

THE MASTERS COLLECTION™

By **EPYX**®

SUB BATTLE

SIMULATOR™

COMMANDER'S
TRAINING
MANUAL

**TOP
SECRET**

Instruction Manual

for use with the

Atari® ST™ computer

Game Design by Digital Illusions



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“Welcome Aboard”

First of all, forget you're using a simulation. It's important that you believe that every strategic move you make may have real life implications—for your country, your crew, and your own life.

Many of the battle situations herein are those you will likely face during your own command. You're using the battle precedents of WWII to practice your critical decision making skills—the kinds of *active* decisions you will be forced to make hundreds of miles out at sea in the face of enemy deck guns, depth charges, and air assaults. And the *tactical* decisions you'll quietly face underwater and under pressure.

Remember, you should *know* your enemy. Study him. Study his ship—what kinds of munitions it carries and its capabilities. And, of course, study your own subs and weapons. You'll find all the information you need at the back of this manual.

Getting Started

- Set up your Atari® ST™ as shown in the owner's manual.
- Plug the Mouse in as shown in the owner's manual. You will also be using Keyboard Commands (refer to Appendix B and the Keyboard COMMAND CARD).
- Insert SUB BATTLE SIMULATOR® disk into disk drive A, label side up, metal end first.
- Turn ON the computer, and a window will appear. Double click on the file named **SUBBATSM.PRG**.
- Your WWII submarine simulation will automatically default to the **Target Practice** mode.

Objective

Your objective is to *command* a WWII submarine, *complete* a mission and *survive*.

Your action can take place in one of three modes:

- **Target Practice** against an enemy convoy
- **Single Mission** in a real combat setting
- **Wartime Command** over the course of the entire war

There are 60 different missions (24 American, 36 German) in addition to the target practice mode. American missions are very close to historical

occurrences, while German missions are not as exact, since actual patrol records for the Germans were mostly destroyed at the end of the war. Missions fall into 4 general categories: Seek and Destroy, Rendezvous (pick up people/supplies, drop off coast watchers), Lifeguarding (picking up downed fliers), and Patrol.

Note: See STARTING SIMULATION and MISSION SIMULATIONS for further explanation of these modes.

Starting Simulation

Note: All controls shown in **color** are explained in the HELP REFERENCES section in Appendix B.

When you first boot SUB BATTLE SIMULATOR® you will be in **Target Practice** mode. In this mode you can become proficient with the controls of your submarine, and gain experience in the tactics of submarine warfare.

Later when you feel confident of your abilities, you can embark on a combat mission by typing **CTRL** and **N** (simultaneously) or by selecting **New Game** from the File menu. In the first selection window, you will click to choose either a **Single Mission** or a full **Wartime Command**. You will next choose your **Level of Play**, which have varying degrees of difficulty. (See **Level of Play** chart on the back of the COMMAND CARD.)

Target Practice

At zero hour your heading is preset in the direction of the convoy. You will be warned (Battle Stations! Battle Stations!) that the enemy convoy is close, but it is not yet within range of your weapons. Take the following action:

- With the mouse, click on the speed gauge at approximately the nine o'clock position to increase your speed to 21 knots (or press the **J** key repeatedly until the speed reaches 21 knots). This will get you to the scene of the battle (within target range of the enemy). (See **Time Compression** on page 6 to reduce even more time.)
- Then, using the **Map View** (press **F6** or **6**) to follow your progress, stay on the surface to catch up to the enemy convoy (**Zoom In** to the 7 Mile View by pressing **Z**). Use the navigation time to check the position of the enemy and to devise an overall strategy and angle of assault.
- Then, using the **Map View** to follow your progress, stay on the surface to catch up to the enemy convoy (**Zoom In** to the 7 Mile View). Use the navigation time to check the position of the enemy and to devise an overall strategy and angle of assault.

- Once an enemy ship comes into view, you can center it in your view by clicking on it. This will activate the **Target Data Computer** which will give you an informational readout on the enemy ship. At this point you may want to match your heading to your view by pressing the **J** key. When a ship is in range (see listing of torpedo capabilities and ranges in Appendix D), click on it and press one of the torpedo buttons (depending on which way you're heading this could be the FWD or AFT torpedo button). Once you're closer you can fire a deck gun to inflict heavy damage. When the **Target Data Computer** displays "Planes in Range!"; press the Anti-Air Gun button to fire on them (you need not be pointing directly at planes to hit them). Remember you only have so many torpedoes and rounds of ammunition (see **Transfer Torpedo** on page 27).

HINT: Position yourself in front of the enemy convoy and *Crash Dive* (click on Crash Dive/Surface button or press **RETURN**) to wait for them. Use your *Periscope* or *Sonar* to keep an eye on them as they advance. When the enemy is close enough, destroy as many of them as you can with your torpedoes. After the enemy convoy has scattered, *Surface* (click on Crash Dive/Surface button or press **RETURN** again) and destroy any remaining ships.

* Refer to APPENDICES for specifics on all **VIEW DISPLAYS**, **GAUGES**, **CONTROLS**, and **INDICATORS**.

Mission Simulations

After you have practiced different strategies and tactics in the **Target Practice** mode you can try your hand at actually commanding specific missions. You might want to start out with **Single Mission** to test the waters and then graduate to **Wartime Command** (multiple missions throughout an entire war) when you feel ready for the responsibility.

A new feature is introduced along with your new responsibilities: if you choose level one or two, you may use the **Navigator** which is contained in the **Special Features** menu. Use this to get to the battle site more quickly. If you choose a higher **Level of Play** you must use the heading dial and **Map View** to navigate, and the **Time Compression Buttons** (see page 27) to get to the battle site more quickly.



Single Mission

You can play a single mission by typing **CTRL-N**, or by selecting **New Game** from the **File** menu. After selecting **Single Mission** and the **Level of Play** take the following actions:

- Use the mouse to click on either **German** or **American** to choose your captain's nationality (and type of sub).
- Use the mouse to click on the **year** of your mission.

Next you will receive top secret orders for your single combat mission. They will contain the specifics of that mission, along with the navigational coordinates necessary to reach your objective(s). At any time during the simulation you can refer to these orders by selecting **Current Orders** from the **Mission** menu.

*Refer to APPENDICES for specifics on all **VIEW DISPLAYS, GAUGES, CONTROLS, and INDICATORS.**

Wartime Command

You can play a full Wartime Command by typing **CTRL-N**, or by selecting **New Game** from the File menu. You will then progress mission-by-mission over the entire course of the war until you are either lost in action or the war ends in your theater.

After selecting **Wartime Command** and the **Level of Play**, take the following actions:

- Use the mouse to click on either **German** or **American** to choose your captain's nationality (and the sub).
- Enter your captain's name from the keyboard.

Your wartime service begins in 1939 if you selected **German** (Germany vs. America/Great Britain, Atlantic Theater). It begins in 1942 if you selected **American** (America vs. Japan, Pacific Theater).

You will next receive top secret orders for your first combat mission. They will contain the specifics of that first mission, along with the Navigational Coordinates necessary to reach your objective(s). You can refer to these orders anytime by selecting **Current Orders** from the **Mission** menu. After you complete your first mission you will receive a **Performance Review** and further orders. And if you successfully complete at least one mission of a **Wartime Command** you will be recorded in the **Hall of Fame**.

*Refer to APPENDICES for specifics on all **VIEW DISPLAYS, GAUGES, CONTROLS and INDICATORS.**

General Operations

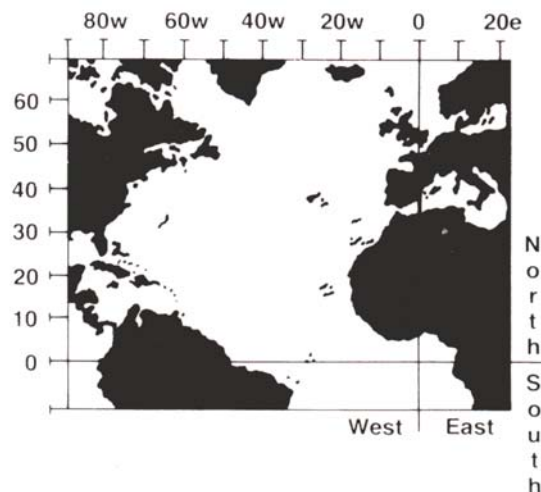
Navigation

Since the **Navigator** is only available in lower levels of play, it's important that we refresh your memory with regards to navigation.

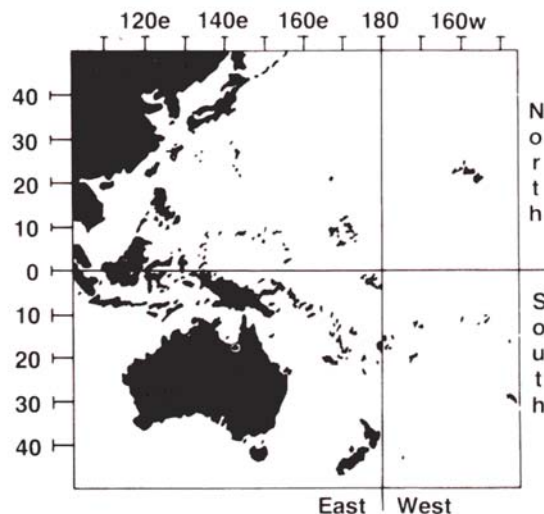
You can navigate your submarine by using the *View*, *Heading*, and *Speed Gauges*. For long distances, the *Time Compression* mode can be used. Remember to check your *Coordinates* frequently and keep an eye on your position using the *Map Displays*. (See COMMAND CARD and Appendix B for Keyboard Commands).

A vessel's position on earth can be expressed in terms of two angles called *latitude* and *longitude*. The north and south angle is called *latitude*. The line of 0 latitude is the equator, 90 degrees north latitude is the north pole, and 90 degrees south latitude is the south pole. The lines of *longitude* run from the north pole to the south pole, dividing the earth into a series of "orange slices."

The Atlantic theater of operations is shown below. A German boat could, for example, head out from Wilhelmshaven, 54°N, 8°E. The boat would head west, for the Greenwich Meridian, crossing into hostile waters about the time the longitude changed from E to W. The patrol area would be in the north Atlantic, all in the western longitudes, after which the sub would head for 0 longitude and home to France or Germany. This boat would see eastern longitudes only as it approached bases in Germany or Italy, and would never see the southern latitudes at all. (See diagram below.)



The American, on the other hand, wanders all over both sides of the international dateline and must know which hemisphere he is operating in at all times. For example, the position of Pearl Harbor, in the Hawaiian Islands, is at 21°N, 158°W, as can be seen below. If a sub commander were to make a little navigational error and find himself at 21°N, 158°E, he would find himself about 3000 miles from base and within easy aircraft range of Marcus Island, which for most of the war was occupied by the Japanese. A similar error placing the boat at 21°S, 158°W would leave the sub in the Tokelau Island group, also Japanese held. Either of the latter two positions would be good patrol areas for sinking Japanese shipping, but a disaster to a boat looking for fuel, food and shore leave. (See diagram below.)



Time Compression

We want you to get as much training in actual battle as possible so we have included a time compression feature so that you can reach the scene of battle more quickly. This allows you to set either a 1 second = 1 second, 1 second = 5 seconds or 1 second = 30 seconds time compression during tactical operations, and a 1 second = 10 minutes or 1 second = 4 hours time compression for sailing to your assigned patrol area (see **Navigator** on page 24) or waiting on station. The 1 second = 10 minutes and 1 second = 4 hours time compressions can be activated only when you are surfaced, and far away from enemy ships or planes. If you run across the enemy your time compression will automatically decrease so that you have time to devise a plan of attack. Press **W** to increase **Time Compression** and **Q** to decrease it.

Saving/Loading A Simulation

Saving a Simulation

You can save your **Single Mission** or **Wartime Command** to another diskette. Press **CTRL-S** or select **Save Game** from the File menu. You must eject the SUB BATTLE SIMULATOR diskette and replace with a formatted diskette on which to save your current simulation.

Note: This feature is not available in **Target Practice** mode.

Loading a Saved Simulation

At any time you can load a previously saved simulation. Select **Load Game** from the File menu. You must eject your SUB BATTLE SIMULATOR diskette and insert the diskette on which the previously saved game was stored. Your **Single Mission** or **Wartime Command** will resume from the point it was saved.

Quitting

You may quit at any time. Select **Quit Game** from the File menu. If you wish to later return to the same **Single Mission** or **Wartime Command**, you must save the simulation before quitting. Quitting will eject the diskette in the internal drive and restart your system.

Historical Perspective

THE GERMAN U-BOATS

Unlike the Americans, the Germans had conducted a very successful submarine campaign in WWI. In WWII Admiral Doenitz, the supreme commander of the German Navy, intended to strangle England out of existence, and he nearly did. However, German aggressiveness was not sufficient to defeat superior Allied technology. The German high command wouldn't produce enough U-Boats, or develop enough new technology, while the Allies mass-produced merchantmen and escorts utilizing the latest technology. The mighty Type XXI submarine was, "Too little, too late" to stem the onslaught of Allied science and production capabilities. German missions were characterized by short, single object missions against superior enemy forces. One defense tactic used by German submarines was to release "bubbles" in the water. In theory this would confuse Allied sonar, but it was mostly unsuccessful.

German Operations

Overview: The convoy battles of the Atlantic are characterized by large convoys being attacked by wolfpacks of submarines.

Strategy: The German U-Boat campaign was to cut off supplies to an island nation, England. The materials came from both the West (the Americas) and the South (Americas, Africa, Middle East, and Far East). Finished goods went North (to Russia) and South. Convoys mostly followed standard routes, as there were no islands.

Operations: Because of this the Germans would send their boats out to an area known to be near a shipping lane, and have the boats wait. In the evenings (when it was supposedly safe to surface), the boats would radio back to base in order to report what had happened during the day, and receive any new orders. However, when the boats radioed back to headquarters, Allied direction finders could triangulate their position and alert convoys in the vicinity.

Tactical: U-Boats would surface at night when they could avoid airplanes and look for the convoy that one of their sister boats had been tracking, or a Luftwaffe (German Air Force) search plane had spotted. When the convoy was sighted, the boat would approach the convoy on the surface and attempt to get off of the forward quarter (on either side). This was the most advantageous position to get a shot in at a convoy.

When within several thousand meters, the boat might submerge in order to reduce the possibility of being spotted. Normally, one to three ships would be attacked depending on their size, range, and perceived value.

When the sub was spotted by lookouts, radar, or sonar, diving was the only way out. The best a boat could do was go deep and stay silent, hoping the escorts gave up or ran out of depth charges.

German U-Boat Specifications

Type IID: was actually a European Coastal/Training boat, obsolete at the outbreak of the war. They saw action in the Baltic, Mediterranean, English Channel/North Sea, and Arctic regions.

Built: 50 units of all types (A, B, C, and D).

Size: 459.2' length, 52.5' wide, and 42.6' "tall".

Displacement: Amounted to 300 tons surfaced, 350 tons submerged.

Speed: Surface (diesel) was 13kts, and submerged (electric only) of 7kts.

Range: Reported as 5600nm at 8kts cruise. Submerged radius of 56nm at 4kts.

Misc. measurements: Crash dive of 25–35 seconds.

Weapons: 3 tubes forward, 5 torpedoes carried (total of 8), some 20mm.

Type VIIC: was the most common type of the war.

Built: Around 705 were built.

Size: 220' length, 20.3' beam, and 15.8' draught.

Displacement: of 781 tons surfaced, 871 tons submerged.

Speed: 17kts surfaced, 8kts submerged.

Range: (surfaced) of 5600nm, 18 hours on battery.

Misc. measurements: Crush depth of 180m.

Weapons: Consisted of a variety of 20mm and 37mm anti-aircraft guns, possibly a 88mm surface gun. Torpedoes were carried in four forward tubes and one aft. Twelve torpedoes were carried or 14 mines.

Type XXI: could have won the war if the production and design problems were worked out earlier, and resources committed to its exclusive production when it was early enough to make a difference! Introduced late in 1944 these were the accumulation of all lessons learned in the six years of submarine warfare. Streamlined hulls, more batteries, snorkel, and silent electric motors.

Built: Reported as 129 units.

Size: 252.6' long, 21.7' wide, and 20.3' draught.

Displacement: 1650 tons surfaced, 1820 tons submerged.

Speed: 15.5kts surfaced, 17.5kts submerged, 5kts on creep motors.

Range: 15,500nm surfaced, 365nm submerged (silent).

Misc. measurements: Dive depth assumed to be over 300m.

Weapons: Six 21" tubes forward, 2 twin 20mm gun turrets, 23 torpedoes carried, 17 torpedoes and 12 mines could also be carried.



THE AMERICAN SILENT SERVICE

American submarines were active during the entire war. Besides just attacking enemy merchant and naval shipping, American submarines flanked carrier task forces, provided lifeguard functions for pilots, did reconnaissance and provided taxi service to refugees and spies. These submarines were initially thwarted in their effectiveness by the defective Mk 14 torpedo. However, the aggressiveness of American senior fleet officers, prior knowledge of Japanese ship movements, improved torpedoes and the excellent quality of the boats themselves turned the tide in the Pacific. American missions were characterized by relatively long times at sea with more than one patrol area being assigned during the course of a mission.

American Operations

Overview: The character of submarine warfare in the Pacific theater was completely different than in the Atlantic. Here, individual submarines attacked smaller convoys that hugged coastlines, or fast moving naval units. There was a definite gap in the technology available to each side. The Japanese had very few radar sets, ineffective depth charges, but adequate sonar. They considered escort duty to be less honorable than serving on surface fleet units. Thus, the quality of the escort crewmen available was less than the average of the Japanese Navy.

Strategy: Since the U.S. Navy was reading the codes of the Japanese Navy, they almost always had the jump on them. Submarines would surface at night and wait for their coded radio instructions. The boats were concentrated in known shipping lanes, and vectored to their targets by the decoded Japanese transmissions. Generally, boats would spend about a month on station.

Operations: A boat would be given a geographic area to patrol, so they would not be attacked by friendly units. If a specific target would become known to Naval intelligence (from the deciphered Japanese communications) then this target would be assigned to various boats along the path of the target.

Tactical: When a target was spotted by a lookout or radar, the sub would try to get off of the port or starboard beam (just like the Germans), and wait until range was down below 3280', if possible. In the case of multiple targets, a captain would not normally attack more than three. Since the Gato and Tench classes had rear torpedo tubes, there was a tactic which called for getting inside the convoy's perimeter and setting up four or so targets with both sets of tubes!

When detected, the American boats could go deeper than the Japanese normally set their depth charges to explode. Therefore, a battered American sub would make good its escape after the Japanese thought they had dropped enough depth charges to "do the job."

Other tactics included the "end run" attack, where the submarine commander would position the submarine in the path of the convoy, submerge as soon as they were sighted and wait quietly for them to approach. Timing of the convoy zigzags was critical, since the convoy could do a zig or zag at the last moment and throw off a torpedo shot.

American Sub Specifications

Gato/Tench Class: Was the mainstay of the fleet. These were in service the entire war.

Built: 73 of the Gato, and 31 of the Tench.

Size: 312' length, 27' wide, 15' draught.

Displacement: 1526 tons surfaced, 2424 tons submerged.

Speed: 19.5 to 20.5kts surfaced, 9kts submerged.

Range: 10,000nm to 13,000nm at 14kts.

Misc. measurement: Carried 378 to 464 tons of fuel. Dive depth of 300 to 1000 ft.

Weapons: 6 torpedo tubes forward, 4 aft, with 24 torpedoes carried. Guns ranged from 3"/50 cal in 1941 to 5"/25 in 1944-1945. Also carried various combinations of 50 cal machine guns, 20mm and 40mm cannons.

S-Boats: Combat action was limited to the first year of the war.

Size: 211' long, 21' wide, 16' draught.

Displacement: 854 tons surfaced, 1062 tons submerged.

Speed: 14.5kts surfaced, 11kts submerged.

Range: 5000 miles at 11kts.

Misc. measurements: Dive depth of 200'.

Weapons: Four 21" tubes forward, some had 1 tube aft. Some had a 4" gun, with a random number of machine guns of 50 and 30 cal.

Appendix A

Inside the Game Screen

A Control Panel:

Various Controls and Indicators.

B Crew Speech Display:

Shows Communication from various crew stations.

C Gauges:

Shows View, Heading, Speed, and Depth.

D View Display Window:

(Tower View shown)

D1 Periscope View

D2 Binocular View

D3 Tower View

D4 Sonar Screen

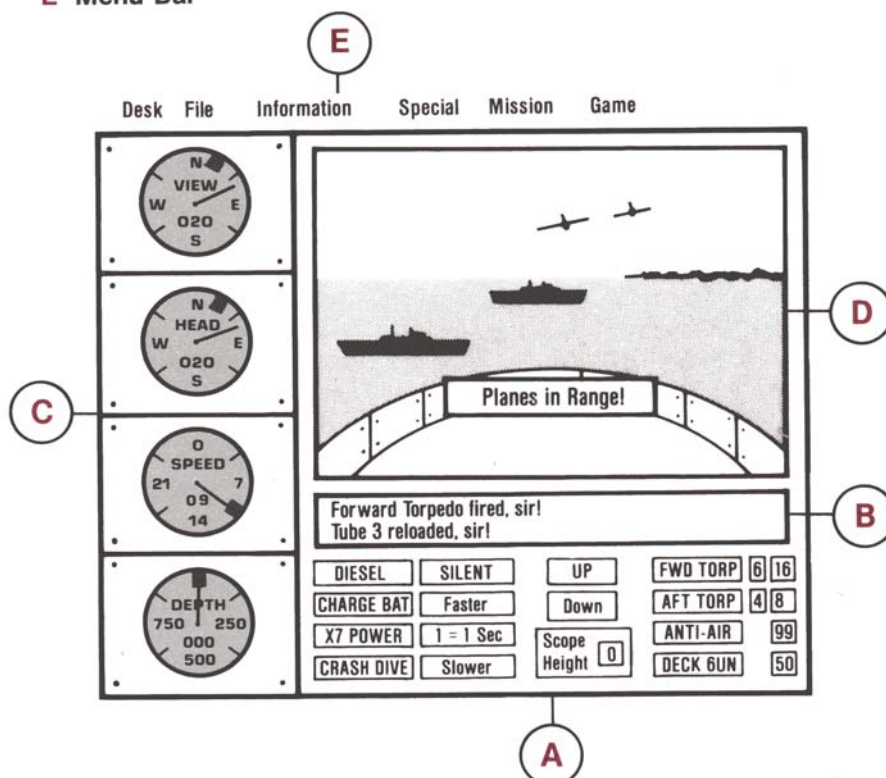
D5 Radar Screen

D6 Map Display

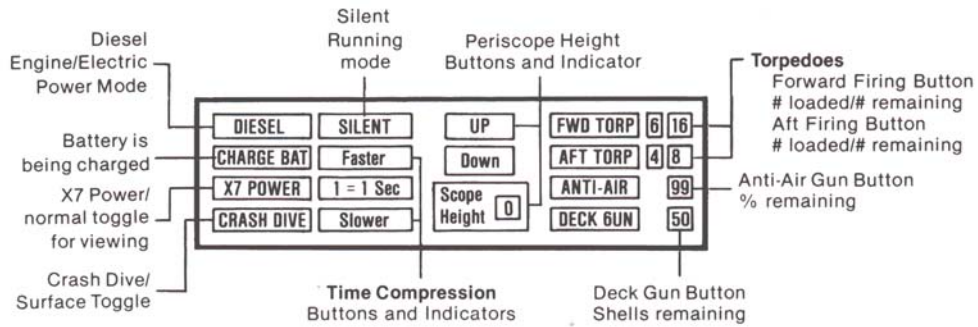
D7 Side Display

D8 Status Readout

E Menu Bar



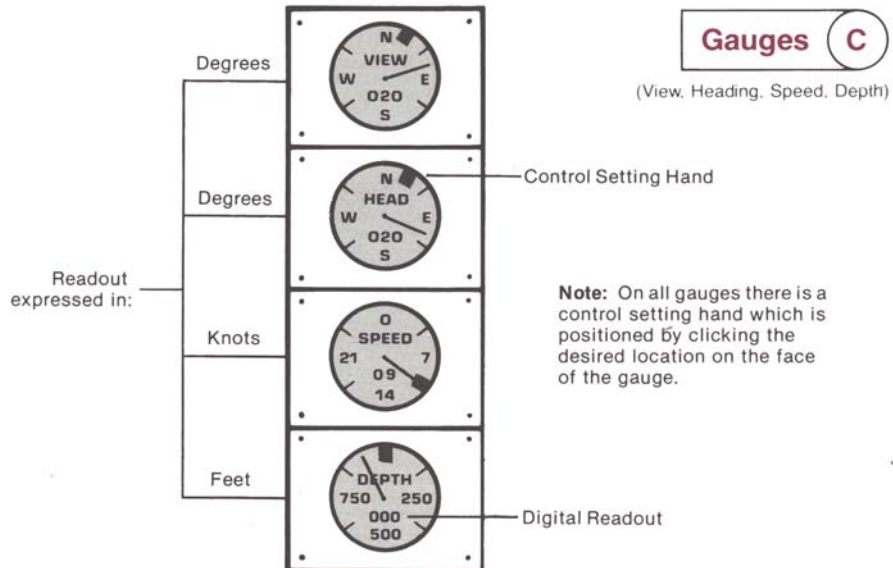
Control Panel A



Crew Speech Display B

Any communication from a crew station will occur in this display.

**Forward torpedo fired, sir!
Tube 3 reloaded, sir!**

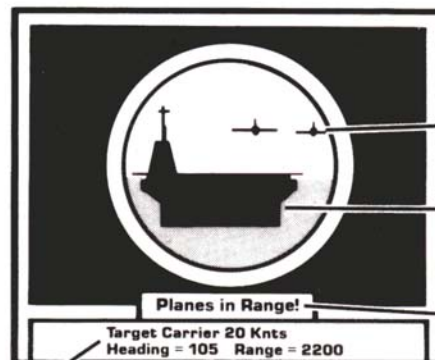


Use the
Keyboard
F1 or 1

Periscope View

D1

(Normal or X7 Power)



Japanese
Zeros

Click on ship to center
the target in window
and to engage the
Target Data Computer

Readout appears only
when **Airplanes** are
within range of **Anti-Air
Guns**

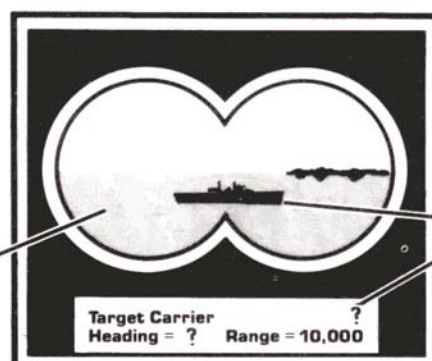
**Target Data
Computer** engaged.

Use the
Keyboard
F2 or 2

Binocular View

D2

(X7 Power)



Click on either side of
window to scroll View
left or right.

Unidentified enemy
ship not yet in range
on **Target Data
Computer** readout

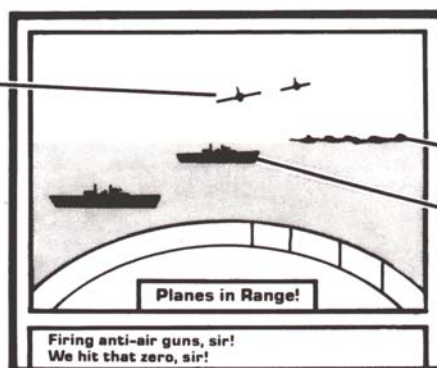
Tower View D3

(Normal)

Use the
Keyboard
F3 or 3

Approaching
enemy airplanes

Click on ship to center
the target in window
and to engage the
Target Data Computer



Coastline

Enemy
target

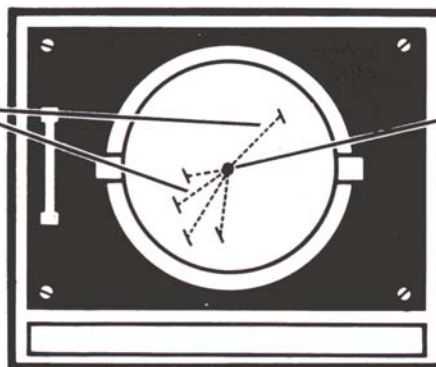
Sonar Screen D4

(6 Mile Maximum Range)

Use the
Keyboard
F4 or 4

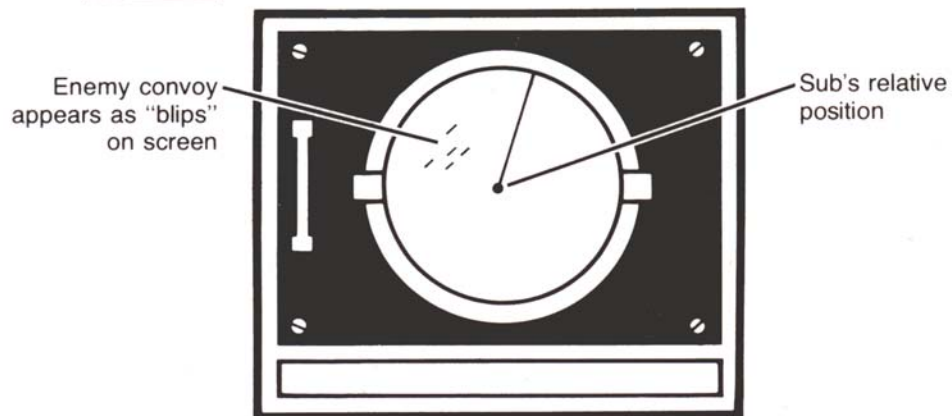
Sonar tracings

Sub's relative
position



Radar Screen D5

Use the
Keyboard
F5 or 5



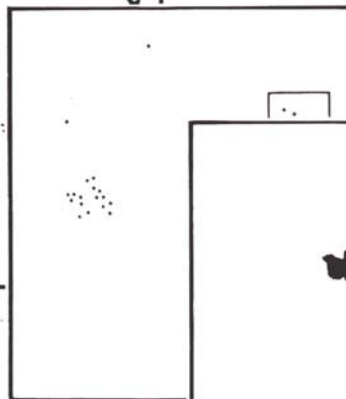
Map Display D6

(Zooming in and out)

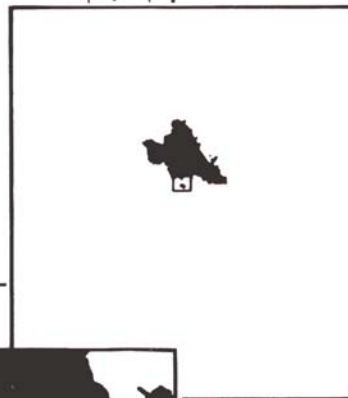
Use the
Keyboard
F6 or 6



2000 Mile Map
(Full Theater)



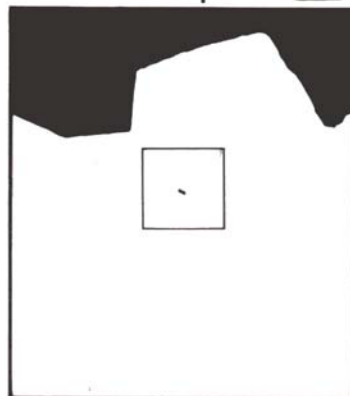
1000 Mile Map
(1/4 Theater)



175 Mile Map



35 Mile Map



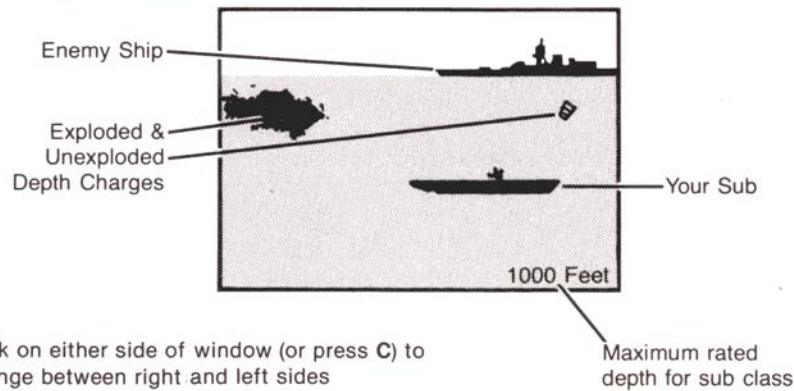
7 Mile Map

View Maps
Available:
7 mile
35 mile
175 mile
1000 mile
2000 mile

By pressing the **Map Display** key (**F6** or **6**) you'll display one of five available views. Pressing either the **Zoom In** or **Zoom Out** key (**Z** or **X**) will display new view levels.

Side Display D7

Use the
Keyboard
F7 or 7



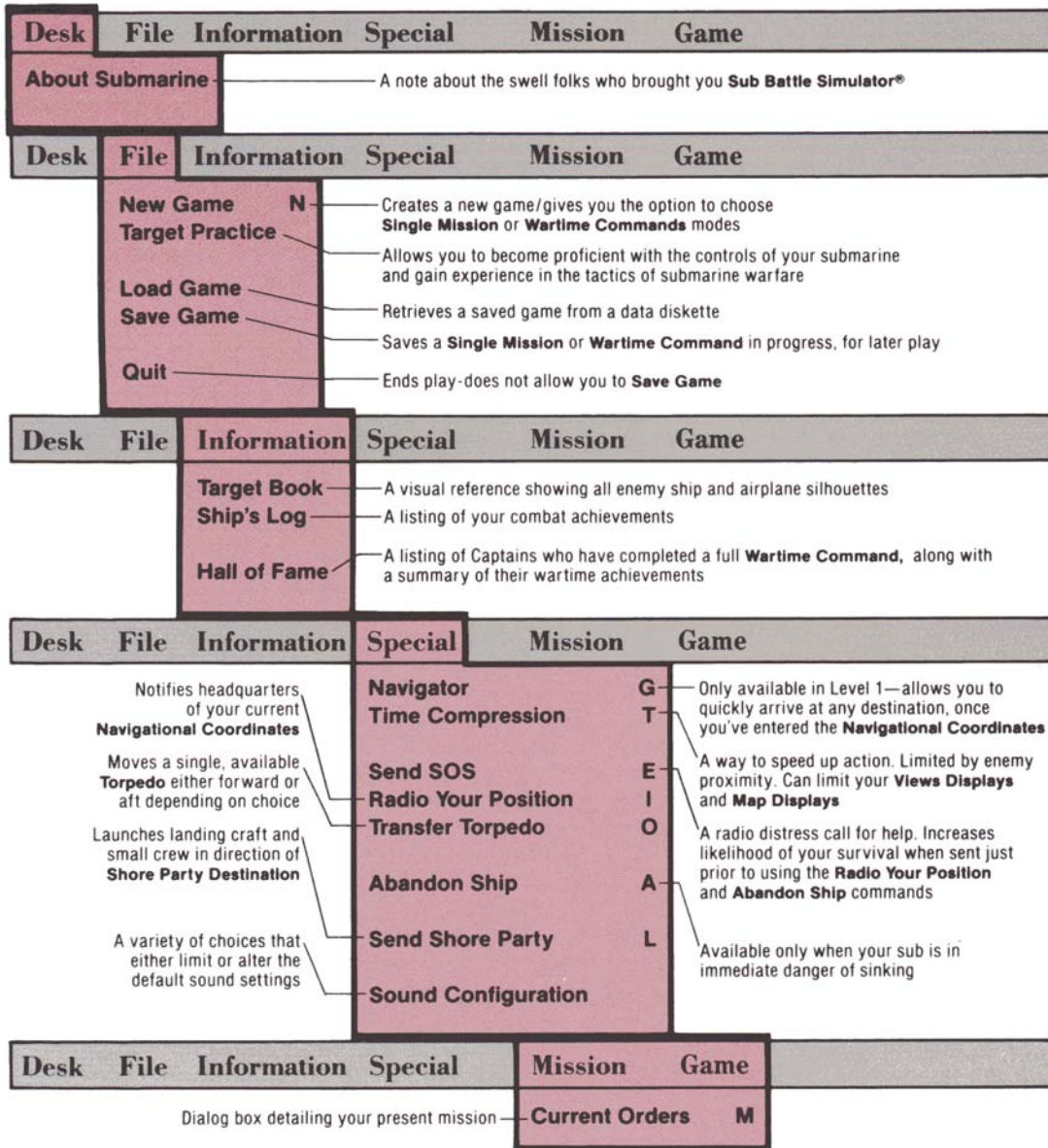
Click on either side of window (or press C) to
change between right and left sides

Status Readout D8

Submarine Class			
Current Damage assessments	Tech Sub	Deck Gun . Repair	Periscope OK
	Sonar OK	AA Gun OK	Pressure Hull . . . OK
	Radar OK	Engines OK	Ballast Tanks . . . OK
	Aft Tubes OK	Battery OK	Dive Planes . . . OUT
	Fwd Tubes OK	Rudder OK	Radio OK
Navigational Coordinates	Latitude	17 deg 32 min 30 sec South	
	Longitude	79 deg 6 min 40 sec East	
Power, oxygen, ship's stores	Diesel 99	Radar : ON	Weather . . Clear
	Battery 100	Mines : 16	Sea State . . . Calm
	Oxygen 100	Torps : Mk 14	Date : 1/16/42
	Supplies 90		Time : 07:55:58
Radar status		# of Mines remaining and type of torpedoes	
		Weather and Sea State	
		Current Mission Date and Time	

Menu Items

E



Appendix B

Help References

KEY	HELP ITEM	DESCRIPTION
CTRL-A	Abandon Ship	One of the <i>Menu Items</i> , enabled only when your sub is in danger of sinking. This option is first presented on the <i>Crew Speech Display</i> . When used in conjunction with <i>Radio Your Position</i> and <i>Send SOS</i> , it will increase the likelihood of your survival.
	Ability of Enemy	Damage inflicting ability of the enemy increases with the <i>Level of Play</i> .
	Active Ports	<i>Home</i> and <i>Destination Ports</i> are shown on the <i>Map Display</i> as a small dotted rectangle.
	Airplanes	Shown in your current <i>Target Book</i> . Able to drop depth charges in Level 2 and above.
	Ammunition Indicators	A) <i>Torpedo</i> indicators give forward and aft torpedo room information regarding the number of torpedoes LOADED in tubes, and the TOTAL number of torpedoes remaining on board (reading from left-to-right). B) the <i>Anti-Air Gun</i> indicator shows the percentage of ammunition remaining. C) number of remaining <i>Mines</i> is shown in the lower right corner of the <i>Status Readout</i> .
G	Anti-Air Gun	Fires <i>Anti-Air Gun</i> . Available when "Planes in Range!" is shown in the WINDOW, or when a ship is targeted (planes are shot at first). Ammunition is reduced 1% each time the gun is fired.
F2, 2	Binocular View	This is a X7 zoom available only on the surface. It is selected by pressing F2 or 2 (or V while using the <i>Tower View</i>).
B	Charge Battery Switch	Recharges your battery only when the diesel engine is engaged (on the surface).
CTRL-S	Continue Game	One of the <i>Menu Items</i> , this "unfreezes" the game action if you have used <i>Suspend Game</i> .

KEY	HELP ITEM	DESCRIPTION
	CONTROLS	Clicking on a control button engages that particular submarine function.
?	Coordinate Key	Displays your current <i>Navigational Coordinates</i> on the <i>Crew Speech Display</i> .
RETURN	Crash Dive/ Surface Switch	This is a toggle switch. It takes you automatically to a depth of 100 feet or, conversely, to the surface. NOTE: 0 key will <i>Trim Depth</i> (level your sub at your present depth).
	Crew Speech Display	A readout of the most recent information from the crew.
CTRL-M	Current Orders	One of the <i>Menu Items</i> , this displays your current <i>Mission Assignment</i> .
	Damage	Damage is first reported on the <i>Crew Speech Display</i> . Degree of Damage increases with <i>Level of Play</i> . Above Level 1, the degree of damage can be absolute in a single step. <i>Status Readout</i> displays all current damage conditions. Damage repair time is slowed while you are in the <i>Silent Running</i> mode.
	Days on Station	A term that indicates the number of days patrolling within a specific tolerance (according to your <i>Level of Play</i>) of your assigned <i>Navigational Coordinates</i> . Completing this task, as ordered, will be reflected on your end-of-mission <i>Performance Review</i> . Each day you are on station, confirmation is given on the <i>Crew Speech Display</i> .
F	Deck Gun	Fires <i>Deck Gun</i> . Can only be fired while on surface. Number of shells remaining shown to the right of the <i>Deck Gun Switch</i> . Reloading time increases with the <i>Level of Play</i> .
	Depth Charges	Released from ships at any <i>Level of Play</i> and <i>Airplanes</i> above Level 1. Can be observed in the <i>Side Display</i> in the WINDOW.



KEY	HELP ITEM	DESCRIPTION
- or +	Depth Gauge	Click anywhere on the face of this gauge to choose desired depth or use an alternative Keyboard Command. NOTE: The - and + keys increase or decrease the depth in 5 foot increments. The shift key when coupled with one of these, allows for 10 foot increments.
	Destination Port	Will be shown in the <i>Map Display</i> as a small dotted rectangle. Upon your arrival you will be notified with a dialog box and be given a <i>Performance Review</i> and further orders.
	Dud Munitions	<i>Torpedoes</i> and <i>Deck Gun</i> shells that fail to explode when fired. The number of dud rounds increases with the <i>Level of Play</i> .
E	Engine Selector Switch	Toggle between diesel engines and electric power. Diesel is only available on the surface, while electric is always available. Electric is automatically engaged when diving or in <i>Silent Running</i> . Use of electric power causes a depletion of batteries, which can only be recharged on the surface by engaging diesel engines and clicking on the <i>Charge Battery Button</i> or by pressing B .
	GAUGES	Click anywhere on the face of a gauge to change to a corresponding setting, or use an alternative Keyboard Command. NOTE: Using the shift key with a key command will increase the amount of change.
	Hall of Fame	One of the <i>Menu Items</i> , this is a listing of Captains who have completed at least a Single Mission of a Wartime Command, and a summary of their combat achievements.
< or >	Heading Gauge	Click anywhere on the face of this gauge to choose desired heading or use an alternative Keyboard Command. NOTE: The < and > keys increase or decrease the heading in 1 degree increments. The shift key when coupled with one of these, allows for 5 degree increments.



KEY	HELP ITEM	DESCRIPTION
	INDICATORS	Display specific submarine functions and special game features.
	Keyboard Command	Keyboard equivalent commands for both <i>Menu Items</i> and regular game controls.
	Level of Play	Controls the level of difficulty in the Single Mission or Wartime Command modes (refer to <i>Level of Play</i> chart).
	Lighting Indicator	Shows the current surface lighting conditions (dawn/day/dusk/night).
F6, 6	Map Display	Pressing the Map Display button allows one of five zoom levels in the WINDOW (7 mi., 35 mi., 175 mi., 1000 mi., 2000 mi.). Press the Z and X keys to Zoom In and Zoom Out on the Map Display. In the first three levels — your sub, enemy ships, and aircraft are shown in detail. The last two levels are commonly used to get an overall idea of your location and to rapidly change your position using the 4 hour <i>Time Compression</i> mode. In these last two levels your sub is indicated on the map with a blinking “+” symbol, while enemy ships are indicated by a blinking “x” symbol.
J	Match Heading to View	Changes your heading to match your current view. NOTE: “Shift-J” locks in this mode. As you change your view, your heading will automatically follow. This can be disengaged by either clicking on the face of the <i>Heading Gauge</i> or using a Heading change key (< or >).
U	Match View to Heading	Instantly changes your view to match your current heading. NOTE: “Shift-U” locks in this mode. As you change your heading, your view will automatically follow. This can be disengaged by either clicking on the face of the <i>View Gauge</i> or using a View change key (H or K).
	Menu Items	Selections available from the pull-down menus at the top of the game screen.



KEY	HELP ITEM	DESCRIPTION
M	Mines	Mines can only be deployed at a depth of 100 feet or less, using the <i>Keyboard Command M</i> . This detaches the mine from the sub leaving it moored at the depth you released it, with a delay before arming, based on your speed.
CTRL-M	Mission Assignment	A dialog box will appear with both departure and destination information and your mission objectives. Radio contact from your headquarters may change your <i>Current Orders</i> , while you are enroute. At the end of your mission you will receive a <i>Performance Review</i> .
?	Navigational Coordinates	References a specific location on the surface of the Earth. Expressed in Degrees, Minutes and Seconds with a compass designation (N, S, E, W).
CTRL-G	Navigator	One of the <i>Menu Items</i> , and only available in Levels 1 and 2. This enables you to quickly arrive at any destination once you have entered the <i>Navigational Coordinates</i> .
CTRL-N	New Game	One of the <i>Menu Items</i> , this enables you to choose either the Single Mission mode or Wartime Command mode.
	Performance Review	Issued upon completion of any mission. This review focuses on how well you followed your <i>Mission Assignment</i> and your combat achievements. Success is the only tolerable substitute for not following orders!
9	Periscope Depth	Automatically brings you to periscope depth, with the periscope 5 feet above the surface (when fully extended).
	Periscope Height Indicator	Digital readout of the current periscope height above the conning tower.
O or P	Periscope Height Switches	Raises or lowers the periscope. In Levels 1 and 2, the periscope is either fully raised or lowered. In Levels 3 and 4, the periscope is raised and lowered in 1 foot increments.



KEY	HELP ITEM	DESCRIPTION
F1, 1	Periscope View	Available in normal magnification, or X7 zoom by typing V on the keyboard.
R	Radar Disengage/Engage	Toggles the radar on and off or releases bubbles on German subs.
F5, 5	Radar Screen	Available only when the periscope is above the surface, this tracks surface and air targets, within a 25 mile range.
CTRL-I	Radio Your Position	One of the <i>Menu Items</i> , this automatically radios your current <i>Navigational Coordinates</i> to your headquarters. When used in conjunction with <i>Send SOS</i> , it will increase the likelihood of your survival in the event that you <i>Abandon Ship</i> .
	Ramming	<i>Damage</i> which results from ramming, increases with the <i>Level of Play</i> .
	Running Aground	Severe or absolute <i>Damage</i> can result! Disabled in the 4 hour <i>Time Compression</i> mode to allow you to travel long distances in a short amount of time.
	Sea State Effects	Enabled only at Levels 3 and 4. This "rocks" the sub at a rate based on the current Sea State.
CTRL-L	Send Shore Party	One of the <i>Menu Items</i> , this is only able to be used when you are near a <i>Shore Party Destination</i> . Upon your arrival, you will be notified on the <i>Crew Speech Display</i> . This command launches a landing craft and small crew.
CTRL-E	Send SOS	One of the <i>Menu Items</i> , this should be used whenever you <i>Abandon Ship</i> . When used in conjunction with <i>Radio Your Position</i> , it will increase the likelihood of your survival.
	Ship's Log	One of the <i>Menu Items</i> , this gives a listing of your combat achievements.
	Shore Party Destination	Will be shown on the <i>Map Display</i> as a small dotted rectangle.



KEY	HELP ITEM	DESCRIPTION
F7, 7	Side Display	Shows the sub and it's relative depth. This can be displayed from the left or right side of the sub by using the <i>Side Display Toggle</i> . Best used for observing <i>Depth Charges</i> and nearby ship activity while submerged.
C	Side Display Toggle	Toggles between left and right sub views by clicking the mouse anywhere in the <i>Side Display</i> in the WINDOW.
S	Silent Running Switch	Used for evading enemy detection, this will engage electric power if not already engaged. This mode will slow down <i>Torpedo</i> reloading and increases <i>Damage</i> repair times.
F4, 4	Sonar Screen	Tracks surface targets, within a 6 mile range, and is effected by <i>Weather Effects</i> and <i>Sea State Effects</i> .
[or]	Speed Gauge	Click anywhere on the face of this gauge to choose desired speed or use an alternative <i>Keyboard Command</i> . NOTE: The [and] keys increase or decrease the speed in 1 knot increments. The shift key when coupled with one of these, allows for 6 knot increments.
F8, 8	Status Readout	This display gives you the damage status of all major areas of your sub. Other sub data, <i>Sea State Effects</i> , <i>Weather Effects</i> , your location, and the data and time are also provided.
CTRL-S	Suspend Game	One of the <i>Menu Items</i> , this "freezes" game action until you <i>Continue Game</i> .
	Target Book	One of the <i>Menu Items</i> , this provides a visual reference showing all enemy ship and airplane silhouettes.
	Target Data Computer (TDC)	Click on enemy target to 'center' TDC in the <i>Periscope View</i> , <i>Binocular View</i> , or <i>Tower View</i> which appear in the WINDOW. Gives informational readout, used to make tactical decisions. Study the information to recognize and know your enemies. The more information you have, the easier it will be to make good tactical decisions for survival and victory.



KEY	HELP ITEM	DESCRIPTION
CTRL-T	Time Compression	One of the <i>Menu Items</i> , this provides a way to speed up the action. You can choose from five available modes: 1 sec., 5 sec., 30 sec., 10 min., and 4 hour. In the 4 hour mode you will be limited to the <i>Radar Screen</i> and either the 1000 mile or 2000 mile <i>Map Display</i> in the WINDOW. In close proximity to the enemy you are limited to the 1 sec., 5 sec., or 30 sec. modes. In the 4 hour <i>Time Compression</i> mode, <i>Running Aground</i> is disabled.
	Time Compression Indicator	Displays the current <i>Time Compression</i> factor.
Q or W	Time Compression Switches	Slows down or speeds up <i>Time Compression</i> . Q slows down and W speeds up.
T or Y	Torpedoes	T fires Forward Torpedo, Y fires Aft Torpedo. Torpedoes can only be fired at a depth of 80 feet or less. Using the <i>Target Data Computer</i> to 'center' on an enemy target gives you the best chance of a hit. Reloading times are slowed in the <i>Silent Running</i> mode and may also be slowed if you have sustained <i>Damage</i> . NOTE: The shift key used with T or Y will shoot the torpedo straight in the direction of your view.
F3, 3	Tower View	This view is from the main conning tower and is only available while on the surface.
CTRL-O	Transfer Torpedo	One of the <i>Menu Items</i> , this is the only way to move <i>Torpedoes</i> between the forward and aft torpedo rooms while at sea. This action is not instantaneous and can only be done if you have <i>Torpedoes</i> available.
0	Trim Depth	Keyboard Command '0' stops a depth change in progress, and levels your sub at your present depth.
I	View Aft	This key will change your View to look Aft (180° from forward). This is helpful for keeping an eye on the position of your enemies and launching aft torpedoes.



KEY	HELP ITEM	DESCRIPTION
H or K	View Gauge	Click anywhere on the face of this gauge and your view instantly changes. By clicking, left or right of center in the WINDOW, or by using a <i>Keyboard Command</i> —your view scrolls left and right. NOTE: The H and K keys increase or decrease the view angle in 1 degree increments. The shift key when used with one of these, allows for 5 degree increments.
F1 - F8 1 - 8	VIEW DISPLAYS	Visual and informational windows for your sub which appear in the WINDOW.
	Weather Effects	Enabled above Level 1 and increases with the <i>Level of Play</i> .
V	X7 Power Switch	A) functions as a zoom from the <i>Periscope View</i> , and B) changes to the <i>Binocular View</i> from the <i>Tower View</i> .
Z	Zoom In	Pressing this button inwardly zooms the <i>Map Display</i> , in the WINDOW, through a variable range — (from the 2000 mile to the 7 mile displays).
X	Zoom Out	Pressing this button outwardly zooms the <i>Map Display</i> , in the WINDOW, through a variable range — (from the 7 mile to the 2000 mile displays).

Appendix C

Glossary

Terms and Definitions

AFT: The rear portion of a seagoing craft.

ANTI-AIR GUNS: Any gun or cannon primarily used for defense against enemy aircraft. Typical examples were 30 and 50 caliber machine guns and 20mm cannons.

BALLAST TANKS: On a submarine, ballast tanks were used to hold various levels of seawater, causing the submarine to dive or climb in depth. Water was removed from the tanks by using compressed air and/or electric pumps.

BOW: The forward portion of a seagoing craft.



BUBBLES: Bubbles were used by the Germans to hide from Allied sonar. They were generated by the equivalent of a giant seltzer tablet.

CONNING TOWER: A low observation tower on top of the submarine which also served as the primary entrance to the interior of the submarine.

CONTROL ROOM: The control center of the submarine. The Captain, Executive Officer, and engineer were all normally stationed in this part of the submarine. All primary control/detection systems (i.e., periscope, dive controls, steering, radar, sonar, etc.) were controlled from this area of the submarine. Typically located under the conning tower.

CONVOY: A group of ships travelling together.

DECK GUN: The primary surface weapon on a submarine. Typically this gun was a cannon of a 2" to 4" bore size.

DEPTH CHARGE: An explosive charge specifically designed to damage submarines. These weapons were dropped or thrown off the side of ships attacking submerged submarines. A typical charge contained 300 lbs. of high explosive and could have its depth set in 10 foot increments.

DIVE PLANES: These were moveable "fins" on the side of the submarine which were used to aid diving and climbing while moving in the water. Similar to flaps on aircraft, they would force the front of the submarine up or down while under power.

DUD: Either torpedoes or deck gun rounds could fail to explode on contact. When this happened, it was labeled a "dud" round or "dud" torpedo.

ESCORT: A class of ships designed to escort merchant and other unarmed shipping. Used to screen and defend these ships against submarines and other attacks.


KRIEGSMARINE: The German Navy.

LATITUDE: The lines on a map which measure your relative distance from the equator. These lines run left and right on maps oriented with North at the top and South at the bottom.

LONGITUDE: The lines on a map which measure your distance either East or West of Greenwich, England (the prime Meridian). These lines would be vertical on a map oriented with North at the top.

LUFTWAFFE: The German Air Force.

MINE: A stationary explosive designed to retard access to the area it is placed. Mines could either be contact or magnetically fused and were used to either "box in" or "fence out" enemy shipping.



PERISCOPE: An optical instrument that allows a submerged submarine to scan the surface. In 1944 the Night Scope with a built in radar antenna was introduced. The Night Scope made a major difference in night observations.

PRESSURE HULL: The outer part of the submarine which keeps the craft from being crushed by water pressure when submerged.

RADAR: A device used to identify the direction and distance of metal vessels which are out of visual range.

RAM: The process of striking another craft with your own.

SNORKEL: A device used to intake air while the majority of the submarine is submerged. Only used in a very limited way by the Germans during WWII.

SONAR: There are actually two types of sonar devices. The first is called "passive" sonar, which uses hydrophones to collect sounds, and which are then interpreted by a human operator to determine the distance, speed, and type of ship heard. The second type of sonar is a kind of underwater radar which uses high frequency sound waves and interprets the reflections. In the game these two are combined and treated as a passive type sonar.

SQUADRON: A group of warships assigned to a particular duty.

SUBMARINE: Any warship that can operate underwater.

TDC: An acronym for Target Data Computer, a mechanical device which was used to assist setting torpedo angle off bow direction on a moving target for maximum accuracy.

TIME COMPRESSION RATIO: The ratio that time is compressed for game play. (i.e., "1 second-5 seconds" means that for each real second that passes, 5 seconds have elapsed in the game.)

TORPEDO: A large self-propelled underwater projectile containing explosives. Used against shipping from submarines, destroyers, or patrol boats.

TUBE: The area of the submarine which held torpedoes ready to fire.

U-BOAT: A German submarine. German submarines were individually numbered instead of named, with a preceding "U" (i.e., U43, U89, etc.) A similar practice was used by the United States with the PT boats (i.e., PT-109).

Appendix D

Weapon Information

SHIP WEAPONS:

Note: These are the weapons your enemy ships will be carrying. Ship weapons have a much larger range due to longer barrels and sturdier gun/cannon mounts than similar weapons on submarines.

Type of Weapon	Rate of Fire	Range in Feet
50 cal. machine guns	250–650	4500–7500
20mm cannon	250–475	9000–12,000
40mm cannon	140–220	12,000–27,000
3" cannon or 72mm	15–20	39,000
4" cannon or 88mm	10–12	42,000–54,000
5" cannon or 125mm	10–12	39,000–54,000

SUB WEAPONS:

Type of Sub	Deck Gun	Anti-Air Guns
Type II–German	Actually none (at Levels 1 and 2 you get an 88mm cannon). Max range: 12,000 ft.	(2) 20mm light cannon. Max range: 4500 ft.
Type VII–German	88mm cannon. Max range: 12,000 ft.	(1–5) 20mm light cannon. Max range: 4500 ft.
Type XXI–German	Actually none (at Levels 1 and 2 you get an 88mm cannon). Max range: 12,000 ft.	(2–4) 20mm light cannon. Max range: 4500 ft.

S-Class-USA	3" cannon. Max range: 10,000 ft.	(2) 50 cal. machine guns. Max range: 2500 ft.
Gato Class-USA	4 or 5" cannon. Max range: 14,000 ft.	(2) 20mm + (1) 40mm light cannon. Max range: 4500 ft.
Tench Class-USA	5" cannon. Max range: 14,000 ft.	(2) 20mm + (1) 40mm light cannon. Max range: 4500 ft.

Small cannons (50 cal, 20mm, and 40mm) were found in the deck and conning tower mounts. They were generally used against aircraft and small boats. Larger guns could do much more damage. The 5" gun, for example, was capable of hitting 500-750 ton ships so hard that the ships were regularly destroyed by them.

TORPEDO SUMMARY TABLE

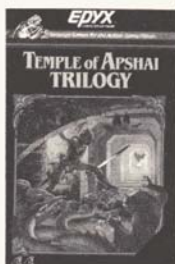
American:

Type	Propellant	Yrs in Use	Dud %	Fusing	Range	Speed
Mk 10	Steam	1941-43	16	Contact	10,800 ft.	36 knots
Mk 14	Steam	1941-43	62	Magnetic	13,800 ft.	46 knots
Mk 14	Steam	1943-45	13	Contact	13,800 ft.	46 knots
Mk 18	Electric	1943-45	6	Contact	12,000 ft.	29 knots

German:

Type	Propellant	Yrs in Use	Dud %	Fusing	Range	Speed
T1, G7a	Steam	1939-44	17	Contact	6,900 ft.	40 knots
T2, G7e	Electric	1939-44	8	Contact	21,000 ft.	30 knots
T3, G7e	Electric	1943-45	25	Magnetic	21,000 ft.	30 knots
T5, G7a	Steam	1943-45	8	Acoustic	1,920 ft.	24 knots

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