NAVEDCOM 143 ~ M

Change 0; June 1988

Nuclear Attack Submarine Combat Operations

RED STORM RISING

The Nuclear Attack Submarine Simulation
from MicroProse
based on the best-selling Tom Clancy novel

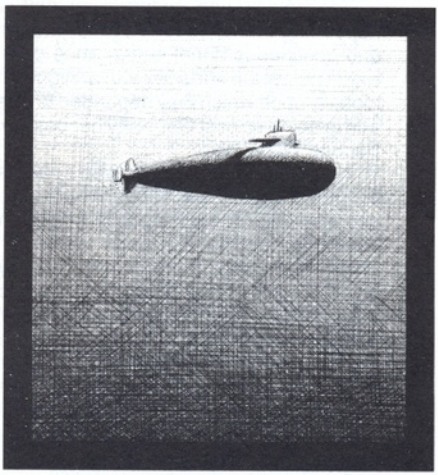
RED STORM RISING is MicroProse's simulation of undersea warfare today, inspired by Tom Clancy's best-selling novel of World War III, *RED STORM RISING*. In this realistic and detailed game, you command a modern nuclear attack submarine in the frigid northern seas. Here you duel with Russian helicopters, warships and submarines in defense of the free world.

RED STORM RISING faithfully reproduces modern naval warfare, complete with computer-guided missiles, TMAs, sonar, radar, lasers and much more. You are the ultimate high technology warrior, commanding your sub from an attack center that includes fourteen different displays and almost fifty different controls. You can steer wire-guided torpedoes to target, set up Harpoon missile launches, then drop decoys and noisemakers to evade enemy counterattacks.

As in all MicroProse products, *RED STORM RISING* includes a wide assortment of options and variations. This simulation has two training scenarios, seven battle scenarios against specific enemy task forces, and the full "Red Storm Rising" campaign game that portrays Tom Clancy's entire World War III experience. The game has a variety of time and difficulty settings, allowing you to experiment with future ships and weapons, and enjoy a challenge appropriate to your experience.

RED STORM RISING is truly the complete game of modern undersea warfare.

Red Storm Rising



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Preface

by Tom Clancy

The submarine tactics with which most of us are familiar never really happened. We've all seen the dramatic movie representations of sweating men in the tight confines of a fleet boat's conning tower. But in fact the most effective work done by submarine commanders in WWII was conducted on the "roof," where they could use their higher surface speed to conduct "end runs," get ahead of their targets, then close in and fire at close range before escaping in the confusion.

Technology has changed all that, even while it was happening in the Second World War. Improved radar sets and continuous aerial surveillance chased the German U-Boats below the surface even at night. This denied them the mobility upon which they depended to close with their targets, and in doing so cost Germany her best chance of winning the Second World War.

Nuclear power and improved sonar technology changed things yet again in the 1950s. A nuclear-powered submarine can now outrun most surface ships, and modern passive sonar can actually out-range the radar used by American WWII submarines. It is not unusual today for a submarine to detect a surface ship, on sonar, at ranges over thirty nautical miles. Torpedoes, once relatively simple machines that ran a straight course until they hit a target or ran out of fuel, are now robotic kamikazes, programmed to search for their targets with active and passive sonars, then close on and destroy it with a half-ton (or nuclear) warhead. Or the submarine skipper can fire surface-to-surface cruise missiles that easily fly those thirty nautical miles.

But one thing has remained constant: the business of a submarine is stealth. Once detected, the enemy surface commander has more ships and weapons to use than the submarine. Helicopters with sonobuoys and dipping sonars — the submarine's deadliest enemy — can hunt and localize their quarry, then engage it with homing torpedoes of their own. You are safe only so long as you are undetected. Your only real advantage is invisibility. Submarine warfare is ambush, followed by evasion; a game of life and death played in three dimensions of cold, wet, unforgiving darkness.

The submarine's other enemy is another submarine. He lives in your environment, knows everything that you know, is trained, armed and equipped as you are. And enemy submarines are getting better. The Walker spy ring and foreign companies like Toshiba have given the Soviets priceless information and hardware with which they have been improving their ships and their training. Their mission is to sink you, to sink the other ships in your fleet, and to sink the merchant ships without which your country and the NATO alliance cannot survive. Simply put, the job of the United

States Navy is to control the sea. The job of the Soviet Navy is to deny us the use of the sea. You can guess which is the easier mission.

You are the commanding officer of an American SSN, a nuclear-powered fast-attack submarine. The word has only just arrived from National Command Authority: Your country is at war. All during the spring of this year, while you prepared your boat for her next deployment, the media was full of stories about the Spring of Promise, perhaps the long-hoped-for end of the Cold War, as East-West arms-control agreements reached fruition after generations of frustrating effort. Then only three days after you sailed on your deployment, something went wrong. Some disaster changed hopes of lasting peace to fear of a real, shooting war. You do not know what happened — SSN's don't get much in the way of news analysis — but none of that matters. Your country is at war, and war-fighting is what they pay you for.

You are thirty-nine years old. A graduate of the United States Naval Academy, you've worked your way up the ladder of your chosen profession: Nuclear Power School; Prototype School; Submarine Officers Basic School; Prospective Nuclear Engineer Officer School; Submarine Officers Advanced Course; Prospective Executive Officer Course; then, Prospective Commanding Officer School; and along the way you picked up a Masters Degree in Operations Analysis at the Navy's own Post-Graduate School at Monterey, California. You've served both on SSNs and SSBNs — the "boomers", the ballistic-missile submarines — but fast-attack was what you wanted, because fast-attack is where the action is. You've been an engineer, a navigator, then an XO. All this has a price. Endless cruises far from home, separations from your loved ones, mini-wars at AUTEC in the Bahamas, fleet exercises in mid-ocean, too many exams and tests to count, month-long strings of eighteen-hour days. But what that price has bought you is association with and respect from the finest men your country can make. You have spent seventeen years learning your craft, and six months ago you achieve a dream you've held since high school — command of your own SSN.

You are now the commanding officer of a ship of war, the most demanding and most god-like job in the world. You are responsible for the safety of your ship, for the lives of over a hundred men, and most of all, you are responsible for carrying out the missions assigned you by COMSUBLANT and COMEASTLANT. You know why you are here. You know what the job is.

You are about to find out how good you really are.

Contents

What's Where

The Manual: This manual is divided into three sections for convenient use. Part I gives specific instructions for all simulation displays and controls. Part II provides greater insight into the tactics, tricks and subtleties of the game. Part III provides background data on weapons, ships and boats involved.

When playing your first training scenario, you'll want to frequently reference the "Battle: Engaging the Enemy" section of this manual, on pages 7-36. This explains the meaning of each display, and how to operate your submarine in battle.

The Technical Supplement: The specific keys and other controllers used in RED STORM RISING vary with computer models. All terms printed in *italics* in this manual are defined in the Technical Supplement. Refer to the supplement for specific controls.

The Keyboard Overlay: This is provided for convenience in Battle. The keyboard overlay does NOT apply to Strategic transit in the RED STORM RISING campaign.

Which Scenario?: We strongly recommend that you try a learning game before you tackle the full RED STORM RISING campaign.

Learning Games

In your first game, you should make the following selections:
Year: 1992
Boat: Improved Los Angeles class
Challenge: Introductory
Scenario: Training Action (vs. either a November-class submarine or a Kashin-class destroyer; take your pick).

Getting Started: After a brief introduction, you'll find yourself in battle. Find the pause key (check the Technical Supplement or your Keyboard Overlay) and use it frequently as you learn. The Replay Battle key is also useful while learning — use it to review what happened to that point.

Experiment with Displays: Try each of the Primary Display and Secondary Display controls.

Find the Enemy: Next start looking for the enemy. Select Tactical Display and View Contacts. Read the section on Sensors (pages 15-23) for more information.

Sail Toward Him: Once you locate the enemy, move toward him. Try the navigation controls, referring to pages 12-15 in the manual for more details.

Fire Weapons: Now try firing weapons at the enemy. A Mark 48 torpedo is suggested. Make sure you're sailing "straight and level" at moderate speed (15 kts or less) before firing. Read the Weapons controls explanation on pages 23-31. Note that you can change commands and even directly control the torpedo unless its wire is cut or lost (page 26).

Further Training: Try a training scenario a few more times. Experiment with a surface ship opponent using Harpoon

or Tomahawk missiles (page 29). Also experiment with evasion, learning to escape enemy torpedoes.

Battles & Campaigns

Battles: Once you've cut your teeth in the training scenarios, it's time to fight a "real" battle. Select one of the Battle simulations instead of a training action. Finding the enemy and identifying him can be challenging. In some cases, he may find you first. In extreme cases, you might sail right into an enemy attack (i.e., you are ambushed!). Don't get flustered. Evade enemy attacks as they come in, and meanwhile develop your contacts until you have sufficient information to launch a weapon.

After you've experimented with a variety of battles, you can select "a Chance Engagement", where you never know what you're up against. You may find adjusting your boat or the time period makes life more interesting here.

The Campaign: Although individual battles provide interesting, satisfying, and variable engagements, the ultimate RED STORM RISING experience is the campaign game. Here you experience the entire course of World War III.

The campaign includes the additional challenge of Strategic Transit. You receive various missions, must discern the enemy's intentions, which enemy force is your objective, and then maneuver into an advantageous attack position while avoiding detection. How well you maneuver in the Norwegian Sea Theater has a powerful effect on how the battle begins.

The campaign is arranged so that the Warsaw Pact's strategies and actions remain unpredictable. You can play the campaign again and again, experiencing new situations and challenges each time. There are literally billions of possible situations in the campaign game.

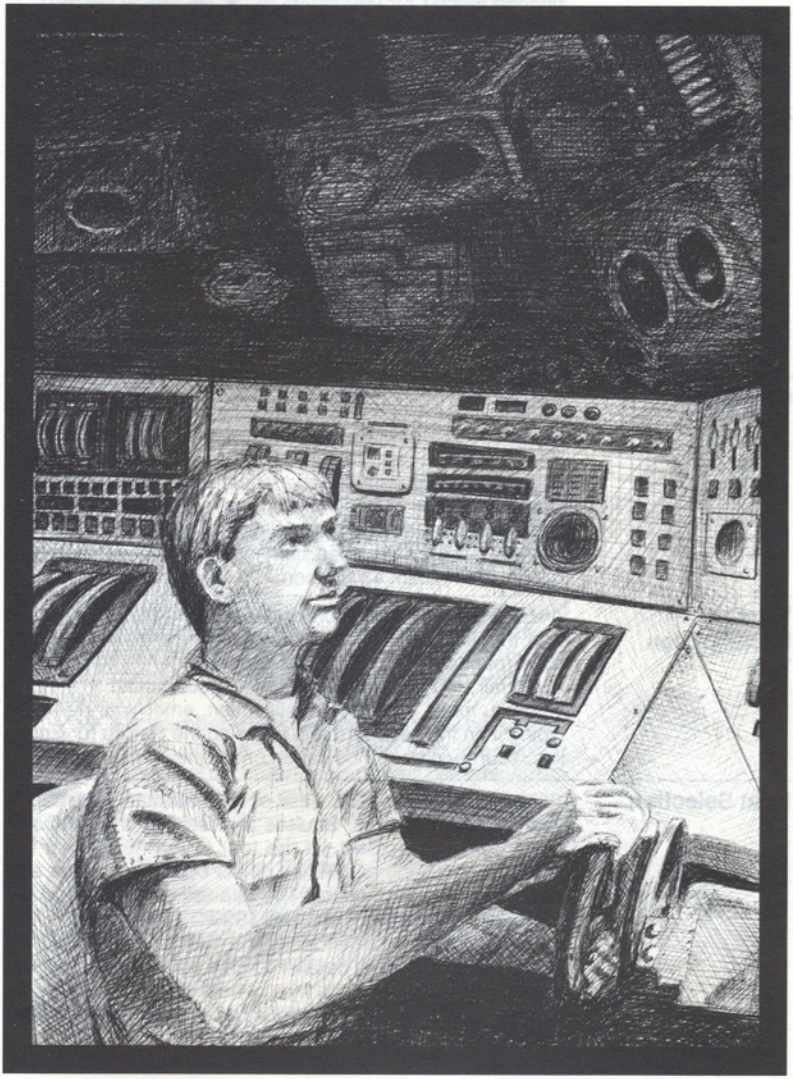
The Efficiency Rating, Medals, and Promotions

Efficiency Rating (ER): After each engagement RED STORM RISING updates your ER (Efficiency Rating) as a US Navy captain. The rating is the average of your performance to date. It takes into account the quality of the opposition including the specific types of ships engaged, as well as the type of boat you command, weapons available, and level of challenge. Successful completion of mission assignments in the "Red Storm Rising" campaign also improves your ER.

Decorations & Medals occur only in the campaign game, rewarding success in action. You need a high ER to qualify for a medal. In order from lowest to highest, the medals are: CM - Navy Commendation; BSV - Bronze Star for Valor; SS - Silver Star; DSM - Distinguished Service Medal; NC - Navy Cross; and CMOH - Congressional Medal of Honor.

Promotions: Modern submarine captains aren't promoted after each battle because a promotion means a new and bigger command. In wartime the navy prefers to keep experienced captains where they are, at their current rank, until either the war is over or a higher position opens up.

Part 1
The Operations Manual



Starting Options

RED STORM RISING has many options. To make a selection, move the Controller to highlight your choice, then press the Selector. Not all choices are available in all situations. Typically the Controller is your joystick, mouse, or cursor keys, while the Selector is the button or Return key. See the Technical Supplement for specific details.

The Year

You can select one of four time periods.

In 1984 Russian naval forces lack "stolen" western technology. However, your submarine is limited to weapons available at that time: the original Mark 48 torpedo and the Harpoon missile.

In 1988 the new Russian SIERRA and KILO class submarines appear, as well as the first fruits of the stolen technology from the west. However, you have the new Tomahawk missile and the improved Mark 48ADCAP torpedo. This scenario represents the situation at the time of the action in the novel *Red Storm Rising*.

In 1992 a nuclear aircraft carrier joins the Russian northern fleet, while technological upgrades spread to more of their vessels. Meanwhile, the Sea Lance ASW missile and Stinger SAM masts are available to NATO.

In 1996 the Russian northern fleet continues to expand in size and virtually all frontline ships have received technology upgrades. Fortunately for the West, the first boats in the new Seawolf class are launched, carrying the new silent-launching ("Swim Out") Mark 48 torpedo.

Warship Identification Test

Examine the illustration on the screen, then compare it with the illustrations in Part III (Reference Manual) of this book (pages 77-99). You must correctly identify the picture. If you fail, you're restricted to training scenarios.

If you make a correct identification, enter your name by typing it on the keyboard and pressing the Return (or Enter) key. Your records will be saved under this name.

Boat Selection

You can select which class of nuclear attack submarine you wish to command. Classes are listed in order of completion, from the oldest (at the top) to the newest (at the bottom). As a general rule, the newer boats are quieter and have more weapons space. The Seawolf class is especially powerful, but not available until 1996.

Alternatively, you can allow the NMPC (Naval Military Personnel Command) detailer to give you a boat, as in the real navy. In this case, the type of boat you receive is partly chance, partly related to the number of submarines of that type currently in the Atlantic fleet.

Level of Challenge

Introductory challenge is recommended for your first few games. Compared to reality, enemy ships are easier to find and track, while your submarine is very resistant to damage and your crewmen quite expert.

Normal challenge is recommended for casual gaming. Compared to reality, enemy ships are slightly easier to find and track, while your submarine is fairly resistant to damage.

Serious is fully realistic in all respects. Enemy commanders are smart, and they use their torpedoes and sonars with considerable skill. This produces a complex and difficult game. Do not attempt this challenge unless you're thoroughly familiar and "up to speed" with all features and tactics.

Ultimate challenge is just as realistic as the "serious" level. In addition, we take a less optimistic view of submarine survivability (a single hit is more likely to sink you!), enemy Captains are very sharp, and your sonar crew is always indecisive: they won't make a positive contact identification unless you examine the acoustic signature and make the identification yourself. Do not attempt this challenge unless "Serious" seems like child's play.

Scenarios

There are three groups of scenarios. Training actions provide an easy learning environment and a place to test new tactics safely. Battle simulations are short engagements between you and a specific category of enemy force.

Red Storm Rising, the campaign, is the "ultimate" scenario, the "big time" where you take your boat to sea to fight in Tom Clancy's World War III. Like all scenarios, it can be played in various time periods, at various levels of challenge, and with the boat of your choice.

Training Actions are simulated engagements, arranged to make learning easier. In both scenarios Russian weapons do *no damage* to your boat. You can experiment with the displays and controls, try various tactics, etc., without risk or difficulty.

"vs. a November-class Submarine": This is a sample underwater battle against Russia's oldest front-line nuclear submarine. The level of challenge you select determines the location of the engagement: Introductory - in the open sea, Normal - in drift/floe ice, Serious - beneath pack ice, Ultimate - in the shallows.

"vs. a Kashin-class Destroyer": This is a sample battle against a mediocre Russian anti-submarine destroyer. The level of challenge you select determines the location of the engagement: Introductory or Normal - in the open sea, Serious - in drift/floe ice, Ultimate - in the shallows.

Battle Simulations test your mettle in various tactical actions. Battle Simulations provided include:

"a Duel": You go "one-on-one" with a Russian nuclear attack submarine. At higher levels of challenge, you will

encounter some of the best subs in the world.

"the Cruise Missile Sub": You seek a cruise missile submarine. Higher challenges often add one or more escorting "guardians".

"the Wolfpack": You must duel with a group of Russian subs. They're operating together, using wolfpack tactics.

"the Boomer Bastion": You must find and destroy a Russian ballistic missile submarine, no easy task. To make matters worse, it's escorted by one or more attack subs.

"a Strike Group": You have intercepted a task force of Russian surface ships. Now you've got to engage them.

"an ASW Group": A Russian anti-submarine task force has been vectored into your area. Can you successfully hunt the hunters?

"a Carrier Task Force": You've stumbled into a submariner's dream: a Russian carrier task force. A chance at a Russian aircraft carrier is an opportunity you don't want to miss.

"a Chance Engagement": One of the above situations is selected randomly. This is a true test of your mettle in battle.

"Red Storm Rising", the campaign, is World War III, from first invasions to victory or defeat. This campaign lasts for many missions and hours. It is the "ultimate" RED STORM RISING scenario, with new and different events occurring each time. Beginners are urged to try a battle simulation or training action first.

Mission Orders

After a short introduction, you'll get your first Mission Orders. Read these orders carefully; they explain your current objective and may describe the enemies you could encounter.

In the Attack Center, the advent of modern computerized display and communications technology gives the captain real-time access to all the information he needs to conduct a tactical engagement. This information is assembled, integrated and streamlined by the computer to provide him with a concise picture of the situation. But even with all this assistance, it's the commander who must analyze the information, resolve ambiguities, fill in the missing pieces using his judgement and experience, and then make the key decisions that spell the difference between success and failure.

Battle: Engaging the Enemy

When your boat meets the enemy, "Battle" begins. The screen displays and controls for battle are sophisticated — modern submarine warfare is quite complex. The keyboard overlay is used here.

If you selected the "Red Storm Rising" campaign game option (see Starting Options, page 10), you begin at port rather than in battle. See the next section, "Strategic Transit", page 34, for details.

To familiarize yourself with the controls, start with a training scenario (enemy hits do no damage, so you can figure things out without being sunk!). Take things one section at a time and ignore those sections marked "Advanced"; you can return to them later.

Due to differences in computer equipment, keys are identified by a title in *italics*. Refer to your Technical Supplement or keyboard overlay to find the specific key on your keyboard. Frequent mention is also made of the *Controller*, which is usually the joystick, mouse, or cursor keys (depending on computer model), and the *Selector*, which is usually the trigger, button, or Return key (depending on computer model).

Advice from Your Computer

From time to time you may find suggestions and advice useful. Your tactical computer can analyze the situation to offer ideas at any time. Just press the *Help* key.

Useful Options

Pause: Press the *Pause* key to freeze the battle. Press this key again to resume the action. Purists should note that the battle runs in slightly accelerated real time; using this key is neither unrealistic nor "cheating".

Replay: This key reviews the entire battle, with each enemy vessel and action listed. At the "Introductory" level replay is available at any time, replaying the action so far. At all other levels of challenge, replay is allowed only at the end of the battle.

Other Options (Advanced)

These special options are included for convenience and personal preferences.

Action Track Toggle: The animated views of weapon launches and attack runs can be turned off and on again with this key. Purists may wish to turn the track off, but those who play for enjoyment will want it on. Note that weapon launches are shown only at the "Introductory" level.

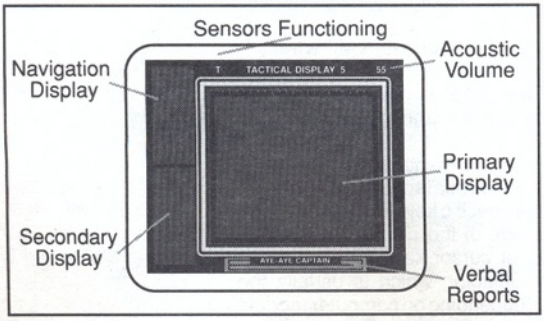
Aborting Commands: Many activities in battle require multiple key presses, sometimes including the use of the *Controller* and/or *Selector*. If you start an activity, then decide against it, there's no problem. Just start a new action. The old activity is "erased" from your computer system automatically if interrupted by a new one.

Of course, sometimes the same key is used in different

activities. Then your computer can't discern the intention to change; the original action will continue if the entry is valid.

Attack Center Consoles

Your computer screen simulates various consoles and displays in the Attack Center of a modern nuclear submarine. As captain, you have three display areas, into which you can "call up" information from fourteen different parts in the attack center. These three display areas are: the Navigation Display, the Primary Display, and the Secondary Display.



Navigation Display: This information is always present.

Primary Display: You can select one of eight primary displays.

Secondary Display: You can select one of five secondary displays; some primary display selections automatically "bring up" a secondary display.

Sensors Functioning: Abbreviations indicate which sensors are operating:

A = Active Sonar
T = Towed Array
R = Radar

Passive sonar operates constantly. ESM (the radar receiver) runs automatically wherever your depth is 55' or less. See "Sensors" below for more details.

Acoustic Volume (AV) of your submarine, a measure of your loudness as you move through the water.

Verbal Reports: Crew reports and confirmation of your orders appear here.

Navigation

Navigation is the art of guiding your submarine through the water. This includes controlling your direction of travel, your depth, and your speed.

Navigation Display

This display informs you of how your boat is travelling.

Heading: Your heading, in degrees, on the compass. North is 000°, East is 090°, South is 180°, and West is 270°.

Speed: How fast you're travelling, in knots (kts). A "C" symbol indicates your propellers are cavitating (making large amounts of noise). As you go deeper, you can go faster and faster without cavitation.

Depth: This shows your current depth beneath the surface, in feet. A special symbol indicates whether you're above or below the thermal "layer". The "layer" interferes with sound — keeping the "layer" between you and the enemy is a good way

to hide.

Rudder: This shows the current course command. "STEADY" indicates you're running straight ahead.

Planes: This shows the current setting of your diving planes, which control the depth of the boat. "LEVEL" indicates you're running level (not changing depth).

Course: To set a course, press the *Set Course* key. The helmsman asks what course you desire. Type a three digit number, from 000 to 360, for the new course. The helmsman will acknowledge and turn the submarine onto that course. You can also enter one or two digits and press the Return key.

Instead of entering three digit numbers, you can press one of eight directional keys (see Technical Supplement) to get one of eight standard course settings: 000°, 045°, 090°, 135°, 180°, 225°, 270°, or 315°.

Depth: To change to a new depth, press the *Set Depth* key. The Helmsman asks what depth you desire. Type a three digit number, from 010 to 999, for the new depth. The helmsman will acknowledge and move the submarine up or down until it reaches the correct depth. You can also enter one or two digits and press the Return key.

Note: Modern nuclear submarines never surface during battle. There is no advantage to surface travel and numerous disadvantages. In fact, surfacing communicates "I surrender" to the enemy. Any captain who surrendered a high technology sub like yours would betray his nation in innumerable serious ways. Therefore, 010' is the minimum depth allowed in battle.

Speed: To change speed, press either the *Increase Speed* key or the *Decrease Speed* key. Your engines have seven power settings, from zero (engines stopped) to six (maximum speed). Each key press changes the power setting one level. The navigation display shows your speed through the water.

Note that a change in power translates slowly into an increase or decrease in speed. Also note that your speed in knots is faster when moving straight than when moving in a tight turn, or when damaged.

Emergency Turns: Instead of giving the helmsman a new course, you can give him specific turning orders. The first time you press the *Left Rudder* or *Right Rudder* key, the helmsman puts the boat into a 5° left or right turn. Each additional key press increases the amount of turn by 5°, first to 10°, then to 15°.

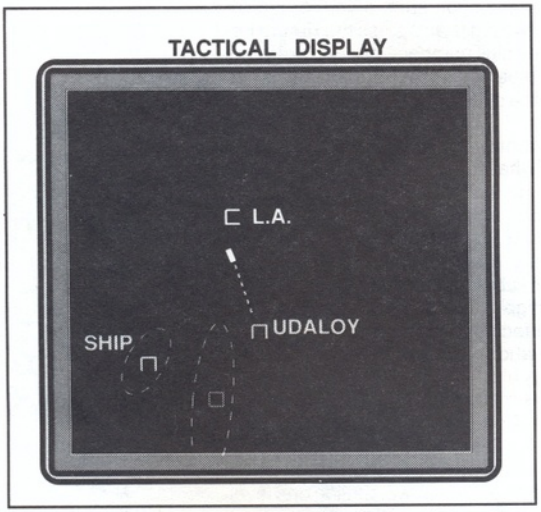
A 5° turn at slow or medium speeds is useful for maintaining your towed array (see page 18 for details). A 15° turn is useful in evading or decoying enemy torpedoes. Also, at maximum speed a 15° turn creates a knuckle in the water, useful in confusing torpedoes (see Evasion, page 32, below).

Straight & Level: If you wish to erase all course, depth, and emergency turn orders, press the *Straight & Level* key.

This evens out your boat so it runs forward on its current heading, at its current depth.

The Tactical Display

Procedure: Press the *Tactical Display* key to put your location and all contacts (potential enemies) on your primary display. This map has five scales, from factor-2 (a local-area close-up) to factor-7 (a wide-area view), which you control with *Zoom* and *UnZoom* keys. See the Technical Supplement for details on map symbology.



The dashed elipses on the display above represent the "uncertainty zone". This is the area the enemy vessel could occupy. The current position of the vessel represents the most probable location. The uncertainty zone is unavailable in some computer models (see Technical Supplement).

Interpreting the Display: This "main display" is used frequently. Most captains favor it for observing the battle situation.

Enemy vessels first appear on this display as dim symbols. The direction is accurate, but usually the range is unknown. As your sensors collect more information over time, the accuracy of the position improves and the symbol changes color. Eventually the sensors determine whether the enemy is a ship, sub or sonobuoy, and finally the specific class. When detection data is good enough, the display plots a "course track" for that enemy, recording his movements. If you later lose contact the display changes the symbol back to a dimmer "best guess" position.

The marks along the top of the display represent one nautical mile (2 Kyds) intervals.

Course tracks for all weapons running in the water (yours and theirs) also appear. You cannot see airborne enemies (missiles and helicopters) unless you are at periscope depth and turn on your radar.

Note: Dim, uncertain contacts frequently "bounce around" your display. A common error of novice captains is to put too much trust in dim, low-percentage contacts.

Map Overlay: Press the *Map Overlay* key for an overlay of water conditions. The key toggles this overlay on and off. The overlay shows acoustic absorption, depth of the shallows, or icepack pressure ridges, depending on the current situation.

Acoustic Absorption: In deep water (with or without drift ice) this map overlay (see *Map Overlay toggle* key) shows

how local water conditions absorb sound. Darker areas with few dots absorb little sound, resulting in good sound transmission and reception. Lighter areas with more dots absorb more, causing poorer transmission and reception.

Shallows Depth: In shallow water, this map overlay (see *Map Overlay toggle* key) shows the depth of the water. Each digit represents one hundred feet of depth. For example, "3" indicates the bottom is 300' below the surface.

Sound transmission is better when the bottom is deeper, poorer when the bottom is shallow. More importantly, running into the ocean bottom will destroy your sub! Therefore it pays to use this overlay frequently.

Icepack: When operating under the Arctic icepack, this map overlay (see *Map Overlay toggle* key) shows the depth of ice "pressure ridges" descending deep into the ocean. The length of the ridge symbol indicates the depth of the ridge: 50', 100', 150' or 200' deep.

Running into an ice ridge will sink your sub, so it pays to use this overlay frequently.

Sensors

Sensors are devices that find and track the enemy. "Passive" sensors constantly "listen" for enemy signals without emitting any betraying signals. "Active" sensors broadcast a signal and "listen" for the return. Active sensors function only if turned on, give detailed data quickly, but often reveal your location to the enemy.

Sensor data is processed by central computers, which update all displays automatically. Still, the results are often incomplete and almost always changing.

Contacts

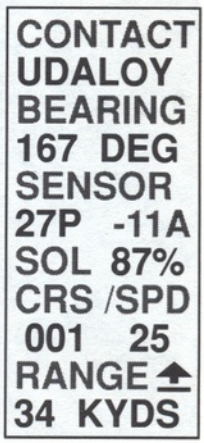
This secondary display gives detailed information about any one "contact" (potential enemy) found by your sensors. The gradual collection and improvement of contact data is called a "TMA" (Target Motion Analysis).

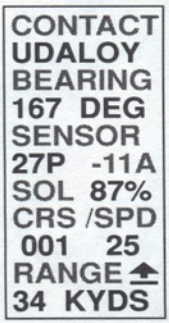
Procedure: Press the *View Contacts* key to see current sensor data for a contact (potential enemy vessel). If more than one vessel is present, press the key again to see the next vessel (i.e., to cycle through the contacts).

Interpretation: When a tactical display is present (on the Primary Display), each time you press *View Contacts,* all contacts but the current one disappear briefly from that tactical display. This lets you relate a specific map symbol yo the contact data.

In addition, the incoming sound from this specific contact is channeled to your display screen. The sound temporarily drowns out the normal sounds of your boat.

CONTACT: The type of enemy contacted. This progresses from totally unknown, to general type (ship or sub), to a specific ship class. The word "CONTACT" may change color to indicate whether the contact is continuing, or is lost (and the data deteriorating).





BEARING: The direction, in compass degrees, from you to the contact. Your course does *not* affect the bearing.

SENSOR: The left value is the signal strength received on your sensor, and which sensor has best reception (A=active sonar, P=passive sonar, T=towed array, R=radar). You don't see a contact until a signal strength of at least "8" is received, but once you've found the contact you can maintain it with a signal strength of "0" or higher. If signal strength is negative you have lost contact.

The right value is the signal strength the enemy's best sensor would get from your boat. This is known only if you know the enemy's specific class, and thus can predict what sensor equipment he has. When his predicted sensor value reaches eight (8) or more, he will "see" you.

Sensors Summary

Type of Sensor	*Sensing Medium*	*Advantages*	*Disadvantages*
Active Sonar	Water: Sound	• 1 ping gives range. • multiple pings give detailed data.	• reveals position to enemy at longer ranges than it can detect them. • works best at 0 kts. • limited to 300° arc.
Passive Sonar	Water: Sound	• receives only, does not reveal position. • gives bearing fast. • longer range than active sonar in most conditions.	• gives data slowly. • provides range last. • works best at 0 kts. • limited to 300° arc.
Towed Array	Water: Sound	• longer range than active or passive sonar in most conditions. • works best at 5 kts. • total 360° arc.	• stops working during and after hard and/or fast turns, high speeds • stops working at 0 kts.
Active Radar	Air: Radar	• best, often only way to track aircraft or incoming missiles. • range equal to ESM. • unaffected by speed.	• signal reveals position to all ships and planes in area, and to subs at mast depth.
ESM (Radar Receiver)	Air: Radar	• receives only, sends no revealing signal. • range superior to periscope/laser, can be superior to sound. • unaffected by speed.	• mast may reveal position. • does not detect sub unless it is using Active Radar.
Periscope (with laser)	Air: Light	• sends no revealing signal to enemy. • can track aircraft with some difficulty. • unaffected by speed..	• mast may reveal position. • mast needs to be higher. than ESM or Active Radar to achieve equal range.

Don't get complacent because no contacts show a "8" or higher sensor value. Your contact data still may be incomplete, and worse, there could be unseen enemies who already "have your number."

SOL (solution): The accuracy of your data. The highest possible accuracy is 99%, which still can be slightly inaccurate. Low percentage solutions are very unreliable.

CRS/SPD: The contact's course (in compass heading degrees) and speed (in knots).

RANGE: The range to the contact, in thousands of yards (i.e., 8 Kyds means 8,000 yards). In addition, the vertical arrow symbol indicates his position abov e or below the layer.

Underwater Sound Sensors

Underwater sensors use sound to detect the enemy. They function regardless of your depth.

(P) Passive Sonar: Unless damaged by a weapon hit, this sensor is always functioning (no key controls its operation). Passive sonar gives the bearing to the enemy with great accuracy. In addition it lets you slowly determine the type of enemy ship. Once that is known, estimates of speed, course and range develop quickly.

Factors in Sonar Sensoring

Factor	Effect
Acoustic Absorption	• The greater the absorption around sensor and/or target, the lower the contact value.
Surface Noise	• The greater the ocean surface noise, the lower the contact value, provided either or both vessels are near the surface. Icepack has the lowest surface noise, open sea or shallows is average, drift/floe ice produces very high noise.
Surface Duct	• If sensor and target are both in surface duct, contact value is increased; the stronger the duct, the greater the contact value.
Thermal Layer	• If sensor and target are on opposite sides of layer, contact value is reduced; the stronger the layer, the lower the contact value.
Water Depth	• The shallower the water, the lower the contact value. This only applies in shallow water.
Icepack	• The deeper the ice ridge, the lower the contact value.
Distance to Target	• The greater the range, the lower the contact value.
Direction Target Faces	• If target's broadside faces sensor, contact value is slightly increased (change is relatively small, though).
Speed of Target	• The greater the speed, the higher the contact value.
Quietness of Target	• The quieter the vessel design, the lower the contact value.
Speed of Sensor	• The greater the speed, the lower the contact value.
Quietness of Sensor	• The quieter the vessel design, the higher the contact value.
Quality of Sensor	• The better the sonar, the higher the contact value.

Sonar Sensing Values
All sensing is rated by "contact value".
A value of 8 or higher is needed to detect a previously unknown enemy.
A value of 0 or higher is needed to maintain contact with a known enemy.

(T) Towed Array: This long, computerized array of hydrophones is towed ("streamed") behind your boat. It functions only when trailing in a straight line or smooth curve. Any tight or fast turn causes "kinks" and "whiplash" that ruin reception. Similarly, if you come to a full stop, it goes slack and fails. You must maintain "seaway", a minimum speed of 4 to 5 knots, to keep the array functioning.

Because the towed array trails deep in the water, it always listens under the layer, even if your sub is above the layer.

The towed array functions like passive sonar, but is much more sensitive. It's one of your best and most useful sensors.

(A) Active Sonar: The *Active Sonar* key toggles this device on and off. One active sonar "ping" gives the exact bearing and range to a contact. Multiple pings establish the contact's course and speed. Unfortunately, these pings also reveal your location to the enemy.

Active sonar usually has a shorter effective range than passive sonar or a towed array.

The Baffles: Your boat's motion leaves an area of confused and disturbed water directly behind it. Sound travels poorly in this area, called "the baffles". It is about 60° wide (30° left and right of directly astern). See page 54 for more details

Your hull-mounted passive and active sonars are "blind" in "the baffles". Your towed array is unaffected by "the baffles", since it trails far to the rear, safely below the disturbed water.

Sea Conditions

This primary display provides a handy visual reference about current conditions at various depths. This information is valuable in estimating sonar performance.

Procedure: Press the *Sea Conditions* key for a graphic display of the basic conditions beneath the surface.

Transmission Index: The quality of sound travel at this location. The higher the value, the better sound carries.

Ambient Noise: The background ocean noise in for this battle.

Surface Duct: This boosts sound transmission above the layer (the stronger the duct, the better sound travels above the layer).

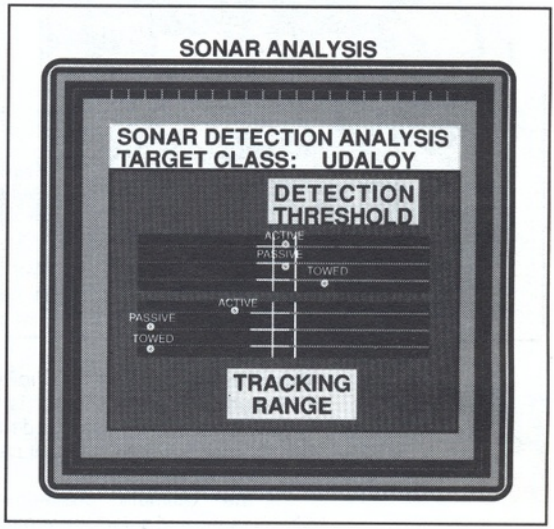
Thermal Layer: This determines how well

sound passes across it (the stronger the layer, the poorer sound travels across it). The depth of the layer may vary a few feet from one location to another.

For more information about the sea and sound, see Part II (the Captain's Manual), Sonar and Other Sensors (pages 46 through 52).

Compare Sonar (Advanced)

Press the *Compare Sonar* key to see the capabilities of your sonars vs. those of an enemy ship, in current conditions. The enemy vessel displayed is the last one shown on your contact report. To compare sonars for different contacts, press the *View Contacts* key to cycle through various enemies.



Interpreting the Display: The top three lines are horizontal bar gauges showing the detection ability of your sonars (active, passive and towed). The bottom three lines are similar gauges for the enemy, provided the type of enemy ship is known.

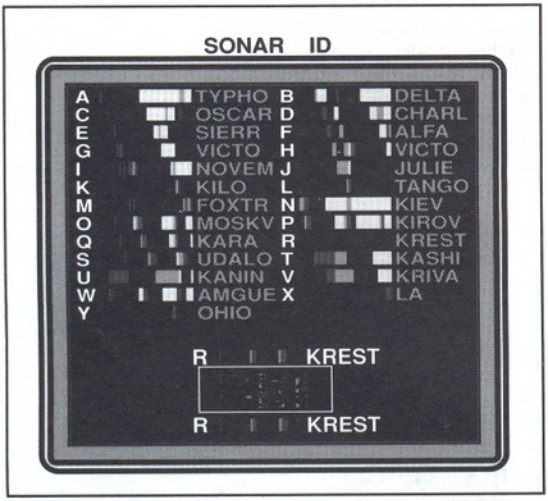
Each bar gauge is divided into three sections. The dark-colored, left side section is the range where sonar reception is too poor to detect or track an enemy. The small middle area, labelled "Tracking Range", is where sonar reception is good enough to track an existing contact, but not good enough to make a new contact. The larger right side area, labelled "Detection Threshold", is where reception is good enough to make new contacts or regain lost ones.

This display automatically takes into account current water conditions, depth, range, and "the baffles" for you and the contact. Therefore it can change quickly, as these variables change.

Tactics: This display is valuable if you're trying to "sneak up" on the enemy, or trying to "sneak away" again. It shows graphically how good your contact is, and how good the enemy's equipment is against you. Applying this information in battle is a complex art, see Part II (the Captain's Manual), Stalking the Bear (pages 53 through 55) for details.

Acoustic Signature (Advanced)

This primary display allows you to compare incoming sound data with data files on enemy ships. Normally your crew does this automatically for you. However, an experienced captain can make an identification faster than their crew, and at the "Ultimate" challenge level the crew insists on the captain examining the incoming sound before a specific ship class is identified.



Procedure: Press the *Acoustic Signature* key to visit your Sonar Room and see the incoming sound patterns. Once this display is visible, hold down the *Vessel Signatures* key while pressing a *Select Vessel* key to make a close comparison between an incoming sound and a specific ship. If you believe your identification is correct, then hold down the *Vessel Signatures* key again while pressing the *Confirm Choice* key.

Results: If your identification is correct, the contact solution % rises and the ship class is added to the contact data. If your identification is wrong, the contact solution % plummets and no ship class is displayed.

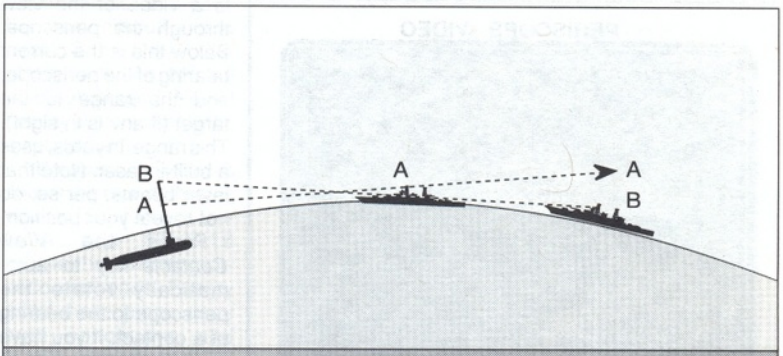
At the "Ultimate" challenge level you must make comparisons and select the vessel; your sonar operators will not do it for you.

Surface Sensors (Advanced)

These devices are mounted on periscopes ("masts") that rise out of the sail (once termed the "conning tower") of your sub. Periscopes and masts have a 60' elevation. They automatically rise to maximum height; therefore your depth controls how much shows above the water. For example, when you go to 45' depth, 15' of mast or periscope is visible above the water.

All of these devices must be above water to function. Furthermore, whenever a mast or periscope is above water, enemy radars *could* notice it and find you. The higher the mast, the more likely this situation. Thus wise captains use surface sensors only when absolutely necessary, for very short periods, and afterward quickly leave that area.

ESM Receiver: This is a sensitive, passive radar atop a



The Earth's Curvature

Visual sightings (including laser rangefinding), ESM reception, and Active Radar are all blocked by water. To see "around" the curve of the earth, a submarine's mast must be above the water.

When the submarine's mast is raised to position "A" it can see enemy ship "A", but not "B". The mast must be raised higher, to "B", before enemy ship "B" is visible.

Visual light (including lasers) follows a virtually straight line. Radar waves, however, "bend" slightly with the curve of the earth, and can travel a tiny bit farther.

Mast Height & Maximum Range

Sub Depth	*Maximum for Radar*	*Maximum for Lasers/Visible Light*
55'	5 Kyds	2.5 Kyds
40'	20 Kyds	10.0 Kyds
25'	35 Kyds	17.5 Kyds
10'	100 Kyds	50.0 Kyds

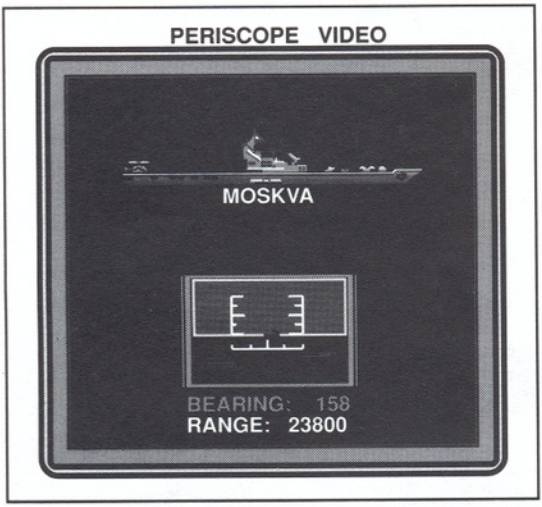
Above are typical maximum visibility ranges at various depths. As depth decreases, the mast rises higher, increasing the maximum range. Radar ranges apply to both active radar and ESM.

mast. It tracks radar signals from enemy surface ships and aircraft. It runs automatically whenever your depth is 55' or less. As this mast rises higher, you can "hear" radar signals from enemies farther and farther away. Although it does not transmit signals, the enemy may spot the mast whenever it is above water.

(R) Active Radar: The *Active Radar* key toggles your radar set on and off. The radar set is atop a mast, which must be above water to function. Active radar gives an accurate plot of nearby surface contacts, helicopters, and airborne missiles. Its range depends on the height of the mast above water.

Active radar alerts any enemy ships, aircraft, or submarines with ESM masts elevated to your presence, provided they are within range.

Periscope & Laser: The *Periscope* key shows the view through your attack periscope. The lower area on the screen



is a video of the view through the periscope. Below this is the current bearing of the periscope, and the range to the target (if any is in sight). This range, in yards, uses a built-in laser. Note that laser beams, per se, do not reveal your position.

Press the *View Contacts* key to automatically rotate the periscope to the bearing of a contact. If you have multiple contacts, each key press rotates the scope onto a new contact.

Use the *Controller* to manually rotate the scope for a "naked eye" view. Most captains find manual rotation a dangerous waste of time.

Press the *Identify Periscope Image* key to see a computerized image comparison with your ship data base.

Note: Maximum visual sighting ranges are less than radar. As a result, rising high enough for a periscope view of an enemy can significantly increase the risk of his radar spotting your scope above water.

Friendly & Enemy Contacts

Be aware that friendly ships and submarines may be found, as well as the enemy. The most likely friendly contacts are other NATO attack subs seeking the same enemy. In rarer cases, you may encounter NATO ballistic missile submarines that have strayed into the combat zone.

It is always wise to identify a contact before firing on it. Otherwise, you may mistakenly attack, or even sink, friendly forces.

Ship Data Base

This puts "on-line" intelligence data about enemy vessels on your primary display.

Procedure: Press the *Ship Data Base* key to see the table of contents. Then press the appropriate letter key for the ship class that interests you.

Interpretation: The data base summarizes the detailed information found in Part III (The Reference Manual) on pages 77 through 99.

Type shows the basic purpose of the vessel, using standard US Navy terminology.

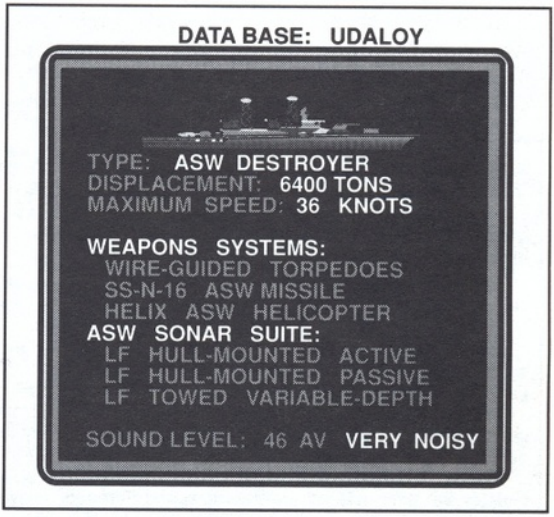
Displacement shows the overall size of the vessel. The

larger the displacement, the more difficult it is to sink. Submarine displacements are for the boat submerged. Not all display systems show the displacement.

Weapons Systems shows the type of threats you could encounter. SS-N-14 and SS-N-16 missiles have homing torpedo warheads. Enemy ASW helicopters carry both sonobuoys and homing torpedoes. RBU rocket launchers (various models) fire a barrage of short-range explosive rockets.

ASW Sonar Suite shows the type of sonars carried. Lower frequency sonars are more effective than higher frequency types. Variable-depth (VDS) and towed array sonars are more effective than hull-mounted types. In addition, they can be streamed below the layer while the owner remains above it.

Sound Level indicates the acoustic volume (AV) of the vessel. The higher this value, the louder the vessel.



Weapons

To damage or destroy the enemy, you must use your weapons. All weapons are "intelligent": they have a homing system that "turns on" at a pre-planned point. From that point onward the weapon "sees" in a 90° arc ahead of it, seeking the nearest target. For additional details on tactics see Part II (The Captain's Manual), Weapons & Attacks (pages 56-61), or Part III (The Reference Manual), US Submarine Weapons (pages 70-72).

Ice & Missiles: All your weapons except torpedoes launch themselves from the sea into the air. In drift and floe ice conditions there is a 25% to 50% chance the missile may hit a piece of ice as it emerges from the water. This, of course, wrecks the missile. Similarly, the Sea Lance's torpedo warhead must drop back into the water at the activation point, and again there is a danger of hitting ice. The Stinger missile mast has similar problems: the mast may hit ice, wrecking the missile on it (but generally not the mast itself).

Beneath the arctic icepack a missile will always hit the ice. However, a close examination of the area (using Tactical Display and Map Overlay) may show "open water" areas

Weapons Summary

Weapon Name	*Avail. from*	*Designed Targets*	*War-head*	*Speed in kts*	*Range (Kyds)*	*Controls Available*
Mk 48	1984	Sub,Ship	large	40,55	0-40	wire, PAP homing, search
Mk 48 ADCAP	1988	Sub,Ship	large	40,60	0-40	wire, PAP homing, search
Mk 48 Swimout	1996	Sub,Ship	large	40,60	0-40	wire, PAP homing, search
Harpoon UGM	1984	Ship	mdm	560	6-120	PAP homing
Tomahawk TASM	1988	Ship	large	475	6-500	PAP homing
Tomahawk TLAM	1988	Land	large	475	6-1000	pre-programmed at port
Sea Lance/Mk 50	1992	Sub	small	625+	6-60	PAP homing, search
FIM-92A Stinger	1992	Aircraft	tiny	1260	0-6	PAP homing

Weapon Name: Common name of the weapon. Mk 48's are torpedoes, all others are missiles, although the Sea Lance has a Mk 50 torpedo as its warhead.

Avail. From: Scenario date the weapon is first allowed.

Designed Targets: Type of target the weapon was designed to attack. Sea Lance can be used to attack ships also, but results may not be very good. "Aircraft" includes helicopters. Land targets are not engaged in the "Battle" game, only during "Cruising".

Warhead: Destructive power of the weapon. The larger the warhead, the greater the chance of sinking a target. Stinger warheads, although tiny in comparison to others, are generally sufficient to destroy a helicopter or small planes.

Speed in kts: Weapon speed in its run to target. Actual missile speed is somewhat variable, value given is just the cruising speed. Torpedoes have passive and active speeds By comparison, ships move 10-30 knots, subs 15-45 knots maximum speed..

Range in Kyds: Minimum and maximum range of the weapon.

Control: Type of control systems on the weapon.

"Wire" means the launcher can control the weapon while it's running (provided the wire is intact), including reprogramming all other controls.

"PAP homing" means a pre-planned activation point (PAP) can be set, after which the weapon homes onto any target within a 90° arc ahead of it. If the weapon is jammed, it continues flying straight unless other controls take over (such as Wire or Search).

"Search" means that if the weapon is jammed and misses, it circles, searching for the target, trying to home and attack again.

"Pre-programmed at port" means the weapon has a guidance program loaded when the weapon itself is loaded onto your boat. It cannot be changed without returning to port for a new set of guidance software.

amid the icepack. Missiles can be fired through these holes, and Sea Lance activation points can be set over a hole (allowing the Sea Lance warhead to drop into the water).

Weapons Loadout

This secondary display shows the weapons available and the reserves in your magazine.

Viewing Weapon Status: Press the *Weapons Loadout* key to see the weapons currently loaded in your tubes. Press the key again to see the your ammunition reserves.

Loading an Empty Tube: If a tube is empty, reloading is a two step process:

1. Press Load Tube key.
2. Press the key that matches the weapon you'll load.

Empty tubes are always loaded in numerical order.

Changing a Loaded Tube: If a tube is full, changing the weapon is a three step process:

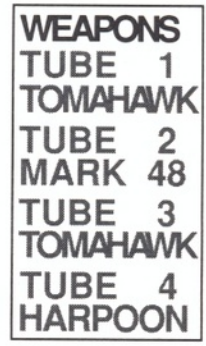
1. Press the Load Tube key.
2. Press the named key that matches the new weapon you wish to load in that tube.
3. Press the number key that matches the tube you wish to change.

Note that this procedure is different from reloading. Therefore, you should know whether a tube is empty or full before you try to load or change it. Watch the prompts carefully.

Notes: VLS tubes are present only on the improved Los Angeles class. They are loaded and unloaded only in port.

Most US Navy submarines have four torpedo tubes, but the upcoming Seawolf class should have eight. Weapons in tubes are listed in order, from top (#1) to bottom (#4 or #8).

Stinger missiles are listed separately. When available they are always loaded.



Ammunition Supply: The weapons in your tubes and magazines are the entire ammunition supply on your boat. In Battle Simulation and Training Action scenarios you cannot replenish your ammunition. In the "Red Storm Rising" campaign you can use StrategicTransit to return to port (Holy Loch, Scotland) and replenish ammunition there.

The Mark 48 Wire-Guided Torpedo

Weapon Capabilities: Launched from a torpedo tube, this weapon is effective against subs and ships. After launching you can guide a torpedo to target unless its wire to your ship breaks or is deliberately cut; after that the torpedo follows a programmed attack plan.

Normal Mark 48's are available in 1984, then are replaced by the ADCAP in 1988. The Swimout is available to Seawolf class submarines only in 1996.

A torpedo can be launched at any depth. Minimum range is a few hundred yards, maximum about 40 Kyds (40,000 yards). The torpedo cruises at 40-42 knots and has a maximum speed after activation of 55-60 knots, depending on the model (ADCAPs and Swimouts are faster).

Mark 48 torpedoes are complex but extremely effective weapons. The ability to control the weapon after launch means that if used properly, this torpedo will never miss.

Firing Procedure: Firing is a three step process:

(1) Press the *Fire Mk 48 Torpedo* key.

This does not fire the torpedo per se. Instead, it gives you access to the torpedo's guidance computer. The primary display switches to Tactical and a flashing square appears. This is the "pre-planned activation point" (PAP) for the torpedo.

(2) Use the *Controller* to position the PAP.

The pre-planned activation point (PAP) is where the torpedo will increase speed, switch on its active sonar and begin seeking the enemy. At the bottom of the display is a readout of the current bearing and range to the PAP.

(3) Press the *Selector* to launch the torpedo.

Torpedoes are launched with compressed air. This "launch transient" temporarily increases your loudness by 8 AV. This could be enough to reveal your location to the enemy. Mark 48 Swimout torpedoes carried by the Seawolf class have no launch transient because they don't use compressed air.

The "On Board" Torpedo Guidance Computer: When launched, a Mk 48 torpedo travels at slow speed (about 40 knots) to the PAP. There its homing sonar switches on, speed increases to 55-60 knots, and it seeks an enemy within its 90° forward arc. Once it finds an enemy the torpedo automatically homes onto (steers toward) that target. If the torpedo homes on a target, then loses it (because the enemy maneuvered away, used a noisemaker, and/or a decoy), the torpedo circles around. It continues circling until it runs out of fuel or begins homing again.

The default depth setting for a Mk 48 torpedoe is to run at the depth it was fired from, and to circle left (L/Search) if it loses a target. To change these settings you must take control after launch (see the next section).

Controlling a Mark 48 Torpedo (Advanced)

The Wire: Mark 48 torpedoes trail a fine wire behind them. This wire is "plugged into" the fire control computers on board your submarine. As long as the wire is intact you can change information in the torpedo's guidance computer, or even control the torpedo directly.

If the wire is broken, you lose control of the torpedo. It follows its last instructions blindly. Tight turns or high speeds by your sub often break the wire, and both together almost always break it. Radical maneuvers by the torpedo are much less likely to break the wire.

The current status of the wire ("W" for intact, "X" for broken) appears on the Torpedo Control secondary display (see below) after the word "SPEED:".

Taking Control: To control a running torpedo, press the *Torpedo Control* key. This puts Torpedo Control on the secondary display (i.e., detailed information about that torpedo). If multiple torpedoes are running, each *Torpedo Control* key press switches to the next weapon (i.e., cycles through them).

Torpedo Control Secondary Display: This display shows the following information about the torpedo:

TORPEDO NAME: Torpedoes are named A, B, C and D inside your weapons computer as they are launched. The computer cannot track more than four torpedoes at once.

TORPEDO STATUS: A torpedo starts inactive, headed toward its PAP (see below). It becomes "ACTIVE" when it reaches that point or is manually activated. Once active, if it finds a potential enemy it begins "HOMING". If the enemy uses a noisemaker or decoy to confuse the torpedo it is "JAMMED".

TIME TO RUN shows the number of seconds before the torpedo runs out of fuel.

TIME TO PAP shows the number of seconds before the torpedo reaches the current pre-planned activation point (PAP).

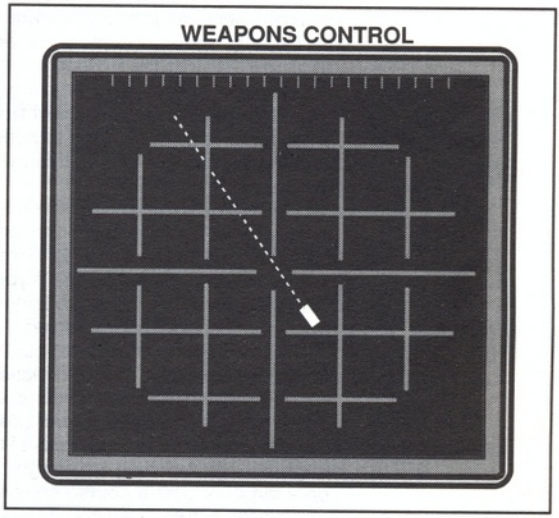
SPEED shows the current speed of the torpedo, in knots. In addition, "W" indicates the wire from the torpedo to your boat is intact, while "X" means the wire is broken.

HEADING shows the current course of the torpedo.

/SRCH indicates whether the torpedo will search left or right if it loses homing, and whether the torpedo is programmed to run above or below the layer.

THE WIRE: If the wire is broken, you cannot take control. A "W" in the Torpedo Control secondary display indicates an intact wire, an "X" indicates a broken wire.

Weapon Control: Pressing the *Weapon Control* key puts this screen on the primary display, and Torpedo Control on the secondary display (if it isn't there already). The Weapon Control display is similar to the Tactical Display (see above), except it automatically starts at factor-3 scale centered around the last *weapon* you had under control (the one now showing on the Torpedo Control display). Each time you press Torpedo Control the display shifts to a new torpedo. Thus the display gives you a "torpedo's eye view" of the situation.



If the torpedo is not yet active, the current PAP appears on this display. If it is off the display at the current scale, it appears on the edge to indicate the general direction.

Map symbols are the same as on the Tactical Display. A map overlay for water conditions is also available, just as on the Tactical Display.

Changing a Torpedo Program: If the torpedo is not yet active, when you press *Torpedo Control* you can either change the programmed guidance settings or manually activate the torpedo. Of course, the wire must be intact.

NEW PAP: You can use the *Controller* to move the PAP to a new position, then press the *Selector* to make the change.

NEW DEPTH: You can select a running depth by pressing the *Run Shallow* or *Run Deep* key. Shallow running torpedoes cruise 50' below the surface. Deep running torpedoes cruise about 50' below the thermal layer. When a torpedo is homing, it automatically moves to the depth of its target.

NEW SEARCH PATTERN: You can reprogram the search pattern by pressing the *L/ Search Pattern* or *R/ Search Pattern* key.

Manual Activation: You can manually activate a torpedo by pressing the *Activate Torpedo* key. When you do this the PAP is ignored and the torpedo activates immediately. It is now under direct guidance. Manual activation is possible only if the wire is intact.

Direct Guidance: After a torpedo is activated (either by reaching its PAP or by manual activation), you directly control its movements as long as the wire remains intact.

Course: You can steer a torpedo using the *Controller*. Moving it left turns the torpedo to the left, moving it right turns the torpedo to the right. Leaving the *Controller* centered means the torpedo cruises straight ahead. However, its seeker is still running. Therefore the torpedo will home on any target it finds. You can override homing with direct left or right turn commands.

Depth: You can control the depth of the torpedo. Pressing the Run Shallow key moves the torpedo above the layer (to about 50' below the surface). Pressing the Run Deep key moves the torpedo below the layer (to about 50' below the thermal layer). If a torpedo begins homing, it automatically moves to the depth of the target.

Search Pattern: In manual guidance you cannot change the pre-programmed search direction (left or right) that occurs if the torpedo loses homing. Instead, pressing the *L/ Search Pattern* key or the *R/ Search Pattern* key starts that search pattern immediately, regardless of the current situation. The torpedo begins circling left or right, continuing until it homes on a target or gets a course command or runs out of fuel.

Cut the Wire: The *Drop Torpedo* key cuts the wire and drops all control of the torpedo, which disappears from your screens and computer controllers. The torpedo itself de-activates and quietly self-destructs, sinking to the bottom. This control is useful if you wish to clear your computer of hopelessly lost torpedoes (remember, you're limited to four at once).

Tactics: Using wire-guided torpedoes effectively is a fine art. For example, through judicious control and careful guidance, you can "sneak up" on an enemy with a torpedo, giving him virtually no warning before the weapon hits. For an in-depth discussion of torpedo tactics, see Part II (the Captain's Manual), Weapons & Attacks (pages 56 through 61).

General Capabilities: Both the Harpoon and Tomahawk use similar attack systems. Upon launching the missile rises to the surface, blasts into the sky from its waterproof cannister, and flies at low altitude to the PAP. There it turns on radar guidance and seeks the nearest target within its 90° forward arc. As soon as it finds a target the missile steers toward that ship. Note that both the Harpoon and Tomahawk use radar guidance, and therefore cannot "see" enemy submarines.

Harpoons are available in all time periods, but Tomahawks are unavailable in 1984.

The missile shows on enemy radar when it leaves the water, but is very hard to track until it reaches the PAP. Once it activates it is easier to track and shoot down.

Harpoon UGM Capabilities: Launched from torpedo tubes, this missile is effective only against ships. It cannot be launched from depths below 300'. You must pre-program a course and activation point for this weapon; it cannot be controlled in flight. Minimum range is 6 Kyds, maximum range about 120 Kyds.

Tomahawk TASM Capabilities: Launched from either torpedo tubes or VLS tubes, this missile is effective only against ships. It cannot be launched from depths below 300'. Like the Harpoon, course and activation point must be pre-programmed. Minimum range is 8 Kyds, maximum range about 500 Kyds!

Tomahawk TLAM Capabilities: Effective only against land targets, these missiles cannot be used in a naval battle.

Firing Procedure: Firing a Harpoon or Tomahawk TASM is a three step process, and similar to firing a torpedo.

(1) Press the *Fire Harpoon* or *Fire Tomahawk* key. This connects your shipboard fire control computers with the missile's guidance system. The pre-planned activation point (PAP) marker appears on your primary display.

(2) Use the *Controller* to move the PAP. This determines the PAP where the missile starts seeking a target. It also determines the missile's initial course, since it flies straight to the PAP. At the bottom of the display is a readout of the current bearing and range to the PAP.

(3) Press the *Selector* to launch the missile. Remember, missiles cannot be launched below 300' depth, and launches beneath ice may be ruined (see page 223).

PAP Suggestion: When beginning, set the PAP of a Tomahawk or Harpoon about 2/3rds of the distance to the target. This gives the missile a wide "search area". For more sophisticated techniques, see Part II (The Captain's Manual), Weapons & Attacks (pages 56-61).

Controlling Missiles: Once a missile is launched it's "on its own". You cannot make any changes or adjustments to the course or activation point.

Sea Lance Missiles

Capabilities: This missile, launched from a torpedo tube, is designed to attack subs. It could be used against ships. It cannot be launched from depths below 300'. Like other missiles, course and activation point are pre-programmed. Minimum range is about 6 Kyds, maximum about 60 Kyds.

The SeaLance is available from 1992 onward.

When the missile reaches its PAP, the warhead is released into the water. This warhead is the small Mark 50 homing torpedo. It immediately activates and begins circling, trying to find a target within its 90° forward arc. If no target is found, the torpedo continues circling, deeper and deeper, until it either runs out of fuel and sinks, or it finally finds a target.

When the torpedo homes on a target, it changes to the depth of that target and drives straight at it. If it loses the target, it goes back to circling.

The Mark 50 torpedo has a relatively small warhead. This makes it more effective against submarines than surface ships. Large submarines and most ships may take two or more hits from this weapon before sinking.

Firing Procedure: A Sea Lance is fired just like a torpedo, Harpoon or Tomahawk. First, press the *Fire Sea Lance* key to "plug into" the missile's guidance computer. Then use the *Controller* to move the pre-planned activation point (PAP). Finally, press the *Selector* to actually launch the missile.

Controlling a Sea Lance: Once a missile is launched it's "on its own". You cannot make any changes or adjustments to the course or activation point, nor can you control or adjust the Mk 50 Torpedo.

Stinger Missiles

Capabilities: This missile is effective only against helicopters. It is fired from a mast above water. Therefore, maximum launching depth is 55'. Entirely self-guided, it must be activated with a course before launching. Once launched it flies straight with an IR (Infrared) homer seeking aircraft emissions in a 90° forward arc. The first and nearest aircraft spotted causes the missile to change course and fly straight at the aircraft. If the aircraft dodges or jams the missile, it continues to fly straight until it finds another target or runs out of fuel (the latter is more likely!).

Minimum range is a few hundred yards, maximum range is about 6 Kyds. Note that this is *very small maximum range.*

Stinger mast mounts are available from 1992 onward.

Firing Procedure: Firing a Stinger is a three step process, like torpedoes and other missiles.

(1) Press the *Fire Stinger* key.

This activates the missile and puts the course marker on your primary display. Remember, you must be at 55' depth or less.

(2) Use the *Controller* to move the course marker.

The missile will fly automatically from your boat toward the course marker. Therefore, the course marker only shows the

direction of flight. It is not a PAP, since the missile is launched active. At the bottom of the display is a readout of the current bearing and range to the PAP.

(3) Press the *Selector* to fire the missile.

This fires the missile. Before launching, check your firing conditions. The missile only has 6 Kyds range — make sure the target is in range! Also remember that ice can wreck the missile as it tries to launch.

Controlling a Stinger: Once a missile is launched it's "on its own". You cannot make any changes or adjustments to the course or target.

Evasion

The enemy may launch torpedoes at you, some of which are delivered long distances through the air by missiles. Fortunately, your sub contains noisemakers and decoys to help you avoid them. In addition, high-speed turns create water turbulence (called "knuckles") that confuse torpedoes.

A warning alarm sounds when a new threat is first located by your crew. In addition, if an enemy torpedo is homing on your boat, you'll hear "pings" on your hull.

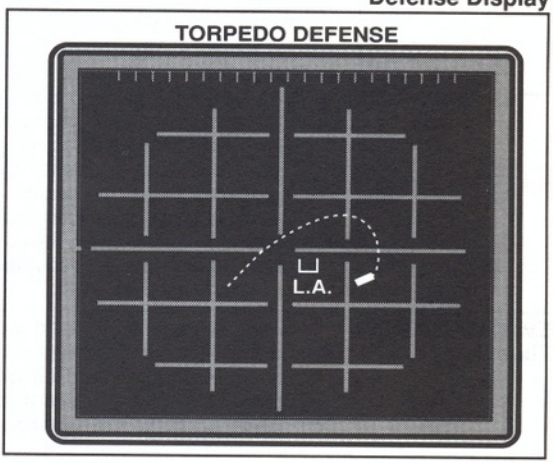
Evasion Techniques Summary

Technique	*Reload Speed*	*Defensive Effect*
Knuckle	a 25+ kt turn	blinds homing torpedo if knuckle closer to torpedo, until torpedo's 90° facing runs past it; short duration.
Noisemaker	quite fast	blinds homing torpedo until torpedo's 90° facing runs past it; short duration.
Decoy	quite slow	torpedo homes on decoy if within 90° facing, *and* if decoy closer to torpedo.

Defense Display

Press the *Defense Display* key to see the location of nearby threatening weapons. Threat Weapons will appear automatically on your secondary display.

The Defense Display is similar to the Tactical Display, except it automatically starts at the factor-3 scale, providing a useful "close up" for observing and evading nearby torpedoes. The display is centered around your boat. The map symbology is the same as on the Tactical Display.



Threat Weapons

Press the *Threat Weapons* key to see a list of enemy torpedoes threatening your boat. There are four possible entries on this list, each with the following data:

BRG (Bearing): This indicates the compass direction from which the torpedo approaches. It also has a symbol showing whether the torpedo is currently above or below the layer.

RG (Range): This indicates distance from you to the weapon, in yards. Weapons begin homing at 2,000 to 4,000 yards, depending on sound conditions in the water. At 1,000 yards or less they are a very serious danger.

Defense Equipment

There are three techniques for "fooling" enemy torpedoes: noisemakers, knuckles and decoys. Each relies on the limited sonar abilities of a torpedo: its sonar only faces forward in a 90° arc (45° left and right of straight ahead).

Noisemakers: Press the *Noisemaker* key to drop this device directly behind your boat. A noisemaker jams a torpedo's sonar if (a) the noisemaker is fairly close to the torpedo, and (b) if the torpedo is facing toward the noisemaker. Jammed torpedoes may head straight into the noisemaker, or may try to steer around it. Unfortunately, once past it they usually circle and seek you once more.

Noisemakers are very small devices. Submarines carry a large number and can drop them fairly quickly. However, if you drop too many too fast, you may be temporarily out until the crew reloads the launcher.

Knuckles: If you make a tight 15° left or right turn at high speed, your sub may form a "knuckle" of turbulence in the water. The knuckle acts like a noisemaker, but lasts for less time. Furthermore, a knuckle is only effective if it is closer to the torpoedo than your boat. If your boat is closer, the torpedo continues homing on you!

Decoys: Press the *Decoy* key to launch this device. A decoy travels straight ahead at 20 knots. It sends out and reflects sound signals that imitate your sub. Actually, the imitation is good enough to fool a torpedo, but is rarely good enough to fool a human sonar operator on a sub or ship.

A torpedo homes on a decoy instead of your sub only if (a) the torpedo is closer to the decoy than to you, and (b) the torpedo faces toward the decoy.

Decoys are launched from a special tube. Reloading and programming a new decoy takes considerable time. If you attempt to launch another decoy too fast, your crew will report that no decoy is ready (yet!).

Evasive Tactics & Theories

When an enemy torpedo approaches, the standard maneuver is to drop a noisemaker, increase speed to maximum, and make a hard turn away. The torpedo will either blindly race through the noisemaker (in Introductory or Casual challenges) or make a curving course around it (in Serious or

Ultimate challenges), then begin circling to re-acquire you.

If you get far enough away, fast enough, the torpedo may never "find" you again. Its maximum acquisition range to start homing is 2,000 to 3,000 yards, depending on sonar conditions. For example, if the torpedo is on one side of the layer and you're on the other, the torpedo must be closer to find you, since contact is more difficult through the layer.

Sending out a decoy as you turn can be useful, since as the torpedo turns, it may see the decoy first and chase that instead of you. Many other tricks and maneuvers are possible, see Part II (The Captain's Manual), Evasion & Escape (pages 62-65) for details.

RBU Rockets: These extremely short-range multiple rocket launchers are carried on most Russian warships. Range varies from a few hundred to a few thousand yards, depending on the model (larger ships generally have longer ranged models). If a ship has your location, and is within range, it may fire a barrage of rockets directly onto your position. These weapons drop quickly through the water and explode around you. They rarely sink you, but often cause damage. The only escape is to prevent enemy ships from getting so close in the first place!

Damage Report

If you are hit, press the *Damage Report* key to show which, if any, systems have been damaged. In general, if you take damage your computer will automatically display the damage report (anticipating your desires). Potentially vulnerable systems include:

ACTIVE SONAR, which means forward damage has knocked out that sonar system.

PASSIVE SONAR, which means hull damage has knocked out that sonar system.

TOWED ARRAY, which means the towed array has been broken and permanently lost (often through damage to its housing on the hull).

TORPEDO TUBES, which means there are casualties and flooding on forward decks port or starboard, including one of the torpedo rooms. Half of your tubes are out of action.

PROP LINKAGE, which means damage at the stern greatly slows your boat.

Strategic Transit: the Norwegian Sea Theater

In "Strategic Transit" you maneuver your sub across hundreds of miles of ocean, seeking out your objective while avoiding enemy patrols.

You control "Strategic Transit" *only* if you selected the RED STORM RISING campaign game option (see Starting Options, page 8). In all other options you bypass this and go directly into "Battle" (see page 11).

The keyboard overlay provided is for use in battle only. Ignore it for Strategic Transit. The main controls for cruising are the *Controller* (typically the joystick, mouse or cursor keys, see the Technical Supplement) and the *Selector* (typically the trigger, button, or Return key).

Home Port

You start the campaign at your home port, Holy Loch, on the western coast of Scotland (northern England). You will need to return here periodically, to replenish your ammunition and/or have damage repaired.

Weapons Handling: To add or subtract weapons from your boat, move the *Controller* to highligh "add" or "remove" on the appropriate weapon. Each press of the *Selector* adds or subtracts one weapon, changing the amount on board.

Selecting weapons for your sub is an important decision. The Mk 48 torpedo is an excellent all-around weapon, especially useful against submarines, particularly diesel/electric subs. The Sea Lance is primarily useful against nuclear subs. Tomahawk TASM missiles are excellent for use against surface ships, but may not be available, in which case carry Harpoon UGMs instead. Some Captains prefer the greater survivability of the Harpoon anyway. Tomahawk TLAMs are useful only if your objective is a land target. Stingers are always worth carrying if they're available.

Repairs: To repair a damaged system on your boat, move the *Controller* to highlight the repair you desire. Press the *Selector* to make the repair.

Returning to Sea: To leave port, move the *Controller* to highlight the "leave port" option and press the *Selector*.

Warning: Your tubes are now unloaded! Pause to load them (see the next page for details).

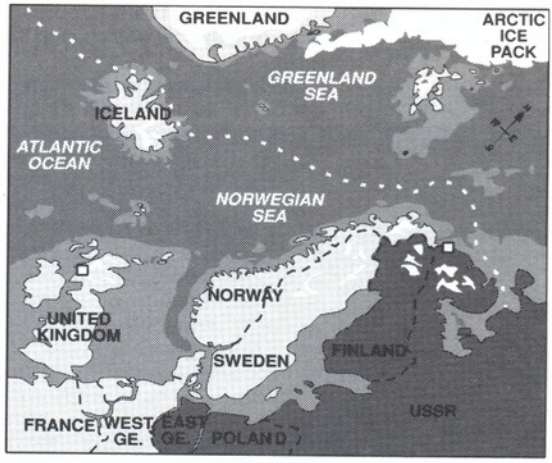
Time: Be aware that weapons handling and repairs take time. While you're in port, the enemy may get far ahead of you. If you wait too long, you may discover that the enemy has achieved their goal and a new mission awaits.

The Map

The map shows the northern waters between Greenland and Scandinavia (the "Norwegian Sea Theater"). For easy reference the map appears in the center of this manual.

During Strategic Transit your sub, enemy task forces, aircraft, and satellites move across the map at an accelerated rate (approximately one second equals one hour).

See the Technical Supplement for map colors and symbols.



Timeliness: The map shows only the latest sightings of enemy forces. Many times sightings of enemy forces are hours, sometimes days old. The map symbol changes color or shape to show the "age" of each sighting. It's unwise to place much trust in old sightings. As new sightings occur your map is automatically updated.

Goals: In general, your objective is to intercept and destroy a specific enemy force at sea. Unfortunately, more than one enemy force may be at sea! Finding the enemy, then moving into a good position for battle, requires both luck and skill. Refer to Part II (the Captain's Manual), Strategic Maneuvers (pgs 43-45) for more information and advice.

Cruising

Maneuver Options: You use the *Controller* to move your sub in any of eight directions. You normally travel at *cruising speed* (15 kts), but if you hold down the *Selector* while moving, you increase to *flank speed* (30 kts). In addition, you can *drift* (moving just a few knots) by not touching the controls.

Tactics: The slower you move, the further your sonars "hear" and the quieter your sub. As you move faster your detection range decreases while the enemy can hear you farther away.

Pause: To freeze time in your cruise, press the *Pause* key. This gives you access to the Attack Center where you can examine your ship, change weapons loading, review your orders, or save the game.

Keyboard Overlay: This is provided only for "Battle". Do NOT use the keyboard overlay controls when cruising.

Pause: The Attack Center

When you pause, or when you contact the enemy, the scene changes to the control room ("Attack Center") of your sub. Use the *Controller* to highlight an option, then press the *Selector* to make that choice.

Reviewing Mission Orders: You can examine the last orders received, to remind you of the current objective.

XO's Ship Status Report: Here you can examine the state of your boat and change the weapon loadouts in your tubes.

To change weapon loadout, first unload a tube by moving the *Controller* to highlight a tube and pressing the *Selector.* Then select the new weapon by moving the *Controller* to highlight the weapon and pressing the *Selector.*

Some submarine classes have special-purpose tubes or weapons. VLS tubes can only be loaded and unloaded at port. Stingers have a special weapons area in the sail with a mast launcher. Since this is a dedicated-purpose launcher, it is automatically loaded and readied.

Computer Log: This allows you to save the game.

Continue on Course: This returns you to Strategic Transit in the Norwegian Sea theater. This option is not available if you encountered enemy naval forces here.

Battle Stations: This option starts the battle. It's available only if you encountered enemy naval forces here.

Are Your Torpedo Tubes Loaded?

Before entering battle, make sure your torpedo tubes are loaded. In addition, make a habit to pause and set up a starting tube load immediately after leaving port. To do this, simply select the XO's Ship Status Report option, described above.

Finishing Your Mission

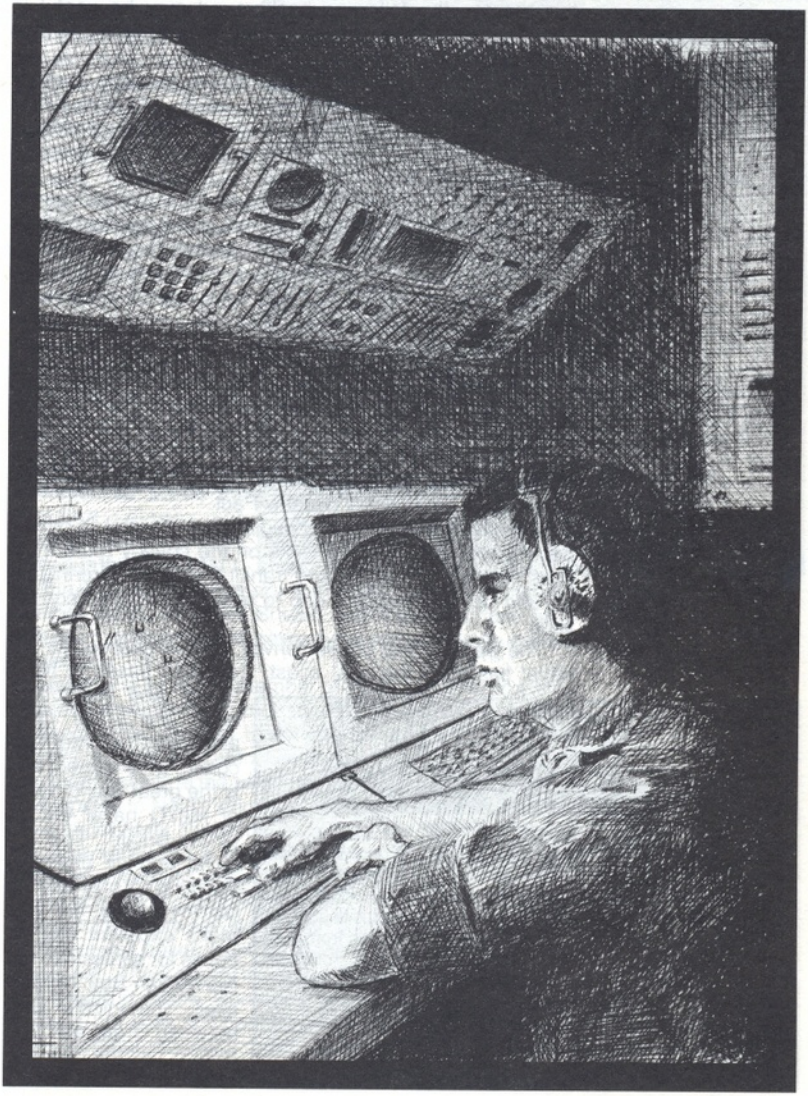
When you conclude a combat with any enemy forces you always uplink a combat report to COMSUBLANT. This happens automatically. If the enemy encountered was *not* your objective, you are informed of this and can continue under current orders. If the enemy encountered *was* the objective mentioned in your orders, the mission ends, results are shown, and new orders are issued to you.

If your target is enemy warships, you should do your best in battle. You won't get a second chance!

Course of the War

A red and blue bar gauge is displayed between missions, as news reports arrive before and after missions. If the dividing line on the gauge moves toward the "WP" (Warsaw Pact") end then the Pact is doing better. If it moves toward the NATO end, then NATO is doing better. If the dividing line moves entirely to one or the end, that side has a decisive advantage that will force the enemy to the negotiating table and end the conflict. Needless to say, you don't want the Pact to win.

Part 2
The Captain's Manual



Captain's Briefing:
The Norwegian Sea Theater

Introduction

For those captains unfamiliar with the military situation in this theater, the following background may be useful in grasping the importance of upcoming operations. It may also give you insights into enemy acitivity.

The Norwegian Sea Theater is the strategic corridor between Russia's Atlantic ocean ports and the NATO "homewaters" between Europe and America. This theater is a nautical "no-man's land" between areas of vital strategic interest to each side.

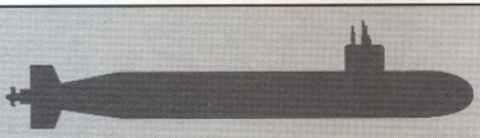
Russia's nuclear deterrent requires control of the coastal seas near Murmansk and Arkhangel'sk, so her nuclear ballistic missile submarines (SSBNs) can cruise in safety. Meanwhile, the NATO land forces are destined eventually to collapse under sustained wartime pressure unless the USA can move large quantities of troops, equipment and supplies across the Atlantic to Europe.

The NATO Perspective

The land war in Europe relies on timely reinforcements moving from America, through the North Atlantic to European ports. Heavy vehicles, huge numbers of troops, ammunition, and other supplies cannot be moved by air, only by sea. Without these reinforcements NATO faces eventual catastrophe against the Warsaw Pact.

The GIUK Gap: The Norwegian Sea Theater is crucial because Russian naval attacks on the convoy route must pass through this region and transit the GIUK (Greenland-Iceland-United Kingdom) gap to reach the Atlantic convoy lines.

The western end of this convoy route is guarded by US naval bases on the east coast, Canadian bases in Nova Scotia and Newfoundland, and small utility airfields on the Greenland coast. At the eastern end is the great island depot of NATO naval forces, Great Britain. The big naval and air bases in Scotland not only face the convoy routes, but also make excellent starting points for sorties into the Norwegian Sea Theater itself. The middle area between Greenland and Britain is the danger zone.



The Role of the SSN: In wartime, the modern nuclear attack submarine (SSN) is unique in its ability to perform almost any naval mission effectively. Only an attack submarine can ambush enemy surface strike groups, seek out ballistic missile subs in their well-defended bastions, deliver missile strikes from just off the enemy coast, and take on hostile attack subs on their own terms. As conventional war intensifies, SSNs are called upon to complete these missions and many more, all vital to the war effort. As an SSN captain in World War III, your performance could spell the difference between victory and defeat for the hard-pressed NATO forces.

Iceland is an independent and peace-loving island nation. It grudgingly admits to common cause with NATO in time of war, especially as it lacks significant military forces itself. American aircraft can use the large Keflavik airbase for naval patrol bombers, and possibly as a fighter base as well. However, Icelandic bases lack the large, well-protected and well-stocked facilities found in Britain or the USA. On the other hand, it is vital that Iceland not fall into enemy hands.

The Faeroes are a similar situation. These tiny islands, Danish territory, do not have any major NATO installations. However, as bases for Russian planes or missiles they would pose a serious threat to NATO. Fortunately the Faeroes are within reach of the jet fighter-bomber bases in Great Britain, and therefore fairly well-protected. Iceland is well beyond this range, and thus more vulnerable.

The New Maritime Strategy

In the 1970s NATO concentrated its naval planning and resources on establishing a barrier at the GIUK (Greenland-Iceland-United Kingdom) gap. This included a line of seabed SOSUS (Sound Surveillance System) sensors across the entire gap, which was divided into "blocks" of ocean, each of which was patrolled by an SSN attack sub. Scouting in front of the line were naval patrol planes of the USA (P-3 Orions) and the UK (Nimrods), while behind it lurked groups of ASW surface ships, primarily British.

In the early 1980s, the US Navy announced a new policy. The Secretary of the Navy John Lehman said:

> I cannot conceive of a NATO war in which we would not be putting one, but several carrier battle groups into the Norwegian Sea at some point. What we must do is to seek out and destroy the Soviet capacity to interdict our uses of the sea.*

This new policy, perhaps inspired by America's growing naval strength in the Reagan Administration (1981-89), clearly indicates a desire to "go get 'em" deep into the Norwegian Sea. A number of NATO naval officers and strategists, including some Americans, are worried by the risks of this strategy. However, in naval warfare victory traditionally goes to the bold leader.

Even if American strategists became more cautious in a real shooting war, it's very likely that attack submarines would be sent deep into the Norwegian Sea to challenge the Soviet Red Banner Northern Fleet.

*quoted in "The Proceedings of the US Naval Institute", September 1985 issue, pg. 43.

Norway is an active member of NATO. Its long coastline provides a series of air and naval bases that command the Norwegian Sea Theater. In wartime these bases could make life difficult to impossible for Soviet ships moving south toward the Atlantic, while at the same time providing needed fuel and ammunition to NATO ships moving toward the Soviet coast. Most importantly, Soviet naval aviation bombers flying from the Murmansk area into the Norwegian Sea could be intercepted coming and going, by fighters based in Norway.

Because of this commanding position, NATO expects the Warsaw Pact to invade Norway on the first day of WWIII. The northernmost bases, such as Banak airfield near the North Cape, will almost surely fall to a combined Soviet paratroop and overland attack. Norway does not garrison this border strongly, nor does she permit other NATO troops to garrison it (for political reasons). Once a war starts, Norway would welcome NATO troops, but they could arrive too late for the

northern regions, and perhaps might not arrive at all, depending on events elsewhere.

The first natural "bastion" to halt a Russian advance into Norway is at Narvik. Surrounded by mountains and glaciers, Narvik boasts an excellent deepwater port at the end of a large fjord. Norway is very narrow at this point, and continues so south to Trondheim. An overland advance along this narrow corridor full of hostile terrain and impossible weather could take months, possibly years. But if the Warsaw Pact somehow takes Trondheim, from there the larger parts of Norway open out. Overland advances to the heart of the nation are possible, even to Oslo. The coastal city of Bergen is well protected by large mountain ranges. It could perhaps hold out longer than Oslo itself.

Needless to say, just as Norwegian ports and airbases are valuable to NATO, so they would be invaluable to the Warsaw Pact, allowing it to extend air and naval power deeper and deeper into the Norwegian Sea.

Offense at Sea: The Barents Sea is crucial to the USSR as a bastion area for its nuclear deterrent SSBNs. The area is also critical to other surface and submarine forces, since they must pass through here on their way into battle, and then again on their way home.

Russia's main defense here is a vast series of airbases around Murmansk on the Kola Peninsula. Huge numbers of reconnaissance and missile bombers, guarded by jet fighters, are all based here, including the formidable Backfire naval attack bombers. Unless these aircraft are destroyed it would be suicide for any surface warship group to approach too closely. Submarines, however, have a significantly better chance of sneaking into the Barents Sea. A submarine here could intercept enemy vessels coming and going, perhaps "bag" an SSBN, or launch a cruise missile attack on a land target (such as a Backfire airbase).

Defense at Sea: The Norwegian Sea and especially the GIUK gap are crucial to NATO's survival. The primary task of naval forces in this area is to sink any Soviet ships or subs transiting the gap. The complex and expensive SOSUS line is designed for just this purpose — to spot intruders so they can be destroyed by plane, ship or sub.

Needless to say, the farther north Soviet naval power is challenged and stopped, the farther they are from the Atlantic convoys. Therefore, a natural NATO strategy is an aggressive defense that pushes as hard as possible into the Norwegian Sea.

The Greenland Sea: This area between Greenland and Spitsbergen is the "open flank" of the Theater. Spitsbergen is officially Norwegian, but is barely populated and militarily worthless. It is much further north than Murmansk, and is not warmed by the Gulf Stream. However, the ice floes around

the island and the pack ice beyond are a happy hunting ground for submarines and their support ships. SSBNs enjoy this area, since some are designed to crash up through pack ice before launching their nuclear weapons.

Ultimately, though, all surface exits from this area lead south to the Denmark Strait portion of the GIUK gap.

The Warsaw Pact Perspective

The USSR's nuclear deterrent relies on ballistic missile submarines operating in the Barents Sea. Above all, the Red Banner Northern Fleet must protect these precious weapons. In addition, the "naval vision" of the USSR extends to Norway, Iceland, and ultimately the convoy pipeline from America to Europe.

Ports: Murmansk, warmed by the top of the Atlantic Ocean's Gulf Stream, is Russia's only year-round ice-free port on the Atlantic Ocean. Arkhangel'sk is better protected from the elements and further south, but is blocked with ice during the winter.

Over the years since WWII, Murmansk and surrounding regions on the Kola Peninsula have expanded into a vast complex of air, land and sea installations, including OTH radars, ABM warning systems, underground docks for submarines, large railyards and depots, and much more.

Murmansk is connected to the rest of the Soviet Union by a long rail line running southward along the Finnish border and the White Sea coastline. The first few hundred miles of this line are exposed to air and missile attacks from Norway, making Murmansk a somewhat exposed outpost.

In comparison, Arkhangel'sk is served by a much more extensive rail network, is closer to the heartland of western Russia, and farther from potentially hostile nations. In good weather, large troop and supply convoys can assemble easily and safely in Arkhangel'sk, where equivalent assemblage at Murmansk would take longer and be much more risky.

Northern Seas: Russia regards the Barents Sea as her private lake. It is, after all, the doorstep to Murmansk and Arkhangel'sk, while the nearest major NATO bases are hundreds of miles away in Great Britain. Russia's invaluable SSBNs ("boomers") patrol here and in the Kara Sea (slightly to eastward). The boomers hold the final nuclear deterrent of the Soviet Union, its defense against annihilation by an American nuclear attack.

SSBNs began operations in the Barents Sea during the late 1960s and early 1970s, and naval forces grew accordingly. Guarding the "boomer bastions" remains the prime directive of the Red Banner Northern Fleet. All other operations are secondary to this goal.

In addition to this defensive duty, in wartime the fleet must support land operations against northern Norway. In fact, without naval support and "end around" amphibious landings,

the Red Army is likely to get stalled near Narvik for the duration of the war.

Southern Seas: If the Soviet Navy can cut the convoy lines from America to Europe, the land war in Europe is as good as won. The victory may not come quickly, but it will come. Of course, achieving this objective requires considerable work.

Initially NATO airbases, carrier task forces, ASW groups, submarines and SOSUS lines present an impassable barrier to Soviet surface ships. Soviet Northern Fleet naval aviation cannot easily stretch its range to reach the convoys, especially not with NATO fighters in Norway. Only the subs have a chance of sneaking southward and running the gauntlet of SOSUS through the GIUK gap.

However, if the Warsaw Pact can use naval aviation to chase NATO surface ships from the Norwegian Sea theater, eliminate or capture the airbases in Norway and Iceland, then cut the SOSUS line, the situation changes. Now Soviet ships and subs can steam into the North Atlantic with impunity, protected by Soviet aircraft and supported by long-range Soviet missile bombers.

Meanwhile, ships may be needed to supply armies operating in southern Norway. And finally, if all other operations on land and sea have gone well, including the destruction of NATO carrier groups and the defeat of NATO forces in Europe, the Warsaw Pact could contemplate the invasion of Britain itself!

Winning the War

In this war, like any war, your job is to accomplish the mission. Doing this helps the war effort, while failure plays into the hands of the enemy.

Your first major problem is finding the enemy. Satellites, recon aircraft, and your own listening can find them, but you're not always sure you've found the *right* enemy. Sometimes it's obvious — an enemy submarine force isn't easily confused with the carrier group you're hunting. Other times, though, you aren't sure until you're engaged in battle, or sometimes not even until after the battle! Watching the enemy's course long enough will give them away, but don't wait so long that they achieve their mission!

As a rule, it's unwise to be distracted by enemies other than your true target. Chasing phantoms allows the real target to escape. Long engagements with secondary opponents depletes your limited ammo, forcing you to return to Holy Loch that much sooner. Of course passing up big, juicy targets like cruisers and aircraft carriers is silly. Taking down a brand new nuclear sub is worth the time too. But getting into a knife fight with some 'cheapo' diesel/electrics, or playing tag with an ASW group of old destroyers and frigates is a needless risk that wastes time and ammunition. Unless, of course, ComSubLant actually *wants* you to clean their clocks!

Classic Stratagems

Modern attack subs have two classic techniques for finding and engaging the enemy: "Sprint and Drift", and the "End Run Ambush".

Sprint and Drift: Here you sprint at flank speed (30 knots or more), then periodically drift at very slow speed (5 knots or less). The sprints eat up large distances, while the drifts let you listen for the enemy.

Sprint and drift is an excellent way to intercept an enemy force, since surface warship groups travel about 20 to 24 knots, amphibious and merchant convoys are 10 to 17 knots, and diesel/electrics can be even slower. Even with occasional drifts, you can outdistance a slow enemy with your sprints.

Intercepting enemy nuclear subs is much more difficult, since they're probably moving at your speed, and using the very same sprint and drift tactics.

End Run Ambush: In this technique, first invented during WWII, you circle around the enemy and position yourself ahead of him. Once in position you can move dead slow or drift, giving you good listening while you remain virtually silent. Best of all, the enemy is coming to you!

The ideal position is ahead and to the side of the enemy, so they parade past your position, presenting their loud broadsides to you. However, due to zig-zags, what seems

like a good side position might become a hopelessly out-of-range spot. Therefore, a cautious captain puts himself squarely in front of the enemy instead.

In comparison, if you're chasing the enemy from astern, you'll be forced to run fast and loud, making it harder for you to listen, and easier for him to hear you. Although you might think a stern approach is good against enemy vessels without a towed array or VDS, in reality the enemy is aware of this also, and makes big zig-zags that "rotate" their baffles in different directions, which effectively prevents that tactic. Besides, in most cases you can't know if the enemy has or lacks a towed array or VDS until it's too late.

The "Red Banner" Northern Fleet

The Task Force: Russian surface task forces are built around a standard high-low mix. A group will include a few modern, powerful warships, plus a selection of smaller and/or older supporting ships. Groups of all powerful and modern ships, or all old and weak ships, are fairly uncommon.

Russian submarine groups are usually all nuclear or all diesel/electric. However, nuclear subs are sometimes assigned to escort important diesel/electric operations. Ballistic missile subs may be escorted by nuclear or diesel/electric subs, sometimes both.

Submarine Escorts: Russian surface ship groups often include one or more submarines. The faster groups, such as ASW forces or carrier groups, have nuclear attack submarines. The slower groups, such as convoys and amphibious groups, may have nuclear or diesel/electric subs. In some cases a separate submarine group of one to four boats will either escort surface ships or "sweep" the waters surrounding them.

Covering Groups: When a Russian force sorties from port it may be supported by a second, "covering" force. This force can be either surface ships, submarines, or both. Typically it sails in front of the main body, or off to one flank. It is rare for this covering group to escort the main force the entire distance. Usually it breaks away at some point. However, if the main group asks for help, the covering group usually rushes to its aid. Therefore, one way to tell a covering group from a main group is to let yourself be spotted during Strategic Transit, and then see if the other group rushes toward you. If it does, it's a covering group. If it doesn't, then it's the main mission — you should get away from the nearby group and go after the main group instead.

Spetsnaz Operations: Russian commandos (Spetsnaz) are generally transported by submarine to their target. Diesel/electric subs are preferred, usually an attack model, sometimes a cruise missile model with commando equipment instead of cruise missiles aboard. In very rare cases Spetsnaz may be carried in nuclear boats, but more often the nuclear boat is just an escort.

When you do engage enemy forces, the engagement generally has three distinct phases. First you attempt to identify and localize the enemy. This phase is basically a sensor duel: the ship with the best sensors and the best position to use them generally wins. Victory, in case you wondered, is definitely identifying the target as hostile, and acquiring sufficient accuracy to fire. Aggressive captain's who don't mind wasting ammo sometimes fire with 50-60% solutions, but NATO trains its captains to wait until they have at least an 85% solution, preferably a 99% solution.

Once a firing solution is obtained the attack phase begins. With today's deadly weapons, the vessel which launches the first well-planned attack is often the victor. A well-planned attack keeps the target unaware of attack until the last possible moment, with no chance of countermeasures or escape. Ideally the attacker does not reveal his position during the attack. The best attack is therefore quick, quiet, and decisive.

Once the attack is delivered, the escape phase begins. If you alerted the target or if other enemy units are in the area, expect to find yourself the target of their counterattacks. Now self-preservation becomes an overriding consideration. Still, a successful captain is always looking for opportunities to hit back at the enemy. Effective use of both defensive and offensive assets simultaneously is the true test of your battle skills.

Using Sonar and Other Sensors

The purpose of sonar and other sensors is to find the enemy, and once he is found, identify him sufficiently for an accurate weapon launch. Of all the sensors on a submarine, sonars are the most important.

Successful captains understand the capabilities and limitations of their sonar. American submarines are, on the whole, quieter than Russian, and outfitted with better sonars. This is your main advantage. If you give it away, you'll soon be taking up permanent residence with Davy Jones.

Sound and Sonar

Sonar is sound moving through water. If water temperature and depth were constant, sound would travel in straight lines. However, both temperature and pressure change, and at every change the sound path bends. Exploiting these local changes gives you a large bag of tactical "tricks" to use against the enemy. Furthermore, the amount of salt in seawater (salinity) varies, and this too can affect sound in much less predictable ways.

Temperature & The Layer: As water gets colder, sound waves bend downward (toward the ocean bottom); as it gets warmer, sound waves bend upward (toward the ocean surface). Typically the ocean is warmest near the surface (about 10 to 20°C, depending on the region and season), then at a 100' to 300' depth it suddenly gets much colder (about 7 to 10°C). This sudden change is the "thermocline", or "thermal layer". Below the layer, temperature gradually declines to 4°C at about 3,000', where the temperature stabilizes. However, no combat submarines can dive below about 3,000', so that issue is irrelevant.

The Curving Paths of Sound: The temperature changes mentioned above cause sound waves traveling downward to "bend" toward the bottom at a steeper and steeper angle (a "negative gradient"), while sound waves travelling upward gradually "bend" up (a "positive gradient").

However, water pressure steadily increases with depth. This increasing pressure "bends" sound upward (a "positive gradient"). Above or near the layer, temperature change has a larger effect than pressure. But as sound waves dive deeper, temperature changes become less and pressure is the greater factor, causing sounds to curve upward again.

Convergence & Shadow Zones: Typically, sound waves that dive into deep water first have a negative gradient due to dropping temperatures, then a positive one as pressure takes over. The wave thus curves down, then curves back upward again, in a large arc.

A unique aspect of this is that regardless of what angle sound starts downward, the bending effects tend to "push" all the sounds onto a single path. Overall, the length of the arc,

as measured across the ocean surface, can be as much as 30 miles. This phenomenon is "convergence". In extreme cases, you can even see the rippling on the ocean's surface as powerful sound waves "converge" on the same spot of ocean surface from far away.

You can use convergence to your advantage. Converging sounds cause "shadow zones" where no sounds can reach, and from which no sounds will reach the enemy. A submarine moving in this shadow zone is effectively invisible. Shadow zones typically occur slightly below the layer.

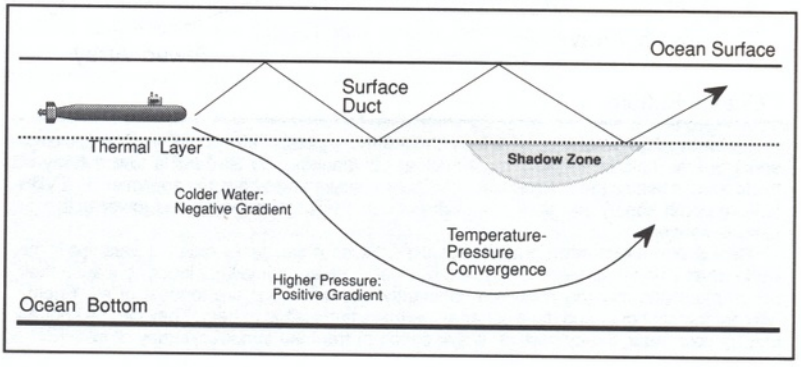
Ducts: Sound waves "bounce" off the underside of the ocean surface. They also bounce from a strong thermal layer, should they hit at a glancing angle. If your sub is above the layer, as sound spreads out from a source (such as your engine room or your sonar), some waves "bounce" between the surface and layer. The stronger the layer, the better the bounce. As a result, sound can be "ducted" long distances.

In exceptional cases, peculiar temperature and salinity changes near the surface can cause a duct there, regardless of the layer.

Isothermal Sound: In rare cases water temperature and pressure changes balance, resulting in virtually straight-line sound. Of course, these "lines" can still bounce from the surface, a strong layer, or the ocean bottom. Isothermal conditions are more likely in shallow water or near the surface in drift ice.

Drift Ice (Ice Floes): In ice floes the lower water temperature and reduced salinity (from melting ice) often result in a weaker layer at a higher depth. On the other hand, the movement, collisions, and breakup of the ice significantly increase background ocean noise. Detection ranges are therefore considerably less. A submarine-to-submarine duel among ice floes often means a close-in "knife fight".

Pack Ice (the Arctic Icecap): Beneath the arctic icepack it is very quiet, as there is virtually no surface noise. The



irregular bottom of the icepack stops nearly all ducting. The low water temperature and low salinity near the icepack result in a very high layer. In fact, underwater pressure ridges can go deep enough to drop through the layer. These deep ridges also interfere with sound transmission. The "best" sound conditions are near shallow ridges or open water.

Shallow Water: In shallow waters a layer may not exist. However, smooth bottoms may allow "bottom bouncing" of sound, turning the entire area into a gigantic duct. On the other hand, rough bottoms trap sound waves and make long-range listening very difficult. In general, though, the shallower the water, the poorer the sound transmission.

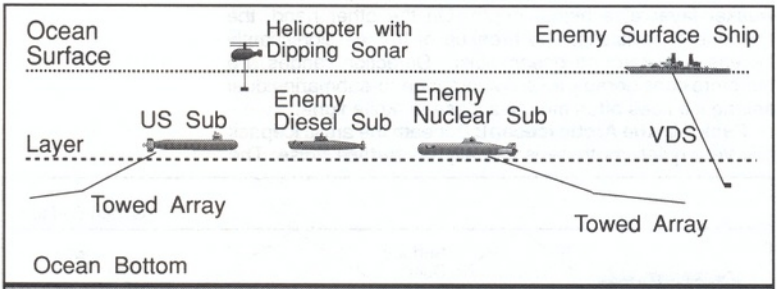
The Baffles: The propellers and wake of a ship or sub disturb the water directly astern. As a result, neither active nor passive sonar can receive sound signals in a 60° arc behind the vessel (30° either side of "dead" astern).

A sub's towed array, a ship's VDS, or a helicopter's dipping sonar are not mounted on the hull. Therefore they have no baffles, but instead operate in all directions.

Contact Tactics

The standard technique for finding an enemy is simple: listen for him. Once you hear him, lurk at low speed and develop a TMA (Target Motion Analysis, i.e., identify him). When he's identified, you can select an appropriate attack.

Listening: The greatest advantage of a submarine is stealth. It is the only naval warship that can hide from an enemy. As a result, using passive sonar and the towed array is the standard method of developing contacts.



Listening Equipment: Submarines have complex passive arrays mounted across large areas of their hull. In addition, most nuclear submarines can "stream" a towed array of hydrophones behind them. Specialized ASW surface warships have the equivalent in a VDS (varible depth sonar) that they trail in the ocean. Helicopters hover and lower active or passive sonars.

Best & Worst Listening: Enemy diesel/electric subs can be the quietest warships in the world when using their electric engines. Nuclear subs are somewhat louder because their power plant (the reactor) must run constantly. Surface ships are loudest of all. Enemy helicopters that hover and dip a sonar are virtually impossible to hear. They can be spotted only by your radar, if they "dip" an active sonar, or from the sonobuoys they drop.

In general, the towed array is a submarine's best listening tool. While passive sonar is hindered by a submarine's own noise, and the noise of water passing over the hull, a towed array is virtually silent. Unfortunately, towed arrays are so long that they invariably sink beneath the layer. If the layer is strong, the towed array may not do a good job "hearing" sounds above the layer. The minimum speed for maintaining a towed array is about 4 to 5 knots. At slower speeds the array goes slack and fails to function. High speeds and especially high speed turns also interfere with towed array reception.

The next best listening tool is passive sonar. Passive sonar has best reception when a vessel is absolutely motionless. Reception degrades as speed increases. Since towed arrays are the ultimate listening tool beneath the layer, a searching sub often runs above the layer so its hull-mounted passive system can listen simultaneously above the layer.

The TMA (Target Motion Analysis): Listening first provides a bearing to the enemy. However, a computerized comparison of incoming sounds is needed to gain more information. As the sonarmen listen, watch their screens, and build up computer data profiles, predictions can be made about the target's course, then about its speed, and finally about its range. Often the sonarmen gain sufficient information to compare the incoming sounds with a "library" of sound profiles for enemy (and friendly) ships. After all, it's embarrassing to sink a friendly ship, or for that matter a whale!

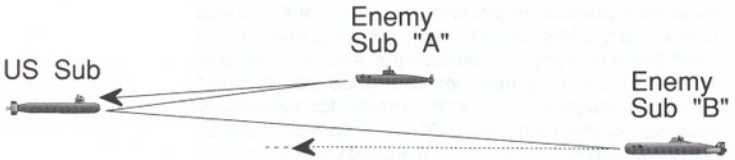
In general, the longer you listen to the enemy, the greater the accuracy of the contact solution. If you lose a contact, solution accuracy gradually degrades to zero.

The most difficult part of a TMA is waiting for that last but crucial piece of information: the range to target. Firing a missile at a target that is much closer than you think means you waste the missile, because it activates after passing the target! Firing a torpedo at a target actually much farther away generally wastes the torpedo, and almost always is a waste of time. To get additional contact data quickly, laser, active radar, and active sonar are useful tools. However, all risk exposing your sub's presence to the enemy.

Using Active Sonar

Active sonar announces your presence to the world. Worse, the enemy can hear it farther than you can get good information (see sidebar). Therefore submarine captains often avoid using it, or restrict their use to occasional pings. However, surface ships are different. Since they are so noisy, and obliged to get somewhere rather quickly, active sonar is their standard search method. However, once a submarine has been identified, ships sometimes slow down and "go passive" in the hopes of hearing interesting information.

Active vs. Diesel/Electrics: If you encounter an enemy



Active Sonar

A US sub sends a single "ping" outward with its active sonar. The ping hits enemy sub "A" and bounces back, giving the US captain accurate bearing and range to the enemy. A few additional pings will give course and speed, as the pings "map" the enemy's movement through the water.

However, the "ping" also continues travelling and reaches enemy sub "B". Although this sound also bounces back, "B" is so far away that the sound is too faint to return to the US sub. (The sonar receiver can't distinguish the returning echo from the background noise of the ocean.) However, enemy sub "B" heard the ping distinctly. Each additional ping gives sub "B" that much more data.

Therefore, using active sonar can be dangerous: the enemy can hear you farther than you can hear him!

quieter than you (for example, a diesel/electric sub), he'll probably hear you first. With that advantage he will stay outside your detection range while building up a 99% TMA, then launch a torpedo or missile. Your first warning of an enemy nearby will be a launch transient (the compressed air blasting the torpedo from its tube), the missile splash overhead, or the pinging of a torpedo's homing sonar.

In this case, as you dodge the attack, the standard response is to "go active". Since the enemy already knows your location, a few pings won't make much difference now. And those pings may well reveal his location to you. If he's outside active sonar range, note the direction his torpedo came from. Chances are good the enemy lurks there.

In fact, until you sink the diesel/electric sub, one useful tactic is to remain active. The enemy you can' see is almost always the most dangerous. Perhaps the only way to remain silent is to fire enough weaponry at the enemy that they're constantly doing loud, noisey things to avoid your attacks.

Active in a Firefight: Active sonar is also useful in the middle of a frantic fight. If you're maneuvering wildly at high speeds to avoid enemy torpedoes, chances are your towed array is out and your passive sonar is "garbaged up" by loud water noise. An enemy you've been tracking may suddenly disappear!

If the enemy are surface ships, they'll probably keep pinging and announce themselves again. However, if the enemy is a submarine, he may be running slow and silent, listening

to all *your* wild gyrations in the water. Here your best bet may be a few active pings, giving you a good fix to launch a torpedo, or better yet, a Sea Lance right onto his head! Once the weapon is launched, turn off the active sonar, concentrate on avoiding his weapons, and then listen to his acrobatics (or the satisfying sound of an explosion when your weapon hits!).

Acoustic Cross-Section

The side of a ship broadcasts sound better than the bow or stern. Similarly, the side reflects active sonar signals better than the bow or stern. Therefore, to minimize your cross-section to the enemy, you should face toward him or away from him. However, since hull-mounted sonar is blind to the stern, the all-around best position is to aim the nose of your vessel toward the enemy.

Masts & Periscopes

ESM Radar Receiver: Enemy surface ships tend to keep their radars running constantly. Your ESM receives radar signals just like your passive sonar receives sound signals. ESM will provide a bearing to the contact, then as your sonar operators combine radar and sonar results, you eventually build a TMA. Periodically check your Compare Sonar display. As soon as your passive or towed array is within the tracking range you can maintain the contact with sonar alone, allowing you to dive below 60'.

To get an ESM fix, rise to 55' depth, then come up 5' at a time until you get an "R" Sensor reading in the View Contacts secondary display. This "R" means your ESM mast just picked up the enemy radar signal.

The great risk of ESM is that the enemy will "see" your mast with his radar. Keeping your mast as low as possible reduces this risk, but it can never be eliminated entirely. Therefore, a wise captain replaces ESM with sonar tracking as soon as possible.

Active Radar: Active radar broadcasts your presence to all enemy surface ships within range. Unlike ESM, active radar provides detailed information about the target very quickly.

Your depth (and thus mast height above water) has a powerful effect on range. Unlike sonar, active and passive radar have the same range. Therefore, if you manage mast height correctly, you could get an active radar fix on a nearby enemy, while remaining invisible to a further enemy because of your low mast. Of course, this only lasts until the enemies compare notes!

The classic use of radar is searching for enemy surface warships. In difficult water conditions, especially ice floes or poor surface ducting, a high-mast radar search can reveal enemies beyond listening range.

In addition, if you're just dying to know the location of an enemy helicopter, rising to 55' for a quick radar scan is useful. You'll only alert enemies within stinger range, and anybody

that close is well worth destroying.

In all cases, the wise commander assumes that active radar announces his presence.

The Periscope: If you suspect that an enemy surface ship or "helo" (helicopter) is fairly close, you can develop a contact with your periscope. The periscope and its laser range finder don't send detectable signals, but keeping the periscope above water does mean that other enemy radars may see it. Therefore, it's best to "inch up" the scope by rising to 55' depth, then rising 5' at a time until you find the target. Once your contact data is good enough for a shot, dive, shoot on the way down, and leave fast.

The problem with a periscope is that enemy radar has better range than visible light. Therefore, a periscope elevation sufficient to aid your contact may be quite high to a radar set. The result is detection. The best way to avoid this possibility is to keep your periscope up for just a few seconds.

Stalking the Bear

American submarines are extremely quiet and outfitted with some of the best sonar equipment in the world. If you're good, this means you can find, stalk, and attack most enemies without being found. A truly expert captain can even guide his torpedo to an enemy who doesn't hear it coming!

Of course, managing a "sneak attack" in the high technology environment of the 1980s and 1990s is considerably more complex than it was in the 1940s (during WWII). However it can be done with careful thought and an awareness of how technology functions.

Stay Quiet while Developing a Contact

The first rule of stalking is "Know your enemy". This means you need a firm TMA (ship class identification and accurate range). Until you have this, it's wise to creep around at 5 kts.

At all times you need to watch the sensor values in the *View Contacts* secondary display. The enemy must reach a sensor value of 16 or more (the detection threshold) to first spot you. Meanwhile, now that you've spotted him, you can maintain the contact with a sensor value of 0 to 15 (the tracking range). If you don't know much about the enemy, assume the worst and keep your sensor values low. This may mean sailing parallel to or away from him at times. Later, when you have more information, you can decide if it's safe to close the range.

Use the *Map Overlay* on the *Tactical Display* to view the water conditions near you and the enemy. Beware of sailing into water that enhances sound transmission — the enemy might suddenly hear you! Be aware of where to go if you must reduce sound transmission: across the layer, near the surface among noisy drift and floe ice, among icepack pressure ridges, or near the high bottom in the shallows.

Also remember that if the enemy is in water with poor transmission, when he moves to better water his "hearing" will improve.

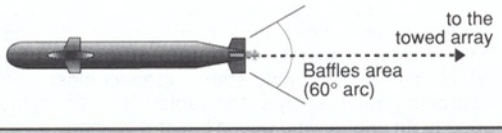
Closing the Range

Once you've identified your opponent(s) and found the range, you can decide what weapon to use and what launching position you prefer. Refer to the next section ("Attacks & Weapons") for details. In general, though, the best weapon launch is a short-range torpedo shot. This usually means you'll want to close the range.

Using the Water: If you're trying to close the range, check the *Compare Sonars* display frequently. The ideal approach keeps all enemy sonars not only below the Detection Threshold, but out of the Tracking Range as well. As you get closer, you'll need water conditions that mask your sounds. Favorite tricks include running on the other side of the layer and deliberately steering into "dirty" water (water with poor

sound transmission).

Positional Advantages: Moving slowly always helps when listening. This is why an "End Run Ambush" maneuver is so advantageous. It puts you ahead of the enemy, allowing you to slow down and wait while he comes to you.



The Baffles:

Active and passive sonars cannot receive sound in a small arc astern. The noise from the propellers and wake of the vessel disturb all incoming sound signals. The baffles are about 60° wide.

Note that the towed array is far astern, unaffected by the baffles.

Ships without a VDS and subs without a towed array are blind to their rear. This "baffles" area is approximately a 60° arc. If your boat is within the "baffles" of an enemy, neither his active nor his passive sonars can hear you, no matter how loud your sounds. Beware, however, that the enemy may zig-zag. When he suddenly changes course, his baffles will swing onto a dramatically different heading.

Russian vessels often travel in small groups, sharing data among them (including data between surface ships and submarines). However, in order to do this effectively, all the vessels must travel in formation. Therefore, until you're spotted, you can rely on the enemy to follow the same course, and to change course simultaneously. Of course, once they contact you or come under fire, their formation almost always breaks up.

Avoiding Mistakes: A common error among novice captains is ignoring comparative sonar values, and therefore announcing their presence earlier than necessary. Once this mistake is corrected, novices still tend to ignore water conditions (i.e., ignore the *Map Overlay*). As a result, they may blindly sail into areas where transmission is good just as the enemy does the same. Suddenly the sonar comparisons jump and they are detected!

Also bear in mind that luck plays a role. The internal noise level of both your boat and enemy vessels varies. There's always the fumble-fingered seaman who slams a door, or the mechanical failure that causes a loud clunk or snap at the wrong time.

Opening the Range

Sometimes you want to maintain or increase the range to the enemy. This is an easier task, since the sonar comparisons should drop. Your chief worry is losing contact too soon. However, the penalty for losing contact is a gradual decline in the contact solution. This gives you a chance to figure out how to regain contact again. This may mean moving to water with better sound transmission, moving to the same side of the layer as the enemy, and perhaps using a brief ESM

Map Insert
DMAHTC Vol IV
National Ocean Service

Briefing Map:
Norwegian Sea Theatre

Please remove for easy reference

The Norwegian Sea Theater

Boats of the Atlantic Fleet 1984-1996

Seawolf Class
(SSN 21 Program)
USS Seawolf (SSN 778*)
USS Barracuda (SSN 779*)
USS Holland (SSN 780*)
(*hull numbers are hypothetical)

Improved Los Angeles Class
(688 Program)
USS Providence (SSN 719)
USS Pittsburgh (SSN 720)
USS Chicago (SSN 721)
USS Key West (SSN 722)
USS Louisville (SSN 724)
USS Helena (SSN 725)
USS Newport News (SSN 750)
USS San Juan (SSN 751)

Los Angeles Class
(688 Program)
USS Baton Rouge (SSN 689)
USS Philadelphia (SSN 690)
USS Memphis (SSN 691)
USS Cincinnati (SSN 693)
USS Groton (SSN 694)
USS Jacksonville (SSN 699)
USS Dallas (SSN 700)
USS Phoenix (SSN 702)
USS Boston (SSN 703)
USS Baltimore (SSN 704)
USS City of Corpus Christi (SSN 705)
USS Albuquerque (SSN 706)
USS Minneapolis-Saint Paul (SSN 708)
USS Hyman G. Rickover (SSN 709)
USS Augusta (SSN 710)
USS Atlanta (SSN 712)
USS Norfolk (SSN 714)

Sturgeon Class
(637 Program)
USS Sturgeon (SSN 637)
USS Whale (SSN 638)
USS Grayling (SSN 646)
USS Sunfish (SSN 649)
USS Pargo (SSN 650)
USS Ray (SSN 653)
USS Sand Lance (SSN 660)
USS Lapon (SSN 661)
USS Hammerhead (SSN 663)
USS Sea Devil (SSN 664)
USS Bergall (SSN 667)
USS Spadefish (SSN 668)
USS Seahorse (SSN 669)
USS Finback (SSN 670)
USS Flying Fish (SSN 673)
USS Trepang (SSN 674)
USS Bluefish (SSN 675)
USS Billfish (SSN 676)
USS Archerfish (SSN 678)
USS Silversides (SSN 679)
USS Batfish (SSN 681)
USS L. Mendel Rivers (SSN 686)

Permit Class
(Thesher Program)
USS Jack (SSN 605)
USS Tinosa (SSN 606)
USS Dace (SSN 607)
USS Greenling (SSN 614)
USS Gato (SSN 615)

update from time to time against surface ships.

Occasionally Active Enemies

Enemy surface ships use their active sonars frequently. They know they're so loud that otherwise you'd sneak up and clobber them. Since they can't hide, they go active to prevent you from getting too close.

Enemy submarines also periodically drift and go active. This tactic is especially popular among louder boats. Again, they know that you play the passive game better than they, because of your better equipment. Therefore they go active at odd intervals to even the contest.

Extremely quiet enemy subs usually remain passive. These subs are especially dangerous if travelling with friends, since they can sneak up on you while their friends are active. Almost all diesel/electric subs are very quiet, and the latest nuclear attack subs are remarkably quiet also.

Avoiding Pings: The best way to defend against an active enemy is to sit behind him, in his baffles. His active sonar can't touch you there. You can also seek especially poor water or longer ranges, so his active pings aren't strong enough to show you. Failing these, you have no other real defense except to shoot quickly. After all, the enemy will start shooting as soon as he can. Your only hope is to get him before he gets you!

Helo Warfare

Enemy ASW helicopters ("helos") are a constant danger when you are engaging surface units. They cruise at roughly 80 knots and tend to rush to each new contact location you provide them. At the contact point the helo usually drops sonobuoys to "fence in" your position, then stops and begin dippings a sonar to get a more precise fix. Impatient pilots may begin dipping immediately. Helos carry lightweight torpedoes, and are therefore a serious danger. However, their sonobuoys have weak sonars, with an effective range of 3,000 to 4,000 yards. Russian helos and buoys normally are active sonars, but passive buoys and dipping sonars do exist.

Weapons & Attacks

The Stealthy Torpedo Attack

The perfect torpedo attack begins with your boat reaching firing position undetected. From there you launch and guide the torpedo to target, keeping it undetected as well. The torpedo is activated only a few seconds before contact, totally surprising the enemy.

Launching Position: A good launching position is a place where you can not only launch the torpedo without risk of detection, but also a place where you can lurk and retain contact with the target while you guide the torpedo home.

Firing a torpedo increases your AV (acoustic volume) by 16, due to the "launch transient" sound of compressed air ejecting the torpedo from the tube. To launch without detection, enemy passive sonars and towed arrays must be below the Tracking Range, that is, have a negative contact value.

Enemies who lack a towed array or VDS cannot hear a launch from within their baffles (55-60° arc astern). Against such ships there is no better launching position.

The Seawolf class has special large torpedo tubes for a "swim out" version of the Mk 48 torpedo. These torpedoes leave under their own power, without compressed air, eliminating the launch transient.

Steering to Target: Your goal is to bring the torpedo as close as possible to the target without detection. As soon as the target detects a torpedo approach, he'll begin dodging and evading. Worse, he'll start looking for you, and soon thereafter torpedoes and missiles may come your way. It's virtually impossible to continue steering a torpedo while evading attacks, so you want to hit home before the counter-punch arrives (or best of all, sink him before he can launch).

Remember that your control of the torpedo depends on a fragile wire. A straight course at 5 kts is usually the best policy while controlling a torp. However, if you don't mind losing use of the towed array, you can stop dead in the water.

A stealthy torpedo run is composed of "way-points". By resetting the pre-planned activation point (PAP) of the torpedo, you can "guide" it through the water on whatever course you desire, with each PAP a "way-point". Naturally, you want to set a new PAP/way-point before the torpedo reaches the old one. Otherwise the torpedo will activate and announce its presence to the world with its homing sonar.

The quietist torpedo approach takes it through water with poor sound transmission. Staying on the opposite side of the layer from the enemy is wise, but approaching from his baffles above the layer is often best, since a towed array or VDS, if any, is almost always below the layer.

Activating the Torpedo: As long as you're undetected wait until the last moment to activate the torpedo. This gives the target minimal time to react and counterattack. However,

in case you're surprised by an attack, make sure your PAPs are functional. If you must dodge a sudden attack, don't be surprised if the wire breaks.

If the enemy detects the approaching torpedo and begins to maneuver, you should activate the torpedo. The main advantage here is that activation increases the speed of your torpedo. For example, a 40-knot inactive torpedo chasing a 32-knot ship only has an 8-knot speed advantage. However, a 60-knot active torpedo has a 22-knot speed advantage — it will catch the target almost three times faster. In addition, you can steer an active torpedo with the *Controller*. This is useful for steering around or through noisemakers, ignoring decoys, and chasing after a wildly maneuvering target.

Once you activate a torpedo, give its sonar every chance to find the target. This means sending it to the same side of the layer as the target, seeking water with good sound transmission, and keeping the enemy within the 90° arc of the homing sonar.

Avoiding Giveaways: A wise captain assumes that sooner or later the enemy will detect an approaching torpedo. This is especially true of quiet enemies with sophisticated sonars and towed arrays. When he detects the attack, the enemy often launches a hasty torpedo in reply. Since he has no contact, he'll simply shoot down the bearing your torpedo came from.

Therefore, steer your torpedo away from your boat so it approaches the enemy from a different bearing. Any enemy torpedoes fired down that bearing won't threaten you!

Other Torpedo Techniques

Reconnaissance by Torpedo: If you believe there is a contact in a certain direction, but are unable to find it, an interesting trick is to fire a torpedo down that bearing, activating it a fair distance from your boat. This may "spook" the enemy into loud maneuvers that give away his position. Of course, maybe he's close enough to hear your launch transient, or perhaps he'll respond in kind with a torpedo in your direction!

The Double Attack: It's almost impossible to conduct a perfect stealthy torpedo attack against first rate enemy ships. Sooner or later the enemy discovers either you or the torpedo. Furthermore, large enemy targets often absorb one or two torpedo hits without sinking. One way to increase the odds is with a double attack.

In this you launch a pair of torpedoes, one right after another, on the same course. Both torpedoes get the same commands, but with one exception: under *Torpedo Control* one torpedo has a *L/ Search Pattern*, the other a *R/ Search Pattern*. Thus if the enemy dodges or decoys the torpedoes, they search in opposite directions. This makes escape much more difficult.

An extreme variant of this ploy is the triple attack. The first

two follow double attack tactics, while the third torpedo distantly trails the first two. The enemy may dodge the first two by moving back through its own noisemaker or decoy, then running down the path the torpedoes came from. If he does, this third torpedo will greet him head-on.

The Snapshot: When you're in a close-range "knife fight" with enemy ships, dodging missiles and torpedoes, it's impossible to maintain a wire to a torpedo. However, with a well-timed activation point, a torpedo "on its own" has a fair chance of hitting a smart enemy, and an excellent chance of hitting a foolish or distracted enemy.

On snapshots you must select the pre-planned activation point (PAP) carefully. Try to anticipate the enemy's course and arrange the PAP so the torpedo will be nose-on to the enemy at activation. Remember that the farther away the target, the more he can move between the time you fire and the time the torpedo arrives.

If you have the time and sufficient torpedoes, double attacks are especially effective snapshots. The counter-rotating search patterns greatly increase your chances of hitting with at least one torpedo.

To make a snapshot, order *Straight & Level* to the helm just before firing. This lets you retain the wire as you launch, a necessity for setting up the best torpedo control commands. The commands needed are simple: set the running depth (shallow or deep) to the enemy's current depth. In a double attack, set up opposite search patterns. Now you're ready to maneuver again as necessary. Of course, the longer you can run straight and slow, the longer you retain the wire and the more chances you have to update the torpedo's PAP, depth, and search pattern.

Launch on Bearing: Enemy captains are not always as crafty as they could be. Their torpedoes may be launched directly from their ship or sub toward you. Therefore, if you fire

Nuclear Weapons and World War III

Both American and Russian warships carry weapons with nuclear warheads. These are not city-busting megaton blast weapons. For example, the American SUBROC has a one kiloton warhead (1,000 of these are needed to equal a one megaton warhead).

Cruise missiles such as American Tomahawk or Russian SS-NX-21 can be armed with nuclear warheads set for a low-altitude air-burst over a task force, where the blast would wreck radars and other topside equipment, start fires, and cause radioactive contamination of the ship.

Missiles or rockets can carry nuclear depth charges that explode beneath the water, causing a shock wave that can crush any submarine at 5 to 8 kilometers. However, the disturbance in the water renders underwater sensors in the area are useless for the next few hours. These warheads can be launched from surface ships (such as the American ASROC or Russian SUW-N-1) or submarines (such as the American SUBROC or the Russian SS-N-15). Many of these weapons have alternative conventional warheads as well.

Finally, land attack cruise missiles can be armed with nuclear warheads, giving warships the ability to start a city-busting nuclear war.

in the direction from which a torpedo came (i.e., launch along that bearing), your torpedo just might find a target.

This form of counter-attack is quick and simple, but not especially accurate. Still, if you're in serious trouble and don't have time to develop a contact, it's better than nothing. Be aware, though, that using this tactic rapidly depletes your ammunition with little to show for it.

Sea Lances

This rocket-launched weapon is designed for use against submarines. Its accuracy depends on the pre-planned activation point (PAP). At that point it releases a homing torpedo is released. Then it circles to the left, searching for the enemy (a 'L/' Search pattern). As a result, the greater the distance between target and PAP, the greater the chance the torpedo will miss the target.

The Long Bomb: If your contact (TMA) with a sub shows a good solution (over 90%, preferably 99%) and a long range (10 Kyds or more) the Sea Lance is dead easy to launch. Just put the PAP on the enemy and let it go. Unless the enemy has their radar mast up and running, they won't know about the threat until the missile's torpedo hits the water. Naturally, if the enemy is moving fast and is far away, you must position the PAP along his anticipated course. The act of dropping a homing torpedo right onto a moving enemy sub, via Sea Lance, is popularly known as "the long bomb".

Remember that the Sea Lance has a small warhead. One hit on a large submarine (such as a Typhoon class SSBN) may not sink it.

The Corral: Some enemy submarines are extremely fast (such as the 45-knot Alfa class!). Unless a torpedo is very close, they can simply outrun most torpedo attacks. To prevent this, you can extrapolate the enemy's course and fire a Sea Lance to a point slightly ahead of him. When it hits the water downrange, the enemy sub suddenly has a homing torpedo in front of him. Now he's caught between the torpedo chasing

If WWIII does occur as a conventional war with limited aims, as Tom Clancy describes in his novel *Red Storm Rising*, neither side gains anything by destroying the world with its nuclear arsenal. On both sides politicians firmly control the use of nuclear weapons. The fear of nuclear escalation is so great that no sane politician will allow any use of nuclear weapons, no matter how small the warhead.

Curiously enough, in the late 1950s and throughout the 1960s, it was official policy of the US in NATO to use nuclear weapons on land and sea against Soviet military forces (but not against civilian targets), as a means of "equalizing" NATO's supposed weakness in forces. Fortunately, fears of escalation, political pressure in Europe, and a gradual understanding that NATO and the Warsaw Pact are actually evenly matched caused a rethinking of this policy in the 1970s.

Today NATO officially maintains a "will use first if necessary" policy. Russia and the Warsaw Pact has announced a "no first use" policy, a more enlightened view. However many expect NATO leaders to resist nuclear exchanges (they will probably prefer "Red" to "dead"). Therefore, a non-nuclear conventional war in Europe is conceivable.

him and the homer in front. In fact, this tactic can be used to block an enemy sub's movement in any direction.

Against Surface Ships: The Sea Lance is a very inferior weapon against surface ships. First, its homing torpedo has a very small warhead that has little chance of sinking anyone, and may not even cause serious damage. Second, it isn't designed to penetrate anti-missile defenses. As a result, it's much easier to shoot down than cruise missiles. Third, while cruise missiles strike a target directly, the Sea Lance drops a torpedo which must then find and strike the target. Even if the missile survives, the torpedo can still miss. Fourth, a Sea Lance launch reveals your position just like a cruise missile (see "Clear Datum" below).

Cruise Missiles

Selecting the Weapon: US submarines have two cruise missiles available. The Tomahawk has a larger warhead and greater range, while the Harpoon has a shorter minimum range and is slightly more difficult to shoot down. In general, though, captains prefer the heavy-hitting Tomahawk.

PAPs & Missile Defenses: The accuracy of Harpoon and Tomahawk missiles is entirely dependent on how you program the weapon. The missile itself is highly reliable. If the seeker identifies a surface ship target, the missile will fly into it.

The pre-planned activation point (PAP) you select before launching determines where the missile's seeker turns on. The missile's course from your boat to the PAP determines the direction it is facing. Remember that the seeker only has a 90° "field of view". A PAP positioned close to a distant and fast-moving target may be useless — by the time the missile arrives, the target is beyond the field of view. To insure lock-on, the further the range the earlier you should set the PAP.

On the other hand, enemy anti-aircraft guns and missiles are serious threats to Harpoons and Tomahawks. They track these missiles much better when the seeker is running. Therefore the later the seeker turns on, the better the missile's chance of survival. This suggests you should set the PAP as close to the target as possible!

In summary, if you set an early PAP the missile will probably find the target but the enemy is more likely to shoot it down. If you set a late PAP the missile might never find the target. But if it does, it has a better chance of surviving. As a result, missile shots against near targets are easier than distant ones, since flight time to near targets is short, permitting you to set a PAP that is very close to the ship.

Multiple Targets: A Harpoon or Tomahawk homes on the first target found by its seeker. This is invariably the nearest target. Unfortunately, large, high-value enemy ships are often screened behind smaller, less valuable ships. To insure the missile goes for the larger ship you must set the PAP *beyond* the smaller one. This can be difficult in long-range shots,

since both the smaller and larger ship could move considerably.

Stingers

These small, light SAMs (surface-to-air missiles) are purely for self-defense against helicopters. Unfortunately, their limited range of 6,000 yards is a severe drawback. Novice captains commonly forget this range limitation and fire off all their armament at targets hopelessly far away, then blame the manufacturer for shoddy equipment!

Another disadvantage is that a Stinger launch, like other missile launches, gives away your position. If you don't kill the helicopter, it could kill you with a close-range torpedo shot, not to mention enemy surface ships and/or subs bombarding you with missiles and torpedoes!

In short, consider carefully whether a Stinger launch is worth the risk. It may be wiser to just sneak away.

Clear Datum

Whenever you launch a missile (Sea Lance, Harpoon, Tomahawk, or Stinger), surface search radars will "pick up" the weapon. The location where it leaves the water is the "datum" point of the launch. A frequent tactic of enemy vessels is to launch their ASW missiles immediately at the datum. Therefore it's important to increase speed and get away from your launching point as quickly as possible.

The classic way to "clear datum" is to dive deep (800' or more) and crank up maximum speed. The depth allows you to use maximum speed without cavitation. It also puts the layer between you and any missiles that hit the water, reducing the chance of them homing on you.

Evasion & Escape

Enemy Torpedoes

To evade torpedoes you must understand how they function. Here your intelligence and creativity compete with the electronic brain of the torpedo. If you're flexible and smart, you'll beat the machine and survive.

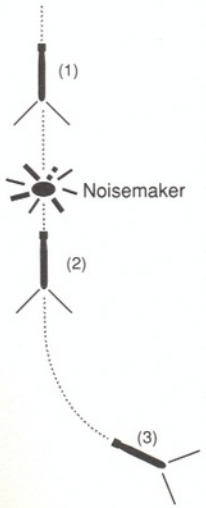
The Snake: Russian torpedoes, once active, rarely run straight to target. Instead their controllers have them "snake" along a gentle zig-zag course. This gives the torpedo a wider field of view, as the nose alternately swings left and right.

Homing: When a Russian torpedo activates, it continues running normally until its active sonar picks up a target (at about 2,000 to 4,000 yards, depending on water conditions). When it finds a target, it changes to the target's depth and drives straight at it. If the torpedo loses the target, it circles right or left (depending on its programming), hoping to find the target once more. Occasionally a Russian torpedo will use a "figure eight" search — first it circles in one direction, then it circles in the opposite direction.

Advanced Programming: If you select a "serious" or "ultimate" challenge, advanced programming features appear on Russian torpedoes.

One advanced feature is a program the sends a searching torpedo spiraling downward. If the torpedo started searching above the layer, it will spiral down and continue searching below the layer.

A second advanced feature is the torpedo's ability to "drive around" a noisemaker. Compare the "Drive Through" logic with the "Drive Around" logic in the sidebars. A torpedo with "drive around" is more likely to find you again after passing the noisemaker.



Drive Through

In this example the torpedo is pre-programmed with L/Search reacquisition logic.

(1) Torpedo's nose sonar (90° arc shown) picks up noisemaker and is blinded. "Drive through" logic is activated.

(2) Torpedo moves directly through the noisemaker.

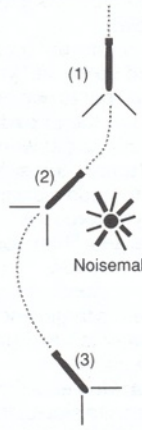
(3) After torpedo passes noisemaker it initiates the L/Search circle, attempting to pick up the target again.

Airborne Torpedoes: Russian SS-N-14 and SS-N-16 missiles fly through the air and drop homing torpedoes, like the American Sea Lance. Also like the Sea Lance, the torpedo circles at the drop point, trying to find a target. Models with advanced programming will spiral downward, eventually diving past the layer. All these weapons

have smaller warheads than their heavier tube-launched cousins.

Russian helicopter-dropped torpedoes act like these missile-borne torpedoes.

RBU Rockets: Many enemy ships carry close-in RBU rocket launchers of various types. These fire a few hundred to a few thousand yards. What they fire is a huge barrage of unguided warheads, programmed to explode bracketing a certain depth. If these rockets land around you the results can be extremely unpleasant.



Drive Around

In this example the torpedo is pre-programmed with L/Search reacquisition logic.

(1) Torpedo's nose sonar (90° arc shown) picks up noisemaker and is blinded. "Drive around" logic is activated.

(2) Torpedo turns right to go around noisemaker.

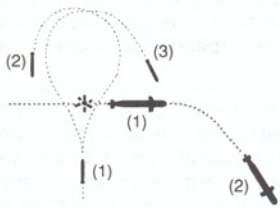
(3) When torpedo passes noisemaker it initiates the L/Search circle, attempting to pick up the target again.

Evasion Techniques

In general, high speed is very important when evading torpedoes. The minimum useful speed is about 20 kts, and flank (absolute maximum) speed is much better. At lower speeds you can't move fast enough to dodge. High speeds and cavitation don't make you an easier target to a torpedo — it uses active, not passive, sonar to find you. Of course, being loud does attract the attention of enemy vessels, so they might continue shooting at you!

Dance to the Side: This is the simplest method of evading a torpedo. The sub either drops a noisemaker, or by turning at 30+ kts forms a knuckle in the water that acts like a noisemaker. Then the sub turns away from the torpedo while it's blinded by the noisemaker or knuckle. The goal is to get outside its field of view before it begins to "see" again.

As the sidebar box illustrates, depending on which way the torpedo searches, you can escape, or end up with a torpedo homing on you again. Depending on the angle the torpedo approached from, and which way it turns, you can



Dance to the Side

An American submarine evades an advanced "drive around" torpedo using a simple technique:

(1) Drop noisemaker to blind torpedo and immediately turn toward enemy. If running at 30 knots, the turn itself will cause a knuckle, eliminating the need for a noisemaker.

(2) If you're lucky, the torpedo with circle the other direction, allowing you to escape before it comes around.

(3) If you're unlucky, the torpedo may circle in the direction you turn and come up behind you!

The Decoy Run

(1) Enemy torpedo approaches from astern. The sub knows this only if its towed array is functioning, as the torpedo is in the "baffles" (invisible to passive sonar).

(2) Sub goes to maximum speed and drops decoy. The decoy, running at 20 kts, falls behind sub.

(3) Torpedo homes on nearest target (the decoy). Meanwhile the sub turns away and leaves the torpedo's field of view before it gets past the decoy.

adjust your own maneuvers to get away from the torpedo as quickly as possible.

The dangerous part of this maneuver is that an enemy torpedo could end up behind you — right in your baffles, at just the time when your towed array is non-functional (due to recent tight turns). If the torpedo suddenly disappears from your display it's time to get worried!

The Decoy Run: As the sidebar illustrates, this tactic is used to defeat a torpedo closing from astern. By outrunning your own decoy, you force the torpedo to home on the decoy as the nearest target. Then you can angle away while the torpedo follows the decoy.

Eventually the torpedo will catch up and pass the decoy. At that point it loses its target and begins a circle search. If you haven't angled away far enough yet, the torpedo may again find you and give chase.

Using the Sea: One excellent way to evade torpedoes is moving to the opposite side of the layer. The torpedo's sonar seeker is less effective through the layer, reducing the torpedo's tracking range. Remember that torpedoes with advanced logic spiral downward as they search, so the layer may help only temporarily.

Heading into "dirty" water is another way to evade enemy torpedoes, since that too reduces their sonar capability. Conversely, it's unwise to be in a strong duct, since their sonar is much improved.

In shallow water or beneath the pressure ridges of pack ice you can lure a torpedo into the seabed or the ice, destroying it. If an enemy torpedo is homing on you, it will move to your depth. You can then run for an ice ridge or an undersea mountain and, just at the last minute, drop a noisemaker. While you evade the obstacle the blinded torpedo drives straight into it. Needless to say, this tactic requires fine timing and superb helmsmanship —running into the sea floor or an ice ridge is invariably fatal to your sub too.

Final Escapes: Dodging torpedoes is just your first line of defense. Your ultimate goal is to stop them from shooting at you. The best way to achieve this is by sinking the enemy. The more cowardly solution is moving to reduce sonar reception, so you become invisible again. Note that even if you do drop below the enemy's tracking range (enemy sensor contact values go negative) he still knows your last position. Don't be surprised if a few more torpedoes or missiles head there.

Fatal Mistakes

Forgetting Your Baffles: Novice captains, maneuvering to avoid torpedoes, often forget to check whether their towed array is functioning or not. If the towed array isn't working yet, you're "blind" in a 60° arc to the rear. In this situation you often hear a novice say "where'd that one come from?" as an

explosion rocks his boat.

Bad Timing in the Dance: Noisemakers and tight turns require fine timing to be effective. If you release a noisemaker and turn too soon the enemy torpedo steers around it, or worse, ignores it entirely. If you act too late, the torpedo hits you before you can get out of the way. In general, you should act when a torpedo is 1,000 to 2,000 yards away. If it's closer than 1,000 yards, you're getting into deep trouble.

Center Ring in a Torpedo Circus: The worst possible situation is to be in the middle of two or three torpedoes, coming from different directions, and all homing on you. Turning away from one will drive you into another. You must watch distant as well as nearby threats, so you don't accidentally sail into a "no escape" situation.

Ignoring RBUs: In the heat of battle, you may forget to stay at least a couple thousand yards away from any Soviet surface ship.If you don't, you could wake up to a rolling barrage of explosions as his rockets erupt around your boat!

No Counterattacks: Dodging torpedoes at high speed makes a lot of noise. If the enemy knew your position previously, they almost surely can continue to track you as you dodge. The best way to get out of trouble is to fire a few things back at them. Even if they don't hit, the enemy will have to maneuver away at high speed, and perhaps lose contact. A good offense is always helpful to the defense.

Russian ASW Tactics

Tactical Philosophy

Russian captains and group commanders are well aware of America's advantages in submarine technology. Their response is to be aggressive, to charge forward, revealing themselves if necessary, but finding you as soon as possible. They don't conserve ammunition, but instead fire quickly, hoping to "flush out" the American even if they don't score a damaging hit.

Russian ships and subs usually operate in groups, almost never alone. Russian subs frequently move to periscope depth, to keep in contact with each other as well as nearby surface ships and helicopters. This way ships and subs can share contact information to develop a cumulative solution, as well as avoid shooting at each other.

Ultimately the Russians are prepared to exchange vessels one for one if that's what it takes to sink the enemy. This may not be good long term naval strategy, but in battle the Russians want results, regardless of cost.

Surface Warship Groups

Surface task forces have a variety of escorts, sometimes including a submarine, around "high value" ships such as aircraft carriers, amphibious assault ships, or transports. Sometimes the group is purely for anti-submarine warfare.

Russian ship groups frequently use active sonar, and may have helicopters with dipping sonar on patrol. A submarine with the group often remains silent, listening to the sonar returns from the surface ships.

If the group makes a contact or observes an incoming missile or torpedo the ships immediately begin battle drill. "High value" ships turn away from the attack while the escort turns toward it at high speed. If a missile launch was observed, they respond with one or more missiles aimed at that spot. If a torpedo is incoming, they fire torpedoes down the bearing of the torpedo approach. They hope the American sub will increase speed to avoid the attack, thus revealing its position.

As the Russians reach the general proximity of the attack, some slow down and listen more carefully, hoping to find some trace of the attacker. If they fail, the group reforms and continues on course. If they find something, they continue attacking with torpedoes, and if possible rockets. Meanwhile the "high value" ships curve around the danger area and continue on course. If the escorts don't get immediate results but can maintain contact, one or two escorts may return to the "high value" ships, leaving fewer to continue tormenting you.

Note that when the Russian escort pursues the attacker, it ceases any close guarding of the "high value" ships. They are aware that NATO subs do not use "wolfpack" tactics. In fact deliberately avoid each other, so a group is unlikely to suffer attacks from two directions simultaneously.

Russian submarines traveling on a mission normally use "sprint and drift" tactics. They will dive deep to sprint (to reduce cavitation sounds), then slow and rise above the layer to "drift" (see page 43). While drifting they may raise a radar mast to check for surface targets, or stream an aerial to send and receive radio messages. A submarine group zigs and zags in unison, but take turns drifting. This means the entire group can hear the pings, but only one sub reveals itself. If one sub is louder than the others, it frequently does all the pinging, since it's likely to be heard anyway!

While drifting, Russian subs may ping once or twice with active sonar. They know quiet Americans can sneak up on them. Pinging with active sonar evens up the odds.

Diesel/electric submarines must occasionally come up to periscope depth and raise a snorkel. This allows them to run their diesel engines and recharge the electric batteries. The diesels are quite loud, so these boats are an easy mark while snorkeling.

If Russian subs hear you with their passive sonar they may try a silent approach, moving toward you slowly and quietly. In fact, one may keep you busy dodging attacks while another sneaks up, trying to get close for a killing shot you might never see.

Boomers: Russian ballistic missile subs (SSBNs) operate differently. They cruise very quietly (at about 5 kts), very deep, in the shadow zone(see page 46), or beneath a noisey ice floe. Their goal is to remain concealed. If attacked they evade, expecting their escorts to deal with threats. The escorts can be nuclear subs and/or diesel/electric subs. When an attack occurs escorts "go active" and begin firing. When you're hunting SSBNs, the louder escorting subs are usually the first enemies contacted. Sneaking past these guardians to find the quiet SSBN can be quite difficult.

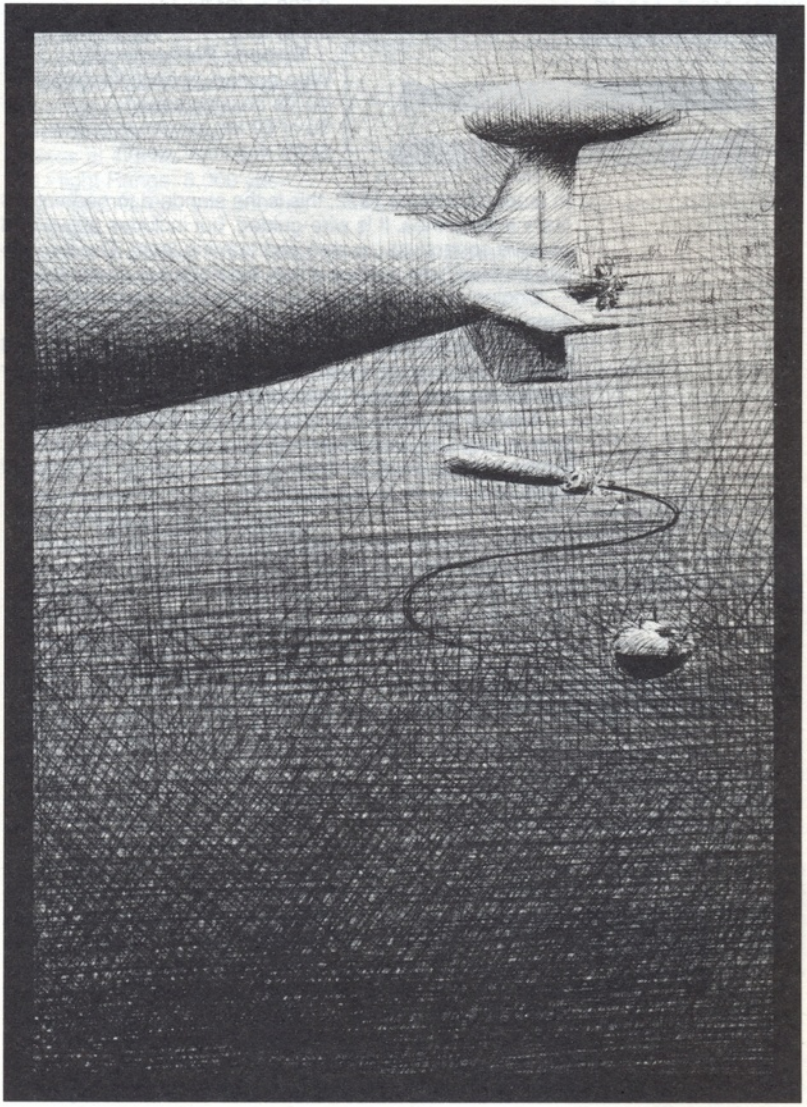
Toshiba, Kongsberg and Russian Propellers

Low frequency sound, which carries farthest in the water, is generated primarily by a submarine's propeller. Achieving the best and smoothest possible curves on a propeller blade has a dramatic impact on a boat's acoustic volume. In the West, giant high technology computer-controlled milling machines created propellers that gave NATO submarines a decisive acoustic advantage over their Russian counterparts.

Unfortunately, in 1981 a Japanese machine tool firm and a financially ailing Norwegian arms dealership responded positively to a proposal by Russia's Techmashimport for four "propeller cutter" milling machines. The Soviets bought machines from Toshiba Machine Company, Ltd. and appropriate computer controllers from Kongsberg Trade Co. Both firms ignored their homelands' regulations, which prohibits the sale of such to East-bloc nations.

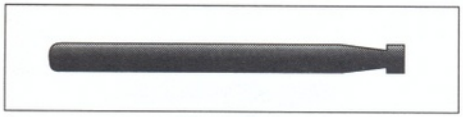
In the years since 1981, as new Soviet submarines are completed, or old boats returned for refit, they acquired new and quieter propeller blades. In the West, the Norwegian government closed down Kongsberg Trade. The Japanese executives managing Toshiba resigned in disgrace (boardroom style hara-kiri) as the firm's US industrial and consumer sales suffered: many American businesses refused to purchase equipment bearing the "Toshiba" label.

Part 3
The Reference Manual



US Submarine Weapons

Mark 48 Torpedo



Dimensions:
300 kg warhead
0.533 m (21") wide
5.8 m long

Torpedo Performance:
Wire-guided, acoustic sensors
40 kts cruising speed
55 or 60 kts maximum speed
3000' maximum depth

Notes:

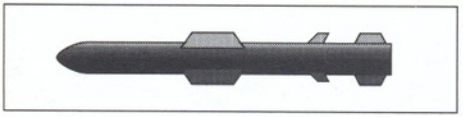
In production since 1972, this is the standard torpedo of US Navy submarines. It is wire-guided, but includes active and passive sonars with search and homing logic. The torpedo can be fired from surface ships, but none are so equipped.

Original production models have been upgraded to Mod 4 standards, to permit attacks on Alfa-class submarines.

In the middle 1980s an improved model appeared, titled ADCAP, with higher speed (60 instead of 55 knots), greater endurance, and various mechanical improvements.

A future variant of this torpedo is the "swim out" version. It could leave an oversized torpedo tube under its own power, Such a torpedo would be the logical armament for the Seawolf class, and has no launch transient.

Harpoon UGM-84A Cruise Missile



Missile Dimensions:
227 kg warhead
0.533 m (21") wide
4.6 m long

Missile Performance:
Pre-programmed course
Terminal radar homing
Cruises at 560 kts
Min Flight Range: 6,000 yds
Max Flight Range: 120,000 yds

Notes:

Since 1977 the Harpoon has been the standard anti-ship missile of the US Fleet. In addition to the UGM submarine version, an RGM version for surface ships and an AGM version for aircraft exist. The missiles are reliable and have performed well in engagements with Libyan and Iranian craft.

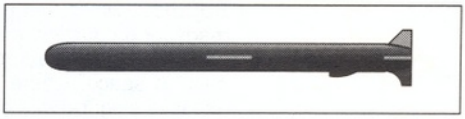
In a typical attack run the missile cruises only a few feet above the water (using a radar altimeter) until it reaches its PAP. Then the terminal homing radar turns on, finds, and locks onto the target. The radar can jump frequencies to evade jamming attempts. In early versions, it "popped up" to make a final dive into the target. However, in later versions this became a programmable option, since it was easier to shoot down during the final "pop up".

The weakness of this missile is its relatively short range and small warhead.

Tomahawk TASM (BGM-109E) & TLAM (BGM-109D) (available from 1988)

TASM Missile Dimensions:
454 kg warhead
0.533 m (21") wide
2.6m wingspan
6.15 m long

TASM Missile Performance:
Pre-programmed course
Terminal radar homing
Cruises at 475 kts
Min Flight Range: 6,000 yds
Max Flight Range: 500,000 yds



Notes:
Originally produced from 1982 as an air-launched cruise missile with a nuclear warhead, it has found a true home as America's most powerful conventional missile.

The TASM (Tomahawk Anti-Ship Missile) was modified for firing from submarines in 1983, including launch from torpedo tubes as well as the VLS tubes in the Improved Los Angeles class. The TLAM (Tomahawk Land Attack Missile) version modified for ship and submarine use appeared in 1984.

The TASM version uses the same guidance and homing equipment as the Harpoon. The TLAM uses the inertial guidance and computerized terrain contour matching system of the original air force weapon.

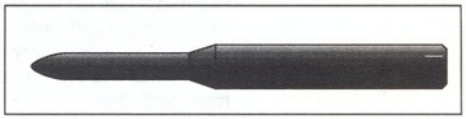
These missiles are much larger, longer ranged, and more destructive than the Harpoon. As of the late 1980s, only battleships, a few cruisers, and attack submarines carried them. The US Navy hopes to add them to other ships. Unfortunately, initial naval procurement for the TASM is a paltry 600 missiles for the entire fleet, compared to 3200 TLAMs and over 4000 Harpoons.

The weakness of this missile is a poorer terminal attack profile than the Harpoon, making it easier to shoot down.

The Sea Lance / Mark 50 ASW Missile (available from 1992)

Missile Dimensions:
1600-2000 kg weight (estimated)
0.533 m (21") wide
6.7 m long (estimated)

Missile Performance:
Pre-programmed course
Supersonic (over 625 kts)
Min Flight Range: 6,000 yds
Max Flight Range: 60,000 yds



Torpedo Dimensions:
45 kg warhead (estimated)
0.324 m diameter (12.75")
2.6 m length (estimated)

Torpedo Performance:

40 kts cruising speed (estimated)
60 kts maximum speed (estimated)
2000' maximum depth (estimated)

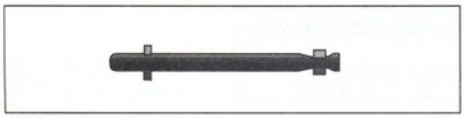
Notes:

This weapon, currently under development as the ASW-SOW (Stand-Off Weapon), is the first long-range ASW weapon for US submarines carrying a conventional warhead. Previously the only long-range missile weapon was the SUBROC, which had a nuclear depth charge. It should be ready for production in the early 1990s.

The missile flies a computer-programmed path to a specific point in space, where it decelerates, hits the water, and releases a lightweight homing torpedo.

The capabilities of this weapon are conjectural, since development continues. It is hoped that the Mark 50 torpedo warhead of the missile can be used also by aircraft and helicopters. This would replace the obsolescent Mark 46 in use since 1965.

Stinger FIM-92A
(available from 1992)



Missile Dimensions:
3 kg warhead (estimated)
0.052 m (2.75") wide
0.203 m (8") wingspan
1.5 m long

Missile Performance:
Passive Infra Red Homing
1260 kts
Min Flight Range: 200 yds
Max Flight Range: 6,000 yds

Notes:

Designed as a shoulder-launched SAM (surface-to-air missile) for infantrymen in the US Army, the Stinger has been attached to jeeps, helicopters, and many other platforms that desire a lightweight SAM. Designs have been proposed that would modify a mast and add a waterproof box launcher to SSNs. The SSN would raise the mast above water, activate the missile, and fire it at a nearby airplane or helicopter.

The Stinger successfully downed an Argentine aircraft in Britain's 1982 Falklands campaign, and has been used effectively by Afghan guerillas against Soviet helicopters in the mid -1980s. However, the range and warhead of this missile are quite small — perhaps too small for a naval weapon. However, any larger missile would probably need a tube launching system, as opposed to the fast and convenient mast launcher.

The Stinger mast launcher is conjectural. The US Navy has not (yet?) contracted for adding these weapons to submarines. If you prefer situations limited to hardware currently in development, do not carry Stingers, regardless of time period.

About Warship Data

Dimensions: The displacement of a vessel, in tons, roughly indicates how difficult it is to sink. Auxiliary and merchant ships are, of course, much easier to sink thant a military vessel of equivalent tonnage.

Size has a minor effect on sonar visibility (smaller vessels are harder to "see").

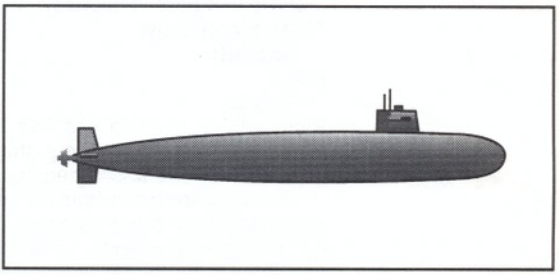
Speeds listed are designed or trials maximums. Most vessels cruise at much slower speeds, since they would quickly exhaust their fuel otherwise. Nuclear powered ships do not have this problem, and can cruise as fast as machinery maintenance permits (though running at top speed continuously leads to mechanical breakdowns).

Weapons: The list of weapons and launchers not only describes the capabilities of the vessel, but also suggests something of its purpose. Very few vessels carry a weapon for every possible purpose or need.

Sensors: Low frequency sonars are the most effective, high frequency the least effective.

SSN Permit

Dimensions:
3,780 tons submerged
84.9m x 8.8m
30 kts, 127 men
Nuclear propulsion



Weapons:
4x 21" torpedo tubes
Mk 48 21" torpedoes
Harpoon UGM missiles
Tomahawk TASM and TLAM theoretically possible

Sensors:
BPS-15 mast-mounted search radar
BQQ-5 low frequency hull-mounted sonar (active and passive modes)
Clip-on towed array

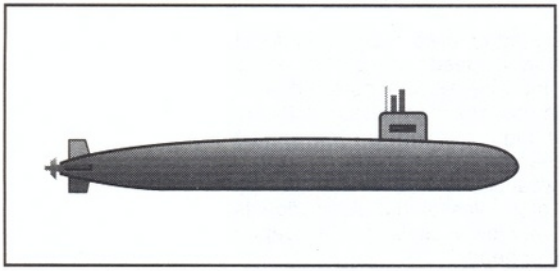
Aircraft:
None

Notes:
These submarines originally joined the US fleet between 1962 and 67. They represent the first large class of advanced nuclear attack submarines. The first ("class") boat was the USS Thresher, which sank with all hands during diving trials in 1963. This was the worst submarine disaster in history. The class was renamed afterward.

These boats are quiet by Soviet standards, but inferior to the more sophisticated Sturgeon and Los Angeles classes. Like the Sturgeons (below), their equipment was upgraded in

the 1970s. Now they are approaching the end of their "useful" service life. Although capable of carrying the Tomahawk missile with minor modifications, the Navy resists putting valuable and rare weapons aboard such old boats. In wartime, where every vessel counts, policy could change quickly.

SSN Sturgeon

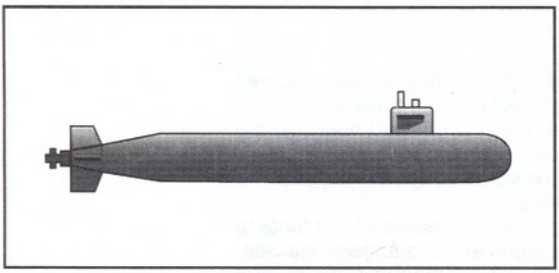


Dimensions:
4,960 tons submerged
92.1m x 9.6m
25 kts, 129 men
Nuclear propulsion
Weapons:
4x 21" torpedo tubes
Mk 48 21" torpedoes
Harpoon UGM missiles
Tomahawk TASM and TLAM missiles
Sea Lance missiles when available

Sensors:
BPS-14/15 mast-mounted search radar
BQQ-5 low frequency hull-mounted sonar (active and passive modes)
TB-16 towed array
Aircraft:
None.
Notes:
From 1967 to 1975 no less than 37 submarines of this type joined the US Navy, where they remain popular boats, especially for under-ice operations.

During periodic overhauls the original BQQ-2 hull sonars were replaced with the much superior BQQ-5, while the fire control systems were updated with the addition of the Mk 117 computer suite. In quality these boats are close to the Los Angeles class, capable of acquitting themselves well against any but the very latest Soviet-built submarines.

SSN Los Angeles



Dimensions:
6,927 tons submerged
109.7m x 10.1m
32 kts, 127 men
Nuclear propulsion
Weapons:
4x 21" torpedo tubes
Mk 48 21" torpedoes
Harpoon UGM missiles
Tomahawk TASM and TLAM missiles
Sea Lance missiles when available

Sensors:
BPS-15A mast-mounted search radar
BQQ-5A low frequency hull-mounted sonar
(active and passive modes)
TB-16 towed array

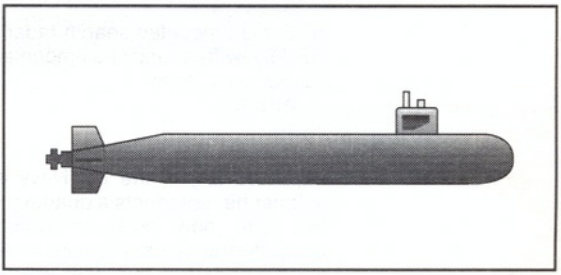
Aircraft:
none

Notes:
In service with the US Navy since 1976, this is the largest class of submarines built in America since WWII, and without doubt the finest. The first 31 built lacked vertical launch tubes. Subsequent versions, the "improved" Los Angeles, have them (see below).

Designed originally for anti-submarine warfare, these boats are believed to be the finest in the world for that task. The tube-launched Harpoon and later Tomahawk missile give the class a formidable anti-ship capability as well. Mast-mounted Stinger SAMs are under consideration for self-defense against helicopters and patrol aircraft.

SSN Improved Los Angeles

Dimensions:
6,927 tons submerged
109.7m x 10.1m
30+ kts, 127 men
Nuclear propulsion



Weapons:
12x VLS tubes for
Tomahawk TASM and
TLAM missiles
4x 21" torpedo tubes
Mk 48 21" torpedoes
Harpoon UGM missiles
Tomahawk TASM and
TLAM missiles
Sea Lance missiles
when available

Sensors:
BPS-15A mast-mounted search radar
BQQ-5A (later BSY-1) low frequency hull-mounted sonar
(active and passive modes)
TB-16 (later TB-16D) towed array

Aircraft:
none

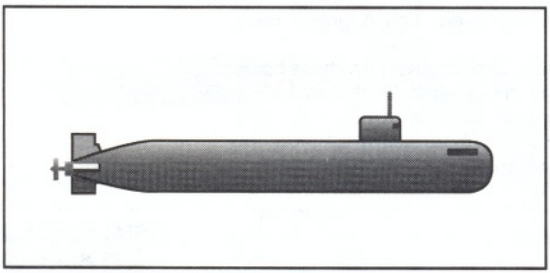
Notes:
In the early 1980s the US Navy added VLS Tomahawk tubes to the Los Angeles class, improving its anti-ship and anti-land target firepower considerably. In addition each new boat got an Anechoic (sound-absorbing) coating, like many of the new Russian boats. The first such improved boat (USS Providence, SSN 719) joined the fleet in 1985.

Additional improvements, including an improved sonar

system and revised plane arrangements are planned for the USS San Juan (SSN 751).

The VLS tubes were added between the inner and outer hulls, so no crew or equipment space was lost. Therefore this group retains all the advantages of the original Los Angeles class. Of course, this design "feature" means that the VLS tubes are inaccessible from inside the boat, and therefore cannot be unloaded or reloaded by the crew at sea.

SSN Seawolf



Dimensions:
9,300 tons submerged
99.4m x 12.2m
35+ kts, 130 men
Nuclear propulsion

Weapons:
8x 30" torpedo tubes
Mk 48 21" Swimout torpedoes
Harpoon UGM missiles
Tomahawk TASM and TLAM missiles
Sea Lance missiles

Sensors:
BPS mast-mounted search radar
BSY-2 low frequency hull-mounted sonar
TB-23 towed array

Aircraft:
None.

Notes:
Expected to join the US Navy in the middle 1990s, this submarine represents a quantum leap in design, with a new hull form, new weapons launchers, and a new, highly computerized sensor system. If all design specifications are met or exceeded, this class will be a dramatic improvement over the Los Angeles. Due to the USSR's ambitious construction program it is unclear whether the Seawolf will restore US technological superiority, or simply restore equality!

Meanwhile, even simple changes in design are valuable. For example, in combat eight torpedo tubes, instead of four, would be an invaluable asset. In addition, the oversize tubes permit the use of "swimout" torpedoes that have no launch transient.

About Warship Data

Type & Name: NATO and Soviet abbreviations are provided for all ships. Names are the NATO names in common use. Actual Russian class names are provided where available.

Dimensions: The displacement of a vessel, in tons, roughly indicates how difficult it is to sink. Auxiliary and merchant ships are, of course, much easier to sink than a military vessel of equivalent tonnage.

Size has a minor effect on sonar visibility (smaller vessels are harder to "see").

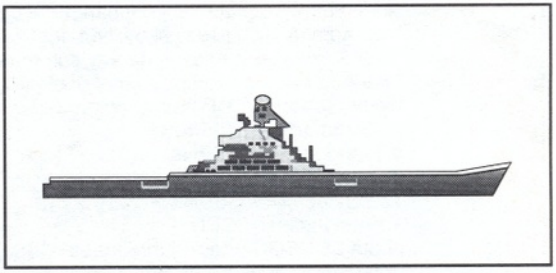
Speeds listed are designed or trials maximums. Most vessels cruise at much slower speeds, since they would quickly exhaust their fuel otherwise. Nuclear powered ships do not have this problem, and can cruise as fast as machinery maintenance permits (running at top speed continuously leads to mechanical breakdowns).

Wpns: The list of weapons and launchers not only describes the capabilities of the vessel, but also suggests something of its purpose. Very few vessels carry a weapon for every possible purpose or need. If a weapon is listed as a "launcher", then a considerable quantity of missile reloads are also carried. Otherwise reloads are rarely carried.

Sensors: Low frequency sonars are the most effective, high frequency the least effective.

CVN Kremlin (or Brezhnev)

(Nuclear Aircraft Carrier)



Dimensions:
70,000 tons
approx 305m long
30+ kts
Nuclear reactors

Offensive Wpns:
None

Defensive Wpns:
SA-N-6 long range SAM launchers
SA-N-9 short range SAM launchers
twin 76.2mm DP guns
sextuple 30mm point-defense guns

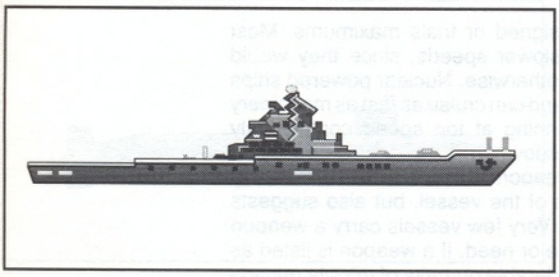
Sensors:
Search and tracking radar, ESM
No sonars

60-75 Aircraft:
Ka-25 "Hormone" or Ka-27 "Helix" helicopters
Su-27 "Flanker" jet fighters
MiG-29 "Fulcrum" jet fighter-bombers
Yak-38MP "Forger" V/STOL jet fighter-bombers

Notes:

This ship, Russia's first "fleet" nuclear aircraft carrier, should enter service in 1989. At the time of this writing, details on armament and aircraft are conjectural, since the first unit is still fitting out. Although built in the Black Sea's Crimean shipyards, most experts anticipate the first unit will transfer to the Northern Fleet after various flag-showing cruises.

CV Kiev
(TAKR- Tactical Aviation Carrying Cruiser)



Dimensions:
36,000 tons
273.0m x 47.2m
32 kts, 1200 men
Steam boilers

Offensive Wpns:
8x SS-N-12 anti-ship missile launchers
1x twin SUW-N-1 nuclear ASW lnchr
2x twin 76.2mm DP guns
2x quintuple 21" ASW torpedo tubes
2x dodectuple RBU-6000 ASW

Red Banner Northern Fleet Order of Battle (c.1986)

Staff:
Admiral I.M. Kapitanets, commander in chief
Vice Admiral V.S. Kruglyakov, first deputy
Rear Admiral A.V. Akatov, deputy commander
Vice Admiral V.K. Korobov, chief of staff
Major General V.P. Potapov, commander, naval aviation

Submarines: 185 total
4 Typhoon class SSBNs
22 Delta class SSBNs
11 Yankee class SSBNs
1 Hotel III class SSBN
about 25 SSGN attack submarines
about 45 SSN attack submarines
1-3 special purpose submarines
1 Golf class SSBs
about 8 Juliet class SSGs
about 65 assorted diesel-electric SSs
about 8 assorted diesel-electric special purpose SSs

Surface Warships: 89 total
1 Kremlin class CVN anticipated
1 Kiev class CV, another anticipated
1 Moskva class CH periodically
11 Cruisers

rocket launchers

Defensive Wpns:

2x twin SA-N-3 long range SAM launchers
2x twin SA-N-4 or -9 short range SAM launchers

Sensors:

Search and tracking radar, ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
VDS, medium frequency

26-30 Aircraft:

14-17 Ka-25 "Hormone" or Ka-27 "Helix" helos
12-13 Yak-38MP "Forger" V/STOL jet fighter-bombers

Notes:

In service from 1975, these "V/STOL Carriers" operate helicopters and the relatively ineffective Forger "jump jets". However, in a fleet that never enjoyed jet fighter support at sea before, the Kiev class is an important ship. In addition, the ship has a formidable missile armament for long-range anti-ship and ASW capabilities, as well as an extensive and gradually improving array of missile and gun defenses.

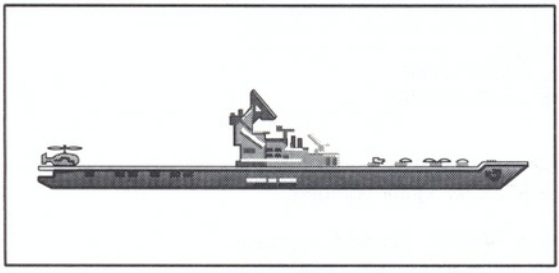
Ships assigned to the Northern Fleet include the Kiev and possibly the Baku. The former has SA-N-4 SAMs, the latter newer SA-N-9 SAMs.

16 Destroyers
7 Krivak class Frigates
40 other Frigates
13 Amphibious Warfare ships

Naval Aviation: 343 combat planes total

55 Reconnaissance & Electronic Warfare Aircraft,
including various models of the:
Tu-95 "Bear", Tu-16 "Badger", Tu-22 "Blinder", An-22 "Cub", Il-18 "Coot"
70 Bombers,
including various models of the:
Tu-22M "Backfire", Tu-16 "Badger", Tu-22 "Blinder"
15 Attack Fighters,
including various models of the:
Yak-38MP "Forger"
18 In-flight Refueling Planes,
including various models of the:
Tu-16 "Badger"
80 ASW Bombers,
including various models of the:
Tu-142 "Bear", Il-38 "May", Be-12 "Mail"
105 Helicopters,
including various models of the:
Mi-8 "Hip", Mi-14 "Haze", Ka-25 "Hormone", Ka-27 "Helix"

CH Moskva
(PKR- Anti-submarine Cruiser)

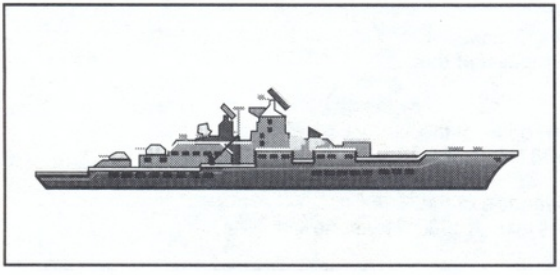


Dimensions:
14,500 tons
189m x 26m
31 kts, 850 men
Steam propulsion
Offensive Wpns:
1x twin SUW-N-1 nuclear ASW lnchr
2x dodectuple RBU-6000 ASW rocket launchers
Defensive Wpns:
2x twin SA-N-3 long range SAM launchers
2x twin 57mm AA guns

Sensors:
Search and tracking radar, ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
VDS, medium frequency
14 Aircraft:
14 KA-25 "Hormone" helicopters
Notes:
The Moskva and Leningard joined the Soviet Fleet in 1967 and 1968. The design is an extremely creative approach to anti-submarine warfare, where helicopters are the "main armament" of the ship. This was particularly effective at that time, when long-range "smart" ASW missiles such as the SS-N-14 were just a designer's dream.

Originally Soviet strategists hoped these ships could flagship ASW groups that would find and sink American SSBNs. However, the idea was defeated by superior US submarine technology and longer ranged SSBN missiles. Today both operate in the Black Sea and Mediterranean, but on exercises have operated periodically in the Atlantic.

BCGN Kirov
(RKR- Missile Cruiser)



Dimensions:
24,000 tons
248m x 28m
32 kts, 800 men
Combined power plant:
Nuclear reactors and steam boilers
Offensive Wpns:
20x SS-N-19 anti-ship missiles
2x SS-N-14 ASW missile launcher*
2x twin 100mm DP guns†

1x dodectuple RBU-6000 ASW rocket launcher
2x sextuple RBU-1000 ASW rocket launchers
2x quadruple 21" ASW torpedoes

Defensive Wpns:

2x twin SA-N-4 long range SAM launchers
12x SA-N-6 long range SAM launchers
16x SA-N-9 short range SAM launchers*
8x sextuple 30mm point-defense guns

Sensors:

Search and tracking radar, ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
VDS, low frequency

3 Aircraft:

3 Ka-25 "Hormone" or Ka-27 "Helix" helicopters

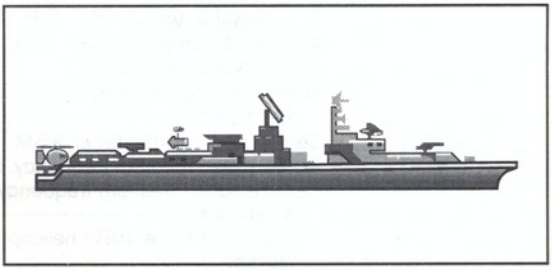
Notes:

*Atlantic fleet versions have SS-N-14, Pacific fleet SA-N-9 instead.
†1x twin 130mm DP guns instead on later units

Since 1980 two of these powerful surface warships have joined the Soviet fleet, with more under construction. These are the largest surface warships in the world built since World War II. Some are assigned to the Northern Fleet, others to the Pacific. The class is studded with sensors and missiles of the latest and most powerful design. Although the Atlantic fleet version is capable of ASW warfare, the real specialty of these ships is surface ship attack and air defense.

CG Kara

(BPK- Large Anti-Submarine Ship)



Dimensions:

8,200 tons
173m x 18.6m
34 knots, 525 men
Gas turbine propulsion

Offensive Wpns:

8x SS-N-14 ASW missiles
2x dodectuple RBU-6000 ASW rocket launchers
2x sextuple RBU-1000 ASW rocket launchers
2x quintuple 21" ASW torpedoes

Defensive Wpns:

2x twin SA-N-3 long range SAM launchers
2x twin SA-N-4 short range SAM launchers
4x twin 76.2mm AA guns
4x sextuple 30mm point-defense guns

Sensors:

Search and tracking radar, ESM

Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
VDS, medium frequency

1 Aircraft:

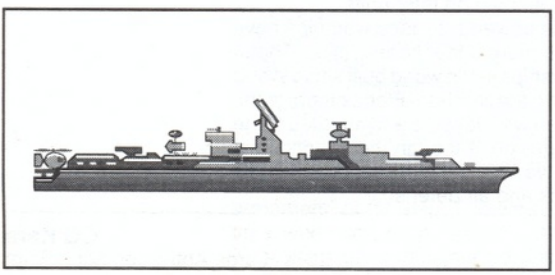
1 Ka-25 "Hormone" ASW helicopter

Notes:

Completed between 1973 and 1980, these cruisers refined the Kresta-style design optimized for air defense and anti-submarine warfare. However, the SS-N-14 and SA-N-3 can be used as anti-ship weapons if necessary. Although usually found in the Mediterranean or the Far East, they are ideal flagships in amphibious operations, or keystone ships in a carrier's defensive screen. Therefore, it's easy to see them transferred to the Northern Fleet in a RED STORM RISING scenario.

CG Kresta II

(BPK- Large Anti-Submarine Ship)



Dimensions:

6,200 tons
159m x 17m
34 kts, 380 men
Steam turbine

Offensive Wpns:

8x SS-N-14 ASW missiles
2x quintuple 21" ASW torpedo tubes
2x dodectuple RBU-6000 ASW rocket launchers
2x sextuple RBU-1000 ASW rocket launcher

Defensive Wpns:

2x twin SA-N-3 long range SAM launchers
2x twin 57mm AA guns
4x sextuple 30mm point-defense guns

Sensors:

Search and tracking radar, ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted

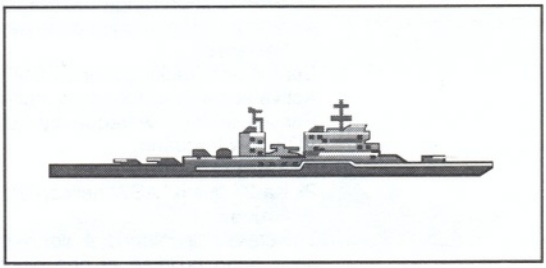
1 Aircraft:

1 Ka-25 "Hormone" ASW helicopter

Notes:

Between 1968 and 1979 ten of these cruisers joined the Soviet fleet, half of them with the Northern Fleet. The original and less sophisticated Kresta I was optimized with anti-ship weaponry. This class was redesigned to specialize in ASW, with reasonably good SAMs as well. At its time the class was very successful, and remains one of the ASW backbones in the Northern Fleet. The main weakness is the lack of VDS equipment.

CL Sverdlov
(KR- Cruiser)



Dimensions:
12,900 tons
210m x 21.6m
32- kts, 1,000 men
Steam turbines

Offensive Wpns:
4x triple 152m (5.9") LA guns
6x twin 100mm (4") DP guns

Defensive Wpns:
16x twin 37mm AA guns
8x twin 30mm point-defense guns

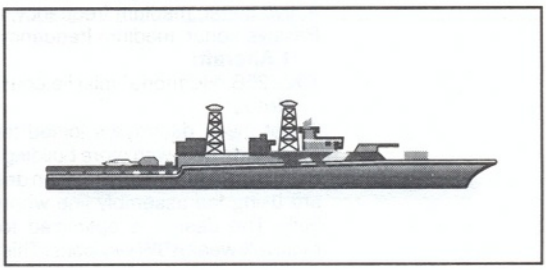
Sensors:
Search and tracking radar, ESM
No sonars

Aircraft:
None.

Notes:
Originally finished in 1951-55, these were Russia's last "old style" gun warships. The term "light" cruiser is a WWII term and indicates that the main battery is approximately 6" size ("heavy" cruisers had 8" guns). These large, heavily armored ships are useful as fleet flagships and amphibious support ships. An attempt to add modern SAMs failed, so further armament changes are unlikely. Of course, a wise captain would probably sneak on board numerous shoulder-fired infantry SAMs (such as the SA-7 or SA-14 "Grail" missile) to supplement the antiquated 100mm and 37mm AA guns.

Nine of the original 20 ships remain in active service, and should remain so for years to come. Due to their great age in continual service, any voyage of significant length must result in a nightmare of mechanical problems and breakdowns.

DDG Udaloy
(BPK- Large Anti-Submarine Ship)



Dimensions:
6,200-6,700 tons
162.0m x 19.3m
34 kts, 300 men
Gas turbines

Offensive Wpns:
2x single 100mm DP guns
8x SS-N-14 ASW missiles
2x dodectuple RBU-6000 ASW rocket launchers
2x quadruple 21"

torpedo tubes

Defensive Wpns:

8x SA-N-9 short range SAM launchers
4x sextuple 30mm point-defense guns

Sensors:

Search and tracking radar, ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
VDS, low frequency

2 Aircraft:

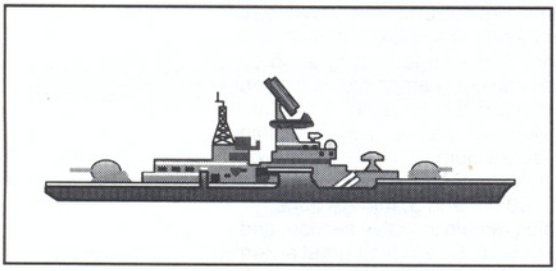
2x Ka-27 "Helix" ASW helicopters

Notes:

The class ship joined the Northern Fleet in 1980, and more have been building at one per year since then. Though termed destroyers by NATO, they are actually small cruisers. Functionally they are optimized for ASW, with formidable modern equipment, including no less than two of the new Helix helicopters (most ships have just one). Class name "Udaloy" means, in Russian, "Courageous" or "Daring".

DDG Sovremennyy

(EM- Destroyer)



Dimensions:

6,300 tons
156m x 17m
34 kts, 380 men
Steam turbines

Offensive Wpns:

8x SS-N-22 anti-ship missiles
2x twin 130mm DP guns
2x sextuple RBU-1000 ASW rocket launchers
2x twin 21" ASW torpedo tubes

Defensive Wpns:

8x SA-N-7 medium range SAM launchers
4x sextuple 30mm point-defense guns

Sensors:

Search and tracking radar, ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted

1 Aircraft:

1 Ka-25B "Hormone" missile control helicopter (no ASW)

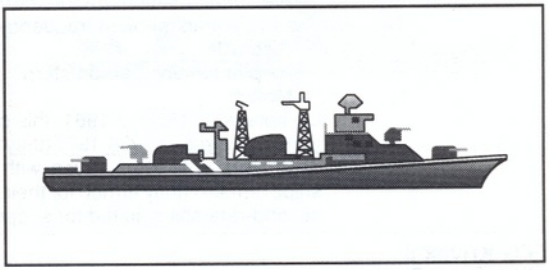
Notes:

Six of these destroyers joined the Russian fleet between 1981 and 1986, with more building. Like the Udaloy, they are more akin to small cruisers than destroyers in size, and in fact are using the assembly line where the Kresta II class was built. The design is optimized for anti-ship warfare, with relatively weak ASW weapons. This ship will be found primarily

in surface warfare groups, and very rarely in ASW groups or defensive screens.

DDG Modified Kashin

(BPK- Large Anti-Submarine Ship)



Dimensions:
3,950 tons
146m x 15.8m
38 kts, 300 men
Gas turbines

Offensive Wpns:
4x SS-N-2c "Styx" anti-ship missiles
2x dodectuple RBU-6000 ASW rocket launchers
1x quintuple 21" ASW torpedo tubes

Defensive Wpns:
2x twin SA-N-1 medium range SAM launchers
2x twin 76.2mm AA guns
4x sextuple 30mm point-defense guns

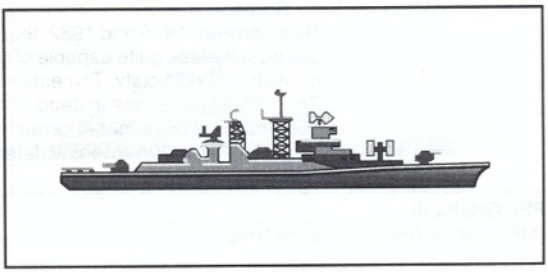
Sensors:
Search and tracking radar, ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted
VDS, medium frequency

Aircraft:
Helicopter landing pad on stern

Notes:
These six large destroyers of the Kashin class were first completed between 1964 and 1973, but from 1973 to 1980 underwent major systems upgrades that added better SS-N-2 missiles, the 30mm guns, VDS sonar, and improved radars. Designed as all-purpose destroyers, they can perform any mission, but lack the punch to be outstanding in a single task. They and their obsolescent cousins make "low" ships in a naval group using a "high-low" mix.

DDG Kanin

(BPK- Large Anti-Submarine Ship)



Dimensions:
3,700 tons
139m x 15m
34 kts, 300 men
Steam turbines

Offensive Wpns:
3x dodectuple RBU-6000 ASW rocket launchers
2x quintuple 21" ASW torpedo tubes

Defensive Wpns:
1x twin SA-N-1 medium range SAM launchers

2x quadruple 57mm AA guns
4x sextuple 30mm point-defense guns

Sensors:

Search and tracking radar, ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted

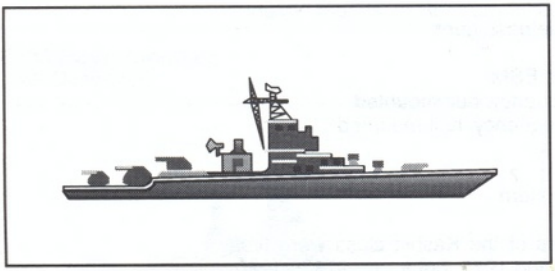
Aircraft:

Helicopter landing pad on stern

Notes:

Completed in 1959 to 1961, this class was upgraded into a purely ASW role in 1968-1977 (they had been general-purpose destroyers until then). Even with these modifications, the ships remain lightly armed for their size. Overall they are now second-rate ships suited for supporting roles only.

FFG Krivak II
(SKR- Patrol Ship)



Dimensions:
3,800 tons
123.5m x 14.1m
32 kts, 200 men
Dual gas turbines

Offensive Wpns:
4x SS-N-14 ASW Missiles
2x single 100mm DP guns
2x dodectuple RBU-6000 ASW rocket launchers
2x quadruple 21" ASW torpedo tubes

Defensive Wpns:

2x twin SA-N-4 short range SAM launchers

Sensors:

Search and tracking radar, ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted
VDS, medium frequency

Aircraft:

None.

Notes:

Built between 1975 and 1982, these "lightweight" ASW ships are nonetheless quite capable of giving NATO submarines a considerable difficulty. The earlier Krivak I design used twin 76mm AA gun turrets instead of the heavier, more flexible 100mm DP (dual-purpose) turrets. Interestingly enough, these ships lack the 30mm point defense guns found on most modern Soviet warships.

FFL Grisha III
(MPK- Small Anti-Submarine Ship)

Dimensions:
950 tons
71.6m x 9.8m

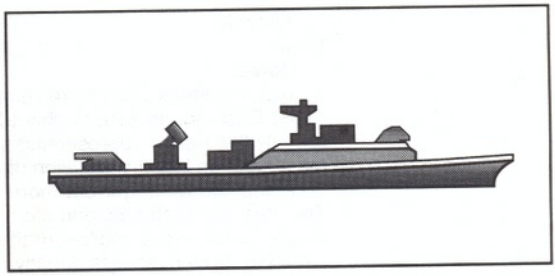
30 kts, 60 men
Diesel/gas turbines

Offensive Wpns:

2x dodectuple RBU-6000 ASW rocket launchers
2x depth charge racks
2x twin 21" ASW torpedo tubes

Defensive Wpns:

1x twin SA-N-4 short range SAM launcher
1x twin 57mm AA gun
1x sextuple 30mm point-defense gun



Sensors:

Search and tracking radar, ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted
VDS, high frequency

Aircraft:

None.

Notes:

Built in various forms from 1968 to 1988, the numerous Grisha III version first went to sea in 1975. This class has one of the longest "production lives" of any modern warship. The main gun armament varies from one model to another, and the Grisha II's have no SA-N-4 SAMs. As of this writing, Grisha IV and V variants are still under construction.

Inexpensive but remarkably well-armed, these ships are not large enough to operate with the fleet. They have very small fuel bunkers and are difficult to refuel, so they must remain near port. They handle heavy seas poorly. They are found primarily in short-range amphibious or supply operations, or in coastal defense ASW groups.

LST Ropucha
(BDK- Large Landing Ship)

Dimensions:

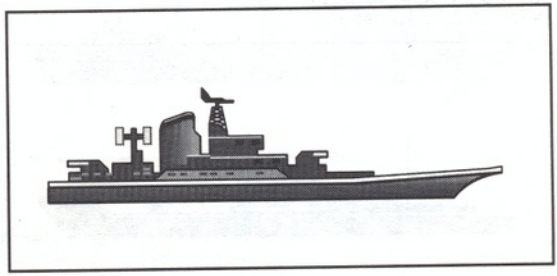
2,200 tons
2,650 tons loaded
113m x 14m
18 kts, 70 men
Diesel propulsion

Offensive Wpns:

None.

Defensive Wpns:

4x quad SA-N-5 short range SAM launchers
2x twin 57mm AA guns

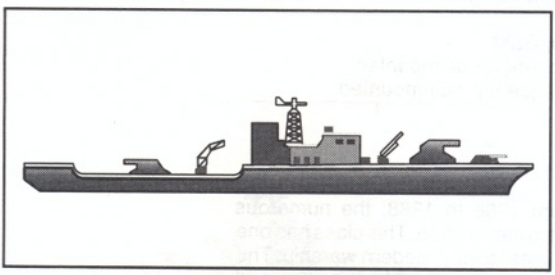


Sensors:

Search radar
No sonar

Aircraft:
None
Notes:
Nineteen of these ships were completed between 1975 and 1985. Each one can carry about 25 armored vehicles and roughly 230 troops, representing all the vehicles and 25% of the men of an infantry battalion (the remaining troops would be embarked on larger but more conventional transports). The ship has both bow and stern doors for "roll-on/roll-off" cargo, as well as a shallow draft so it can nose up onto a beach to deliver vehicles directly.

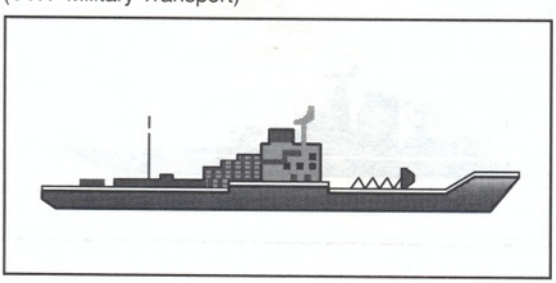
AS Urga
(PB- Floating Base)



Dimensions:
6,750 tons
9,600 tons loaded
145m x 17.7m
17 kts, 450 men
Diesel propulsion
Offensive Wpns:
None.
Defensive Wpns:
2x quad SA-N-5 short range SAM launchers
4x twin 57mm AA guns
Sensors:
Warning radars

No sonars.
Aircraft:
Helicopter landing pad on stern
Notes:
Completed between 1963 and 1972, these ships are designed to maintain and support submarines at sea. They supply food, fuel, water, torpedoes, and workshop facilities for repairs. Six are still in service, each with various modifications to its superstructure, giving each one a unique appearance. Two more serve as training ships.

AE Modified Andizhan
(VTR- Military Transport)

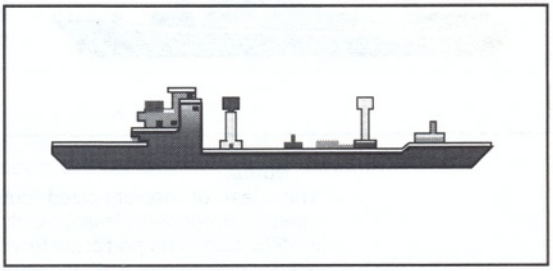


Dimensions:
4,500 tons
6,740 tons loaded
104.0m x 14.4m
13.5 kts, 100 men
Diesel propulsion
Offensive Wpns:
None.
Defensive Wpns:
None.
Sensors:
Warning radar
No sonars.

Aircraft:
Helicopter landing pad on stern

Notes:
Originally built as cargo ships in 1958-60, these ships were revised in the 1970s to carry replenishment missiles for warships that expended their ammunition. Another forty without missile-stowage modifications exist in the Soviet merchant marine.

AOR Dubna
(VT- Military Tanker)



Dimensions:
4,300 tons
11,100 tons loaded
130.1m x 20.0m
16 kts, 60 men
Diesel propulsion

Offensive Wpns:
None.

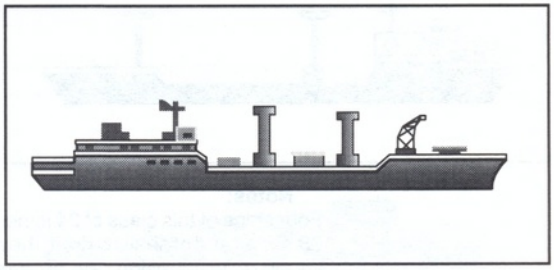
Defensive Wpns:
None.

Sensors:
Warning radar
No sonars.

Aircraft:
None.

Notes:
These are common small replenishment/refueling ships; the four in this class were completed between 1974 and 1979. The ship is outfitted for underway replenishment to three ships simultaneously, as well as having extra berths for replacement sailors.

AOR Boris Chilikin
(VT- Military Tanker)



Dimensions:
8,750 tons
24,500 tons loaded
162.3m x 21.4m
16.5 kts, 380 men
Diesel propulsion

Offensive Wpns:
None.

Defensive Wpns:
Removed.

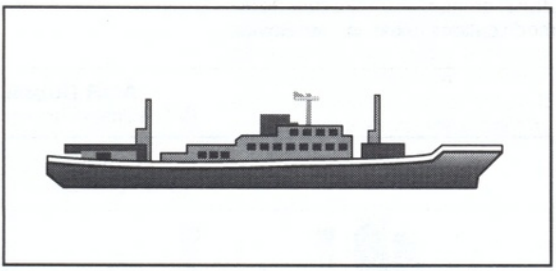
Sensors:
Warning radar
No sonars.

Aircraft:
None.

Notes:
Typical large replenishment/refueling ships, the six fleet ships in this class were completed between 1967 and 1978. The ship is outfitted to replenish two ships simultaneously. Originally fitted with 57mm guns, these were later removed

as unnecessarily increasing the crew and maintenance costs, with no equivalent increase in military capability.

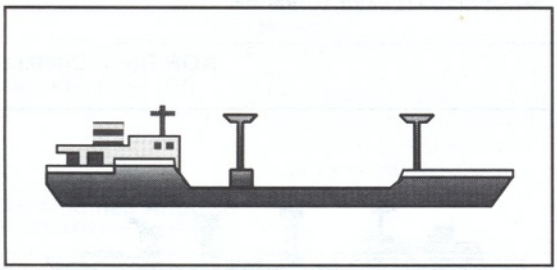
AP Amguema
(VTR- Military Transport)



Dimensions:
9,050 tons
15,700 tons loaded
133.1m x 18.9m
15 kts, 75 men
Diesel propulsion
Offensive Wpns:
None.
Defensive Wpns:
None.
Sensors:
Navigation radar only.
No sonars.
Aircraft:
None.

Notes:
This class of medium-sized icebreaking passenger ships operates in northern climates. Only one, the Yauza, completed in 1975, is officially part of the Soviet Navy. The other fourteen are in civilian service. In wartime, though, they would immediately become troop transports. Carrying capacity is a respectable 6,600 tons.

AK Yuniy Partuzab
(VTR- Military Transport)



Dimensions:
2,050 tons
3,950 tons loaded
88.7m x 12.8m
13 kts, 25 men
Diesel propulsion
Offensive Wpns:
None.
Defensive Wpns:
None.
Sensors:
Navigation radar only.
No sonars.
Aircraft:
None.

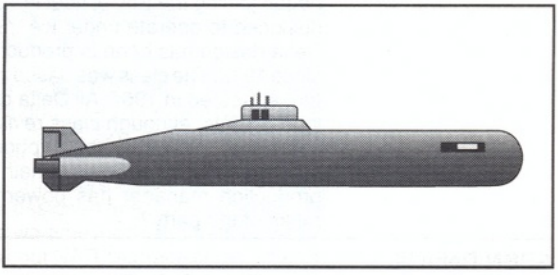
Notes:
Four ships of this class of 24 joined the Soviet Navy in 1975-78. Small and of shallow draft, they are well suited to carrying supplies, ammunition, etc. in amphibious operations. The remaining civilian ships would undoubtedly join the navy in wartime.

SSBN Typhoon

(PLARB- Nuclear-powered Ballistic Missile Submarine)

Dimensions:
25,000 tons submerged
170.0m x 25.0m
25 kts, about 150 men
Nuclear propulsion

Weapons:
20x SS-N-20 nuclear missiles each with 6-9 MIRV warheads
SS-N-16 ASW missiles
26" torpedoes
21" torpedoes
4x 26" torpedo tubes
2x 21" torpedo tubes



Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
Towed array may be added later

Notes:
The first boat in this class was completed in 1983, with production continuing at about one per year thereafter. They are the world's largest submarines, and the USSR's very latest nuclear deterrent. The design is a considerable improvement over the ungainly Delta class. The boats can operate beneath the arctic icepack, where they break through to launch their missiles. In the open sea they can launch from underwater. The nuclear missile tubes are located forward of the sail, a unique but sensible feature.

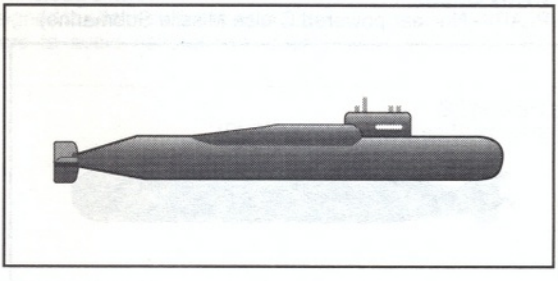
The SSBN Typhoon II class of the 1990's is a slightly improved version of this boat with additional quieting and slightly improved sonar systems. This class is hypothetical but a logical extension of the current design.

SSBN Delta IV

(PLARB- Nuclear-powered Ballistic Missile Submarine)

Dimensions:
13,550 tons submerged
155.0m x 12.0m
24 kts, about 120 men
Nuclear propulsion

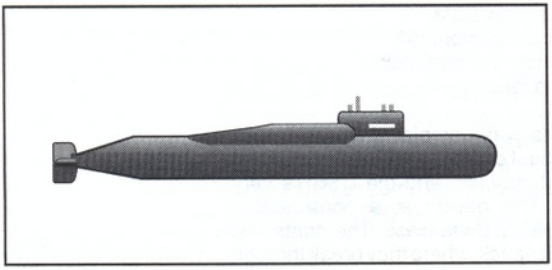
Weapons:
16x SS-N-23 nuclear missiles each with 7 MIRV warheads
21" torpedoes
6x 21" torpedo tubes



Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted

Notes:
This latest variant of the turtle-backed Delta class SSBNs began joining the Soviet fleet in 1984. Like the Typhoon, it is designed to operate under ice, rising through it to fire. The Delta design has been in production with various upgrades since 1972. The class was based closely on the Yankee class that appeared in 1967. All Delta class boats are remarkably loud SSBNs, although class revisions have improved them somewhat. Now that the Typhoon class is available, it's surprising that these boats remain in production. Perhaps the production manager has powerful influence in the upper ranks of the party?

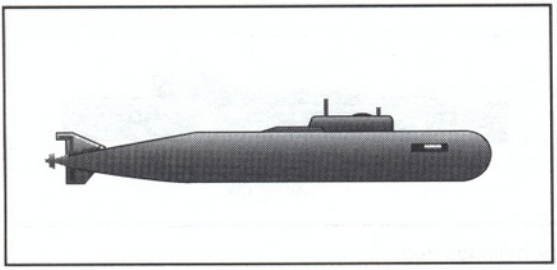
SSBN Delta III
(PLARB- Nuclear-powered Ballistic Missile Submarine)



Dimensions:
13,250 tons submerged
155.0m x 12.0m
24 kts, about 120 men
Nuclear propulsion
Weapons:
16x SS-N-18 nuclear missiles with 7 MIRV warheads
21" torpedoes
6x 21" torpedo tubes
Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted

Notes:
This portion of the large Delta class was completed between 1975 and 1982, and remains a significant part of the Soviet nuclear deterrent. These boats have the same weaknesses as the Delta IV group (see above), and in addition are not designed to surface through the icepack for firing.

SSGN Oscar
(PLARK- Nuclear-powered Cruise Missile Submarine)



Dimensions:
14,500 tons submerged
150.0m x 18.0m
35 kts, about 120 men
Nuclear propulsion
Weapons:
24x SS-N-19 anti-ship missile tubes
SS-N-16 ASW missiles
26" torpedoes
21" torpedoes
4x 26" torpedo tubes
4x 21" torpedo tubes

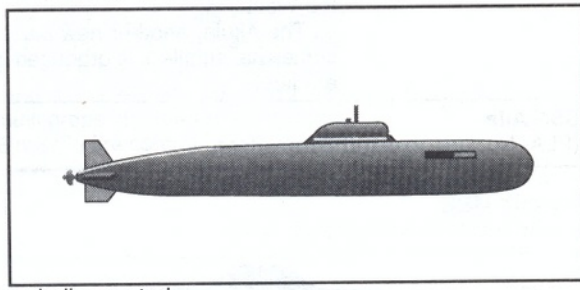
Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
Towed array may be added in future

Notes:
The first boat in this class joined the fleet in 1982, with a follow-on ship appearing roughly every other year. The Oscar is "state of the art" in heavy-hitting Soviet submarines. The SS-N-19s are at least equal to the Tomahawk in range and power, and have their own launchers in addition to the eight torpedo tubes. This boat is designed to absorb considerable damage without sinking. In wartime these submarines would avoid NATO subs and seek out NATO surface ships instead. The dream of every Oscar captain must be to "bag" an American nuclear aircraft carrier.

SSGN Charlie II

(PLARK- Nuclear-powered Cruise Missile Submarine)

Dimensions:
5,400 tons submerged
102.0m x 10.0m
23 kts, 110 men
Nuclear propulsion



Weapons:
8x SS-N-9 anti-ship missile tubes
21" torpedoes
6x 21" torpedo tubes

Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted

Notes:
Only six of this class were completed between 1973 and 1982. Apparently they suffer from mechanical difficulties and design flaws, partly the result of using just a single nuclear reactor in the power plant (instead of two). As with the Oscar class, these boats are designed to attack surface ships. They are probably under orders to avoid contact with enemy submarines.

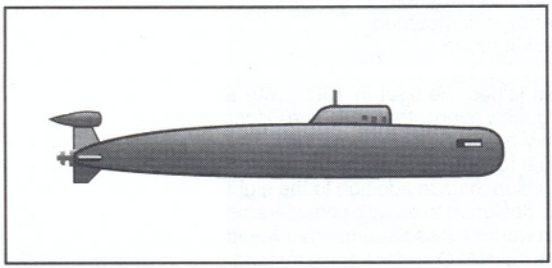
SSN Sierra

(PLA- Nuclear-powered Submarine)

Dimensions:
7,550 tons submerged
110.0m x 12.0m
36 kts, about 90 men
Nuclear propulsion

Weapons:
SS-N-16 ASW missiles
26" torpedoes
21" torpedoes
4x 26" torpedo tubes

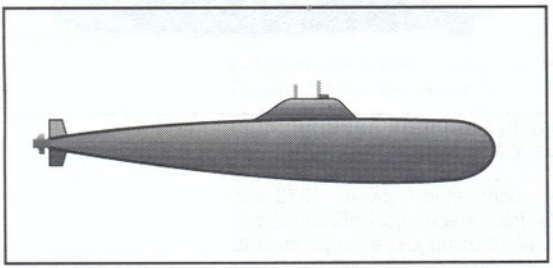
SSN Sierra
(PLA- Nuclear-powered Submarine)



4x 21" torpedo tubes
Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
Towed array
Notes:
Launched starting in 1983 for use in the Northern Fleet, this class is Russia's latest and most advanced attack submarine. Armament and sonars are the best models available. The anechoic (sonar-absorbent) coating and quiet design benefits from technology purchased and stolen from the West.

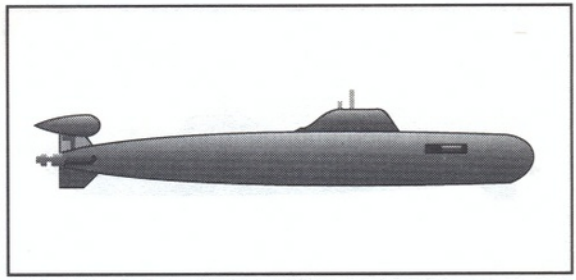
The Akula, another new class with similar features (but somewhat smaller), is produced in Siberia for the Far Eastern fleet.

SSN Alfa
(PLA- Nuclear-powered Submarine)



Dimensions:
3,700 tons submerged
81.4m x 9.5m
45 kts, about 45 men
Nuclear propulsion
Weapons:
21" torpedoes
6x 21" torpedo tubes
Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull mount
Passive sonar, low frequency, hull-mounted
Notes:
This is the world's fastest and deepest-diving warship class, giving it enormously tactical advantages. It is also the most innovative and daring submarine design in 25 years. Six boats were completed between 1979 and 1983. The strong, light titanium hull is enormously expensive (the Soviets refer to these as the "zolotaya nyba" — golden fish). However, this hull not only gives the sub deep diving abilities, but also protects it from damage. The reactors use highly efficient liquid metal for heat exchange, but may not be as safe as Western designs. Compared to the new Sierras, this boat is extremely loud, especially at high speed.

SSN Victor III
(PLA- Nuclear-powered Submarine)



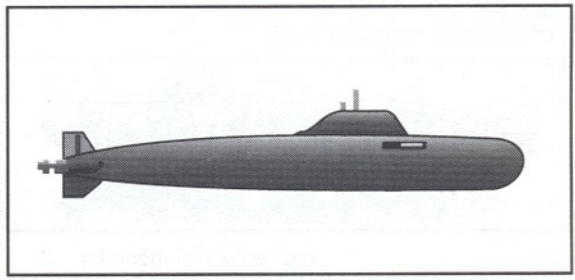
Dimensions:
6,300 tons submerged
106.0m x 10.0m
29 kts, about 85 men
Nuclear propulsion

Weapons:
SS-N-16 ASW missiles
26" torpedoes
21" torpedoes
4x 26" torpedo tubes
2x 21" torpedo tubes

Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted
Towed array

Notes:
The last and best of the Victor class, the 21 boats in this group were completed between 1979 and 1986. This class was the first to have a towed array. The propeller arrangements were originally unsatisfactory, and all have been upgraded with new Toshiba/Kongsberg-built props that turned a lemon into a star performer. SS-N-16 missile fire control was retrofitted in the middle 1980s to the entire group.

SSN Victor II
(PLA- Nuclear-powered Submarine)



Dimensions:
5,700 tons submerged
100.0m x 10.0m
30 kts, about 80 men
Nuclear propulsion

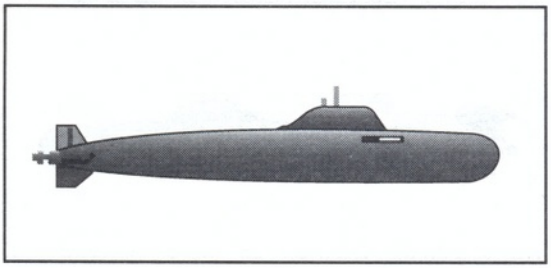
Weapons:
SS-N-16 ASW missiles
26" torpedoes
21" torpedoes
4x 26" torpedo tubes
2x 21" torpedo tubes

Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted

Notes:
The seven boats in this group were designed as Victor I upgrades, and were completed between 1972 and 1978. They lack towed arrays, are somewhat louder and less sophisticated than Victor IIIs, but otherwise are capable and effective attack submarines

SSN Victor I

(PLA- Nuclear-powered Submarine)



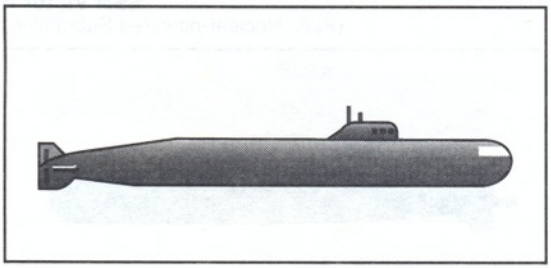
Dimensions:
5,100 tons submerged
95.0m x 10.0m
30-32 kts, about 80 men
Nuclear propulsion
Weapons:
21" torpedoes
6x 21" torpedo tubes
Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mount
Passive sonar, medium frequency, hull-mounted

Notes:

The sixteen boats in this leading group of the Victor class were completed in 1968 to 1975. Designed for high speed, they are neither as sophisticated nor as quiet as later models, but represent a major improvement over the November class. In fact, these improvements were so significant that this class remains in operational service, while the Novembers are being retired.

SSN November

(PLA- Nuclear-powered Submarine)

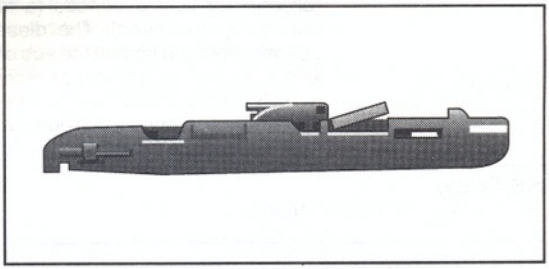


Dimensions:
5,300 tons submerged
110.0m x 9.0m
30 kts, about 80 men
Nuclear propulsion
Weapons:
21" torpedoes
16" ASW torpedoes
4x 21" torpedo tubes
4x 16" torpedo tubes
Sensors:
Mast-mounted search radar and ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted

Notes:

Built between 1959 and 1964, these were Russia's first nuclear submarines. Originally 15 Novembers were built, but only 12 remain in service. They are definitely second rate attack submarines and the remainder will probably be retired gradually over the next five to ten years. Compared to current designs they are loud, poorly armed, and nearly blind due to inferior sonar systems. No systems or weapons upgrades are likely this late in their operational life.

SSG Juliet
(PLRK- Conventional Cruise Missile Submarine)



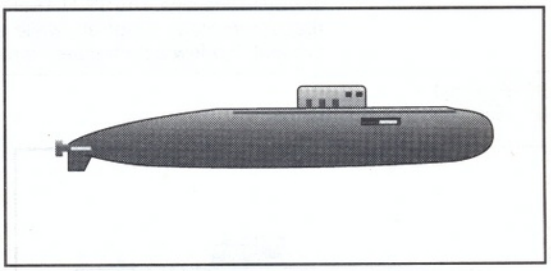
Dimensions:
3,750 tons submerged
90.0m x 10.0m
14 kts, about 80 men
Diesel/electric engines

Weapons:
4x SS-N-3a "Shaddock" anti-ship missiles
21" torpedoes
16" torpedoes
6x 21" torpedo tubes
4x 16" torpedo tubes

Sensors:
Mast-mounted search radar, missile targeting radar, and ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, medium frequency, hull-mounted

Notes:
These diesel/electric cruise missile subs were finished between 1961 and 1969. They are conventionally-powered equivalents to the Echo class of SSGNs, and remain in service despite serious weaknesses. They are very loud by diesel/electric standards.The boats must surface to target and fire their SS-N-3 missiles. The missiles themselves are not especially effective against ships with good defenses, but could wreak havoc if fired into a convoy of unarmed merchantmen.

SS Kilo
(PL- Conventional Submarine)



Dimensions:
3,000 tons submerged
70.0m x 9.9m
25 kts, about 60 men
Diesel/electric engines

Weapons:
SA-N-5(?) SAM missile launcher
21" torpedoes
6x 21" torpedo tubes

Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted

Notes:
This class first joined the Soviet fleet in 1982 and construction continues. They are the latest and most advanced diesel/electric subs in the fleet, with greater speed than earlier designs. Medium-sized and short-ranged, with inexpensive weapons systems, these boats have been offered for sale to

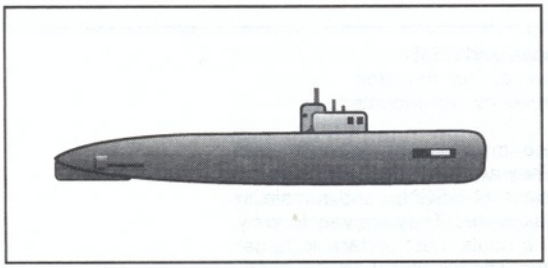
India and various Soviet-aligned third-world powers.

Like all diesel/electric designs, their electric engines can run only for limited periods (a few hours to a few days, depending on speed). The diesel engine requires air to operate, demanding that the sub either run on the surface, or with a snorkel raised from periscope depth.

This class is the first operational submarine to carry a SAM system, an appropriate addition in a ship that regularly operate near the surface (when snorkeling).

SS Tango

(PL- Conventional Submarine)



Dimensions:
3,900 tons submerged
92.0m x 9.0m
20 kts, 72 men
Diesel/electric engines

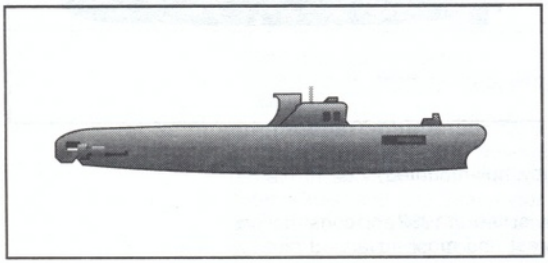
Weapons:
SS-N-16 ASW missiles
21" torpedoes
10x 21" torpedo tubes

Sensors:
Mast-mounted search radar and ESM
Active sonar, low frequency, hull-mounted
Passive sonar, low frequency, hull-mounted

Notes:
Twenty of this class were built between 1972 and 1982. Although not as modern as the Kilos, these boats are the largest diesel/electric attack subs currently in Soviet service, and quite effective. The SS-N-16 fire control system is believed present in most, if not all, while a SAM launcher may be present in a few as an experimental installation.

SS Foxtrot

(PL- Conventional Submarine)



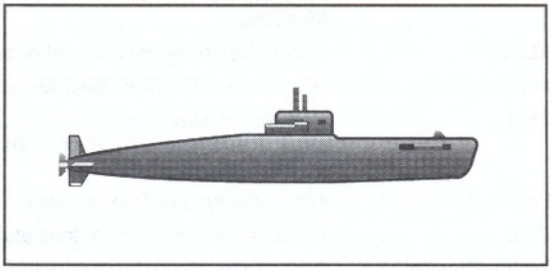
Dimensions:
2,400 tons submerged
91.5m x 7.5m
16 kts, 75-80 men
Diesel/electric engines

Weapons:
21" torpedoes
10x 21" torpedo tubes

Sensors:
Mast-mounted search radar and ESM
Active sonar, medium frequency, hull-mount
Passive sonar, medium frequency, hull-mount

Notes:
About 50 boats of this type were completed between 1958 and 1967. The Foxtrots were the last of the old, inexpensive, large-quantity diesel/electric subs. At their time they were an effective threat, but now they border on the second rate.

SS Whiskey
(PL- Conventional Submarine)



Dimensions:
1,350 tons submerged
75.0m x 6.3m
13.5 kts, 50-55 men
Diesel/electric engines

Weapons:
21" torpedoes
6x 21" torpedo tubes

Sensors:
Mast-mounted search radar, crude ESM
Active sonar, medium frequency, hull-mounted
Passive sonar, high frequency, hull-mounted

Notes:
Designed during WWII, over 200 Whiskeys were built until 1957, when construction finally ceased. This makes them the most numerous submarine class ever built. About 50 to 70 still remain in service, plus dozens more owned by Soviet client states. Loud, slow, and poorly outfitted by modern standards, these boats require extremely skillful handling and plenty of luck to survive against modern Western warships.

Glossary

AA: Anti-aircraft, a weapon capable of shooting down aircraft or (usually) missiles.

ABM: Anti Ballistic Missile. The Russian ABM system includes radars and warning systems covering the borders of the nation, and special point-defense systems designed to protect Moscow.

ADCAP: Added Capability, an improved version of the Mark 48 torpedo.

Arkhangel'sk: Soviet port on the White Sea, sometimes written as Archangel.

Boat: Correct US Navy term for any submarine, no matter how large. A submarine is never a "ship"; that term is limited to surface vessels.

Boomer: Nickname for a nuclear ballistic missile submarine (SSBN).

Con: Controls, the steering controls of a vessel.

Cruise Missile: A long-range slowly flying missile. Shipboard versions usually have a rocket booster that accelerates the missile to cruising speed, after which a much more efficient air-breathing jet engine takes over. Depending on size and guidance equipment, such missiles can travel hundreds of miles.

Dodectuple: Group of twelve, in this case a 12-tube launcher.

DP (Dual Purpose) Guns: A naval gun designed to fire either at surface targets (LA) or at flying targets (AA). Flying targets can include both aircraft and missiles.

ELF: Extremely Low Frequency, sound systems that use very low frequency waves transmitted through the earth itself. Used for coded messages from a nation to its ballistic missile submarines at sea.

ER: Efficiency Rating; a numerical performance evaluation of a US Navy officer.

ESM: Electronic sensing measures; passive receivers of electronic signals, especially radar signals.

GIUK Gap: Greenland - Iceland - United Kingdom Gap, the various straits that connect the Norwegian Sea to the North Atlantic Ocean.

Helm: Movement controls for a naval vessel.

Helo: Common naval abbreviation for helicopter.

HF: High Frequency, sonars that operate using high-frequency sound. These are the least effective of all modern sonars.

Kyds: Thousands of yards; for example, 6 Kyds is 6,000 yards.

Laser: A beam of coherent light, generally invisible to the human eye, although certain types can damage the eye.

LA (Low Angle) Guns: Guns designed solely to fire at surface targets, such as other ships or the land. The weapons cannot elevate or train fast enough to hit airborne targets, and usually lack sufficient rate of fire and fire control devices as well.

Launch Transient: Sound of a weapon being launched from an underwater torpedo tube. The sound is caused by compressed air (used to launch all but "swimout" weapons).

LF: Low Frequency, sonars that operate using low-frequency sound. These are the best of all modern sonars.

Mast: A long telescoping pole that can be raised above the sail (conning tower) of a submarine. A periscope is a mast with mirrors and lenses. Other masts have radar sets, ESM gear, radio antennae, snorkels, or a Stinger SAM launcher.

MF: Medium Frequency, sonars that operate using medium-frequency sounds. These sonars are superior to high frequency (HF), but inferior to low frequency (LF) models.

OTH: Over The Horizon, a type of very large radar set that can bounce radar signals far over the horizon, allowing it to "see" hundreds of miles out to sea.

Point Defense Guns: A multiple-barrel "Gatling gun" that fires thousands of rounds per second. These guns, often with computerized radar control, are designed to shoot down cruise missiles a few seconds before they hit the ship. Their range is too small to be useful as AA weapons.

Radar: Radio frequency waves directed into the air, whose reflections are used to determine the location of objects.

RBU: A multiple-tube ASW rocket launcher (in Russian, "Raketnaya Bombometnaya Ustanovka"). The weapon fires all tubes simultaneously. The rockets scatter into a pre-planned pattern and explode around a pre-planned depth. The model number indicates maximum range (RBU-6000 has 6,000 yard maximum range, etc.).

RN: Royal Navy, the fleet of the United Kingdom.

SAM: Surface-to-Air Missile.

Sonar: Sound waves travelling through water, the analysis of which is used to determine the location of objects in the water.

SOSUS: Sound Surveillance System, a network of FFQ-10(V) sound sensors about 10 to 30 Kyds apart on the seabed, linked by cables to a computerized command center ashore.

TASM: Tomahawk Anti-Ship Missile, a version of the Tomahawk missile designed for use against naval targets.

TLAM: Tomahawk Land Attack Missile, a version of the Tomahawk designed for use against land targets.

TMA: Target Motion Analysis, the use of sound patterns to completely identify and locate enemy vessels. The concept is often extended to all incoming data, including radar and laser.

Transient: see Launch Transient.

Transit: To pass through an area, generally used to describe a vessel moving through restricted waters (such as a strait, passage between islands, etc.).

UGM: Underwater Guided Missile, a version of the Harpoon designed to be launched from torpedo tubes.

USN: United States Navy, the navy of the United States of America

USS: United States Ship, used as name prefix for all ships of the USN.

VDS: Variable Dipping Sonar, a sonar device that a ship lowers over its stern by cable, to "stream" in the water behind and below it.

V/STOL: Vertical/Short Takeoff and Landing, a type of aircraft that can direct its jets downward to "jump" into the air and hover for a landing. Often the aircraft use a short rolling start up a "ski jump" type ramp to increase their load at takeoff. Aircraft of this type are common on small aircraft carriers, such as the British "Sea Harrier" on the Invincible class, or the Russian Yak-38 "Forger" on the Kiev class.

XO: Executive Officer, a standard US Navy abbreviation

US Navy Warship Abbreviations

BB: Battleship, conventionally powered.
BBG: Guided missile battleship, conventionally powered.
BC: Battlecruiser (lightweight battleship), conventionally powered.
BCGN: Guided missile battlecruiser, nuclear powered.
CV: Aircraft carrier, conventionally powered.
CVN: Aircraft carrier, nuclear powered.
CH: Helicopter cruiser, conventionally powered.
CG: Guided missile cruiser, conventionally powered.
CGN: Guided missile cruiser, nuclear powered.
CL: Light cruiser (despite the name, it has numerous large-caliber guns), conventionally powered.
DD: Destroyer, conventionally powered.
DDG: Guided missile destroyer, conventionally powered.
FF: Frigate, conventionally powered.
FFG: Guided missile frigate, conventionally powered.
SS: Attack submarine, diesel/electric powered.
SSG: Guided missile (cruise missiles) submarine, diesel/electric powered.
SSGN: Guided missile (cruise missiles) submarine, nuclear powered.
SSN: Attack submarine, nuclear powered.
SSBN: Ballistic missile submarine, nuclear powered.

Soviet Navy Warship Abbreviations

BDK: Large Landing Ship (Bol'shoy Desantnyy Korabl').
BPK: Large ASW Ship (Bol'shoy Protivolodochnyy Korabl').
BRK: Large Missile Ship (Bol'shoy Raketnyy Korabl').
DK: Landing Ship (Desantnyy Korabl').
EM: Destroyer (Eskadrennyy Minonosets).
KR: Cruiser (Kreyser).
MPK: Small ASW Ship (Malyy Protivolodochnyy).
MRK: Small Missile Ship (Malyy Raketnyy).
PKR: ASW Cruiser (Protivolodochnyy Kreyser).
PL: Submarine (Podvodnaya Lodka).
PLA: Nuclear Submarine (Podvodnaya Lodka Atomnaya).
PLARB: Nuclear Ballistic Missile Submarine (Podvodnaya Lodka Atomnaya Raketnaya Ballisticheskaya).
PLARK: Nuclear Cruise Missile Submarine (Podvodnaya Lodka Atomnaya Raketnaya Krylataya).
PLRB: Ballistic Missile Submarine (Podvodnaya Lodka Raketnaya Ballisticheskaya).
PLRK: Cruise Missile Submarine (Podvodnaya Lodka Raketnaya Krylataya).
RKA: Missile Cruiser (Raketnyy Kreyser).
SDK: Medium Landing Ship (Srednyy Desantnyy Korabl').
TAKR: Tactical Aircraft Carrying Cruiser (Takticheskoye Avianosnyy Kreyser).
VT: Military Tanker (Volennyy Tanker).
VTR: Military Transport (Volennyy Transport).

Designers' Notes

In 1986, a year after he finished the best-selling WWII submarine simulation "Silent Service", Sid Meier contemplated an equivalent game about modern submarine warfare. The idea languished until a meeting was suggested between him and Tom Clancy, author of the best-selling novel of World War III, *Red Storm Rising*. Not only were his books full of interesting situations, but Mr. Clancy himself was full of ideas, advice and suggestions. Furthermore, his co-author Larry Bond proved to be a fountain of data, algorithms, and technical information about modern naval warfare.

Armed with this, Sid developed a detailed and accurate simulation of a modern submarine in combat. At times we were worried that realism would work against us, since the traditional "look through the periscope and shoot the torpedo" image of submarine combat is gone from modern warfare. But strangely, each time someone took the helm of this program, they were quickly caught up in the high-tech world of TMAs, missiles, and wire-guided torpedoes.

In addition to realism and accuracy, Tom Clancy provided another invaluable asset: a vision of what might happen in a "conventional" (non-nuclear) World War III. This is the setting for submarine operations here, especially the campaign, with its various missions and sometimes surprising events. Of course, to keep each game fresh and interesting, events may not strictly follow those in the novel (otherwise you'd know what was going to happen). However, both the Warsaw Pact and NATO follow the political and strategic thinking of the novel. Clancy readers will find familiar situations appearing frequently, if sometimes unexpectedly.

Contemporary news events suddenly came home to us as the simulation design progressed. The importance of the Toshiba/Kongsberg propeller scandal became very obvious. Advances in oceanographic research showed that early 1970s models of sound in water were much too simplistic — recent work about undersea "weather" became important, and was incorporated into the game. Naturally, the latest books and magazines about military equipment around the world were of crucial importance.

Most of all, this simulation lets you play through "scenarios" just like Navy and civilian design staffs do, analyzing the value of various "platforms" (ships) and weapon systems. Were the VLS tube additions worthwhile in the Los Angeles? Play the game and see. Currently only SSBNs carry decoys, but we assume wartime SSNs will use them too. What if they don't? Play the game and see.

Furthermore, the game gives you insight into funding debates in Congress today. Is the new Seawolf class

worthwhile? Do we really need a weapon like the Sea Lance? Now you can understand these issues from a military viewpoint. Formerly esoteric newspaper articles may prove much more interesting, now that you understand the implications in procurement decisions.

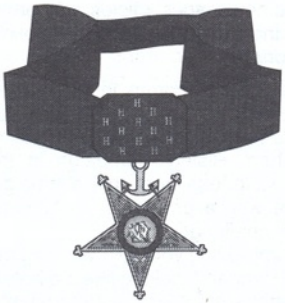
Success in RED STORM RISING comes in two flavors. The first challenge is mastering the job of fast-attack sub captain. After training and a few battle simulations, you're ready for the full "Red Storm Rising" campaign in the Norwegian Sea. Emerging victorious from this campaign, preferably in victory parade with a promotion to Admiral, proves you've mastered this challenge.

The second challenge is improving your ER. Winning the war is one thing. Winning the war and looking like the hotest sub driver in the USN is something else! Striving to constantly improve your ER does have its rewards — with higher ERs come the more prestigious medals, up to and including the most coveted decoration of all, the Congressional Medal of Honor.

As in all MicroProse products, in RED STORM RISING we followed our standing policy of using unclassified sources only. At times we made educated guesses, especially regarding Russian equipment quality. We tried to maintain a balanced viewpoint in this. For example, in areas where American "official" figures are probably underestimates, we took a similar view of data about Russian equipment. In the past our flight simulators GUNSHIP and PROJECT: STEALTH FIGHTER inspired knowledgeable military officers to commend us on their accuracy. Apparently our educated "guesses" about unmentioned or secret equipment were close the mark! We feel confident that submariners will be pleased with this simulation.

As always, MicroProse has no particular political viewpoint, nor do we promote antipathy toward any nationality or race. RED STORM RISING uses the setting of a novel, and as such is fiction. If anything, it's tragic that Mr. Clancy's portrayal of World War III is so believable. Here at MicroProse we would much prefer that all war machines be used only in imaginative computer simulations, never in real life.

The entire team involved in this project found the world of RED STORM RISING exciting and educational. It is an ideal device for the "armchair admiral" to experiment with state-of-the-art naval systems. We enjoyed spending over a year putting it together. We're confident you'll enjoying sailing it into the dangerous waters of the Norwegian Sea Theater, in Tom Clancy's vision of World War III.



Congressional Medal of Honor

Navy Cross

Distinguished Service Medal

Silver Star

Bronze Star for Valor

Navy Commendation

Credits

Game Design
Sid Meier
with Arnold Hendrick

Original C-64 Programming
Sid Meier and Richard Orban
with Silas Warner

Computer Graphics
Murray Taylor
with Max Remington

Music & Sound Effects
Ken Lagace
with Sid Meier

Manual Text
Arnold Hendrick

Manual Graphics
Murray Taylor with Barbara Bents
and Jackie Ross

Technical Advice & Research
Larry Bond and Tom Clancy

Quality Assurance
Chris Taormino

Playtesting
Chris Taormino, Alan Roireau, Roy Gibson, Bill Stealey, Vicki Smith, Larry Martin, Pete Simonetti, Silas Warner, Arnold Hendrick, Sid Meier, Steve Meyer, Larry Bond, Chris Carlson, Jim Baker, Sam Baker, Pat Slocomb, Dave Markov

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