destroyers carry up to 60.

This large supply of depth charges permits the enemy to conduct prolonged pursuit of a submarine and to drop a large quantity of depth charges on it. The proximity of enemy light forces bases, which are along the coast of his shipping lanes, permits a vessel pursuing a submarine to receive rapid relief and, therefore, increases even more the duration of the pursuit of our submarines and the quantity of depth charges dropped on them. The following submarines experienced the longest pursuit.

On 29 March 1942, two hours after a successful attack on two transports escorted by five patrol vessels and three minesweepers, the submarine *Shch*-422 was subjected to a brief but quite intense pursuit. In two hours, 177 explosions were heard. The submarine evaded subsequent pursuit by withdrawing to our shore batteries. The submarine did not receive serious damage.

On 16 May 1942, the submarine *M*-172 was pursued for seven hours after a successful attack on transports escorted by two patrol vessels and three minesweepers. Up to 324 explosions were counted during this time. The submarine withdrew under the cover of our shore batteries. The hull and machinery received heavy damage.

Our commanders normally employed the following methods to evade pursuing enemy ships.

Measures were employed to reduce the noises generated by a submarine: the boat’s speed was reduced; control of the rudders and planes was shifted over to manual; and all machinery whose work was not absolutely essential was stopped. Some commanders also turned off the gyrocompasses. However, this measure was pointless during movement because the noise from a working gyrocompass was significantly less than the noise generated by the propellers at any
speed. These measures significantly exacerbated the enemy’s efforts to detect and pursue submarines by sound.

As a rule, large and medium submarines submerged deep and remained there between the layers of the explosions of the enemy’s depth charges. Small submarines practiced evasion, remaining at shallower depths.

Submerging deep gave the submarines a whole series of advantages. As has already been mentioned, it was more difficult for German type S devices to hear and detect the boat. If fuel or air bubbled from the submarine, a large trail formed behind it. For example, an increase of the boat’s depth by 30 meters with a speed of three knots increases the size of an oil slick left behind by 300 meters. This makes it more difficult for the enemy to use the oil slick as an orientation for dropping depth charges. It is totally natural for pursuing ships to drop depth charges a bit ahead of an oil slick. Therefore, it is advisable for the submarine to be positioned some distance from it. When there is a current, the oil slick will form at some angle to the course of the submarine. The influence of this error in determining the submarine’s course will be greater when the end of the slick is farther from the boat, because the time of the depth charge is increased and, consequently, the submarine moves farther away.

When the submarine is at a significant depth, the majority of the depth charges will explode above the boat. Such explosions are less dangerous because they produce less shock effect on the boat; the possibility of shoving the boat to the surface is excluded. Concerns that the boat’s hull is under greater pressure at a great depth and, therefore, cannot withstand the additional force from an explosion are not warranted. The increase in pressure during an explosion is so brief that it simply would be incorrect to combine it with the static pressure. The magnitude of the pressure resulting from an explosion is so great that a difference of 3–5 atmospheres in static pressure on the submarine’s hull has no essential significance. Obviously, during depth-charge detonations, it is undesirable for the submarine to be at a depth close to the operating limit for which the boat’s hull was designed.

When it is not possible to submerge deep or into the layers between enemy depth-charge detonations, the submarine should remain at shallower depths in order to be farther away from the depth-charge explosions of the first layer.

Small submarines, which have less operational depth, often prefer this maneuver, considering that for them only the depth charges in the first layer will be dangerous. When they are between 35 and 60 meters, the detonations of these and other depth charges are dangerous. The logic in this regime is well known, but only when there is no oil slick or bubble track.

All commanders employ movement by varying courses. Without question, this measure is appropriate. There are numerous systems of zigzagging. Most commanders change courses after each successive depth-charge detonation. Some steer so as to keep the explosions aft of the boat. This course of action cannot be considered effective. A change of course should interfere with the enemy’s calculation of maneuver for dropping successive depth charges. After a depth-charge explosion, the enemy looks for the submarine’s movement, determines its course, and then calculates the data for the new depth charging. Consequently, courses must be changed between iterations of enemy depth charging.
Some commanders have employed a simple zigzag movement, changing course in turn first to port and then to starboard. The enemy easily recognizes such a method, and it facilitates his orientation on the submarine’s position.

Zigzagging should be more complex. Turns should not be less than 30 degrees. At low submarine speeds, a lesser angle of turn per unit of time will result in a very small lateral displacement of the submarine relative to its previous course. The time spent on a tack should coincide with the time required for surfacing of fuel from the depth at which the submarine is located. Then, if a fuel cell leaks, the oil slick formed on the surface will always indicate where the boat has been. This does not require nearly as many turns as initially presumed. Assuming a surfacing velocity of an oil leak to be 15 centimeters per second, we figure one minute and 40 seconds for a submarine proceeding at a depth of 15 meters, five minutes for 45 meters, and eight minutes and 20 seconds for 75 meters. Rounding off, we arrive at a time on tack for these cases of two, five, and eight minutes respectively.

When the situation permitted, in the Varangerfjord area the commanders selected a general direction of movement calculated to allow them to withdraw under cover of our shore batteries on Rybachiy Peninsula—in shallow areas so as to reach great depths as quickly as possible and in coastal areas to be able to reach the open sea, and so on. As a general rule, it is recommended to select a general direction that will lead to depths approaching the submarine’s operational depth limit. If the submarine is at a modest depth, the enemy is forced to saturate a large expanse of water with depth charges. To accomplish this, he must drop depth charges to explode at various depths, which reduces the probability of destroying a submarine. When a submarine is at a great depth, it can lay on the bottom to repair any damage it may have received.

Some commanders have made it a practice to move in spurts. While the propeller noises of enemy ships were audible, the submarine moved, and when the pursuing ship stopped, the submarine also stopped its engines and steered by inertia. Such a method of operation is good when all enemy ships stop their engines at the same time. The enemy more frequently uses another method: one or two ships stop engines and sound range the submarine at rest, while the other ships maneuver for depth charging. In these conditions, executing such a method is significantly more complicated.

Another method of operations has also been practiced. Immediately after the depth-charge detonation, the submarine commander would give ahead full, and then once again, the submarine was throttled back to ahead slow. This method was effective when the commander had to move to some other area quickly; it permitted an increase in the submarine’s average speed. This had no effect on making it more difficult for the enemy to calculate his depth-charge settings, because he would make those calculations based on the data he received while listening to the submarine. Therefore, the movement of the submarine when the enemy was not listening was of no consequence. On the other hand, such movement led to the expenditure of additional electrical energy. The conservation of electrical energy has vital significance in these conditions.

Thus, during the pursuit on 16 May, for example, the M-172 discharged its batteries to 13 degrees; on another occasion, the Shch-307 discharged its batteries to 11 degrees. It is effective for the boat to increase its speed when the enemy is proceeding for a subsequent dropping of depth charges. This is not difficult to determine, for there is a rapid approach of enemy ship propeller noises toward the submarine.
The most correct way to calculate a direct evasion of depth charging is for the sonar operator to determine the location of the attacking ship. Because any delay can be extremely unpleasant in these conditions, it is very important for the sonar operator to be skilled in rapidly discerning the propeller noises of the attacking ship, and in giving the commander accurate reports regarding the changes in the ship’s bearing. The commander should well understand that a slow change of bearing on the bow is dangerous for the submarine. For the depth charges to detonate close to the hull, they should be dropped in front of the submarine and on its course. If the submarine is at a modest depth, a more rapid change in bearing is also dangerous. To be correct, whenever the sonar operator reports changes in bearing on the submarine’s bow, the commander should always takes commensurate with the change.

Some commanders have made it a practice to ground the submarine on the bottom to avoid enemy pursuit, which normally has led to prolonged and heavy depth charging of the submarine.

**Only in extreme cases should commanders ground on the bottom, for they can never be sure that there is not a fuel or air leak.** Even an insignificant fuel leak, unnoticeable during the boat’s movement, forms an oil slick on the water’s surface when the submarine is grounded on the bottom. This slick indicates the submarine’s exact location to the enemy, who then can immediately determine the submarine’s position and depth. He does not even have to guess at what depth settings to place his depth charges. The answer is clear—to explode on the bottom. This facilitates the destruction of the submarine to the greatest possible degree.

The circumstance that the enemy did not manage to destroy a submarine lying on the bottom when its exact position was known attests to the difficulty of precisely dropping depth charges on submarines. A depth charge dropped at a slow speed can damage the ship that dropped it. To avoid this, the depth charges have to be dropped at high speed (15–18 knots). With such a speed, a delay of 2–3 seconds in dropping the depth charge moves the detonation 16–25 meters, which can reduce its effectiveness against the submarine. In reality, with the organization of depth-charge handling that exists on ships, one can expect the delay in dropping them to be significantly greater.

Our Black Sea submariners, operating in shallow depths in the northwestern portion of the sea, are forced to lie on the bottom during pursuit. To do otherwise would give away the boat’s position by the silt raised from the bottom by its propellers. In these cases, one must also stop the gyrocompass, because its movement can be heard at full silence. In addition, the following rule must be observed: **As soon as it has been determined that the pursuing ships have departed, the submarine must withdraw from the grounding site.** There have been cases when the enemy ships, having fixed the submarine’s position, have departed to replenish their supply of depth charges. Returning with a metal detector, they once again undertake the depth charging of the submarine. Clearly, it is totally thoughtless to lie and wait for the follow-on attack. But the submarine commander must confirm that the ships have indeed departed and have not simply stopped their engines to wait for the submarine.

In a number of cases, the enemy has broken off the pursuit of a submarine initiated during the day only with the coming of nightfall. Consequently, when the electricity supply is limited, it must be expended so that it will last until darkness.

In conclusion, the hulls of our submarines have proved to be very good during the explosions of nearby depth charges. Various instruments and equipment have stood up less well,
especially the electrical gear. The shock mounting of instruments in a large portion of the submarines has shown quite favorable results.

More complex, however, are the enemy ships that have ultrasonic equipment. These devices can be detected only if our submarines have similar ultrasonic gear. If a commander suspects that the enemy is monitoring his submarine with such a device, he must dive deep and try to maintain the enemy ship at an acute angle on the bow.

All the discussions conducted above are appropriate for the general case. In every individual case, tactical methods should be adjusted for the existing situation.
Chapter XI

Lessons of Submarine Combat Operations against Enemy Sea Lines of Communication

The purpose of submarine combat operations against sea lines of communication has been the curtailment of enemy shipping. In the north and on the Baltic, submarine operations have interrupted the provisioning of German forces operating from Finnish territory and in the area of the occupied Baltic districts. One contributing factor to the respite that has continued for more than 18 months on the Murmansk sector of the front is the difficulty the Germans have experienced in supplying their ground forces.\(^{37}\) We can confidently state that over this period, the Germans have suffered many more losses while moving forces and equipment by sea than they have experienced on the ground front itself.

Already in August 1941, when our submarine operations were just beginning on the enemy’s northern sea lines of communication and only four transports had been sunk, the commander of all German forces in Norway, in demanding a strengthening of air forces in the north, reported that submarine operations were greatly hampering the transport of troops and supplies along the coastline of northern Norway. What would he say later when our submarines and aviation began to sink not two transports per month, as in the beginning, but 10 and even 15?\(^\) The commander of all German naval forces in northern Norway submitted similar reports to the central command for naval shipping at the end of 1941. Pointing out the large threat to maritime shipping that our submarines had created, he requested the dispatch of 12 German submarines with experienced commanders to counter them. This request was approved, and submarine reinforcements arrived in the north.

However, neither an increase in the number of aircraft nor replenishment of submarine forces operating in northern Norway was able to help the Germans. The losses our submarines inflicted upon the enemy, though there were some fluctuations (caused mainly by our own internal problems), were on average maintained. Thus, if in the north even in 1941 the Germans had acknowledged great difficulties in maritime shipping created by our submarine operations, then there was no basis to change this evaluation by the end of the period under examination.

To establish the results achieved by our submarines on the Baltic Sea, we will refer to excerpts from the Swedish newspaper *Dagens nyukheter* for 20 October 1942.\(^{38}\)

The attack of enemy submarines\(^{39}\) on ferries operating on the Trelleborg–Sassnitz line (19 October 1942) has turned the most southwestern corner of the Baltic Sea into a dangerous zone of military operations . . .

. . . The Kronshtadt–Leningrad military naval base, no matter how strongly pressured by German- and Finnish-occupied territory, continues to remain a strongpoint of Baltic naval forces, and Soviet submarines under the direction of brave and desperate commanders undoubtedly are breaking out through the narrow, mined, and extremely closely guarded waters of the Gulf of Finland to disrupt shipping on the Baltic Sea . . .

. . . Russian submarine operations in the Baltic Sea, no doubt, are causing great concern for the Germans. These submarines have already threatened shipping in our eastern coastal waters for a prolonged period and have not permitted the Germans to establish firm sea lines of communication. The forced system of
convoying and escorting; the hunt for submarines, which is dangerous and sustains greater materiel and human losses; and the restriction of sea lines of communication—all this, undoubtedly, has disrupted the Germans’ well developed plan for shipping on the Baltic Sea. . .

The Swedes, who cannot be accused of exaggerating our successes, gave such an evaluation of the situation created by our submarines on the Baltic. There is no need for us to add anything to their evaluation.

On the Black Sea, our submarines also inhibited shipping along the western coast to a large degree. It is known, for example, that several times Italian tankers departed from the Bosporus heading for Romania to pick up oil, and each time they returned because of reports of our submarines near the Bosporus. As a result of the losses in their limited transport fleets and the danger of new attacks by our submarines, the Romanians and Germans were forced to employ self-propelled barges and small craft for shipping.

Thus, while submarines were unable totally to block enemy sea lanes in all our theaters, they significantly degraded them and, therefore, facilitated the Red Army’s accomplishment of missions in adjacent sectors of the land front.

During the period under consideration, our submarines, operating on enemy sea lines of communication, inflicted significant materiel losses by destroying enemy transports and the supplies, guns, and troops that they carried.

Table 33 shows the total numbers (by month and for the entire period under examination) of enemy ships sunk by our submarines and their approximate total tonnage. As indicated in this table, our submarines sank 281 enemy ships of various categories and classes, with a total displacement in excess of 1.5 million tons. Figures 26, 27, and 28 show the number of ships sunk by fleet.

Northern Fleet submarines were first in overall results by number of ships sunk, with 52 percent of the total. Baltic Fleet submarines destroyed 28 percent, and Black Sea submariners 20 percent. In tonnage destroyed, Northern Fleet submarines account for 49 percent of the total, Baltic Fleet 39 percent, and Black Sea Fleet 12 percent. The average enemy losses from submarine activity across all the fleets are 13.5 ships and 76,500 tons per month. By individual fleet, the average results for one month of the campaign are highest for Baltic Fleet submariners. Northern Fleet submariners are close to the Baltic Fleet in average number of ships sunk per month.

However, these figures cannot be looked at purely mechanically as some type of measurement of submarine combat operations. It is necessary to take into consideration the density of enemy traffic on a sea line of communication, the number of submarines that were able to be employed for operations against sea lines of communication, the amount of time that submarines were actually in position, and a number of other factors.

We do not have a mandate to give a general evaluation of submarine combat operations by fleet. This is a prerogative of the higher naval command. We will present a number of statistical measures that can be useful for various discussions.
To gain an impression of how effective our submarine positions were, tables 34, 35, and 36 show the actual number of days positions were serviced by submarines, the number of enemy ships sunk in each of them, the number of ships sunk extrapolated to 100 days of submarine presence in positions, and the actual number of submarines lost in positions.

[Tables 34, 35, and 36 here in original text.]

From these tables, one can conclude that the most lucrative positions for submarines were in the Baltic Sea, where the average number of transport sinkings reached 23.7; this figure reached only 10 in the Black Sea and 14 in the north.

Thus, it must be recognized that there were areas in the Baltic Sea that were more favorable for submarines than on other seas. Unfortunately, both of these areas in the Baltic Sea were seldom serviced by submarines, because they were close to Swedish territorial waters. Swedish protests forced us to cease submarine operations in these areas. On the Black Sea, the area of the Bosporus and Tuzla spit come to the fore; in the north, it is the Kirkenes area and Lopphavet.

The locations of our submarine losses are given in table 36 but only generally, since it was impossible to establish whether many submarines perished at sea or in their positions.

The numbers that show how submarines of various types were employed in the different fleets are also of some interest. In table 37, it is interesting to note that the average time Baltic Fleet submarines were present in their positions is two times longer than submarines of the same type on other seas. Type Shch submarines spent the greatest time at sea.

It is also interesting to look at the figures for the average duration of a submarine’s presence in position relative to 100 tons of displacement. The numbers in this table clearly indicate that the larger the displacement of the submarine, the smaller proportion of the submarine’s time in position.

We will point out one more indicator—the rate of success of submarine torpedo attacks. Table 38 gives a summary of the attacks conducted by each submarine. In an inspection of this table, one is struck by the exceptional success rate of several Northern Fleet submarines. Almost all of the malyutki, the Shch-421, the K-3, and the L-20 had almost 100 percent success. Some of these submarines made as many as 10 attacks (M-172). This indicates that such commanders as Heroes of the Soviet Union Fisanovich and Lunin, who did not have a single miss, can indeed be named submarine torpedo snipers.

There are good marksmen on the other seas as well, to include the submarines Shch-309 on the Baltic, and M-31 and M-62 on the Black Sea.

We note that in number of ships sunk, the M-171 (commanded by Hero of the Soviet Union Captain Third Rank Starikov), which sank 15 enemy ships in 21 months of the war, is in first place among all fleets.

Table 39 gives a summary of torpedo attacks by type of submarine. Interestingly, type M submarines are in first place in all fleets (on the Baltic Sea, the L-3 [the only submarine of this type in that fleet] is in first place). Type S submarines are in last place.
Not far from them would be type K submarines. The transfer to the K-21 of Hero of the Soviet Union Captain Second Rank Lunin (prior to this he was on the Shch-421) sharply raised the success rate of torpedo firing of this submarine type.

This underscores the tactical superiority of submarines of less displacement. Small submarines are significantly easier to steer and the probability of their destruction by various anti-submarine assets is less. This permits their commanders to operate more skillfully.

[Tables 37, 38, and 39 here in original text.]

The last issue to be discussed is the significance of stern torpedo tubes. Of the 201 attacks that submarines with stern tubes carried out during the period under discussion, the stern tubes were used for 50 engagements, that is, 25 percent of the total. Stern torpedo tubes constitute 25–33 percent of all torpedo tubes on Soviet submarines. Thus, we see that without question, stern tubes are needed on submarines, and the percentage of stern and bow tubes reflected here is confirmed by experience (considering that submarines quite rarely expend all torpedoes). The necessity and importance of stern tubes on submarines is also confirmed by the fact that the LK Tirpitz had to be attacked with stern tubes.
Chapter XII

Main Conclusions Concerning Submarine Command and Control

The results achieved by our submarines confirm that they are a powerful means of combat on enemy sea lines of communication in contemporary conditions.

- The following are the basic shortcomings in the utilization of our submarines on enemy sea lines of communication:
  - Weak coordination with other fleet forces and with submarines located in nearby positions.
  - Employment of submarines singly.
  - Patterned fashion of submarine employment (position method and the too similar method of cruising in a limited area).

- Coordination of submarine operations with other fleet forces should encompass the following:
  - Reporting the enemy’s location and direction of movement to submarines during the day.
  - Searching for the enemy at night by surface forces in seaward sectors, outside of obstacle fields.
  - Interfering with the enemy’s creation of anti-submarine [obstacle] lines on our boats’ movement routes.
  - Discovering passages through obstacles by observing enemy ship movement and by conducting minesweeping reconnaissance by surface forces designated specifically for this purpose or during the conduct of other missions.
  - Assisting submarines during their forcing of anti-submarine [obstacle] lines.
  - Assisting submarines being pursued by the enemy or which have had an accident, which should include the dispatch of specially designated forces to support submarines operating against lines of communication.
  - Detecting and reporting by submarines of the movement of large convoys to ensure that other fleet forces conduct attacks against the enemy.

- As a rule, submarines should cover the entire extent of the sea lines of communication. This forces the enemy to disperse his anti-submarine forces and means. When the number of boats available for this is a limited, cruising submarines must be maintained in heavily trafficked areas of enemy sea lines of communication, and cruising submarines must operate along the entire length of his sea lines of communication in the remaining area.

- Employment of groups (or pairs) of submarines should be directed at sustaining sequential (not combined) attacks. This permits us to exploit the weakened
security after the first submarine’s attack and interferes with the enemy’s pursuit of the submarines after they have attacked his ships.

- The following standard types should be considered for submarine command organization:
  - Delegation of missions to the brigade commander an assignment to him of the necessary forces.
  - Delegation by the brigade commander of partial missions to division commanders by operating areas.
  - Preservation of command of all submarines at sea by the brigade commander.

- Planning of submarine combat operations is necessary to uniformly and systematically disrupt enemy sea lines of communication. The presence of a reserve is necessary to reinforce submarine operations during periods of anticipated heightened enemy shipping.

- A basic element that has limited the employment of our submarines is repair.

- When necessary, the duration of submarine presence in positions can be significantly increased by carrying extra fuel in specially adapted tanks in the free-flooding space between the hulls without significant increase in danger to the submarine.

- Areas where submarine operations are most effective can be identified by detailed analysis of results achieved by the boats.

- Stealth is one of the fundamental means that ensures successful submarine operations, but it should not be an end in itself. Stealth has decisive significance as a tactical element. A commander must know when stealth is necessary and when it should be violated.

- Passive waiting for the enemy’s appearance does not yield success. We must seek out the enemy by proceeding into the traffic stream.

**Concerning submarine employment of torpedo weapons**

- The torpedo is the means of most rapid and reliable destruction of enemy ships. When possible, torpedoes should be used first.

- A new method of firing torpedoes has significantly increased our success rate. Submarine commanders should be required to use this new firing method. When submarines have received MO-3 instruments, we must transition to engagement by spread using new firing tables.

- Our commanders must fire at several ships of a convoy and conduct follow-on attacks to raise the effectiveness of our submarine operations.

- The best results have been achieved at engagement ranges of 1,000–2,000 yards, with an angle on the bow of 100 degrees.
• It is necessary to improve in all ways the training of commanders at sea in conducting night attacks. The number of torpedoes fired at night should be increased.

• Good ballistic characteristics have come from 58/38 torpedoes. In a large proportion of the cases, the strike of a single torpedo has led to the destruction of a 5,000–6,000-ton transport.

• We must fire torpedoes with noncontact fuses during attacks on submarines and vessels of shallow draft.

• 45/36 torpedoes should be used for operations in shallow waters.

• It is necessary to organize test exercises to check the following:
  o Firing from a turning boat.
  o Firing in heavy seas when surfaced.
  o The magnitude of the “drop” made by a torpedo when fired.
  o Firing from depths of 20 meters and greater (for blind attacks).

Concerning use by submarines of deck guns and scuttling charges

• If submarines cannot use torpedoes to sink unescorted enemy transports, then they must use artillery.

• The employment of artillery against enemy patrol forces is warranted when it enables a submarine to destroy a valuable target escorted by these ships or when the situation forces the submarine to use it.

• Engagement of enemy transports during daylight at close ranges (less than 3,000 yards) is unacceptable.

• We must improve the training of submarine crews in firing at night.

• Considering the presence of decoys, the sinking of ships with scuttling charges should not be considered.

Concerning the employment of submarines in minelaying operations

• The employment of submarines for minelaying operations has yielded favorable results, showing a significant restraining influence apart from the materiel losses.

• The mission statement for submarine minelaying operations should specify the area where the submarine commander is permitted to place mines, leaving it to him to determine (by preliminary reconnaissance) the exact positions for the mines.

• The most effective method is to place mines in banks in areas that have already been swept by enemy minesweepers.

• Observation of areas where mines have been laid is necessary in order to establish the results. Otherwise, it is impossible to make adjustments in plans for future minelaying.
The acceptance into service of PLT-2 (floating) mines significantly broadens the capability of type L submarines, particularly during operations against enemy convoys.

**Concerning submarine combat with enemy anti-submarine forces**

- The most effective methods for combating enemy anti-submarine forces are being revealed by analysis and generalization of our submarines’ combat experience. Up to this time, such systematic work was not being conducted in our fleets. It should be a basic obligation of submarine brigade staffs and departments.
- The presence of enemy ship escorts makes stealth more difficult to achieve in our attacks and increases the expenditure of torpedoes without a corresponding increase in the effectiveness of the attacks.
- Heavily mined areas are dangerous and must be crossed at maximum depths, but not closer than 10–15 meters from the bottom. Submarines should be surfaced at night, when there is a rising tide.
- Frequent cases of our submarines encountering minefields that were known to them, the detonation of mines, and the loss of submarines to mines have resulted from a low level of navigational proficiency on submarines. This requires that the most serious attention be paid to assigning qualified navigators to submarines and to providing them with the means that will permit the improvement of navigational accuracy in poor visibility conditions and when there are shifting currents.
- Submarines must submerge to a depth of not less than 30 meters when evading enemy attack. However, they should go as deep as possible in shallow waters.
- The principal method of combat with aircraft is to submerge to a depth of 40–50 meters.
- Type M submarines have shown the best success on all seas. This shows the effectiveness of the construction of submarines with the least possible displacement but fully capable of carrying out operational and tactical missions.

The acquisition of extensive combat experience by commanders and all submarine crews, the significantly growing initiative of commanders and their success in employing weapons, the improved command and control of submarines, and the transition to more developed methods of their employment all provide a solidly based confidence that our submarines will manage to achieve still greater results, create still greater interference with enemy shipping, and destroy still more of his transports and cargoes.
## APPENDIX A

**Basic Tactical/Technical Elements of Diesel Submarines of Soviet Navy of Pre-war and Wartime Production**1

<table>
<thead>
<tr>
<th>Boat type</th>
<th>Series</th>
<th>Basic dimensions</th>
<th>Displacement</th>
<th>Propulsion</th>
<th>Speed</th>
<th>Range</th>
<th>Armaments</th>
<th>Crew (officers, petty officers, sailors)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>length x beam x draught (m)</td>
<td>surfaced submerged</td>
<td>No x hp</td>
<td>(knots) surfaced submerged</td>
<td>at full and economical speed</td>
<td>Torpedoes; Torpedo supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(tons)</td>
<td>Diesel Electric</td>
<td></td>
<td>kt., naut. mi.</td>
<td>Deck guns, machine guns, # of rounds</td>
<td>Mines</td>
</tr>
<tr>
<td>Dekabrist</td>
<td>I</td>
<td>76.6 x 6.4 x 3.76</td>
<td>934</td>
<td>2x1100</td>
<td>14.6</td>
<td>2570</td>
<td>8 – 533 B – 6 S – 2</td>
<td>1 – 100 (120) 1 – 45 (500)</td>
</tr>
<tr>
<td>Leninets</td>
<td>II</td>
<td>78.0 x 7.2 x 3.96</td>
<td>1025</td>
<td>2x1100</td>
<td>14.5</td>
<td>3600</td>
<td>6 – 533 B – 6</td>
<td>1 – 100 (122) 1 – 45 (250) 1 – 7.62</td>
</tr>
<tr>
<td>XI</td>
<td></td>
<td>79.9 x 7.0 x 3.96</td>
<td>1040</td>
<td>2x1100</td>
<td>14.6</td>
<td>3400</td>
<td>6 – 533 B – 6</td>
<td>1 – 100 (122) 1 – 45 (250) 1 – 7.62</td>
</tr>
<tr>
<td>XIII</td>
<td></td>
<td>85.3 x 7.0 x 4.05</td>
<td>1120</td>
<td>2x1100</td>
<td>15.0</td>
<td>2750</td>
<td>8 – 533 B – 6 Deck - 2</td>
<td>1 – 100 (150) 1 – 45 (500) 2 – 7.62</td>
</tr>
<tr>
<td>XIII-bis</td>
<td></td>
<td>83.3 x 7.0 x 4.05</td>
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1 This table is extracted and translated from V.I. Dmitriev, *Sovetskoye podvodnoye korabli* [Soviet submarine construction] (Moscow: Voenizdat, 1990), Appendix 5.

2 Shown are the number of torpedo tubes (B – bow, S – stern) and caliber of torpedo in millimeters; number of guns, their caliber in millimeters, and (basic load); number of mine tubes or mine cisterns; type and quantity of mines.

©English Translation James F. Gebhardt, 2011
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Appendix B
Geographical Place names

A
Adlergrund – a sandbank, apparently between Bornholm Island and Rugen Island in the Baltic Sea.
Akhtopol – also Akhtebola, a port town on the Bulgarian coast south of Burgas.
Akmenrags – a cape north of Liepaja on the Latvian Baltic coast.
Aland Sea – a body of water south of the Aland Island group, between the Gulf of Finland and the Swedish coast.
Altafjord – a body of water on the northwest Norwegian coast.
Arkhangelsk – a Soviet port city on the mouth of the Dvina River in the White Sea.
Arkona – a cape on German territory opposite Trelleborg, Sweden.

B
Balaklava – a settlement on the southern coast of Crimea.
Barents Sea – a body of water north of the Kola Peninsula, bounded on the east by Novaya Zemlya and on the west by the Norwegian Sea.
Batsfjord – a small fjord and village on the northern coast of the Varanger Peninsula in northern Norway.
Batumi – a port city on the eastern coast of the Black Sea just north of the Turkish border.
Belomorsk – a city on the western shore of Onega Bay in the White Sea, south of the Solovetskiy Islands.
Berlevag – a small village on the northern coast of the Varanger Peninsula in northern Norway.
Bogshøe – probably Bogskar, a lighthouse on an island east of Stockholm and south of Aland.
Bornholm – a large Danish island in the Baltic Sea off southern Sweden.
Bosphorus – the strait through Turkish waters joining the Black Sea with the Mediterranean Sea.
Bothnia, Gulf of – a body of water between Finland and Sweden north of the Aland Island group.
Botnica – the Gulf of Bothnia.
Breidsund – also Breysund and Broysund, the strait between Hjelmsoy and Havoy Islands, west of Mageroy Island in northern Norway.
Brusterort – an unidentified locale, probably on the German coast in Danzig Bay.
Burgas – Bulgarian port on the Black Sea.
Bustasund – also Bust Strait, a body of water off Slotten, on the west side of the Porsanger Peninsula.
Constanta – large Romanian port on the Black Sea.

D
Dago – also Hiiumaa, an island of the Moonzund group near the mouth of the Gulf of Finland.
Danzig – German/Polish Baltic port, now named Gdansk.
Darss – a locale on the north German coast, west of Rugen Island.

E
Emine – a cape on the Black Sea, northeast of Burgas, Bulgaria.

F
Falsterbo – a lighthouse at the southwestern tip of Sweden
Feodosia – a Russian port on the northeastern coast of the Black Sea
Fehmarn Island – an island off the northern German coast, between Kiel Bay and Mecklenburg Bay.
Fidonisa – an island off the coast of Romania.
Frakfjord – a small fjord on the northern of Stjernoy Island in northwestern Norway.
Fugloy Sound – a body of water adjacent to Fugloy Island in northwestern Norway.

G
Gedser – a locale on the southern tip of Falster Island in Denmark.
Gogland – also Hogland, an island in the Gulf of Finland.
Gotland – a large island off the Swedish coast in the Baltic Sea.
Gottenhafen – now Gdynia, a Polish port on the western side of Danzig Bay.

H
Hammeren – the northernmost land point on Bornholm Island in the Baltic Sea.
Hammerfest – a coastal settlement on Soroysund in northern Norway.
Hanko – also Hango, Soviet naval base on Finnish territory west of Helsinki.
Hano Bay – a body of water off the southeastern coast of Sweden.
Harbaken – a cape east of Syltefjord on the northern coast of Varanger Peninsula in northern Norway.
Hefring – an unidentified locale on the Swedish coast near Norrkoping.
Helnes – a lighthouse and cape on Mageroy Island, east of Nordkapp at the entrance to Porsangerfjord.
Helsinki – the capital city of Finland, on its southern coast.
Hobergen – the southernmost extremity of Gotland Island in the Baltic Sea.

I
Irben – a strait at the western entrance to the Gulf of Riga.

J
K
Kagsund – a body of water south of Arnoy Island in northwestern Norway.
Kaliakra – a cape on the Bulgarian Black Sea coast, northeast of Burgas.
Kalmarsund – a body of water between Oland Island and the Swedish mainland.
Kappeluden – an unidentified locale in Sweden.
Karkinitskiy Bay – a large bay on the northeastern side of Crimea in the Black Sea.
Karlskrona – a port on the southern coast of Sweden.
Karlsøy – a small island on the northwestern coast of Norway.
Kherson – a cape on the southwestern coast of Crimea in the Black Sea.
Khob River – a river that drains into the Black Sea on the eastern coast north of Poti.
Kiel – a German port city opposite Denmark on the Baltic Sea.
Kikhelkon – an unidentified locale in the Baltic Sea.
Kildin Reach – a body of water at the mouth of the Kola Inlet.
Kirkenes – a Norwegian port city adjacent to Russian territory in the far north.
Kola Inlet – on the Barents Sea on the west side of the Kola Peninsula, location of the large port Murmansk.
Kolkasrags – a cape jutting into the Gulf of Riga on the southern shore of the Irben Strait.
Kristinestad – a Finnish coastal settlement on the Gulf of Bothnia.
Kronshtadt – the fortress island guarding Leningrad, a longtime Russian/Soviet naval base.
Kvaenangen – small island on northwestern Norwegian coast; also an adjacent body of water (Kvaenangenfjord).
Kvaloy – an island on the northwestern Norwegian coast; location of Hammerfest.
Kvarken – bodies of water, South Kvarken on western side of Aland Island, controlling entrance to Gulf of Bothnia; North (sometimes East) Kvarken, midway up the gulf near Umea, Sweden.

L
Landsort – a locale on an island off the Swedish coast south of Nynashamn and also a deep trough in the waters between Nynashamn and Gotska Sandon.
Leningrad – now Sankt Petrburg, the former capital city of Russia at the eastern end of the Gulf of Finland.
Libava – Libau, now Liepaja, Latvian port on the Baltic Sea.
Liinakhamari – a small port at the bend in Petsamofjord, opposite Cape Krestovyy.
Lopp Havet – also Lopphavet, a body of water off the northwestern Norwegian coast at Arnoy Island.
Loppa – an island in Lopp Havet.
Lubeck – a German port on the Baltic Sea.
Luga – a bay at the mouth of the Luga River, west of Leningrad on the Gulf of Bothnia.
Lulea – a Swedish coastal settlement in the northern Gulf of Bothnia.
Luppa – a small island near Gogland in the Gulf of Finland.
Lyngenfjord – a body of water south of Arnoy Island in northwestern Norway.

M
Mageroy – an island off the northwestern Norwegian coast.
Mageroysund – the body of water on the south side of Mageroy Island.
Makkaur – also Makkaursandfjord, a body of water on the northern Varanger Peninsula in Norway.
Mangalia – a Romanian port on the Black Sea near the Bulgarian border.
Mecklenburg – a bay at Rostok on the northern German Baltic coast, south of Denmark.
Memel – also Klaipeda, Lithuanian port on the Baltic Sea.
Molotovsk – now Severodvinsk, a Soviet port and repair base along the White Sea coast, west of Arkhangelsk.
Mon – a Danish island midway between Trelleborg, Sweden, and Rostock, Germany.
Moonzund – an archipelago of more than 500 islands off the western coast of Estonia.
Murmansk – the large port city in the southern reach of Kola Inlet in northern Russia.

N
Narvik – Norwegian port at the northern end of Vest Fjorden.
Nekso – a port on the east coast of Bornholm Island in the Baltic Sea.
Nidden – an unidentified locale, probably on the eastern coast of Gotland Island in the Baltic Sea.
Nikolaev – a Soviet port in the northern Black Sea, east of Odessa.
Nordkin – a locale in the extreme northern part of Norway, east of North Cape (Nordkapp) at Laksefjord.
Norrkoping – a Swedish inland port south of Stockholm.
Novorossiysk – a Soviet port on the eastern coast of the Black Sea.
Nordre Bergsfjord – also Nordrefjord, a body of water landward from Lopp Havet in northwestern Norway.

O

Ochamchira – a Soviet port on the eastern Black Sea coast, south of Sukhumi.
Odessa – a large Soviet (now Ukrainian) port city on the northwestern Black Sea coast.
Oland – the long island off the southeast coast of Sweden.
Olinka, Cape – a cape on the western coast of the Black Sea, south of Sulina, Romania.
Oranienbaum – now Lomonosov, a city west of Leningrad on the Gulf of Finland.
Ore Sund – the strait between Sweden and Denmark at Copenhagen.
Ovisi – a locale along the Latvian Baltic coast, north of Ventspils.

P

Pappe – an unidentified locale in the operating area of the Baltic Fleet.
Persfjord – body of water on the northeastern coast of the Varanger Pensula in northern Norway.
Petsamo – also Pechenga, a settlement at the southern end of Petsamovuono in the extreme northwestern part of Russia, west of Murmansk.
Petsamovuono – also Petsamofjord and Petsamo Inlet, a body of water west of Rybachiy Peninsula.
Polyarnoye – also Polyarnyy, a Soviet naval base and Northern Fleet headquarters in Kola Inlet northeast of Murmansk.
Pomerania, Bay of – the body of water adjacent to the Polish–German coast south of Bornholm Island in the Baltic Sea.
Porsangerfjord – a large body of water on the northern Norwegian coast.
Poti – A Soviet (now Georgian) port on the eastern coast of the Black Sea.

Q

R

Rauma – a Gulf of Bothnia port on the Finnish western coast.
Riksheft – an unidentified locale, probably in Danzig Bay.
Ristna – the westernmost point on Dago or Hiiumaa Island, near the mouth of the Gulf of Finland.
Rolvsoy – an island off the northwestern Norwegian coast at the 24th meridian.
Ronne – a port on the western side of Bornholm Island in the Baltic Sea.
Rovaniemi – a Finnish town on the Arctic Circle, headquarters for German troops in the region during the war.
Rugen – a large island on the northern German coast, due south of Trelleborg, Sweden.
Rybachiy Peninsula – also Fisher Peninsula, west of Murmansk on Soviet territory.
S

Sammelsund – a body of water southeast of Kvaloy Island.
Sandhammaren – the southernmost point of the Swedish mainland opposite Bornholm Island.
Sassnitz – a German Baltic port on the eastern side of Rugen Island.
Sekstan Bank – an unidentified sandbank in the Baltic Sea, probably north of Gotland Island.
Shabler – a locale on the Bulgarian coast just south of the Romanian border.
Simpnesklubb – a lighthouse on Sweden’s eastern coast, south of Stockholm.
Simrishamm – a Swedish coastal settlement northwest of Bornholm Island.
Sinop–Samsun – two Turkish ports on the south-central Black Sea coast.
Smygehuk – a locale on the Swedish southern coast between Trelleborg and Ystad.
Soelosund – a body of water along the Latvian or Estonian Baltic coast.
Soroy – an island off the northwestern Norwegian coast at the 23rd meridian.
Soroysund – the body of water on the southeastern side of Soroy Island.
Steynort – an unidentified locale in the Baltic Fleet operating area.
Stolpe Bank – a sandbank southeast of Bornholm Island, north of the Polish coast.
Strusteynbukht – an unidentified locale in the Northern Fleet operating area.
Sulina – a locale on the Romanian Black Sea coast, just south of the Ukrainian border.
Suurkyul – a coastal locale, probably on Estonian territory.
Svaerholtklubb – also Cape Svaerholtklubb, the northernmost point of Svaerholt Peninsula, which separates Porsangerfjord and Laksefjord.
Swinemunde – now Swinoujscie, a Baltic Polish port.
Syltefjord – a settlement and body of water on the northern Varanger Peninsula coast in northern Norway.

T

Tallinn – an Estonian port on the Gulf of Finland.
Tanafjord – a body of water west of Varanger Peninsula on the Norwegian northern coast.
Tarkhankut – a peninsula and cape on the western side of Crimea.
Trelleborg – a settlement and harbor on the southern Swedish coast opposite Rugen Island.
Tromso – a port city on the northwestern Norwegian coast.
Tromsoy – the island on which Tromso is located.
Tuapse – a port on the eastern Black Sea coast south of Novorossiysk.
Tuzla – a cape on the Romanian Black Sea coast, south of Constanta.
Tyuters – Bolshoy and Malyy, two islands in the Gulf of Finland north of Narva Bay.
U
Ullsfjord – a body of water east of Tromso in northern Norway.

Ust–Dvinsk – also Daugava or Daugavgriva, a seaport several miles north of Riga, Latvia, in the Gulf of Riga.

Utlkippen – an island and lighthouse south of Karlskrona, Sweden.

Uto – an island off the Swedish coast, southeast of Stockholm, north of the Landsort trough; also an island at the mouth of the Gulf of Finland, southeast of Aland Island.

Uusikaupunki – a Finnish west coast port on the Gulf of Bothnia.

V
Vaasa – a Finnish west coast port on the Gulf of Bothnia opposite Umea, Sweden.

Vadso – a port on the southern coast of Varanger Peninsula in northern Norway.

Vannsund – a body of water adjacent to Vannoy, an island west of Lopp Havet in northwestern Norway.

Varangerfjord – body of water between Varanger Peninsula and the Norwegian mainland.

Vardo – a port on the northeastern coast of Varanger Peninsula in northern Norway.

Varna – a Bulgarian port on the Black Sea just south of the Romanian border.

Vaytalakhti – probably also Vaydaguba, a small bay on the northwestern tip of Rybachiy Peninsula, west of Murmansk.

W

X

Y

Yasmund – an unidentified locale on the German Baltic coast south of Bornholm island.

Ystad – a port on the Swedish southern coast.

Z
ENDNOTES

1 For the resolution of this and other issues, the British government maintained a mission at Northern Fleet headquarters in Polyarnoye, headed by an admiral of the Royal Navy.

2 At the present time, the length of the mooring cables of the mines placed by our submarines has been increased to 260–300 meters. This permits us to lay our mines at the same depths at which the German mines are placed.

3 The Russian here is kreyserskoye polozheniye, or cruising condition, which is defined as surfaced with empty main ballast tanks and full rapid dive tanks. The submarine is ready for an emergency dive. See V.I. Dmitriyev, Sovetskoye podvodnoye korablistroyeniye (Soviet submarine construction), Moscow: Voyenizdat, 1990, 51n, hereafter cited as Dmitriyev, Sovetskoye. [Trans.]

4 Concerning the presence of underwater submarine bases, see “Enemy Operations in the Baltic Sea in 1942,” page 23. [Translator’s note: Lacking a complete citation for this source, it could not be obtained to determine what is meant by “underwater submarine base.” Perhaps it refers to caves or pens that submarines enter and exit while submerged.]

5 The Russian here is zhidkiy grunt, literally “liquid soil.” A Russian language naval dictionary defines it as “a layer of sea water, the density of which is significantly greater than the density of the water layers above and below it.” See Voyenno–Morskoy Slovar [Military naval dictionary], V.N. Chernavin, ed. (Moscow: Voyenizdat, 1990), s.v. zhidkiy grunt, 142.

6 The Russian here is obespechivayushchiye komandirov, literally “supporters of the commanders.” But these were, in fact, officers from a higher-level staff, senior to the submarine commanders, who accompanied them on every sortie, watched their every move, and advised them on every decision. An example of this practice in the Northern Fleet is given by N.I. Vinogradov, Podvodnyy front [Underwater front] (Moscow: Voyenizdat, 1989), 20. [Trans.]

7 The fleet military council was comprised of the fleet commander, fleet senior political officer, and fleet chief of staff. [Trans.]

8 Gadzhiev, Magomet Imadutinovich, 1907–42. At the time of his death on 13 July 1942, Gadzhiev was commander of the 1st Division, Submarine Brigade, Northern Fleet. The type M submarine on which he was returning from a sortie was attacked by a German aircraft and he was killed. He was awarded HSU posthumously on 23 October 1942. [Trans.]

9 Areas could be quite extensive, and division boats were expected to cruise in them.

10 The essence of the “cruising in a limited area” method was that submarine operating areas, separated only by boundary lines, thus covered all enemy lines of communication.

11 This incident is described in more detail by the brigade commander, N.I. Vinogradov, in his memoir Podvodnyy front [Underwater front] (Moscow: Voyenizdat, 1989), 156–69. [Trans.]

12 This incident is recounted in Vinogradov, Podvodnyy front, 107–11. [Trans.]

13 This incident is recounted in Vinogradov, Podvodnyy front, 101–06. [Trans.]

14 Kolyshkin, Ivan Aleksandrovich (1902–70); awarded HSU on 17 January 1942 for sinking eight German vessels with a combined displacement of 72,500 tons. Completed Academy of the
General Staff in 1950; chief of the Higher Naval Academy, retired as rear admiral in 1959. [Trans.]

15 This incident is briefly mentioned in Vinogradov, *Podvodnyy front*, 9–10. [Trans.]

16 Fisanovich, Izrail Ilich (1914–44); awarded HSU on 3 April 1942 for sinking three German transports. Killed in action on 19 September 1944 while a submarine division commander in the Northern Fleet. [Trans.]

17 This incident is described in an excerpt from Fisanovich’s writings in the collection compiled by A.V. Dmitriev, *Podvodniki atakuyut* [Submariners attack] (Moscow: DOSAAF, 1985), 137–43. [Trans.]

18 Starikov, Valentin Georgievich (1913–79); awarded HSU on 3 April 1942 for sinking five German transports. Completed Academy of the General Staff in 1953; chief of Pacific Fleet Higher Naval Academy, retired as vice admiral in 1972. [Trans.]

19 The M-class submarine was notorious for breaching when it fired torpedoes. Despite the best efforts of the crews, they were often unable to take on sufficient ballast in the bow tank rapidly enough to prevent the bow from breaking the surface.

20 Starikov describes this incident in an excerpt in *Podvodniki atakuyut*, 68–94.

21 Lunin, Nikolay Aleksandrovich (1907–70); awarded HSU on 3 April 1942 for sinking seven German transports. Retired as rear admiral in 1962. [Trans.]

22 The failure of the commander to consider these factors in the end exposed the submarine to great danger. Two months later the submarine encountered two destroyer escorts at night at close range. Instead of rapidly diving the boat, the watch commander, trained to consider lightly the mentioned rules, began to summon the boat’s commander. Not only the commander but the commissar and navigator came up. The boat came under fire (the commander and helmsman were wounded), it was rammed during its dive, and was forced to return to base.

23 Travkin, Ivan Vasilevich (1908–85). Commanded the K-52 in the Baltic Fleet, and for sinking 13 enemy vessels was awarded HSU on 20 April 1945. Retired as a captain first rank in 1956. [Trans.]

24 Greshilov, Mikhail Vasilevich (1912–unk.). Greshilov successfully commanded in turn the M-35 and Shch-215 in the Black Sea Fleet; awarded HSU on 16 May 1944. After his retirement at captain first rank in 1959, he worked as a senior engineer in the Institute for Acoustics of the Academy of Sciences of the USSR. [Trans.]

25 The utilization of antiaircraft guns against aircraft is examined in Chapter X, “Submarine Combat with Enemy Anti-submarine Forces.”

26 A photograph of the commander of the group of anti-submarine patrol boats that sank the K-2 appeared in the February 1943 issue of *Marine Rundschau*.

27 At the present time the tether has been lengthened to 300 meters.

28 At the present time lengthened to 260 meters.

29 This formulation of the mission is from the submarine commander’s summary of the sortie.
Initially, the written order to the submarine required its return to base immediately after laying the mines. This was changed by an oral instruction.

The longest period in base (40 and 47 days) occurred between the most recent laying of mines near the west coast and in another area of the Black Sea. If these recent sorties to the west coast and subsequent stay in base are excluded, then the results are as follows: the \textit{L-4} – 26 days at sea, 42 in base; and the \textit{L-5} – 17 days at sea and 40 in base.

The period of operation of the mine has been temporarily reduced to five days.

This applies to those submarines that do not have bubble-less firing devices.

The probability of detonating a mine in actuality is greater, because many submarines travel in minefields for hours and cross the line of mines at various angles several times.

According to observations of our submarine commanders, explosions of depth charges dropped by an aircraft occurred at depths on the order of 20–30 meters.

Presently, the enemy is using depth charges preset to explode at depths of from 15–120 meters with 10-meter intervals.

This remark is in reference in the failure of the German ground offensive to reach Murmansk, its objective, in the fall of 1941, and the subsequent stabilization of the front line at the Litsa River approximately 50 kilometers northwest of Murmansk. This position remained static until the Soviets launched their own offensive on 7 October 1944, which by the end of October resulted in the forced withdrawal of all German forces from Soviet territory west of Murmansk and the Soviet occupation of Norwegian terrain around Kirkenes. [Trans.]


Attacked by the submarine \textit{D-2}. 