HARPOON3

Operating Instructions
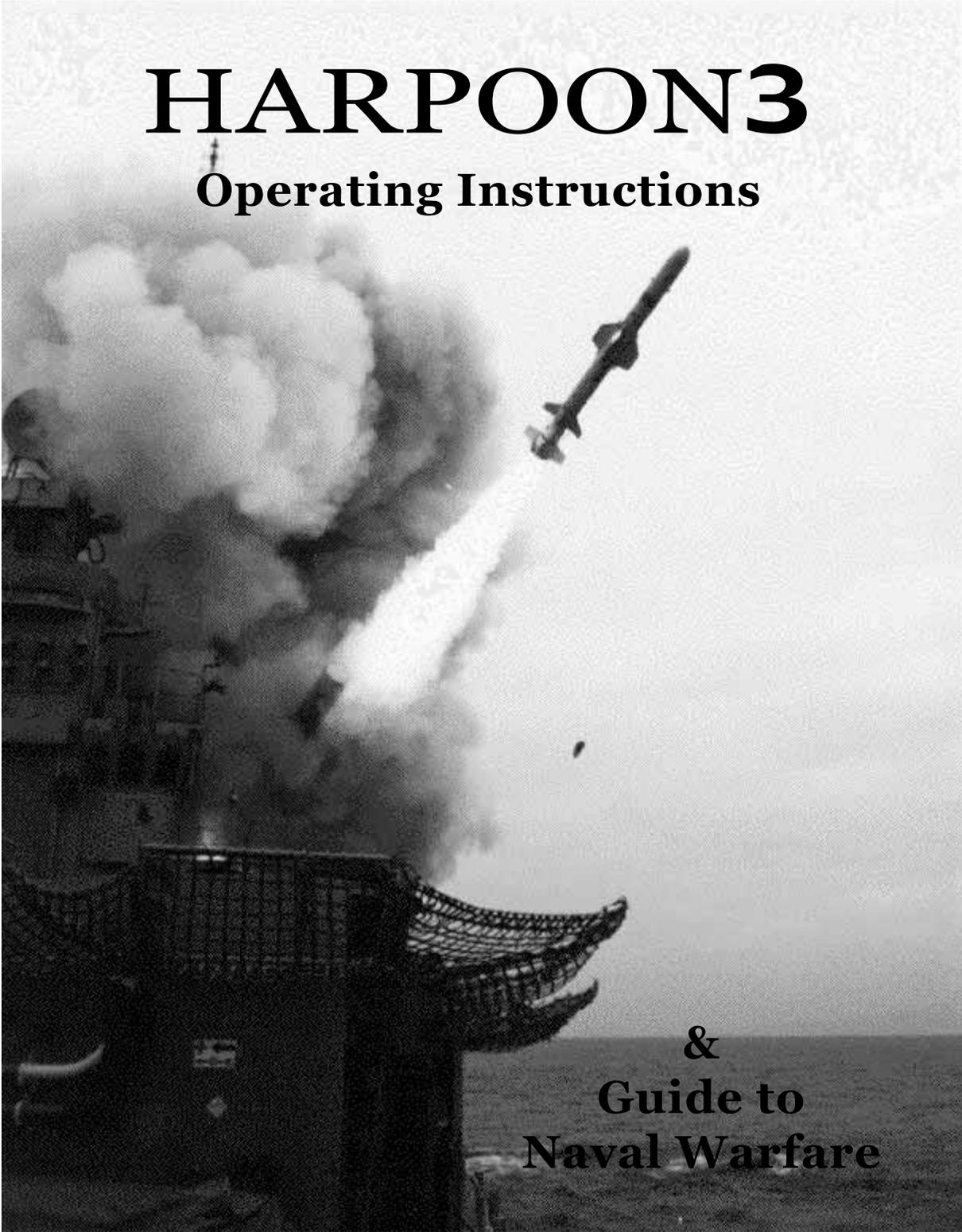
&
Guide to
Naval Warfare

Operating
Instructions
&
Guide to
Naval Warfare

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Harpoon3

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Credits

HARPOON II™ COMMAND CARD

IBM® PC AND MACINTOSH™ W/ EXT. KEYBOARD

MOUSE CONTROLS

IBM PC
- Left click to select
- Right click to Center Map
- Shift-click to Select/Deselect multiple units/groups

MACINTOSH
- Click to Select
- Option-click to Center Map
- Shift-click to Select/deselect multiple units/groups

BEARING ONLY ATTACK
- IBM: Ctrl + F1
- MAC: Opt + F1

Numeric keypad functions

- RENAME UNIT/GROUP/CONTACT/NAV ZONE
- COURSE TRACKS ALL/SEL/OFF
- DATA BLOCK ALL/SEL/OFF
- DISPLAY GROUPS/UNITS
- TOGGLE RANGE/BEARING ON/OFF
- RENAME REFERENCE POINTS
  - IBM: Ctrl + 7 (Home)
  - MAC: Opt + 7
- ADD REF POINT — 0 INS
- DEL REF POINT — DEL
- NUM LOCK
- /
- *
- -
- 7 Home
- 8 ↑
- 9 PgUp
- 4 ←
- 5
- 6 →
- 1 End
- 2 ↓
- 3 PgDn
- +
- Enter
- DECREASE TIME COMPRESSION
- INCREASE TIME COMPRESSION
- CLEAR OLD CONTACT
- 1:1 TIME

- SONOBUOY RELEASE
  - [PASSIVE]
  -] ACTIVE
- MARK AS HOSTILE — H
- UNASSIGN — U
- SELECT PREVIOUS UNIT/GROUP — BACK SPACE
- SELECT NEXT GROUP/UNIT — SPACE
- WEAPONS FREE — `~`
- GROUP SELECTED UNITS — G

FUNCTION KEY / TOOLBAR BUTTON

Function Key	Action
F1	ATTACK
F2	SPEED ALT DEPTH
F3	NAV MODE
F4	FORMATION EDITOR
F5	LOGISTICS
F6	AIR OPS
F7	NAV ZONE EDITOR
F8	WINDOW PREF
F9	SENSORS
F10	NEW ZOOM WNDW
F11	HELP
F12	PAUSE/RESUME GAME

WINDOW CONTROLS

Button	Action
F10	NEW ZOOM WINDOW
Z	ZOOM IN
X	EXPAND OUT
T	TRACKING WINDOW ON/OFF
F8	WINDOW PREF

FORMATION EDITOR

Button	Action
D	DETACH UNIT(S)
PZ	PATROL ZONE
(triangle)	THREAT AXIS
CPU	COMPUTER CONTROLLED UNIT

THREE-SIXTY

HARPOON II™ COMMAND CARD MACINTOSH™

Key	Function
[3]	CLEAR OLD CONTACT
[5]	TOGGLE RANGE/BEARING ON/OFF
[7]	RENAME UNIT/GROUP/CONTACT/NAV ZONE
[7]	RENAME REFERENCE PT.
[9]	DISPLAY GROUPS/UNITS
[0]	ADD REFERENCE PT.
[Opt]	
[G]	GROUP SELECTED UNITS
[~]	WEAPONS FREE
[SPACE]	SELECT NEXT GROUP/UNIT
[/]	COURSE TRACKS ALL/SELECTED/OFF
[*]	DATA BLOCK ALL/SELECTED/OFF
[.]	DELETE REFERENCE PT.
[+]	INCREASE TIME COMPRESSION
[-]	DECREASE TIME COMPRESSION
[ENTER]	1:1 TIME
[Opt]	BEARING ONLY ATTACK
[BACK SPACE]	SELECT PREVIOUS UNIT/GROUP
[U]	UNASSIGN
[H]	MARK AS HOSTILE
[[ ]	SONOBUOY RELEASE — PASSIVE
[ ]]	SONOBUOY RELEASE — ACTIVE

HOT KEY / TOOLBAR BUTTON

[⌘] +

Key	Function
[1]	ATTACK
[2]	SPEED ALT DEPTH
[3]	NAV MODE
[4]	FORMATION EDITOR
[5]	LOGISTICS
[6]	AIR OPS
[7]	NAV ZONE EDITOR
[8]	WINDOW PREF
[9]	SENSORS
[0]	NEW ZOOM WNDW

HELP
[⌘H] [⌘P] PAUSE/RESUME GAME

MOUSE CONTROLS
◆ Click to Select
◆ Option-click to Center Map
◆ Shift-click to Select/deselect multiple units/groups

FORMATION EDITOR

Toolbar	Function
[D]	DETACH UNIT(S)
PZ	PATROL ZONE
	THREAT AXIS
CPU	COMPUTER CONTROLLED UNIT

WINDOW CONTROLS

Key	Function
[⌘0]	NEW ZOOM WINDOW
[Z]	ZOOM IN
[X]	EXPAND OUT
[T]	TRACKING WINDOW ON/OFF
[⌘8]	WINDOW PREF

THREE-SIXTY

"Oh, for a Muse of fire!"

Thus Shakespeare did apologize to his audience in Henry V for not being able to show them, in living, moving color all the splendor and might of armies in the field and the clash of battle. We would echo without qualification that same sentiment about Harpoon33 well. Given realistic limits on our diskette count, there is only so much 'fire' we can put on to them. We focused the majority of our attention on the game engine and the interface instead. As the adage puts it; "Modern naval warfare is an indoorsy thing...colored symbols march across computer screens in air-conditioned spaces". To those who cannot see beyond this abstraction, we remind you: This is how it really looks in an actual Combat Information Center, and men and women are fighting for their lives as those phosphor dots wink out. Yes, it's a game, but it's also an incredibly accurate simulation; this is how it really works, and the reality behind that abstraction is never far off.

This project has filled almost every waking moment of the last year of our lives. It represents the dreams and toil of many individuals who worked unbelievable hours to bring it all together. We sacrificed a lot of glitz and eye-candy in order to craft the finest simulation of its kind. At over a million lines of source code, this product surpasses many of the finest classified military simulations available today, and many naval officers reaffirm that to us on an almost daily basis.

We would like to personally thank the entire programming staff for all their long hours and personal loyalty when all the chips were down. It could never have happened without their drive and professional pride in their work. Thanks also to the families of our development staff for their support.

Many thanks also go to our superb artist with the patience of Job; Rick Lenz, who would get it all looking just right (after hours of work) when either of us would burst into his office and say, "Rick, could you just move this a little to the left.... Oh, and the color is all wrong too... We changed one of the hot keys, can you re-do the Command Card?"

When we imported and translated the digital maps from three different US and Canadian government sources, we found gross inaccuracies in the original data. Since the only other available sources offering better quality were highly classified, we could never use them in our public version of Harpoon. So under the supervision and tutelage of Scott Witte, the following tireless individuals corrected by hand thousands of coastline and island polygons using high resolution survey maps from the Defense Mapping Agency. A hearty well-done to Mauria Finley, Mike Aspinall, and Dave Kotz

Another great labor was the database. Literally thousands of sensors, communications systems, weapons, datalinks, ships, aircraft, submarines, and all their propulsion plants and fuels all had to be researched and correlated and finally entered in one by one. It took years of experience and knowledge to know what went where, and when to be suspicious of manufacturers' claims and how to interpolate conflicting sources. Darrel Dearing's skill in coordinating this was priceless, as were those who slaved away in research and data entry: Dave Kotz, Rod Graves, Frank Hale, and Chris Stephens.

Chris Carlson also deserves high praise for the principles and data that drive the sonar model. His patient and repeated explanations of underwater acoustics and sonar integration theory were very much our inspiration and guiding light in this area.

The United States Naval Institute was the major source of our platform photography for the Harpoon-II database. Special thanks go to Photo Archivist-extraordinaire Mary Beth Straight, who knows her stuff when it comes to ships, subs, and aircraft! We strongly recommend to anyone interested in professional naval and maritime issues or affairs look into a membership with this organization. Their monthly periodical "Proceedings" is one of the few items we actually wait by the mailbox to receive, and fight over when it arrives. Information about joining the USNI can be found in the back of this manual. Join today and support an outstanding professional organization!

Introduction

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Harpoon3

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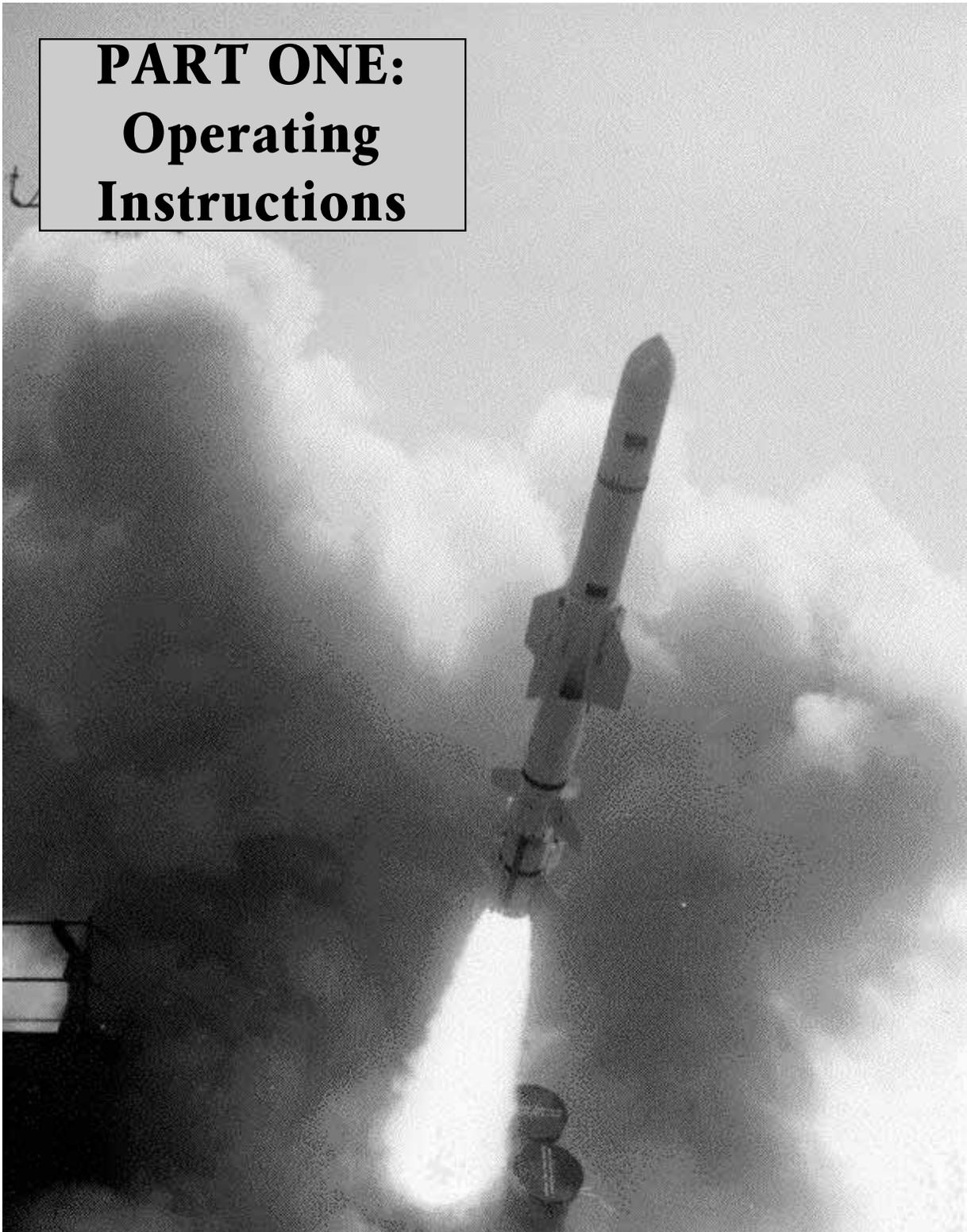
Welcome Aboard!

You are about to take command of the awesome power of modern naval and air forces. If you are new to Harpoon then there is much to learn to successfully command these forces under the most difficult scenarios. If you are a seasoned "Harpooner," we believe we have put together an experience that, like the first computer Harpoon, will provide you with thousands of hours of entertainment and challenging modern conflict. **Harpoon3** has plenty of things the veteran Harpoon user will find familiar, and yet there are many new features that will demand both your attention and newly acquired familiarity.

Not Just a Game

This is more than just a game. It is a simulation that accurately represents the capabilities and limitations of modern naval and air forces. A painstakingly detailed labor of love went into providing **Harpoon3** with the most accurate data that can be obtained from open or unclassified sources. You will not find another entertainment product on the market that has the amount of data contained in the **Harpoon3** database.

Flexibility of Interface

One of the most striking things about **Harpoon3** is the use of a windowing interface. Using this interface will provide you with the flexibility to arrange the layout of your tactical display suit to your own particular needs and tastes. You may choose to display either one or multiple windows at the same time. Each window can be re-sized or "iconized" for later viewing by a simple double-click of the mouse. Each window has its own display preferences settings so you can have one window containing terrain and depth information, while another window displays weather information. There are many combinations available. There is an enormous amount of information in a **Harpoon3** scenario; the unprepared may easily become overwhelmed. Your use of the interface to create a screen layout will make obtaining and managing the information easier. The interface gives you the versatility to customize the game display and set the level of detail that best suits your style of play and the tactical situations at hand.

Do your Homework!

The dedicated efforts of many people went into making this product the most accurate and exciting simulation you can run without security clearance. **Harpoon3** is not difficult to play. It is, however, a challenge to play **Harpoon3** well. While we want you to start enjoying the experience right away, we heartily recommend taking some time to become familiar with the manual before you set sail for the new challenges that await you. You will be a more proficient commander if you log a few hours doing the head work necessary to be the cool, confident, modern commander required to meet the contingencies and conflicts found in **Harpoon3**. As mentioned above, with the vast amount of information that you will receive as you command your forces, it is not uncommon to become over-whelmed. The greater your familiarity with the interface, and the custom features it offers, the better prepared you will be to lead your forces to the successful completion of the mission objectives.

About this Manual

This manual is divided into two parts. **Part One** contains the *Operating Instructions.* These instructions include both the Tutorial, and the Descriptive Instructions. Both provide detailed information on how to use the **Harpoon3** interface. **Part Two** is the *Guide to Naval Warfare.* This guide is a comprehensive reference source that will give the user an orientation into the complexity of modern naval warfare.

Included in the *Operating Instructions* is a step-by-step tutorial that will get you up and running **Harpoon3** by taking you through a series of basic scenarios. The tutorial will give the user the opportunity to become familiar with utilizing the interface, commanding units, and using the vast platform database to make informed tactical decisions.

It is recommended you take a moment to, at the very least, read through the tutorial to become familiar with the interface and the use of the toolbar. The tutorial has been designed to provide you with a working knowledge of the most important basic commands. Veteran

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Harpoon users should not view using the *Tutorial* as a "demotion," instead it is a wise investment of your time and will make you a better commander.

After you have read through the *Tutorial,* you may then decide whether you desire to actually run the tutorial scenarios or skip them and dive into the first tactical scenario. We recommend reading the *Guide to Naval Warfare* at your leisure, using it to hone your tactical skills. The Guide was written by a former Naval Officer with years of experience. Investing the time in study could make the difference once you find yourself on the simulated high seas.

For the PC User

For the PC, most of the **Harpoon3** interface can be utilized with your mouse and the toolbar. All mouse clicks described in this manual refer to a click with the left mouse button. The only exception is the use of the right mouse button to center the map display on whatever point you click using the right mouse button. In addition to the toolbar, major commands can also be given using the keyboard. A guide to the keyboard commands can be found on the **Harpoon3** Command Card. In addition, 'PC Only' symbols are placed in the manual next to items that apply only to those users with a PC version of **Harpoon3**.

For the Macintosh^{tm} User

For the Macintosh^{tm}, most of the **Harpoon3** interface can be utilized with your mouse and the toolbar. The only exception is the use of the **Option** key and the mouse button simultaneously to center the map display on whatever point that you click. In addition to the toolbar, major commands can also be given using "hot keys"; individual or combination keys on your keyboard. A guide to the keyboard commands can be found on the **Harpoon3** Command Reference Card. Also, 'Mac Only' symbols can be found next to items that apply only to those users with the Macintosh™ version of **Harpoon3**.

PC Only symbol

Macintosh Only symbol

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Attention New Harpoon User!

Welcome to the exciting world of modern naval warfare. We hope you enjoy **Harpoon3** and that you too will find yourself spending many hours commanding contemporary naval and air forces. To be a successful **Harpoon3** commander, it is important for you to invest time to become familiar with how the interface for **Harpoon3** works. Just as important is learning the tactics required to bring about the successful completion of the missions that await you. Because **Harpoon3** is a complex simulation, learning how to access and use the information that will be made available to you as you play is paramount to your success. Be sure to familiarize yourself with how to give commands to your forces. Modern naval warfare is often described as "hours of boredom, interrupted by moments of stark terror." Use those "hours of boredom" to improve the flow of information or "intelligence" required to make your "Commander's estimate of the situation." Doing this will better prepare you for when those "moments of stark terror" arrive. And trust us, those moments are going to arrive!

View yourself as a naval officer assuming a new command. Become familiar with your forces. Know your capabilities. Equally important is becoming familiar with the capabilities of the enemy. **Harpoon3** provides an extensive platform database containing detailed information about the capabilities of every platform (surface vessel, submarine, or aircraft) used in the game. In **Harpoon3**, as in real life, it is often true that victory goes to the commander that "gets there first with the most." A successful commander has to also know how and when to use "the most." Before using your firepower, it is wise that you have the best information about your situation and the situation(s) surrounding you. Those familiar with current events know this may mean the difference between destroying a threatening enemy contact or shooting down an unarmed civilian airliner.

For New and Veteran Harpoon Users

If you are a veteran of the first computer Harpoon we believe you will be very pleased with what we have accomplished with **Harpoon3**.

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Besides the interface, another noticeable feature of **Harpoon3** that differs from its predecessor are the maps. The maps in **Harpoon3** are vector-generated and are based upon data obtained from a variety of government agencies from several nations, including the Central Intelligence Agency, the Defense Mapping Agency, and the National Oceanic and Atmospheric Administration. These maps are very accurate and when future BattleSets and the **Harpoon3 Scenario Editor** are released, players will see even more versatility from the **Harpoon3** mapping routines. We are no longer limited to one specific region of the world as was the case in each of the original computer Harpoon BattleSets.

The database for **Harpoon3** is extensive. Every ship, submarine, aircraft, weapon, and sensor in the database is made up of individual propulsion, mount, and warhead components. The entire database is cross-referenced so that the database of available platforms for the **Harpoon3 Scenario Editor** increases every time you purchase a new **Harpoon3 BattleSet**. We put a great amount of effort and planning into the **Harpoon3** database. To obtain the amount of data available to you in **Harpoon3** by other means would cost you thousands of dollars and take hundreds of hours of research.

The data is used by the complex and realistic modeling to determine movement, sensor detection and performance, weapon effectiveness and the adjudication of hits, damage, and kills.

Weapons and sensors are not the only things modeled in **Harpoon3**. Nature itself is part of the **Harpoon3** modeling. Realistic weather conditions are represented in the simulation as wind & sea state, precipitation, and cloud cover.

Harpoon3 introduces the use of neutral and unknown contacts. Unlike the first computer Harpoon, you will now make contact with other platforms (a platform is a ship, aircraft, or submarine) but will not know their identity unless you improve your visual or electronic means of detection. Many of the scenarios contain neutral civilian ship and aircraft traffic that may be operating in your area. This adds a degree of realism and will challenge your decision-making process.

You will find there is less "micro-management" required in **Harpoon3.** Your ships, subs, and aircraft can be assigned to missions providing them with mission profiles that are based upon their abilities and the threat situation. This allows you to give the orders and watch what happens. Of course, you can intervene at anytime and give orders to individual platforms as you see fit.

We have also introduced logistics elements to the game. You can no longer expect to have an unlimited supply of ordnance and fuel. If your aircraft land at a base that does not have the type of ordnance your planes require then they will probably just be making a fuel stop. Conventional ships (non-nuclear powered) can now be refueled and replenished at sea. Fuel and ordnance supplies are not unlimited and are factors to be considered during operations. For air operations, the capability for aerial refueling has been included with **Harpoon3**.

Interface Basics

In order to make **Harpoon3** easier to use, we gave it a windowing interface. If you are familiar with windowing interfaces (like Microsoft‑ Windows™ or Macintosh™ interfaces), you might want to skip this section. If you haven't used windowing interfaces before, read on.

Menu Buttons

Buttons are raised areas (actually, they are drawn to look raised) on the screen. They generally represent options available to you within that window or box. For example, the only button in some dialog boxes is the one labeled **OK**, because all you can do is acknowledge that you have received the information. By contrast, the zoom map windows have multiple buttons to control game functions.

Toolbar Buttons

Each map window in Harpoon3 has a row of colored buttons along the top of the map. These toolbar Buttons are used to issue a variety of orders to your groups, units, or bases as well as provide visual information for each map. Use of each toolbar Button differs slightly. Each button will be explained later in this manual.

Toolbar Buttons

Radio Buttons/Check Boxes

Many of the dialog boxes and windows in Harpoon3 use radio buttons and check boxes to enable certain game options. Unlike Menu and Toolbar buttons, Radio buttons and Check boxes have two states: selected and non-selected.

Menu Button

*Radio Buttons
Check Boxes*

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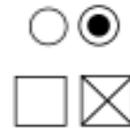
Mouse Basics

In the interest of making the rest of this manual easier to read, we need to define a few basic mouse concepts.

Click

When we talk about a mouse click, we mean quickly pressing the mouse button and letting it go. In **Harpoon3** (and other windowing applications), this is generally the method for selecting an item from a menu or marking a point on a map. You don't need to worry about holding down the mouse; how long it takes to make the click doesn't matter. For the PC all clicks are made with the left mouse button with the exception of map centering which uses a right mouse click. Macintosh™ uses Option-click to center the map.

Double-Click

A double-click is two clicks as fast as you can do it. In **Harpoon3**, double-clicks serve several purposes. As in other windowing programs, double-clicking in a window's upper left corner closes the window (except on Macintosh™ computers, where one click will suffice). Most menu selections will allow you to double-click to highlight the particular selection and simultaneously select it, thus eliminating the need to hit another button such as an **OK** or **CANCEL** button. Also, double-clicking on a target finishes the targeting procedure for all appropriate functions (from assigning attacks to landing aircraft).

Drag

A drag is performed by holding down the mouse button and moving the mouse to a new location. Generally, this operation is used for making a user-defined box (like a Zoom Map - see below) or drag-selecting several units. A Drag can also be used to move an Icon or a Window, both of which will be explained in detail below.

Mouse Pointer

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The mouse pointer (generally an arrow) changes shape at different times to indicate different modes. Thus, when you are choosing a target for an attack, the mouse pointer will look like a targeting crosshair, while at other times it will be the traditional arrow, a pointer finger, or one of several other possibilities.

Mouse Pointers

Hot Keys

Although the use of a mouse is required to play **Harpoon**3, many commands and options may be selected using the keyboard. Throughout this manual the use of individual keystrokes and combinations of keystrokes are referred to as "hot keys." Some of the hot keys differ between PC and Macintosh™. The **Harpoon3** Command Card has been provided with a list of every hot key and toolbar button. Please review this card to become familiar with the hot keys for your type of computer.

Windows

A window is a rectangular area of the screen bounded by a border. To differentiate it from a box, a window is sizable (that is, you can change its size).

Window Size and Re-sizing

To change the size (and shape) of a window, move the mouse cursor to the edge of the window; when the cursor changes to a split arrow, hold down the mouse button and drag the edge of the window to where you want it. You can also change the size of a window by clicking on the up arrow in the upper-right corner; doing so will enlarge the window to its maximum size. If you want to restore a window to its former size after you've enlarged it, click on the button in the upper right corner with both up and down arrows. Note that when changing the size of the Main Map window it will stay proportional at all times since it represents the entire scenario map area. Zoom and Tracking windows behave differently as you will see later in the tutorials.

Window

Closing Windows

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To close a window, double-click on the bar in the upper left corner. Note that there is no close button on the Main Map Window since it can't be closed.

Moving Windows

To move a window, move the mouse cursor to the title bar, hold down the mouse button, and drag the window wherever you would like the window placed. Release the mouse button when the window is in the area you desire. You should be careful about dragging a window too far off to the edge of the screen; once you do so, it will become difficult to manipulate it any longer. Also, if you encounter a situation where one window covers another there are five ways to gain access to the window "underneath":

> **• Close the covering window.**
> **• Move the covering window.**
> **• Send the covering window to an icon.**
> **• Click on a portion of the covered window to bring it to the front.**
> **• Use the Window pull-down menu and select the menu item in the lower portion of the menu list that bears the name of the window that is covered.**

Iconizing or Minimizing Windows

To reduce a window to an icon, click on the down arrow in the upper right corner. An icon will appear bearing the name that was in the title bar of the window. You can then drag this icon to some out-of-the-way spot for later use by clicking on it and dragging it to the new location.

 The Macintosh™ interface does not support the iconizing or minimizing of windows.

Icons

Icons are reduced, miniature windows that you can arrange on the screen to keep useful information out of the way but still at hand. For example, if you create a window around a unit to closely follow its course, you could then iconize that window and move the icon into a corner of the screen - nicely out of the way. When you want to see that window again, double-click on it to restore it to its former size and screen placement.

Icon

Enlarging Icons

To restore an iconized window, double click on the icon. The window will reappear in its original location.

Dialog Boxes

A dialog box is a fixed area of the screen bounded by a rectangle. Unlike a window, a dialog box is not sizable, and often it is not moveable either. In **Harpoon3**, dialog boxes give you information from your staff, allow you to give orders to your units, and allow you to modify game settings like time compression.

Dialog Box

Selecting

To do almost anything in **Harpoon3**, you have to select some item (a window, a unit, a menu choice, etc.). To select an item, move the mouse cursor to that item and click the mouse button once.

Selecting Multiple Items

A special case of selecting items is **Harpoon3**'s ability to allow you to select multiple items (units, groups, bases, and reference points). **Harpoon3** allows you to use two methods of selecting multiple items. First, you may drag a rectangle around all the items in an area; all of the items will be selected (though only appropriate ones will be included in the action). Second, you can use the mouse pointer and the shift key to select multiple targets. To do so, hold down the shift key and click on each item you want to select; then double-click while holding the shift key down on
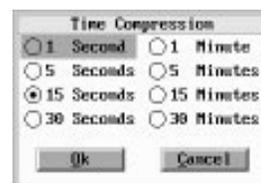
the last item. This method is useful for selecting some items in a crowded area with many items (units, bases, or reference points). Shift-click can also be used to deselect individual items as well.

TUTORIAL

Tutorial

The **Harpoon**3 **Tutorial** has been designed to take you through a series of lesson scenarios. These lessons will familiarize you with the interface while demonstrating how to use each command and menu function in **Harpoon3**. The **Harpoon3 Tutorial** is a wise investment of your time. We understand that you are anxious to start playing and we have designed the **Tutorial** so that you may learn while you play.

Running Harpoon3

If you have not already installed **Harpoon3**, we recommend you do so now. Consult the Installation Instructions. Begin the lessons by running the **Harpoon3** executable file. **Harpoon3** was installed in either the HARPOON2 sub-directory for PC, or the HARPOON3 Folder for the Macintosh™. Once **Harpoon3** has loaded and the title screen and credits have passed, you will see the BattleSet/Scenario Selection Screen. This screen is used to select the BattleSet and scenario you wish to play during the current **Harpoon3** session.

Selecting the Tutorial

Select the Tutorial by placing the mouse cursor on the word "Tutorial" and clicking with your left mouse button

Macintosh™ users simply click the single mouse button.

Tutorial Scenarios

Once you have selected the Tutorial from the Scenario Selection dialog box, you will see a set of Lesson Scenarios displayed to the right side of the dialog box. Each of these lessons focuses on a particular series of commands and functions in **Harpoon3**.

 The following are the Tutorial Lessons for **Harpoon3**:

Lesson I:	**Orientation**
LessonI I:	**Course and Speed**
LessonI II:	**Using Sensors**
Lesson IV:	**Using Weapons**
Lesson V:	**Submarine Operations**
Lesson VI:	**Air Operations**
Lesson VII:	**Using the Mission Editor**
Lesson VIII:	**The Formation Editor**

Loading a Scenario

We will start with *Lesson I: Orientation*. Select the first scenario of the tutorial by either double-clicking on the scenario name or by clicking once on the scenario name and then once on the **OK** button located in the lower left area of the Scenario Selection dialog box.

Scenario Load Status

While the scenario is loading watch the **Incoming Message Window** to see the various portions of the scenario as they are loaded into the computer's memory.

Cross Platform Loading and Saving

Harpoon3 supports cross-platform loading and saving. Scenarios and saved game files can be opened and saved on either the PC or the Macintosh™. NOTE: Attempting to load a game saved from a scenario that was part of a Battleset you do not own will produce unpredictable results.

Choosing Sides

Once the scenario has loaded, you will be asked to choose sides. Click on **Good Guys.**

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Setting Difficulty Level

Press the Difficulty button to set the level of difficulty for the scenario you will be playing.

On the PC, You have four choices:

- **Easy**   **Beginner settings**
- **Average**   **Novice settings**
- **Hard**   **Expert settings**
- **Default**   **User defined settings**
- **Custom**   **Modifies difficulty settings**

The initial setting for Harpoon3 is **Default.** For this tutorial select **Easy** and then **OK**. A more detailed explanation of Difficulty Levels and how to customize your default settings can be found in the Reference Section.

On the Macintosh™ version there is a Difficulty Settings dialog box that allows you to toggle the individual difficulty settings. Selecting **OK** saves those settings to a preferences file, which will then be used each time the game is played.

Custom Difficulty Settings

Detection Settings:
- ◉ Show All
- ○ Auto ID
- ○ Auto Side ID
- ○ Auto Datalink
- ○ Full Reality

☐ Enforce Real Time
☐ Use Aircraft Logistics

Staff Handles:
- ☒ Navigation
- ☒ Weapon Allocation
- ☒ Threat Axes
- ☒ Formation
- ☒ Form Air Patrol

[Cancel]   [OK]
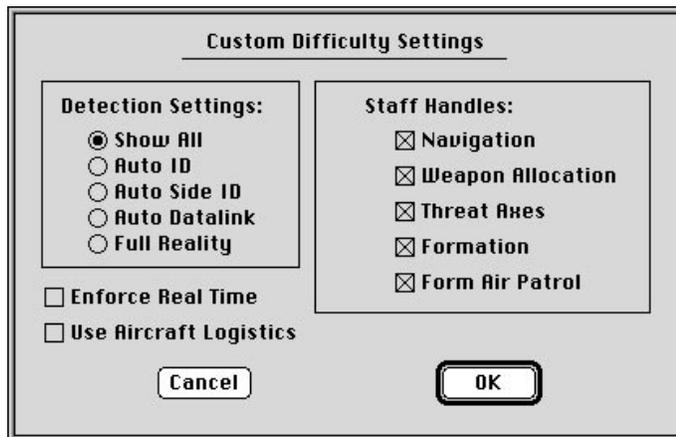
Macintosh Difficulty Settings Dialog box

Viewing Orders

After selecting your side and setting difficulty level, it is time to review your orders. Take a moment to read the scenario orders on the right side of the Side Selection window. You can use the scroll bar at the side of the orders window to read all of the orders. These orders can also be viewed at anytime while you are playing the game. Once you have reviewed your orders, click on **OK**.

Lesson I: Orientation

Now that you have selected your side, examined your orders, and the scenario has been loaded, it is time to become familiar with the **Harpoon3** screen and the components of the interface.

Main Window

The Main Window depicts the entire map area of the scenario. In the Lesson I scenario the Main Window is currently in icon form and labeled **"Lesson I."** Go ahead and double-click on the icon. The window will expand and the entire map area will be displayed. For this first Tutorial scenario the only map features that are active are the coastlines and a single unit symbol. The unit represented here is the USS *Lewis B. Puller*. We'll learn more about the *Puller* later in this lesson.

Map Preferences

Let's go over the components of the map. The map area itself is where the ocean, coastlines, groups, units, and bases are displayed. At the top of the display area is a toolbar containing the buttons used to issue orders to your units or change the window's features. To activate the various display options, click on the toolbar button marked **PREF**. This is the Map Preferences button and will display an options screen with a variety of display options which may be selected.   It is important to note that you may set a combination of display preferences in each individual window. Each window may have an independent set of preferences. Use this feature to create windows containing a variety of display information. Let's try out the various Preferences. Go ahead and select the **PREF** toolbar button from the Main Window. The **Map Preferences** box should now be in the center of your screen.

PREF Toolbar Button
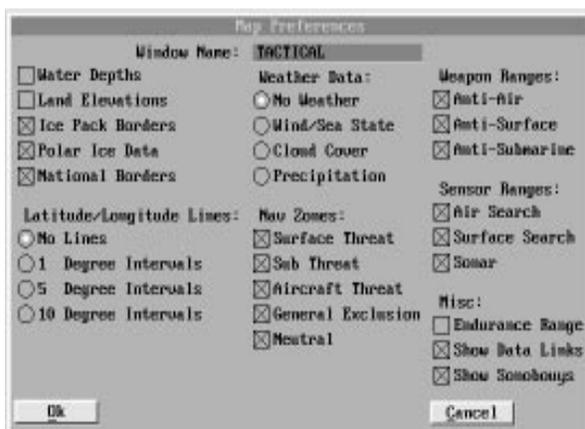
Map Preferences Dialog Box

Window Name

To change the name you see displayed in the title bar of a window, click on the text field containing the current window name and type the name you desire.   Go ahead and change "Lesson I" to "Lesson One" or to whatever you want to name the window. You can change the window names to whatever you want during a game to keep track of various areas, units, or groups. Be aware that large window names will not be practical when you have the map window in icon form. Use small names or abbreviations when naming windows.

Water Depths

Water depths are represented by colored tick marks every 30 minutes of map distance. This is one-half degree or 30 nautical miles at the equator. The water depth scale is represented for three levels, sea level to 10 meters, 10 to 100 meters, and 100 to 1000+ meters. Select Water Depths and click on **OK**. You should now see colored tick marks representing the various depths of the ocean represented on the map. Go ahead and click the **PREF**

button again to return to the Map Preferences window. Click the Water Depths selection so it is turned off.

Land Elevations

Land elevations can be displayed in 500 meter bands starting at sea level (0 meters) and going up to 2500 meters. Each band can be represented by a colored tick mark. Like water depths, tick marks are placed in 30 minute intervals on the map. The color of the tick mark indicates the elevation for that particular area on the map. The size of the tick mark will depend on the size of the map area represented by the map window and the level at which the map is magnified. We will learn more about changing the magnification level of the map and how to determine the various altitude colors later in this tutorial. For now, select the Land Elevations box and click the **OK** button. You should now see various colored tick marks representing the elevations of the land masses on the map. Go ahead and click the Map Preferences button again to return to the Preferences window. We are going to leave the elevations off for now while we look at some other display features. Click the Land Elevations selection so it is turned off.

Ice Pack Borders

To display the polar ice pack borders, click on the Ice Pack Borders selection. The ice packs will only be displayed in scenarios taking place close to the polar regions of the world. Surface ships cannot traverse across polar ice. The ice packs are represented on the map as a line similar to coastlines. Think of it as a variable coastline which changes with the seasons. Because this scenario does not take place in a polar region, ice packs can not be viewed from this first tutorial scenario. Leave this selection off (no "X" in the small square) for now.

Polar Ice Data

Polar Ice Data is provided every half-degree of map distance. When this selection is ON, the entire area defined by the Polar Ice Borders will be displayed. Leave this selection off for now.

National Borders

To display national borders on the map click on this item in the Preferences window. The selection is active if there is an "X" in the small square. Borders are represented as lines within the land masses on the map. Select this box and click on the **OK** button. You should notice there are now several lines representing borders on the land masses. Now select the **PREF** toolbar button again to bring back the preferences listing. You can leave the borders on or off, the choice is yours.

Latitude & Longitude Lines

Latitude and longitude can be represented on any map. You can choose to have no lines, or lines at either 1, 5, or 10 degree intervals. Go ahead and try it out. When you have finished looking at the lines, select No Lines to avoid cluttering the screen as we examine other aspects of the display.

Weather Data

Harpoon3 contains a global weather model that creates the weather conditions most likely to be found in the geographic region in which the scenario takes place. The following weather display choices are available:

No Weather

No weather information will be displayed on the map.

Wind & Sea State

Color coded tick marks similar to the land elevation and depth information will be displayed. The colors vary with the speed of the wind in each half degree interval.

Cloud Cover

The color tick marks represent the type of cloud cover in a given area. The categories for cloud cover are clear, scattered, partly cloudy, and overcast.

Precipitation

The color tick marks represent nine categories of precipitation. The categories include three levels of fog, three levels of rain, and three levels of snow. No precipitation is present if no tick marks are displayed.

Nav Zones

Navigation or "Nav" Zones are areas that you can designate as off-limits to all or some of your units. We will explore how to create and use Nav Zones later in the tutorial. For now, we are interested in the types of Nav Zones and how to display them on the map.

Surface Threat

A Surface Threat Nav Zone will exclude all surface ships from entering the zone. Aircraft and submarines are unaffected by this type of Nav Zone. You may create, modify, or delete this type of Nav Zone.

Sub Threat

A Sub Threat Nav Zone will exclude all submarines from entering the zone. Aircraft and ships are unaffected by this type of Nav Zone. You may create, modify, or delete this type of Nav Zone.

Aircraft Threat

An Aircraft Threat Nav Zone will exclude all aircraft from entering the zone. Submarines and ships are unaffected by this type of Nav Zone. You may create, modify, or delete this type of Nav Zone.

General Exclusion

A General Exclusion Nav Zone will exclude all units, aircraft, ships, and submarines, from entering the zone. You may create, modify, or delete this type of Nav Zone.

Neutral

Similar to a General Exclusion Nav Zone, a Neutral Nav Zone will exclude all units, aircraft, ships, and submarines, from entering the zone. You may NOT create, modify or delete a Neutral Nav Zone. Most Neutral Nav Zones will be created when the scenario is designed and will be present from the start of the scenario.

To display the various Nav Zones, you would select each one so an "X" appears in the boxes. There are no Nav Zones in this first lesson. We will explore their use later in the tutorial.

Weapon Ranges

To display the approximate ranges of your weapons, place an "X" in the boxes next to the following:

Anti-Air Warfare (AAW)

Displays a ring depicting the approximate range of the farthest reaching AAW weapon for each platform.

Anti-Surface Warfare (ASuW)

Displays a ring depicting the approximate range of the farthest reaching ASuW weapon for each platform.

Anti-Submarine Warfare (ASW)

Displays a ring depicting the approximate range of the farthest reaching ASW weapon for each platform.

Once you have all the items selected with an "X", click on the **OK** button. You should see several colored rings around the *Puller* representing the approximate ranges of its weapons.

Sensor Ranges

To display the approximate ranges of your sensors, place an "X" in the boxes next to the following:

Air Search

Displays a ring depicting the approximate range of the farthest reaching AAW sensor for each platform.

Surface Search

Displays a ring depicting the approximate range of the farthest reaching ASuW sensor for each platform.

Sonar

Displays a ring depicting the approximate range of the farthest reaching ASW sensor for each platform.

Once you have all the sensor items selected with an "X", click on the **OK** button. Since we do not have any sensors activated, the only sensor range circle that you should see is the *Puller's* passive sonar.

Range Rings and Groups

Range rings are not displayed while in group view. To view approximate range rings, make sure all desired display options are set in the Map Preferences dialog box, then press the Unit View hot key.

Data Links

Data Links are used to relay communications, sensor, and contact information between platforms. Data links can only be established between units with operational communications equipment that are in range of one another. A data link provides the ability to "see" things from the point of view of another platform.

Think of a data link system as a network of sensors and communications equipment. If you select the Data Links selection, the links will be represented by thin lines between the data link capable platforms on your side. We will take a look at data links later in the tutorial when we have more platforms on the map. Go ahead and leave the Data Link selection on.

Show Sonobuoys

Place an "X" here to display individual sonobuoys on the map. Sonobuoys are dropped into the water by Anti-Submarine aircraft and have their own sensor range circles and data link lines. Because many sonobuoys on the screen can clutter the view, it is a good idea to only use the Show Sonobuoys display option in windows that are being used for ASW operations.

Endurance Range

Place an "X" here to show the approximate range each platform has based upon its current fuel state. The endurance circle for the *Puller* is very large so it will not show up on your map, so we will not select it at this time. Endurance circles for aircraft are more noticeable as they have much shorter ranges and use fuel at a faster rate than either ships or submarines.

Tutorial Settings

For the purposes of this tutorial you should have the following settings for Map Preferences:

Water Depths:	**OFF**
Land Elevations:	**OFF**
Ice Pack Borders:	**OFF**
Polar Ice Data:	**OFF**
National Borders:	**OFF**
Latitude/Longitude:	**NO LINES**

Weather:	**NO WEATHER**
Nav Zones:	**All OFF**
Weapon Ranges:	**All ON**
Sensor Ranges:	**All ON**
Data Links:	**ON**
Show Sonobuoys:	**ON**
Endurance Range:	**OFF**

*Zoom Window
Toolbar Button*

Creating Zoom Windows

A Zoom Window can be created by first clicking on the Zoom Window toolbar button. The mouse cursor should now resemble a "+". Place the mouse cursor at any location on the Main Map area and drag a box as you hold the mouse button down. Once you release the mouse button, a new map window will appear. The new window is a Zoom Window labeled "Zoom Map 1." Note this new window has its own toolbar buttons. A Zoom Window will have the same preferences as the map from which it was originally created. If you wish to have different settings, use the Map Preferences button (PREF) for this new window to give it its own display parameters. Click on the PREF button in this new Zoom Window and rename it "Tactical View". Now grab the corner of Tactical View zoom window and stretch the window so it's big enough for you to see all of the toolbar buttons for this window. Unlike the Main Map window, zoom windows do not stay proportional and can be stretched to any size without distorting the map.

Centering the Screen

Since the map area displayed in the new Zoom Window is smaller than the Main Map, you can move around within the map and center it on any location. To center the map place the mouse cursor on the point you wish to designate as the new center of the map and click the right mouse button for PC or Option-click for Macintosh™. The map should now be centered on the point where you clicked. Try it by clicking around and making various points on the map the center. This

Zoom In/Out
Toolbar Buutton

is a rapid means of traversing across the map surface in any direction.

Zoom In & Out

The new window has three toolbar buttons that were absent from the Main Map. The first two buttons are Zoom In and Zoom Out. Use these buttons to magnify or expand your view in the map. Try clicking the Zoom In button three times and watch what happens to the view in Tactical View. It should zoom in towards the map. Now click on the Zoom Out button three times. Doing this should have expanded the view back to where it was prior to using the Zoom In button. Go ahead and center the map on several areas using the center map feature described above and use the Zoom In and Zoom Out buttons to change the magnification of the view. For example, try centering the map on a coastline and then zoom in and out or center on the *Puller* and change the magnification. When you are comfortable with how these two buttons function, center the map around the *Puller* and zoom out enough to where you can see the *Puller* and some of the coastlines.

Tracking Window
Toolbar Button

Creating Tracking Windows

Another toolbar button not found on the Main Map is the Tracking Window button. A Tracking Window allows the user to select a unit or group and center the map screen continuously on that unit or group. This means the window will keep the selected unit or group in the center of the window as it moves across the map. To create a Tracking Window, select the *Puller*. Next, click on the Tracking Window toolbar button. This should center the window on the *Puller* and the title bar for the window should now read "Tracking." You can use the PREF button to rename the window whatever you choose. Go ahead and name the window "Tracking USS Puller." A Tracking Window can be changed back into a regular Zoom Window by clicking on the Tracking Window toolbar button again. Try it now. As you can see, the window returns to a normal zoom window and if you select tracking window again, the map centers on, and follows, the *Puller*. You will have to rename the tracking window each time you go from a tracking window to a normal zoom window. Go ahead and rename

the window "Tracking USS Puller."

Additional Window Types

There are a variety of windows used by the **Harpoon3** interface to display information. We have already learned about the map windows, now we will take a look at the other types of windows that can be displayed using the **Window** pull-down menu.

Game Status Window

The Game Status Window provides you with the current game time, and time compression ratio. In this tutorial scenario the Game Status Window is already active. If it had not been, you would have needed to select Game Status Window from the **Window** pull-down menu. The Game Status Window can be moved anywhere on the screen. To display the Game Status Window after it has closed, use the **Window** pull-down menu selection and select Game Status Window. As you can see, the current game time is 12:00 noon on January 1, 1994 and the game is currently paused. The time is displayed in Greenwich Mean Time (GMT) which is also referred to as "Zulu" time.
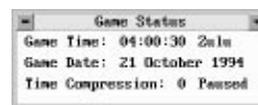
*Game Status
Window*

Zulu Time

Zulu time is used as a standard time reference for aviation and maritime navigation. GMT (Greenwich Mean Time) is named for Greenwich, England, the location of the Royal Observatory which the Prime Meridian (zero longitude) passes through. Using Zulu time puts all aviators and mariners in the same time zone regardless of their geographic location. Although your forces may be operating using Zulu time, the light conditions due to the position of the sun depend on the location. For example, if you are operating off the coast of Japan and it is 12:00 Zulu (noon GMT) it will still be night where you are located as the local time will be in the evening.

Unit Status Window

The Unit Status Window contains information relating to the

Unit Status Window

current unit or group that is selected. The unit Status Window is already active in this tutorial scenario so we do not need to use the **Window** pull-down menu to create it. If the Unit Status Window was not active, you would need to select Unit Status Window from the **Window** pull-down menu. Go ahead and select the ship symbol in the middle of the main window. The Unit Status Window should now show you that the selected ship is the USS *Lewis B. Puller*, an *Ingraham* class guided-missile frigate, operating on the side of "The Good Guys." The *Puller* has a speed of 5 (creep) and has no damage. The current endurance in hours and the current Emission Control (EMCON), state is displayed. The *Puller* is not currently assigned to a mission and awaits your orders. Had the *Puller* been an aircraft, submarine, or unknown contact, the Unit Status Window would differ slightly. We will note the differences for these other types of platforms later in the Tutorial. There are two buttons in the Unit Status Window, the Database button and the Report button.

Database

Finally, click on the Database button. Selecting this button brings up the Platform Database entry for the USS *Puller*. You can also view the platform database by selecting the Platform Display selection from the **Window** pull-down menu.

Database Display

Platform Selection Buttons

You can view detailed information on ships, weapons, subs, aircraft and facilities by clicking on the corresponding button in the database window. Press Show All (or Show Selected) to toggle between the currently selected unit and all of the items in the Harpoon3 database.

Sensor and Mount Data

It is possible to view weapons and sensor information by clicking the corresponding Sensors and Mounts buttons on the database window. Close these windows by double-clicking the button in the upper-left corner.

Platform Text

Scroll through the data text for the *Puller* to learn more about its specifications and to read a brief description of the *O.H. Perry*-class guided-missile frigate.

Displaying Platform Image

Platform Image

To view a diagram and photograph of the *Puller*, click on the Picture button in the lower right corner. A window containing a line diagram and photograph of the ship class will appear on your screen. This window is dependent on the database window. The image window will remain until you double-click in the upper left corner or close the database window. Closing the image window will not affect the platform database window.

Report

Click on Report in the Unit Status window for detailed information about the current unit or base selected. The Report provides more detailed information than the Unit

Status window. Go ahead and click on Report. You will see sections of the Report window listing the weapons and sensors available to the *Puller*. You can use the scroll bar at the side of each section to view the entire weapon and sensor list. Go ahead and close the Report when you have finished reading it.

Order of Battle

Click on the Order of Battle selection in the **Window** pull-down menu to produce a listing of all the groups, units, and bases that are currently under your command. Close the Order of Battle box when you are finished viewing it.

Legends

There are four legends to provide you with information about symbols and colors used to represent units & groups, map components, sensors, weapon ranges, and weather. Go ahead and select Legends from the **Window** pull-down menu and then select each of the following from the Legends sub-menu:

Symbol Legend

A legend depicting the symbols that represent various unit, group, base, and other "game pieces."

Map Legend

A legend depicting the colors used to represent various elevation, depth, weather, and Threat Zones.

Tactical Legend

A legend depicting the colors used to represent various sensor & weapons ranges, as well as contact status.

Weather Legend

A legend depicting the colors used to represent various weath-

er-related information.

System Memory Remaining

To view the amount of system memory **Harpoon3** is using at anytime select Memory Remaining from the **Window** pull-down menu. Go ahead and select it now. This selection will provide you with the following information about memory being used by Harpoon3:

- **Memory available at the start of the scenario.**
- **Memory used by the interface.**
- **Memory used by the game engine.**
- **Largest block of memory left.**
- **Total memory left.**

System Memory Window

On the PC, these values will probably be larger than the actual amount of system RAM present in your computer. Harpoon3 implements virtual memory which uses some of your hard drive when required.

Incoming Messages Window

This is where text information is presented. This window is already active for this tutorial scenario. Information about contacts, threats, and your own Damage Control will be displayed in this window. The location and size of the Incoming Messages window is up to you. It will appear at the bottom of the screen before and during the process of loading a scenario. After the scenario has loaded, the Incoming Messages window may appear in another location or may not appear at all, depending on how the scenario screen layout was saved when the scenario was last exited. You can also re-size the Incoming Messages window to your liking. The following information is displayed in the Incoming Messages window:

Incoming Messages Window

Range and Bearing

If you select Toggle Rng/Bearing and click on it so that it reads

[ON] from the **Settings** pull-down menu, the range and bearing between mouse clicks on any map window will be displayed in the Message Window. Altitude/depth and lighting conditions are also provided for each point. Go ahead and select the **Settings** pull-down menu and click Toggle Rng/Bearing so it reads **[ON]**. Now click anywhere on the map; do it several times and note the changes in range and bearing as you click. Once you are comfortable with the use of this feature, please turn it [**OFF]** until we need it later in the Tutorial. This feature may be toggled on and off with a hot key. Consult the Harpoon3 Command Card for details.

Scenario Load Status

The Message Window is the only window you will see on the screen as a scenario is loading. While a scenario is loading, it will indicate the various portions of the scenario that are being loaded into the computer's memory.

Platform Hit/Destroyed

When a platform is hit, sunk, or destroyed a text message will appear in the Message Window. If this event type is selected in the Game Settings then this text will also appear in a Staff Message Box.

New Contacts

When a platform is detected a text message will appear in the Message Window. If this event type is selected in the Game Settings then this text will also appear in a Staff Message Box.

Contact Change

When a contact is lost a text message will appear in the Message Window. If this event type is selected in the Game Settings then this text will also appear in a Staff Message Box.

General Information

General information regarding aircraft ready status, damage reports, mounts reloading, and other information will appear as text messages in the Message Window. If this event type is selected in the Game Settings then this text will also appear in a Staff Message Box.

Current Orders

You can review your orders at anytime by selecting Current Orders from the **Window** pull-down menu. The orders are identical to the ones you viewed earlier after side selection. It is not necessary to have the orders displayed during the game. If you desire, the Current Orders text can be reduced to an icon so that you can easily review them from time to time by double-clicking on the icon.

Scenario Info

You can review text information about the scenario you are currently running by clicking on Scenario Info from the **Window** pull-down menu. This information is identical to the Scenario Info available when selecting a scenario.

Display Features

The display features for Harpoon3 are very flexible. The user may customize the display by changing the colors used or selecting from one of two sets of symbols.

Colors

Harpoon3 provides the user with the ability to change the colors used to represent the interface, maps, and the game elements (such as symbols). There are three ways to change the colors but for the purpose of this tutorial we will only be covering one of them. Select Colors from the **Settings** pull-down menu. A sub-menu should now appear to the side of the **Settings** menu, click on Default Palettes. You will be given the following five choices:

> • **Aegis Display**
> • **Amber Display**
> • **OJ-663 Display**
> • **Greyscale Display**
> • **Conventional Display**

Go ahead and select Aegis Display. Doing this should change the map colors on your display. Now, try the other selections. The OJ-663 Display is the initial default setting for **Harpoon3**. For the purposes of this tutorial please reset the palette to OJ-663 before continuing with the tutorial lessons. More information about customizing and setting colors is contained later in this manual.

Choosing a Symbol Set

Select Symbol Set from the **Settings** pull-down menu. A sub-menu should appear offering the choice of either Stylized or NTDS symbols.

Stylized

Stylized symbols are more intuitively understood and are drawn to resemble various platforms. Because they are easier for new players to recognize, the stylized set is the initial default set for **Harpoon3**.

Stylized Symbols

NTDS

Naval Tactical Display System symbols are based upon the symbols used by actual military systems. **Harpoon**3 has been designed to resemble these actual military systems. To achieve true realism, users may consider learning and using the NTDS Symbology. After all, millions of your tax dollars went into the design of these symbols to make them easy to recognize. The **Harpoon3** Design Team invites you to learn these symbols and play Harpoon3 as realistically as possible. They were designed to convey information without relying on context. This is important when a screen is crowded with symbols, time-pressure is high, and you are approaching information overload. Users can instantly see the relations and capabilities of a threat presented by a symbol with a minimal amount of thought.

NTDS Symbols

Lesson Summary

That concludes **Lesson I: Orientation**. If you followed each step of the lesson you should now be familiar with each element of Harpoon3's interface. You also learned to move about a map and how to create Zoom Maps and configure them to display a variety of information. Now that we are finished with the first lesson, let's move on to the next lesson. Select the **File** pull-down menu and choose Load BattleSet. Once you have the BattleSet Selection menu up, go ahead and choose the Tutorial BattleSet and click on **Lesson3: Plotting Course & Speed.**

Lesson3: Course & Speed

After you have selected Lesson3, choose **Good Guys** as your side. Leave the Difficulty Settings as they are currently set.

You should now be looking at a display almost identical to the Lesson I. Once again, the USS *Lewis B. Puller* is the lone unit on the map. We will be using the *Puller* to become familiar with navigation procedures for **Harpoon3**.

Notice that there are three small "X's" located at various points on the map. These are Reference Points. We will be using them to assist us in our navigation lesson.

Showing Data Blocks

A Data Block is the text information displayed next to each unit, group, base, or reference point. Use the Show Data Blocks hot key to toggle the data block settings. There are three settings for Data Blocks:

> • **Data Blocks Off for all units.**
> • **Data Blocks On for all units.**
> • **Data Blocks On for the selected unit only.**

Go ahead and try it. Press the Show Data Blocks hot key several times and watch the map display. Also notice that the current setting is displayed in the Incoming Messages window. Data Blocks provide Unit/Group Designator (or name), course, speed, and when appropriate, altitude/depth. You should set Data Blocks On for all units for the remainder of this tutorial lesson.

Navigation Toolbar Button

Pencil Mouse Cursor

Drawing & Plotting a Course

Let's start by plotting a course to Reference Point 1. Select the *Puller* and then click on the Navigation toolbar Button. Your mouse cursor should now change into a pencil shape. Place the cursor at a point about one-third the distance from the *Puller* to Reference Point 1 and

click with your mouse button. A line should appear from the unit symbol to the point where you clicked the mouse. If a line does not appear, try the course tracks hot key that toggles the display of course tracks for all units, the selected unit, and no tracks at all. Consult the **Harpoon3** Command Card to determine the correct key for toggling the course tracks. Once you are looking at the line you just created, notice at the point the line ends there is a small circle. This circle is called a waypoint. Halfway between the unit symbol and the first waypoint is a small triangle, this is called a midpoint. We will examine both the waypoint and the midpoint shortly. For now, let's resume plotting our course to Reference Point 1. Go ahead and place the mouse cursor on a point that is two-thirds the distance from the *Puller* to Reference Point 1 and click on that spot. Another line segment with a waypoint and a midpoint should appear. Now let's finish our course. Place the cursor at a point just beyond Reference Point 1 and click. A third line segment, waypoint, and midpoint should appear. You have now finished drawing the course to Reference Point 1. We are finished plotting the course so we need to exit the navigation mode. Place the mouse cursor on the navigation toolbar button and click once. The Navigation toolbar button should come back up and your mouse cursor should now be back to normal (an arrow). After clicking on the toolbar button the Navigator now examines the course you have drawn and plots it. While you are in navigation mode, you are drawing the course and when you exit navigation mode, the course is actually plotted and assigned to the unit or group.

Moving a Waypoint

Suppose you want to change the course you just plotted. Let's examine how to edit our existing course. First, let's say that we want to change the location of the final waypoint of our present course. Start by clicking on the third waypoint. It should change color to indicate that it has been selected. Click on third waypoint and hold down on the mouse button to grab it. Now move the mouse to drag the waypoint to a new location. Notice the outline of the course segment from the second and third waypoints now appears as another color and moves as you move the mouse. Drag the third waypoint a short distance from its original location and release the mouse button.

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The course will change to the new location.

Inserting a Waypoint

To insert a waypoint between two existing waypoints, grab the midpoint between two waypoints and drag it to the place you wish to insert the new waypoint. When you release the mouse button a new waypoint, course segment, and midpoint are all created. Go ahead and create a new waypoint by dragging one of the midpoints a short distance from its present location and releasing the mouse button.

Deleting a Waypoint

To delete an existing waypoint drag it to an adjacent waypoint and release the mouse button once the waypoint is placed in the same position as another waypoint. Try deleting the waypoint you just created.

Editing a Course using the Navigation Mode

You can also edit a course with the Navigation Mode used earlier to create the original course. Select the second waypoint and then click on the Navigation toolbar button. The course from the second waypoint has been deleted. Since you are now in Navigation Mode, click on a new point near Reference Point 2. A new course segment should appear. Click on the Navigation toolbar button and this new course will be plotted. You can revise a course using this procedure from any waypoint including the current location of your unit or group. Clicking on the unit or group clears any other waypoint from being selected. When you have clicked on the unit or group you are now at waypoint 0. Waypoint 0 is constantly changing as it is the current location of the unit or group. If you click on the Navigation toolbar button while on waypoint 0, your entire course will be deleted. Be careful when using the Navigation toolbar button with a unit or group that already has a course plotted.

Using the Navigator

The Navigation routine used by **Harpoon3** (referred to as "Naviga-

tor") ensures that the course you have drawn does not violate Nav Zones and, in the case of ships and submarines, does not traverse land. When a course is drawn that would take a unit or group through one of the above mentioned regions, the Navigator will plot a course around the area.   Let's try it out. Select the *Puller* and then click on the Navigation toolbar button. Any previous course plotted is now deleted. Draw a course directly to Reference Point 3, even though the course goes right through land to reach the destination. Now, click on the Navigation toolbar button to plot the course. The Navigator will begin to work on plotting the best course around the land mass. This will take a few seconds, so don't be surprised if the course is not plotted immediately. If you look carefully you should see dotted lines appear as the Navigator evaluates several courses to reach the final destination. Once the Navigator has found the optimum path, it will complete the plot. You can now edit the course manually if you wish. Go ahead and keep the course to Reference Point 3 as we move on in the lesson to learn about setting speed.

***Speed/Altitude/
Depth Toolbar
Button***

Setting Speed

Ensure that you have selected the *Puller* (waypoint 0) and then click on the Speed toolbar button. A menu box will appear that allows you to set your speed to one of the following:

***Speed Selection
Dialog Box***

  • **Stop:** Engines disengaged, speed set to zero.

  • **Creep:** Engines engaged at low speed. Optimum passive sonar speed. Actual speed varies between ship and sub types.

  • **Cruise:** Engines engaged at intermediate speed. Optimum fuel efficiency achieved. Actual speed varies between ship and sub types.

  • **Full:** Engines engaged at high speed. Maximum speed available for sustained periods of time without suffering an engine casualty. Fuel consumption rate is greatly   increased. Actual speed varies between ship

and sub types.

- **Flank:** Engines engaged to maximum speed possible.
Fuel consumption rate is very high at Flank. To be used in
urgent or emergency conditions only. Actual speed varies
between ship and sub types.

Beside the above settings, a speed can be entered in the text block
provided with the Speed/Altitude/Depth menu box. Go ahead and
select the Cruise setting and click on **OK**. You have now set the initial
speed for the *Puller*.

Waypoint Orders

Certain orders can be preset to be executed upon reaching a waypoint.
For example, we can create an order for the *Puller* to change speeds
once it reaches the first waypoint. Let's try it. First, select the first
waypoint. Next, click on the Speed/Altitude/Depth toolbar button.
The same menu box that we used to set the *Puller's* initial speed will
appear. Choose Full and click on the **OK** button. When the *Puller*
reaches waypoint 1, it will change from Cruise to Full.

Nav Zones

Nav Zones were briefly covered in the last lesson so you should have
an understanding of the various types of Nav Zones. We are now
going to create a Nav Zone and see what effect it has on navigation.

Create a Nav Zone

Prior to creating a Nav Zone, make sure that you have Nav Zones
set to display from the Map Preference window. To create a Nav
Zone start by clicking on the Nav Zone toolbar button. Your
mouse cursor should change into a pencil cursor identical to the
one used while in navigation mode. Place the mouse cursor at a
point near waypoint 1 and start clicking and moving the mouse
around the waypoint. Draw a box around the waypoint with the
line segments created each time you click. When you reach the
point where you are ready to close the polygon you just created,

*Nav Zone Toolbar
Button*

click on the Nav Zone button again, the polygon will close automatically. A dialog box should appear with a variety of exclusion zones to choose from. Select General Exclusion A and hit the **OK** button. The line segments should change into one line making up the polygon with a small circle at the point where you first clicked to begin drawing the polygon. This circle is used to select the polygon to edit or delete it.

Editing a Nav Zone

Go ahead and select the circle. Note that when selected, the individual points you used to create the polygon appear. These polygon nodes can be moved and deleted exactly like the navigation waypoints. We will cover deleting a Nav Zone after we have used this particular Nav Zone to demonstrate navigation around and through it.

Navigating Around Nav Zones

Now that we have a Ship Exclusion Nav Zone around waypoint one, let's try to navigate through it. Select the *Puller* again, click on the Navigation toolbar button and draw a course through the Nav Zone you just created. The Navigator will plot a course around the Nav Zone in a manner similar to the way the course was plotted around land to Reference Point 3 in the earlier example.

Navigating Through Nav Zones

You may require that a unit ignore a Nav Zone because it is critical for the successful completion of the mission to get to a spot inside. To navigate through the zone, start by selecting the unit or group that you want to navigate through the zone. Next, double-click on the Nav Zone toolbar button. The menu box used to designate Nav Zone types will appear with an "X" in every type of Nav Zone that the selected unit or group currently respects. In our case, click on the General Exclusion A box to clear it and then click on **OK.** The selected unit will now ignore any Nav Zone that has this type. If the polygon has other types selected, the unit may avoid for those reasons. It is important to check and see if a Nav Zone has multiple

types before attempting to navigate through with the ignore feature. Try it out. Plot a new course through the Nav Zone you created earlier. The Navigator will now plot a course through this type of Nav Zone. To restore the original settings for the selected unit, simply repeat the process and place an "X" in the box as it was before.

Deleting a Nav Zone

To delete a Nav Zone, select the Nav Zone you wish to delete and then double-click the Nav Zone toolbar button. The Nav Zone type menu will appear again. Click on the "X" representing the selected Nav Zone type and remove it. This will delete the Selected Nav Zone. Go ahead and delete the Nav Zone you created earlier.

Run the Game

Go ahead and select Resume/Start from the **Settings** pull-down menu. The game will now start and the *Puller* will begin to move on the course plotted. As the game runs, you can edit the course at anytime. Go ahead and create or move a waypoint so that waypoint 1 is close to the *Puller*. Select waypoint 1 and click on the Speed toolbar button. Choose Full to give the *Puller* a speed change at waypoint 1 as we did earlier in this lesson. If you want, you can speed the time compression by hitting the "+" key on the number pad portion of your keyboard. To reduce the time compression rate hit the "-" key on the number pad. Watch either the speed setting on the Unit Status Window or the unit data block as the *Puller* approaches waypoint 1. When the *Puller* reaches waypoint 1 the speed will change to Full.

Lesson Summary

You should now be familiar with how to draw and plot courses and assign speed settings. Go ahead and experiment with setting course and speed until you are comfortable. Once you are familiar with what you learned in Lesson3, select Load BattleSet from the **Settings** pull-down menu and load **Lesson III: Using Sensors**.

Lesson III: Using Sensors

After you have selected Lesson III, choose **Good Guys** as your side. To demonstrate the effective use of sensors and how the detection model in Harpoon3 works, it will be necessary to change the Difficulty setting for this tutorial scenario.

Click on the Difficulty button and select the **Average** Difficulty Level. Using this level will provide us with a Detection Setting of Auto Side ID which will make the sensor detection more realistic. Press **OK** to confirm the selection.

On the Macintosh™, click on the Difficulty button and toggle the settings to match the following. Then click on **OK**.

Now, click on the **OK** button on the Side Selection window to start the tutorial scenario.

Passive vs. Active

You should now be looking at a display almost identical to the first two lessons. Once again, the USS *Lewis B. Puller* is the lone unit for your side on the map. We will be using the *Puller* to become familiar

with the use of sensors. Note in the Unit Status window that our sensors are currently passive which means that we are not using active sensors at this time, it also means that your passive sensors are on-line and sensitive. An active sensor is a radar or sonar that is emitting either electric or sound energy. An active radar sends out electronic pulses which reflect off of a target and are interpreted by the radar and displayed on a screen. The same is true for active sonar which uses sound energy instead of electric energy in the pulse. For more on active and passive sensors, read the appropriate section in the Guide to Naval Warfare in the latter portion of this manual.

Composite Warfare Command Structure

Harpoon3 uses a command structure based upon the U.S. Navy's Composite Warfare Command. This structure divides the aspects of naval operations into several areas. For the purposes of Harpoon3 we have used five of these aspects. Each Composite Commander has a particular call sign to identify them when making radio or intercom (called the "1MC" on U.S. Navy ships) broadcasts. An actual radio or 1MC call will be simulated when a contact is made by one of the following Composite Warfare Commanders:

Alpha Bravo (AB)

The Senior Commander. In Harpoon3, this means you. All radio calls to AB are directed to you, the player.

Alpha Echo (AE)

The Electronic Warfare Commander. Anytime an emission from a jammer is detected or lost, AB will be informed by AE. Unknown electronic or electromagnetic signals, such as jammer emissions, are referred to as "rackets".

Alpha Sierra (AS)

The Anti-Surface Warfare Commander. Anytime a surface contact is made or lost, AB will be informed by AS. An unknown surface contact is referred to as a "skunk".

Alpha Whiskey (AW)

The Anti-Air Warfare Commander. Anytime an air contact is made or lost, AB will be informed by AW. An unknown air contact is referred to as a "bogie."

Alpha X-ray (AX)

The Anti-Submarine Warfare Commander. Anytime a sub contact is made or lost, AB will be informed by AX. An unknown sub contact is referred to as a "goblin".

Start the Lesson

Go ahead and start the lesson by selecting Start/Resume from the **Settings** pull-down menu or using the hot key. The scenario will start with the *Puller* awaiting your orders. Go ahead and plot a course to Reference Point 1 and set your speed at cruise. Following this course will provide you with several different contacts.

Air Contact

After a few moments, you should receive a contact report from AW alerting you to a new air contact. Notice that the contact is displayed to the north of your position. If the exact location of the contact can not be determined, an Electronic Support Measures (ESM) track will appear as an elongated diamond with an air unit symbol inside. This represents what your passive sensors have detected. It means that the contact is emitting some kind of energy from either radar or radio communications and is strong enough to be detected by your ESM sensors. The actual location of the air contact is somewhere inside the diamond. The area bordered by the changing diamond is an uncertainty region. Uncertainty regions appear when the contact's location is not known but there is enough information on the direction of the contact to interpolate the region where it is most likely to be located.

Evaluating a Contact

Click on the aircraft symbol and take a look at the Unit Status window. Here you will be able to view information about the contact. Since it

is an unknown contact we have little information about it. Notice for example that there is no information about course and speed on the contact. Click on the Report button in the Unit Status window. In the Sensor text box there is a listing of the type of emission that is coming from the air contact. Since the emission is an air weather radar and a transponder set with a commercial code, there is a high probability that the contact is civilian air traffic. Depending on your tactical situation, your orders, and the number of assets you have available, you could find out more about the contact by using other sensors, or sending your aircraft to intercept and identify. Since we are a lone ship we can only use our sensors.

Sensor Toolbar Button

Using Active Radar

Go ahead and turn on your radar by clicking on the Sensors toolbar button. Click on the Active selection for Radar in the Sensor Selection dialog box. Range circles should now appear around the *Puller* and the Unit Status window should say ACTIVE in the EMCON block. The range circles represent the maximum effective range of the sensors. These are not absolute as sensor ranges can vary due to meteorological conditions, as well as factors relating to the position and size of the contact. The yellow circle represents the surface search radar and the white circle (which is only visible as a large arc) is the air search radar.

Sensor Selection Dialog Box

Radar Contacts

You should now have a better fix on the first air contact while also detecting a second air contact. You should now have two air contacts. If you click on either of these contacts you will see that you can now see information about their speed and course. The reason we did not detect this second contact is because the aircraft was not radiating any energy from radar or radio. Confirm this by clicking on the new air contact and selecting the Report button in the Unit Status window. There is no type of sensor listed which means the contact is not emitting. Since we have no ESM information coming from the new contact, it is truly an unknown. For the purposes of this lesson we are going to allow the air contact to approach our ship to demonstrate

visual identification. Go ahead and let the air contact approach and watch what happens. It should head straight for the *Puller*. The first air contact is moving more to the east away from your location. Notice that as it moves past, the contact will switch between being displayed as a solid contact and as an uncertain ESM track. This happens more frequently with contacts moving near the maximum range of the detecting platform. You may also temporarily lose the contact only to have it reacquired and reported as a new contact. Pay particular attention when this happens so you don't incorrectly assume that another aircraft has been detected. As the first air contact moves to the east, the accuracy of the contact will diminish and will eventually be lost. Since the first air contact is moving away from our location it is not a concern. The second air contact is, however, beginning to turn towards our location. Although this would normally be the cause for some concern on our part, we will allow the contact to get closer.

Visual Identification

Once the second air contact is in visual range (which varies depending on weather, time of day, size of contact, and the altitude of the contact) you will receive a message indicating that we have identified the contact. Notice that ID information is now provided in the Unit Status Window. We can see the contact is a civilian airliner taking a big chance by not having its transponder or radar turned on! Since it is not a threat, we will allow it to pass. In real life that pilot would have received a stern radio warning or would have been intercepted by fighters or even shot down if the tactical situation was tense. We will allow the contact to pass and continue. Leave the radar active for now.

Sonar

As we continue on our course we will now learn more about the sonar. Your passive sonar is always on. The capability of your passive sonar to detect is reduced as the ship's speed is increased. Let's decrease our speed by clicking on the Speed/Altitude/Depth toolbar button and selecting Creep as our new speed. Notice that the passive sonar range circle increases once the *Puller* has slowed. This increase in passive

sonar range is due to the reduction in noise that results from the ship moving slower through the water. After awhile, you should detect an unknown submarine submerged somewhere below and along your course.

Sub Sonar Contacts

Unlike ships and aircraft, it is unlikely that you will ever visually ID a submarine contact. Sub contacts are very difficult to pinpoint. There is always the strong possibility that you will lose contact with a submarine. The location, speed, aspect to your platform, and a variety of other factors, will determine the accuracy of your submarine detection. Submarines will often make aspect changes to foil any attempt by another submarine to follow them from behind. This tactic can also make it more difficult to maintain a solid passive contact on the submarine.

Working the Contact

Let's do a little bit of aspect changing ourselves. Go ahead and make a few minor changes to the *Puller's* course so the ship "zig-zags" across its original course. Do this by making several 45 degree turns back and forth. See if the contact changes as you make the turns. For this example the submarine is making turns as well, so you should see some changes.

Active Sonar

After watching the contact for a short while, go ahead and turn on the active sonar. Do this by clicking on the Sensor toolbar button and selecting Active Sonar. Notice that the sonar range changes colors to indicate that the sonar is now active. The big drawback to using active sonar is that you are now sending sound pulses through the water that can be traced back to your location. Active sonar announces to everyone where you are located. Depending on the location of the sub contact when you go active, there may be changes in the quality of the contact. Observe the contact for a few moments and then turn off the active sonar.

Tutorial Lesson III: Using Sensors

Resume Course and Speed

The submarine used in this lesson was neutral and not a threat. We will let it pass, noting that the quality of the contact degrades as we move further away. Notice that the size of the uncertainty region surrounding the sub contact increases as we get further away. Let's continue on our original course to Reference Point 1. Go ahead and increase speed to Cruise.

Surface Contacts

After continuing on the course towards Reference Point 1, you should soon detect a surface contact. Notice that the contact is an ESM detection which means that the *Puller* is detecting some kind of energy radiating from the contact. Select the contact and click on Report in the Unit Status Window. The sensor list shows several types of radar common to British naval vessels. The contact is not in radar range yet so we will wait a bit and see if the detection improves as we get closer. Eventually the contact will solidify and you will be able to determine the contact's exact location. Once this happens, the contact will change to a brighter color indicating a solid contact.

ESM vs. Active Radar Detection

Once you have a solid contact, turn off your radar and watch what happens to the contact. It went back to being an ESM track. Now turn the radar back on and watch the contact solidify again.

Identification

As the contact gets closer there is a chance that we will make a visual identification. If we wanted, we could also send up a helicopter to identify the contact. We will cover the capabilities of on-board helicopter use in another lesson. At this range the contact has detected us as well. If it were an enemy ship there is a good chance we would have several missile contacts as well. Once the surface contact is in visual range it will be identified as H.M.S. *Exeter*, a British Navy destroyer.

ECM

At a point close to where *Puller* and *Exeter* pass each other, *Exeter* will turn on her Electronic Counter-Measures (ECM). Turning on the jammers can affect radar and communications. Note that when the jammer is turned on, a small "Q" will appear in the upper right corner of the unit symbol representing *Exeter*, and a small "X" will appear in the upper right corner of *Puller*. These markings designate the *Exeter* as the jamming source and that *Puller* is having her sensors degraded due to jamming. After a short while *Exeter* will shut off her jammer. Once this happens, go ahead and try out *Puller's* ECM gear by clicking on the Sensor toolbar button and selecting ECM Active. Note the "X" marking on *Puller*. You will not have information about other ships being jammed unless they are in communications with you. There is an "X" on *Puller* because your own jammers are affecting your sensors. Go ahead and turn the jammers off for now.

Comm Link

The only selection in the Sensor Selection box that we have not used is Comm Link. This is used to establish and maintain communications between units on your side. We will cover this in detail in an upcoming lesson.

Remainder of the Lesson

The remainder of Lesson III takes place as the *Puller* turns east and traverses between Reference Points 1 & 2. You should make contact with another submarine and one more surface vessel. Go ahead and explore the remainder of this scenario by working these two contacts.

Change the Detection Setting

To properly demonstrate how to work sensor contacts you should try running this scenario again with a more difficult Detection Setting using the Difficulty button and selecting Custom. Go ahead and give it a try. Reload the Lesson III tutorial scenario and set the Detection Setting to Full Reality using the Custom difficulty setting button. Running at Full Reality will provide you with less information about

the contacts once they are detected. This will make it more difficult to positively identify contacts. When you have fully explored the scenario at Full Reality you can go back and try each of the various detection settings. When you are ready to move to the next lesson go ahead and open the Tutorial BattleSet again to load **Lesson IV: Using Weapons.** Finally! You get to shoot at something!

Lesson IV: Using Weapons

Difficulty Level

Select **Lesson IV: Using Weapons** from the Scenario Selection window. It is recommended you set your Difficulty Level to **Average** for this lesson. If you are playing the Macintosh™ version, match your difficulty settings to those found in **Lesson3I**. Select **Good Guys** from the Side Selection window.

Starting the Lesson

Once again, you are in command of the USS *Lewis B. Puller*. As with the other two previous scenarios, you will be navigating from the present position of the *Puller* to Reference Points 1 & 2. Go ahead and set your course to the two Reference Points as you did in the previous lessons. Set your speed to Cruise and leave your sensors turned off for the time being. Note that for this lesson scenario, some new range circles are shown around the *Puller*; these are the ranges for Anti-Surface, Anti-Air, and Anti-Submarine weapons.   These circles represent the maximum range of the weapon in each category. Go ahead and start the scenario lesson by choosing Start/Resume from the **Settings** pull-down menu.

Weapons Free or Weapons Tight

There is an option in the Game Preferences dialog box under the Settings menu that determines whether or not your units will fire on enemy air targets independently. Weapons Free allows units under your command to engage independently and Weapons Tight prevents units under your command from firing without orders from you. The default setting on Harpoon3 is Weapons Free. When Weapons Tight is selected it will be up to you, the user, to engage incoming air and missile targets. It is important to note that Weapons Tight is only respected by units that are unassigned or on plotted missions. Units on other missions or out of comm range will always behave as if the Weapons Free option is selected. For the purpose of this lesson leave

the setting as Weapons Free. There is also a hot key that can be used to select Weapons Free. Consult the **Harpoon3** Command Card for details.

Air Threats

Shortly into the scenario you should have two air contacts to the north. Go ahead and watch these contacts for a few minutes to see if you can determine more information about them without turning your sensors on and revealing your position. Click on each contact and determine what kind of emissions your ESM gear has detected. The contacts are emitting surface search radar that can be found on several Soviet-made heavy bombers. So, it is a logical assumption (for this scenario, at least) that these are the Bad Guys. Let's watch them for a while and see where they are headed.

Acquire Air Targets

After observing these contacts for a few minutes, we can see they are headed for our position. It looks like we may have a fight on our hands. In most scenarios you would probably have additional assets such as fighter aircraft to intercept a possible threat. We are going it alone in this scenario to demonstrate the use of surface-to-air weapons. Go ahead and activate your radar (you should know how to do this from our last lesson). You should quickly obtain solid contacts on both aircraft. The next portion of the tutorial will demonstrate the differ-ence between automatic and manual engagements.

Automatic Engagements

Since we have set the Staff Preference option to Weapons Free, allow the first aircraft to get close enough for a visual ID to see if the *Puller* will engage the air threat on her own.   The first aircraft is identified as a Bear-F Bomber (ASW variant). Once it has been identified, the *Puller* will automatically engage. You should see a video of a missile launch and if you have a PC with a sound card or a Macintosh™, the sound of the missile launch will be heard as well.   A missile symbol will appear and begin tracking towards the target. If it hits you will

notice a rosette pattern representing an explosion surround the aircraft hit by a missile. If the missile misses, additional missiles will be automatically launched.

Manual Engagements

We are going to engage the second air target manually. First, select Weapons Tight from the Game Preferences dialog box within the **Settings** pull-down menu. Then, click on the Attack toolbar button. Your cursor should now be a targeting crosshair. Once the second air threat has crossed the range circle for your air weapons, go ahead and double-click on the aircraft symbol. A box will appear with four panels. The upper-left is the firing unit, the upper-right is the list of available weapons listed in the order of most capable weapon for the designated target. The lower-left panel lists the target(s) and the lower-right lists the weapons allocated for the target(s) listed. This is the Weapons Allocation dialog box. As you can see, one SM-1 missile has been allocated to engage the target. Let's fire 3 missiles by clicking twice on the listing for the SM-1 in the upper-right panel. The number of SM-1 missiles allocated should now be 3. On second thought, let's only fire 2 missiles and save some of the taxpayer's money. Click once on the listing of 3 missiles in the lower-right panel. The number of missiles should now read two. Go ahead and hit **OK.** The missiles should now launch with a display identical to the automatic sequence used to engage the first threat aircraft. In the unlikely event that both of your missiles should miss, fire again. By the time the second aircraft is destroyed you should pick up a third incoming air contact.

Manual Engagements with Groups

We are going to engage the last air threat as a group. Although it doesn't seem so, the third incoming air threat is actually a group of two aircraft. Make sure that the *Puller* is selected. When the aircraft come within range, click on the attack toolbar button and then drag-select the incoming air group. Once again the Weapon Allocation dialog box will come up, but you will notice that this time there are two Bears listed in the enemy unit section of the screen. You will see that the staff

Attack Toolbar Button

has already allocated an SM-1 to each. Go ahead and hit **OK.** The missiles should now launch, and each of the allocated missiles will track its assigned target. In the unlikely event that both of your missiles should miss, fire again.

A Note About Drag-Selecting Groups

Drag-selecting can be used to select reference points, friendly units, and enemy units. One key function of drag-selecting is in forming groups. To do so, simply drag-select the units you wish to group and press the 'G' hot key. To group friendly airborne units, the units must be the same type of aircraft, have identical loadout types, and be on the same mission.

Staff Allocation

Each time you attack a target your Staff will automatically allocate a number of appropriate weapons unless you do not have Allocate Weapons selected in the Staff Preferences settings found in the Game Preferences dialog box under the **Settings** pull-down menu. Even if you have the Staff allocate weapons, you can still manually edit the allocation by clicking on the various selections in each panel on the Weapons Allocation box.

Surface Threats

With the air threat eliminated, let's continue on course for Reference Points 1 & 2. Leave your radar on. As we near Reference Point 1 we should be detecting two surface contacts. Once there is a surface detection, go ahead and continue to close on the contacts to make a visual ID. In the meantime, evaluate the contacts by selecting each and clicking on the Report button to determine what type of radar each one is emitting. We can see that the first contact is radiating a Square Tie Surface Search (SS) radar and a Drum Tilt acquisition radar, both are common to Soviet missile boats. The second contact has a generic navigation radar. Looks like a cargo ship being escorted by a missile boat. Let's take 'em both out.

Tutorial Lesson IV: Using Weapons

Attacking

Once the first contact is in range of your surface weapons (outer weapons range circle), go ahead and click on the Attack toolbar button (make sure the *Puller* is currently selected). The mouse cursor should change to a targeting crosshair. Either double-click on the first surface contact or drag-select it. The Weapons Allocation Window will appear as it did when we were targeting air targets earlier in this lesson. This time the target is a surface contact and the weapons are surface-to-surface missiles and guns. Because the Staff Allocation feature is turned on in the Staff Preferences, a Harpoon missile has already been allocated for the target. Go ahead and double-click on the allocated Harpoon missile to remove it from the allocation list. Instead, select the Standard Anti-Radiation Missile (ARM) by double-clicking on it in the Weapons Available list.

Anti-Radiation Missiles

Anti-Radiation Missiles (ARM) are weapons that guide on radiated energy. They can be used to destroy an enemy's radar system. An ARM will lock on to the signal radiating from an enemy radar or jammer and fly directly to that source. ARMs can be launched from surface ships and from aircraft. Click on **OK** after allocating one ARM to be targeted on the first surface contact. Another dialog box will appear listing the number of ARMs allocated and the various types of emitters currently detected that are radiating from the target. You can then allocate each individual ARM to a particular emitter. Click **OK** to confirm the selection that has already been made by your Staff. Video and audio representations of a missile launching will play and a missile symbol will appear on the map screen heading toward the target. If the missile is shot down or misses the target, fire another. Go ahead and target the first surface contact with a Harpoon missile to finish it off.   After it has been hit click on the unit symbol for the first contact and note that in the Unit Status window the unit is on fire and sinking.

Bearing Only Attacks

Some weapons can be launched without designating a target. Bearing Only Attacks allow the player to designate a point on the map where the weapon's targeting sensors will activate and begin searching for a target. This can be useful if you have lost a contact but have a good idea where it is located and want to launch an attack even though you do not have a fix on the target. To launch a Bearing Only Attack use the Bearing Only Attack hot key. Consult the Harpoon3 Command Card to find out what key to use for your computer type. The cursor will change to a pointer finger cursor. Move the cursor to the point you want the weapon's seeker to activate. Click once with the mouse button to designate the activation point. The Weapons Allocation Box will appear with a list of Bearing-Only capable weapons. Allocate and launch in the same manner as before. Go ahead and launch a Harpoon in the general direction of the second surface contact designating an activation point just in front of the contact. The missile will launch, proceed to the activation point, and then activate its search radar to acquire a target. The missile should hit if the weapon's sensor locks-on to the target.

Naval Gunfire

Naval Gunfire does not have the range of surface-to-surface or surface-to-air missiles. You have to get in closer to use guns. Go ahead and close with the second surface contact. Click on Attack from the toolbar and allocate several gun bursts from several of the available guns. Each allocation of a gun is a burst that fires several rounds. The number of rounds per burst varies with each weapon. Hit **OK** to fire. It will take many shots to sink the ship. Once it is damaged and burning, go ahead and proceed on the original course towards Reference Points 1 & 2.

Continue on Course

After the *Puller* passes Reference Point 1 and changes its heading for Reference Point 2, you should detect another surface contact. This contact is going to be more of a challenge. It is an enemy missile boat

with many missiles. We are going to engage it to demonstrate missile air defense. There is a chance that the *Puller* could be hit and the scenario could end. Now is a good time to demonstrate the Save Game feature. By saving the game now you will be able to return to this point in the lesson without having to repeat the first two engagements.

Saving a Game

Select Save As from the **File** pull-down menu. A dialog box will appear that provides a space for you to type the name of file to be used for the saved game. Go ahead and save the game as **LESSON4A.SAV**. Once it is saved, load the saved game by selecting Open from the **File** pull-down menu and choosing **LESSON4A.SAV**.

Air Defense Against Missiles

Now that you have a saved game available, let's press on into battle. Continue on course to close the distance between the *Puller* and the enemy contact. When the contact is in range of your surface-to-surface weapons, fire away! It is likely that as soon as you fire, the contact will launch missiles at your missiles and at you directly. Watch what happens as both sides defend against inbound missiles. Several of the missiles will be shot down resulting in a video of an air target being hit and the symbol for the missile disappearing from the map. Since Weapons Free is currently selected in the Staff Preferences, the *Puller* has been defending itself without your intervention. This does not preclude you from targeting an inbound missile manually. To do so, treat the inbound missile in the same manner as you did when you targeted and launched on the incoming Bear-F aircraft. Go ahead and try to engage manually if you wish. If the *Puller* is sunk, go ahead and reload the game you previously saved and try again until you are comfortable with how to engage missiles. This is also a good opportunity for you to have some fun by getting into a shooting match with the enemy missile boat. When you have had enough, go ahead and read the rest of the lesson. Active & Passive Counter-measures

Active and Passive Counter-Measures

Close-in Weapons System (CIWS)

Many ships are equipped with a Close-in Weapons System (CIWS) that is used as a last resort. CIWS is a rapid-fire Gattling gun that engages inbound missiles at close range. This defensive system is automatic.

Naval Guns

Some naval guns may also be used to engage an incoming missile threat. In Harpoon3, this type of point defense is automatic.

Chaff

Chaff is made of strips of radar reflective material which is fired from launchers on ships and airplanes to confuse enemy radar. The most common use of chaff is to decoy inbound missiles. The launching of chaff is automatic.

Flares

Flares are very hot incendiary devices that are launched from ships or aircraft to decoy heat seeking missiles. Flares are used and depicted in the same manner as chaff.

Jamming

Some ships and aircraft have the ability to jam enemy radar by transmitting powerful signals that interfere with the enemy radar. To turn on jammers, press the Sensors toolbar button and select Active for the Electronic Counter-Measures (ECM) selection.

Blip Enhancers

Some helicopters are equipped with blip enhancers. This is an electronic device the sends out a signal that lures incoming enemy

missiles by providing a signal that resembles that of a ship. Some enemy missiles can be lured using blip enhancers. To use a blip enhancer a helicopter must be flying near the ship that is targeted by enemy missiles. Use the Sensor toolbar button and select Active for ECM to activate blip enhancers.

About Submarine Threats

Now that we have engaged surface contacts, let's discuss submarine threats. As we noted in Lesson3I, submarines are very elusive. The range of the *Puller's* Anti-Submarine Warfare (ASW) weapons system (the MK-46 torpedo) is not very great. Getting close to a submarine with a surface vessel is not a sound tactical move. Most of the time the submarine will prevail. Normally, ASW helicopters would be launched from the *Puller's* flight deck to prosecute a sub contact. We will cover this aspect of ASW in the Air Ops tutorial lesson. Engaging a sub contact with surface-launched torpedoes uses the same targeting and weapons allocation procedure as we used to engage air or surface targets with missiles. If you should find yourself in the position where you are on top of an enemy sub it would be best to launch a couple of torpedoes and leave.

Run at Full Reality

For a greater challenge, try running this lesson again with the Detection Setting at Full Reality. You will notice that it is more of a challenge to be successful when the enemy is more difficult to identify. While you already know what will happen in this scenario, running it at Full Reality will make you appreciate the efforts required to identify contacts before engaging.

End of Lesson

Let's move on to the other side of the equation and learn about submarine operation from the point-of-view of the submarine commander. Load **Lesson V: Submarine Operations.**

Lesson V: Submarine Operations

Difficulty Setting

For best results, set your Difficulty Setting to **Average** for this tutorial scenario. Macintosh™ users should use the settings from **Lesson3I**.

Getting Started

In this lesson we will leave the USS *Lewis B. Puller* and take command of the USS *La Jolla,* a *Los Angeles*-class fast attack submarine. Using Lesson V, we will examine some of the unique characteristics of submarine operations. Once you have selected Lesson V, choose **Good Guys** again. The Lesson V tactical map is identical to the previous lessons except that instead of the *Puller*, the *La Jolla* is present.

Navigation

Select the *La Jolla* and plot a course to Reference Points 1 & 2. Navigation for submarines is identical to the procedures used for surface ships. The major difference is that submarines can change depth. The Speed/Altitude/Depth toolbar button is used to set a submarine's speed and depth at which it will operate. Go ahead and set the *La Jolla's* speed to creep and her depth to intermediate.

Using Sensors

The primary sensor for a submarine is its passive sonar. You can see the passive sonar range circle for the La Jolla on the map display. Although submarines also have an active sonar capability, using active sonar can reveal the sub's presence. Using active sonar is not advised because it gives away the position of the submarine and the element of surprise will be lost. The passive sonar is always functioning, therefore it does not need to be turned on. Continue on course with passive sonar only.   You can increase the time compression to 5 minutes. As soon as you detect a surface contact reduce your time compression to 1 second.

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Surface Contacts

The quality of the contact will depend on several factors, including the speed, size, and aspect of the contact. Your speed and depth, as well as the location of the thermocline, all affect the quality of a sonar contact. Try changing your depth and course if you need to improve the contact. Since the contact is very large, it has been identified as the *Alligator*, a cargo vessel for the Bad Guys. It is unlikely that it is traveling unescorted, which means there is a very good chance there is another ship in the area we have not detected. The second contact should be made shortly after the first and will be a *Nanuchka*-class missile boat. Fortunately for the *La Jolla*, neither of the contacts has any ASW weapons.

Sub Contacts

It has been said that the best way to hunt a submarine is with another submarine. Shortly after detecting the two surface contacts, a submarine contact will be detected to the northeast of the *La Jolla's* position. We now have two surface contacts that are lucrative targets while a sub threat exists nearby. Let's take out the two surface contacts and then deal with the sub.

Using Weapons

Escort or not, we are going to attack the *Alligator*. With the *La Jolla* selected, click on the Attack toolbar button, allocate two Mark 48 ADCAP torpedoes, and press **OK**. You will see two torpedo symbols appear and move toward the *Alligator*. Normally we would change course and depth to evade. First, let's demonstrate the use of missiles from submarines by attacking the *Nanuchka* class escort. The procedure for launching a missile from a submarine is identical to that used with ships with one important exception, the submarine **must** be at shallow depth or above when launching. Go ahead and change the *La Jolla's* depth to shallow by clicking on the Speed/Altitude/Depth toolbar button and selecting Shallow. It will take a minute or two for the sub to change depth. In addition, because the torpedo tubes on the *La Jolla* were all loaded with ADCAPS, we must load the missile manually. When it reaches shallow, double-click on the Logistics

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toolbar button. In the Reload Weapon Selection dialog box you will see three panels: Mount List, Mount Weapons, and Magazine Weapons. The Mount List displays the available mounts on the selected unit and whether or not they are currently loaded. The numbers next to a mount (in this case "1/1") indicate both the number of rounds it contains and the number it can hold when full. The Mount Weapons panel shows all the possible weapons that can be loaded into the selected mount and which ones currently are. The Magazine Weapons panel displays all the remaining unallocated ordnance on the selected platform. In the Mount List, select one of the full torpedo tubes. It should be designated as **533 mm MK68TT x 1/1**. In the Mount Weapons list, find and double click on one of the **MK48 ADCAP 1/1** torpedoes. Notice the 1/1 becomes 0/1 and the selected tube in the Mount List also changes from 1/1 to 0/1. This designates that the torpedo tube mount is now empty. To load the mount, double click on the **Harpoon ID x 6/8** in the Magazine Weapons panel. Notice it decreases to 5/8, the Harpoon ID in the Mount Weapons list changes to 1/1 and the selected torpedo mount in the Mount List changes to 1/1. Click on OK. Loading mounts takes a certain amount of time, so allow several minutes to pass (game time) and then attack the *Nanuchka* by clicking on the attack toolbar button, double clicking on the *Nanuchka*, and allocating a RGM-84D Harpoon ID. After clicking OK, you will see a missile symbol appear. The missile will fly to the target and if it hits, the hit video will display. If it misses, reload the other mounts with Harpoons or attack the *Nanuchka* with ADCAPS. Now it is time to deal with the sub contact.

Using the Thermocline

The temperature of water creates layers in the ocean that affect the propagation of sound. Submarine commanders take advantage of this temperature layer called the Thermocline or "layer". In **Harpoon3,** the layer is located between the shallow and intermediate depth bands. Being above or below the layer offers a sub commander the ability to minimize detection depending upon the location of enemy subs. You may have to change the *La Jolla's* depth several times to get the best detection and attempt to determine the sub contact's depth. Remember, the sub contact may have detected you as well. Changing your

course and depth is a wise tactical procedure. Go ahead and alter both course and depth from time to time as you close with the sub contact.

Close with the Sub Contact

For our purpose in this lesson let's leave the *La Jolla's* depth at intermediate and plot a course toward the sub contact. As the La Jolla gets closer to the contact we should have enough of a quality detection on the contact to identify the class of submarine. This contact is an *Akula*-class attack submarine.

Engage the Sub Contact

Attempt to maneuver behind the *Akula*. You may need to alter speed to catch it in the correct position. Once you are behind the Akula close to within two or three miles. Once in position, attack the *Akula* with a MK-48 ADCAP torpedo.

End of Lesson

When you have either sank the *Akula*, or lost contact, or even been sunk yourself, go ahead and end the scenario and load **Lesson VI: Air Operations.**

Lesson VI: Air Operations

Getting Started

Set your Difficulty Setting to **Average** for this tutorial scenario. Users of the Macintosh™ version should use the Difficulty Settings from **Lesson3I**.

In this lesson we will concentrate our attention on the use of aviation assets. Once the Lesson VI tutorial scenario has been loaded you will see that the Good Guys have one airbase called "Good Guys 1" located on the northern half of the map named Tactical. On station to the northwest of the base is the USS *Theodore Roosevelt* aircraft carrier. A known enemy installation, a fuel depot, is located just south of Good Guys 1. Just north of the base two aircraft are circling. One is a KC-135 Stratotanker and the other is an F-16 Fighting Falcon. There are also two reference points that will be used during the lesson.

Launch Aircraft

Let's get a better idea of what our situation is by launching an E-3 Airborne Warning and Control (AWACS) aircraft. Select the Good Guy 1 airbase, then select Order of Battle from the **Window** pull-down menu. The report will provide a listing of what aircraft are currently assigned to the base. You will see there is only one E-3 Sentry and four F-16 Fighting Falcons available. There are three ways to launch an aircraft from a base or ship:

> • **Formation Air Patrol - Using the Formation Editor**
> • **Air Mission - Using the Mission Editor**
> • **Manual Launch - Using the Launch/Ready Aircraft
>   Window**

We will be using the Manual Launch method to get the E-3 airborne. Close the Order of Battle window and then click on the Air Ops toolbar button. A Launch/Ready Aircraft window will appear listing the E-3, its loadout, status, and mission assignment. Below the aircraft listing is an inventory of the highlighted aircraft's loadout.

Click on the E-3 Sentry and press the Launch button at the bottom of the screen. A small box will appear asking how many aircraft you desire to launch, hit OK to approve the "1" already selected for you. Notice that listing for the E-3 now includes "O/T Launch" which stands for "ordered to launch." If you change your mind and do not want the aircraft to launch, click on the Clear button to remove the launch order for that aircraft. We want to launch the E-3, so go ahead and press **Continue** to execute the launch order. The window will close and after about two to three minutes the E-3 Sentry will launch and begin circling near the airbase, awaiting your orders. Select the E-3 and press the Navigator toolbar button. Plot a course to Reference Point 1 and set the E-3's speed to cruise and the altitude to High by clicking on the Speed/Altitude/Depth toolbar button. A higher altitude improves the range your radar can detect. After the aircraft begins to head towards Reference Point 1, turn on the radar. You should immediately detect an airborne contact and a surface contact.

Ready Aircraft

Aircraft can be configured to carry a variety of different weapons, fuel tanks, and jamming pods. Collectively these components are called "stores." The type of mission the aircraft will perform dictates the particular loadout it will use. Loadouts will differ between aircraft as each aircraft has its own capacity and endurance range.

Let's demonstrate how to ready aircraft by selecting the Good Guy 1 airbase and pressing the Air Ops toolbar button. As before, the Launch/Ready Aircraft window appears. Select one of the F-16s and press the **Ready** button at the bottom of the window. The top portion of the window will now display a list of available loadouts for the F-16. Go ahead and click on several of them and note that the contents of each loadout are displayed in the lower portion of the window. For this first F-16, select a PGM (precision guided munition) loadout by clicking on the loadout and then clicking on the **OK** button. The list of loadouts will change to the list of aircraft. Note that one of the F-16s is now listed with a guided loadout and will be ready in 30 minutes. Go ahead and ready each of the four F-16s with different loadouts of your choice. When aircraft are ready a message will appear in the

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Incoming Message window and, if selected, a Staff Message box. The procedure we used to ready aircraft for the airbase is identical to readying aircraft on a carrier or a ship with helicopter facilities.

Anti-Ship Strikes

Now that the E-3 is providing us with a better picture of our situation, let's take a closer look at the surface contact. Select the USS *Roosevelt* and press the Air Ops toolbar button to view the Launch/Ready Aircraft window. The "*Teddy R*" has one F/A-18 Hornet with a Standoff loadout (SO), another Hornet with an Iron Bomb (IB) loadout, an F-14 Tomcat with an Air-to-Air loadout (ATA), and an SH-60B Seahawk helicopter with an Anti-Submarine loadout (ASW). Select the F/A-18 with the Standoff Loadout, which we can see in the loadout listing below includes two AGM-84D Harpoon missiles. Press **Launch** and **OK** to confirm. Now we will learn how to use the Airborne Intercept Routine. Once the Hornet is airborne, select it and then press the Air Ops toolbar button. The mouse cursor will turn into a targeting crosshair. Double-click on the surface contact. Doing this will order the F/A-18 Hornet to intercept the surface contact. When ordered to intercept the contact, the Hornet will set its own course, speed, and altitude toward the surface contact. If the contact is determined to be hostile, the Hornet will engage the target.   As we will soon see, the surface contact is our old friend the *Kriminsky Komsomolets*. When the Hornet is in range it will launch one or both Harpoon missiles at the ship and either return to base or launch another missile depending on the result of the first launch. Now let us focus our attention on the enemy fuel depot.

Air-to-Ground Strikes

As we did with the first F/A-18 Hornet, launch the second one from the *Roosevelt*. The second Hornet carries iron bombs. They should do fine against a fuel depot. You can choose to have the Hornet intercept the fuel depot or you can just plot a course to the depot and when you are directly over it, press the Attack toolbar button and allocate your load of iron bombs against the fuel depot. Go ahead and try it either way. When you have expended bombs and time on this target, let's move on to the air contact.

Air-to-Air Engagements

We still have to deal with the airborne contact. Select the *Roosevelt* again and launch the F-14 Tomcat to intercept the air contact. When the F-14 is in range of the contact it will launch an AIM-54 Phoenix missile at the contact. The contact in this lesson scenario is a TU-16 Badger bomber. If your missile misses, launch again or close with the target and engage with guns by using the Attack toolbar button and allocating bursts from the 20 mm cannon. You must be in very close to the target to engage with guns. When the target is destroyed the F-14 will remain on station loitering until it is low on fuel ("BINGO FUEL" in pilot terms) at which time it will return to base.

Airborne ASW

There is a submarine in the vicinity of Reference Point 2. Select the *Roosevelt* and launch the SH-60 Seahawk. Once it is airborne plot a course for Reference Point 2. Plot the course so that the SH-60 passes back and forth over Reference Point 2. To locate the sub we will drop several sonobuoys. When the Seahawk reaches the area around the Reference Point, hit the one of the Sonobuoy Release hot keys on your keyboard (consult the Harpoon3 Command Card to find out which key to use for your type of computer).

There are two types sonobuoys: Passive and Active. A Passive sonobuoy listens for sounds in the water while an Active sonobuoy sends out a sonar ping and listens for the return of the sound to determine if there is a submarine in the area. When you drop a Passive sonobuoy it will be in communication with the aircraft that dropped it, providing the aircraft with contact information. An Active sonobuoy has a passive capability identical to the Passive sonobuoy and can also be turned on to send out pulses of sound energy to detect submarines. To turn on an Active sonobuoy first select the sonobuoy and then press the Sensor toolbar button.

Drop several of each type of sonobuoys and wait to see if they detect the sub. When the sub is detected, engage it by selecting the SH-60 and clicking on the Attack toolbar button and clicking on the sub

contact. Allocate a torpedo and hit **OK**. The torpedo will deploy and begin to search for the submarine. Sub contacts can also be intercepted in a similar fashion to that used to intercept aircraft, ships, and ground targets. Play around with the sub contact for a few minutes and then let's move on to explore aerial refueling.

Aerial Refueling

Remember the F-16 and the KC-135 circling north of the airbase? The F-16 is probably getting low on fuel. Let's use these two aircraft to demonstrate how to conduct aerial refueling. Start by selecting the F-16 and then clicking on the Air Ops toolbar button. The mouse cursor will change to a targeting cursor. Place the cursor on the KC-135 and double-click. You can also drag-select the KC-135. This will cause the F-16 to plot an intercept course with the KC-135, which will loiter until the F-16 arrives to begin aerial refueling. This process takes several minutes once the two aircraft join. Once the F-16 has finished refueling it will continue to loiter with the tanker until you give it orders to do something else, or it will return to the mission to which it was assigned prior to the refueling order.

Land Aircraft

Once you are finished with the aerial refueling, let's end this tutorial scenario by ordering all airborne aircraft to return to base. Select the aircraft you wish to order back to base and click on the Air Ops toolbar button. The mouse cursor will change into a crosshair. Click on the desired landing site, either a base or ship. The base or ship must be capable of supporting the selected aircraft. For example, you cannot land a fighter jet on a frigate, or a land-based aircraft like the E-3 on an aircraft carrier. Go ahead and order any of the other aircraft used in this lesson to land. This completes Lesson VI. Our next lesson deals with creating & editing missions.

Lesson VII: Using the Mission Editor

Getting Started

Load Lesson VII from the Scenario selection screen, choose **Good Guys** as your side. Set the difficulty level to **Average**. The map area for this lesson scenario is identical to the previous lesson. Users of the Macintosh™ users should use the Difficulty Settings from **Lesson3I**. Again, the airbase Good Guy 1 is present, as well as the USS *Theodore Roosevelt*. There are several Reference Points placed around the map that will be used during the lesson.

Mission Types

This lesson demonstrates the use of what is probably the most powerful and useful function in **Harpoon3**: the Mission Editor. Using this feature allows units or groups to perform a variety of missions. Ships, aircraft, submarines or a combination of these platforms can be assigned to missions. Assigning units or groups to missions offers the user the flexibility of allocating various assets to perform specific functions continuously during a Harpoon3 session. Once units or groups are assigned to a mission they will automatically launch, transit, patrol, detect, and in most cases, prosecute enemy contacts. Missions are more than just patrols though. They can be modified as the tactical situation changes during a scenario. There are three general types of missions:

> • **Area**
> • **Strike**
> • **Reconnaissance**

For the purposes of this tutorial lesson we will be creating one mission from each type. It is recommended that you read more about the various kinds of missions available under each type. More information is contained in the **Mission Editor** section of this manual.

Existing Reference Points

Many of the mission types utilize Reference Points to designate the area in which the mission will take place. Reference Points can be placed anywhere on the map. In this lesson there are currently six Reference Points already on the map. We will use these points to create some missions later in this lesson. Use the Data Block hot key to toggle the Reference Point names on. Consult the **Harpoon3** Command Card for information about what hot key to use for your computer type.

Selecting Reference Points

A Reference Point can be selected in a manner similar to that used to select a unit or group. Select one of the Reference Points on the map by clicking on it. When selected, a Reference Point will change into a triangle. Multiple Reference Points can be selected at the same time by either clicking one at a time or drag-selecting several at the same time.   To "deselect" a Reference Point, click on it again and it will return to an "X" indicating it is no longer selected. Go ahead and try selecting several points using both the methods described above. When you are familiar with selecting Reference Points set all the points so that none of them are selected.

Adding Reference Points

Let's create a new set of Reference Points. Use the Add Reference Point selection from the **Mission** pull-down menu to add a Reference Point to the map. Once Add Reference Point is selected, the mouse cursor will change to a pointer finger. Place the cursor on the point where you want the Reference Point to appear and click once. A small "X" will appear. Reference Points may also be added using a hot key. Consult the **Harpoon3** Command Card for information about the hot keys. Place two additional Reference Points near Reference Points 1 & 2 using the existing Reference Points to form a rectangle.

Tutorial Lesson VII: Using the Mission Editor

Move Reference Points

Reference Points can be moved to new locations after they have been placed on the map. To demonstrate, select one of the reference points you created and then choose the Move Reference Point selection from the **Mission** pull-down menu. The mouse cursor will change to a pointer finger. Click on the location where you want the selected Reference Point to be located. The Reference Point will move to the new location. Make sure you only have one point selected when using this feature.

Naming Reference Points

Reference Points are numbered in the order in which they are placed on the map. The name of the Reference Point will appear with a datablock name of "Ref X" where "X" is the number of the Reference Point. Reference Points can be renamed by selecting the Reference Point and using a hot key. Consult the Harpoon3 Command Card for information about the hot keys. Go ahead and name one of the points you created to whatever you wish.

Delete Reference Points

To delete a Reference Point, you <u>do not</u> have to select a point first. Start by choosing the Delete Reference Point selection from the **Mission** pull-down menu. The mouse cursor will change to the pointer finger. Place the mouse cursor on the Reference Point you wish to delete and click. The Reference Point will disappear from the map. Reference Points can also be deleted using a hot key. Consult the Harpoon3 Command Card for information about the hot keys. Be careful you do not delete a Reference Point that is being used by a current mission. Go ahead and delete the Reference Point you just renamed and then create another one to replace it in the same spot.

Create a Mission

Let's start by creating an Area Mission using Reference Points 3, 4, 5, & 6. Select each of these Reference Points. Ensure that only these four points are selected. These four points will define the area in

which the mission will take place. Next, select the Create Mission selection from the **Mission** pull-down menu. The Create Mission window will appear in the center of the screen.

Mission Name

An operation name will be randomly assigned to the mission. This name is generated randomly from a list of words. Click on the text block and type in "AAW Patrol 1" as the mission name, over-writing what the computer chose for you.

Choose Mission Type

We will now choose the mission type. Let's send out an Area Anti-Air Warfare Patrol by clicking on the small circle next to **Patrol AAW.**

Emission Control

In the same dialog box you have the ability to set the sensor status desired for the assigned platforms to use during the mission. There are three types of Emission Control:

Passive

No active sensors to be used on the mission.

Intermittent

Active sensors will radiate intermittently. A window will appear allowing you to set the interval, duration, and variance of the emissions.

Active

Active sensors will be used during the duration of the mission.

For the AAW patrol you are creating, select **Active**.

Tutorial Lesson VII: Using the Mission Editor

Time Delay

Missions can be given a time delay so that they commence at a set number of days, hours, and minutes from when the mission is assigned. To assign a time delay simply click on the time delay text blocks and type in the desired delay. **CAUTION**: Once you set a time delay it can not be changed after you leave the **Create Mission** window. If you desire to change the time delay you will have to delete the mission and re-create it. For the "AAW Patrol 1" mission we will not be using the Time Delay feature.

1/3 Rule

When the 1/3 Rule check box is marked, the mission handler AI keeps one-third of the aircraft assigned in the air. This applies to *area missions* only. If the 1/3 Rule check box is not marked, all of the aircraft assigned to the area mission are launched.

Edit Now

The Edit Now selection box in the Create Mission window allows the user to go directly to the Edit Mission dialog box. Select this box as we still need to edit this mission. If the Edit Now box is not selected and the **OK** button is pressed, the mission will be created, but you will have to use the Edit Mission selection from the **Mission** pull-down menu to edit the mission. After selecting Edit Now press the **OK** button.

Edit Missions Dialog Box

After a mission has been created, units or groups need to be assigned before the mission may commence. The Edit Missions dialog box has three columns:

Missions

This column lists all missions that have been created. The listing of "Plotted" will show all units currently being manually plotted. You should see "AAW Patrol 1" in this column as well.

Assigned Units

This column lists all units that have been assigned to the mission currently selected in the **Missions** column.

Unassigned Units

This column lists all units not assigned to a mission. Anything listed in this column can be assigned to a mission. Individual aircraft will not be listed here. If the word "Aircraft" appears in the column it means that there are aircraft available for missions at one or more of the bases, ships, or ship groups listed.

For this first mission we will assign two F-14 Tomcat fighters to patrol for enemy aircraft in and around the rectangle made by the selected Reference Points. First, select "AAW Patrol 1" in the Missions column and then click on the Add A/C button at the bottom of the **Edit Missions** dialog box. The **Assign Aircraft** window will appear on the screen with a list of aircraft, their current loadout, ready status, and current assignment. Also displayed in the bottom half of the dialog box are details concerning the loadout of the aircraft currently selected. Click on the F-14 Tomcats and then click on the Assign button at the bottom of the box. A small dialog box will appear asking how many of these aircraft should be assigned to the mission. It should show '2'. Click **OK**. The current assignment for the F-14 aircraft will now read "O/T Mission" which stands for "Ordered To Mission. Other aircraft can be assigned, or readied using the **Assign Aircraft** window. With the two F-14 Tomcats ordered to the mission, click on the **Continue** button. You will now return to the **Edit Missions** dialog box . Click on "AAW Patrol 1" in the first column. You can now see that the word "Aircraft" is listed in the Assigned Units column in the middle of the box. This means that there are currently aircraft assigned to the selected mission.

Confirm Mission Assignments

Press **OK** to provide final confirmation for the mission assignments and to exit the **Edit Mission** dialog box. The mission is now active

and will launch shortly. The F-14s will launch and fly to the designated patrol area and begin flying in a patrol pattern searching for air contacts. While the AAW patrol is launching, let's create a strike mission against the enemy airbase to the south of our airbase.

Create a Strike Mission

Start by selecting the enemy target, in this case, the airbase to the south. Next, select New Mission from the Mission pull-down menu. The Create Mission dialog box will appear. Change the mission name to "Ground Strike 1" and click on the Ground Strike selection for the mission type. Set Emissions to Passive and select Edit Now. Once you have all of the above set, press **OK**.

Edit Strike Mission

From the Edit Missions dialog box, assign four A-6 Intruders to the strike mission using the same procedure used to assign the F-14s to the AAW mission.   After the Strike mission is activated, let's continue with our third and last mission, a Reconnaissance Mission.

Create a Reconnaissance Mission

Select Reference Points 3, 4, 5, and 6 to designate the mission area. Select Recon Ship from the **Create Mission** dialog box with Emissions set at Intermittent. Select Edit Now and then press **OK**.

Edit Reconnaissance Mission

From the **Edit Missions** dialog box, assign one P-3 Orion to the recon mission using the same procedure used to assign the previous two missions. After the recon mission is activated, let's sit back and watch what happens.

Mission Behavior

The aircraft assigned to the three missions you created will all perform their assignments in different ways. The AAW mission will patrol the assigned area with active sensors and will engage any enemy air target it contacts. The Strike Mission will fly to the target, drop bombs, and return to base. The Reconnaissance Mission will patrol the assigned

area looking for enemy ships. If any ships are detected the reconnaissance aircraft will not become decisively engaged and will attempt to identify and "shadow" the contact. For the purposes of this scenario we have added several enemy contacts for you to deal with as you wish. Go ahead and experiment using the mission aircraft to engage the targets. We have provided you with extra aircraft if you desire to experiment with the other types of missions (consult the detailed Mission Editor instructions later in this manual).

Ships and Submarines

All of our mission examples have been aircraft related. Ships and subs can also be assigned to missions. The only difference between aircraft missions and ship or submarine missions is the use of the Assign Aircraft to Mission window. Ships and submarines can be assigned to a mission from the Edit Missions dialog box by selecting the mission and then double-clicking on the unassigned ship or sub. This lesson scenario provides you with our old friends the *Puller* and the *La Jolla*. Go ahead and experiment using the existing Reference Points, or points that you wish to create, to assign both of these two platforms to missions. You will find that they will take longer to get to their designated areas but that they will generally behave in a manner that is similar to the aircraft on missions.

Editing Existing Missions

The Mission Editor can also be used to edit existing missions. The Editor is accessed by selecting the Edit Mission selection from the **Mission** pull-down menu.

Freeing Units

You must remove a unit from its current mission before assigning it to another. Also, be aware that if you manually plot a course for a unit, that unit is considered by the mission handler AI to be assigned to a plotted mission, therefore it must be unassigned, or removed from that mission. Deleting the mission will free all formerly assigned units.

Read More About It

It is recommended that you read the detailed instructions for the Mission Editor to become familiar with some of the details that were only covered briefly in this lesson. The Harpoon3 Mission Editor is a vital part of the simulation and mastering it will provide you with greater flexibility and success as you play Harpoon3. Now let's move on to the next lesson, **Tutorial VIII: The Formation Editor**.

Lesson VIII: The Formation Editor

Getting Started

Select **Lesson VIII: The Formation Editor** from the Scenario Selection window. It is recommended that your difficulty level be set to Average for this lesson. Users of the Macintoshtm version of the should use the difficulty settings from **Lesson3I**. Select **Good Guys** from the Side Selection window.

The Formation Editor

This lesson demonstrates the use of the Harpoon3 Formation Editor. A formation is a group consisting of two or more units. Subs cannot be included in any formation. The Formation Editor is used to position the units within a group in the best possible configuration to meet potential threats. In this lesson you will learn to create and arrange patrol zones within a formation's threat axes, and assign units to these patrol zones. There are three threat axes within a Harpoon3 formation:

- **Anti-Submarine Warfare (ASW)**
- **Anti-Air Warfare (AAW)**
- **Anti-Surface Warfare (ASuW)**

User created patrol zones can be assigned to each threat axis. This allows you to set units within the formation on patrols in areas relative to the formation's center as the group moves.

Starting the Lesson

As the scenario opens, you should see a group of four ships in the English channel. This group has no mission and is currently set to move to a default formation. Default formations are quite limited in their design, so in this lesson you will learn how to arrange the formation in such a way that the group is better protected. Select the group, then click once on the Formation Editor button. Expand the window to full size, and click on the Zoom Out toolbar button three (3) times. Now that we can see the group in the formation editor, let's

Formation Editor button

begin by creating an Anti-Submarine Warfare patrol zone within the ASW threat axis.

The Anti-Submarine Warfare axis (ASW)

The ASW threat axis is placed in anticipation of incoming sub threats. As the formation moves, the ASW threat axis moves also, always facing the direction that the formation is headed. This allows you to create and assign a patrol zone to the ASW axis, assign an anti-submarine unit to it, and have that unit automatically transit to face the direction the formation is moving. As most sub threats the group will encounter will be coming from the direction of the group's Path of Intended Motion (PIM), this is a useful function for a group com-mander.

Turn on the sonar range rings by clicking on the Pref toolbar button, and marking the ASW Sensor box. Click **OK**. Now find and select the *Arleigh Burke*. It should be apparent that since the *Sir Bedivere* has no sonar range ring, it is not an applicable unit for this patrol. Click on the Patrol Zone button, and drag-select a zone 1/3 the width of the open end of the ASW wedge, from the outer curved line of the ASW Threat Axis down to the fourteen (14) mile range circle. Try to center this in the ASW wedge if possible. After releasing the mouse button, a dialog box will appear prompting you to select the type of patrol movement.

PZ

Patrol Zone button

Formation Editor window showing ASW Patrol Zone

There are three different possible movement configurations :

> • **Sprint-Drift**
> • **Station Keep**
> • **Random**

Sprint-Drift-a high speed run across the patrol zone followed by a reduction of speed to drift. This is used to make passive sonar observations during the 'drift' phase.

Station Keep- the unit alters course and speed as the formation moves to maintain a location in the center of the patrol zone.

Random- the unit randomly selects a side of the patrol zone, finds the midpoint of that side, and then navigates there, repeating as needed.

Station/Patrol Type dialog box

For this patrol, select **Sprint-Drift**, then select the *Arleigh Burke* again to update the display. You should see the newly created patrol zone. If the patrol zone is not satisfactory, you can create another to replace it by repeating this procedure.

You may have noticed that the sonar range circle for the *Arleigh Burke* has changed size. This is because the ship is moving (or will be when we unpause the game), which limits the sonar's effective range.

High Value Units (HVU's)

HVUs are those units which must be protected by the formation. Since the ASW axis is always facing the path of intended motion, the ideal place for HVU's is in the center of the formation, directly behind the leading anti-submarine unit. Find and select the *Sir Bedivere.* Then

click on the Patrol Zone button, and drag-select a zone behind the ASW wedge that covers from about the one mile to the three mile range circle, making it 45° degrees across. Select **Station Keep** as the patrol type, and then click on **OK**. Now that all the units assigned to the ASW threat axis are arranged, let's assign a patrol to the Anti-Surface Warfare Axis.

Anti-Surface Warfare axis (ASuW)

The ASuW threat axis is used to anticipate and counter surface threats. Unlike the ASW threat axis, the ASuW need not necessarily change direction with the group. It will, by default, stay pointing in the same direction relative to the ASW axis, unless we either assign it a specific compass direction, or make it track a specific threat.

Find and select the *Ticonderoga*. Now click on the small colored triangles in the Formation Editor window until you find the ASuW axis. Click on the outer arc of the wedge and drag it until it is pointing due south. Now we will place the *Ticonderoga* on a patrol. Click on the Patrol Zone button, and drag-select an area centered in the wedge that ranges from the three to seven mile range circles and is approximately 1/3 the width of the wedge. Select **Station Keep** as the patrol type and click on **OK**. Click on the *Ticonderoga* again to display the patrol zone. Here we have set the ASuW axis to remain pointing due south.

Anti-Air Warfare axis (AAW)

The AAW threat axis is primarily used to counter aerial threats. There are times when it is advantageous to make this axis tracking, meaning it will rotate to face the designated threat. For this lesson we want to assign an anti-air patrol to the AAW axis and have it track a source of possible air threats. First let's create the patrol. Find and select the *Stout*. Now click on the colored triangles until you find the AAW threat axis. Click on the Patrol Zone button and drag-select an area within the AAW wedge that ranges from the seven to 10 mile range circles and is about 1/3 the width of the wedge. Select **Station Keep** as the patrol type, then click on **OK**. Click on the *Stout* again to display the patrol zone.

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Now we will make the AAW axis track a source of possible air threats. Resize the Formation Editor window by clicking on the up and down arrow button, then drag the window to the right side of the screen to clear the view of the tactical map. Start the game for a few seconds and let it run until you detect the enemy base to the south, then pause game. This is the source of the air threat that we want to track. Click once on the Tracking toolbar button from the Formation Editor window, and click once on the Tactical map window to activate it. Double-click on the enemy base. Next, find and select the *Stout* in the Formation Editor. Notice that the position of the AAW axis has changed to track the enemy threat. It will continue to rotate throughout the scenario, always facing the enemy base.

Tracking Threat Axis button

Aerial Patrols

In addition to the obvious advantage airborne units have in line-of-sight detection, they can also be deployed to several specific patrol types. These are:

- **Combat Air Patrol (CAP)**
- **Advanced Early Warning (AEW)**
- **Dipping Sonar**
- **Sonobuoy**
- **Surface Combat Air Patrol (SUCAP)**

Combat Air Patrol (CAP)-an aircraft carries an air-to-air loadout to engage enemy airborne units.
Advanced Early Warning (AEW)-an aircraft carries sensor loudout to search for enemy units.
Dipping Sonar-a helo will occasionally loiter and drop dipping sonar.
Sonobuoy-a helo will drop a line of sonobuoys along the leading edge of the patrol zone.
Surface Combat Air Patrol (SUCAP)-an aircraft carries an anti-surface loadout to engage enemy surface units.

For the purpose of this lesson, let's create a Sonobuoy patrol to watch for possible sub threats. First, resize the Formation Editor window by

Air Ops button

clicking once on the up arrow, then click on the Zoom Out toolbar button twice. Next, drag the 14 mile range circle out to 25 miles, and drag the 10 mile range circle out to 20 miles. This is to create a frame of reference for the patrol we are about to make. Find and select the *Arleigh Burke*. Click on the Air Ops toolbar button. Now, drag-select a zone centered in the ASW wedge ranging from the 20 to the 25 mile range markers. Make this zone 1/3 the width of the ASW wedge.

A dialog box should appear requesting that a patrol type be designated. Click on **Sonobuoy**, and set Radar, Sonar, and ECM to passive. Click on **Continue**.

At this point, a window should appear listing all of the aircraft in the group that are not launching or already in the air. Select a SeaHawk, and click on Assign. Then click on **OK**, and select **Continue**. The remaining SeaHawk will be used to maintain the patrol station when the one we assigned runs low on fuel or is destroyed in combat.

End of Lesson

Close the Formation Editor window (do not just iconize it), and then plot a course out of the channel and northeasternly to the Good Guy's Port. Pull up a tracking window centered on the group to observe how the assigned units respond to their new patrol orders. The base to the south will be sending hostile aircraft to 'test' your new formation, and from here on out you are on your own. Good luck!

Because managing formations effectively may be the most challenging aspect of play in Harpoon3, it is recommended that you read the material on the Formation Editor found in the Reference Section of this manual.

Tutorial Summary

Congratulations! Now that you have finished all of the lesson scenarios, you should be ready to start the scenarios contained in Global Conflicts I. The tutorial scenarios are always available for review in case you want to brush-up on a particular aspect of the game.

Reference

Reference Section

Pull-down Menu Selections

Harpoon3 has a menu bar across the top of the screen. This menu bar contains the features that apply to the entire game. In general, we arranged **Harpoon3** so that functions applying to the entire game (such as loading a scenario or setting time compression) are in the menu bar, while functions applying to specific units and groups are presented in windows and dialog boxes. The menu bar contains the following items:

PC or Apple

Clicking on **PC** or **Apple** on the menu bar will produce a menu with the following items:

About Harpoon3

Clicking on About Harpoon3 will show the names of the **Harpoon3** Development Team and our dedicated Beta Testers.

File

Clicking on **File** in the menu bar will produce a menu with the following six items:

Open

Clicking on Open brings up a window showing all the available scenarios and currently saved games. Clicking on an item in this list and then clicking on OK will bring up a new scenario or return you to a previously saved game.

Harpoon3 supports cross-platform loading and saving of scenarios. However, attempting to load a game saved from a scenario that was part of a Battleset you do not own will produce unpredictable results.

Save

Clicking on Save saves the game to a file with the same name you used last for this scenario. If you want to save the same game at two different points, or change the name of the saved game, use Save As.

Save As

Clicking on Save As brings up a dialog box wherein you will be prompted to enter a new file name for this saved game. As noted above, this feature allows you to save the same scenario at different points.

The PC version will add the .SAV extension by default.

Load BattleSet

Clicking on Load BattleSet brings up the Scenario Selection dialog box. Use this selection if you want to load a different scenario or if you want to restart the one you are currently playing. After a scenario is selected, the Side Selection dialog box will appear. You can choose what side to play and view the Orders. The Difficulty Level is also set from the Side Selection dialog box.

If you decide you wish to return to the active scenario select Load File, then hit the Cancel button.

Difficulty Levels

The difficulty levels are based upon various combinations of Detection and Staff Handling Settings. The Detection Settings include the following:

Show All

All units will be displayed with their location, platform type, and side. Units from other sides <u>do not</u> have to be detected. All friendly units will be automatically in communication.

Auto ID

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All units displayed or detected will be identified by type of platform and side. Units from other sides <u>must</u> be detected. All friendly units will be automatically in communication.

Auto Side ID

All units displayed or detected will be identified by side. Units from other sides <u>must</u> be detected. Detected Unit platform types must be determined. All friendly units will be automatically in communication.

Auto Data Link

Units from other sides <u>must</u> be detected. All friendly units will be automatically in communication. All contacts must be evaluated to determine platform type and side.

Full Reality

Units from other sides <u>must</u> be detected. All contacts must be evaluated to determine platform type and side. Communications are not automatic and must be established.

Note that in all cases, missiles and torpedoes <u>must</u> be detected using sensors regardless of the detection setting. The Staff Handles Settings include the following:

Navigations

Staff will automatically alter any course entered so that it will avoid land or Nav Zones relevant to the platform. If this setting is turned off, attempts to draw courses through land (for ships & subs) and Nav Zones will be rejected.

Weapon Allocation

Staff will allocate type and number of weapons when attacking. If this setting is turned off, the user will have to allocate the type and number of weapons for each target.

Threat Axes

Staff will attempt to point any axis you have left unmodified at the source of a threat, which is usually a base or a ship as opposed to a single aircraft.

Formations

Staff will establish group formations to include Patrol Zones for ships and submarines.

Formation Air Patrol

Staff will assign aircraft that are assigned to the units or bases in a formation to Combat Air Patrols or Airborne Early Warning Patrols.

Enforce Real-time

If this selection is turned on, Real-time will be enforced during play. Using Real-time means that the simulation is running at all times; during weapons allocation, readying aircraft, viewing the database, etc. If the game is paused when Real-time is enforced, the user will not be allowed access to any menu or toolbar function. If Real-time is not enforced, the user may pause the game and still have access to menus and use the toolbar to give commands to units or groups without the game clock running. Once the game is resumed, any orders given during the pause will be executed. Real-time not being enforced is the initial default setting for **Harpoon3**.

Aircraft Logistics

If this selection is turned on, all platforms on both sides will have limited ordinance. This limitation does not apply to machine gun rounds and iron bombs.

Pre-set Difficulty Levels (PC Only)

On the PC, there are three pre-set difficulty levels that can be selected from the BattleSet Selection window. In addition, a custom setting feature is provided that allows the user to modify the detection and staff settings. The following is a listing of the various detection and staff settings for the levels of difficulty:

Easy

Detection Setting

Show All

Staff Settings:

Navigation
Weapon Allocation
Threat Axes
Formations
Formation Air Patrols

Real-time

Not Enforced

Average

Detection Setting

Auto Side ID

Staff Settings

Navigation
Weapon Allocation
Threat Axes

Formations

Real-time

Not Enforced

Hard

Detection Setting

Full Reality

Staff Settings

None

Real-time

Enforced

Custom/Modify Difficulty Settings

Use the Custom button to modify the difficulty settings for the scenario you are about to play. To modify the actual default settings you will need to edit the Harpoon2.ini file.

Difficulty Settings (Macintosh™)

The Macintosh™ version of **Harpoon3** has a Difficulty Settings dialog box. Individual difficulty items have check boxes which can be toggled on or off. Once the **OK** button is hit, the options you have selected are saved to the game preferences and become the new default difficulty settings.

```
┌──────────────────────────────────────────────────┐
│           Custom Difficulty Settings               │
│  ┌─────────────────────┐ ┌──────────────────────┐ │
│  │ Detection Settings: │ │ Staff Handles:       │ │
│  │  ⦿ Show All         │ │  ⊠ Navigation        │ │
│  │  ○ Auto ID          │ │  ⊠ Weapon Allocation │ │
│  │  ○ Auto Side ID     │ │  ⊠ Threat Axes       │ │
│  │  ○ Auto Datalink    │ │  ⊠ Formation         │ │
│  │  ○ Full Reality     │ │  ⊠ Form Air Patrol   │ │
│  └─────────────────────┘ └──────────────────────┘ │
│  ☐ Enforce Real Time                               │
│  ☐ Use Aircraft Logistics                          │
│        [ Cancel ]            [  OK  ]              │
└──────────────────────────────────────────────────┘
```
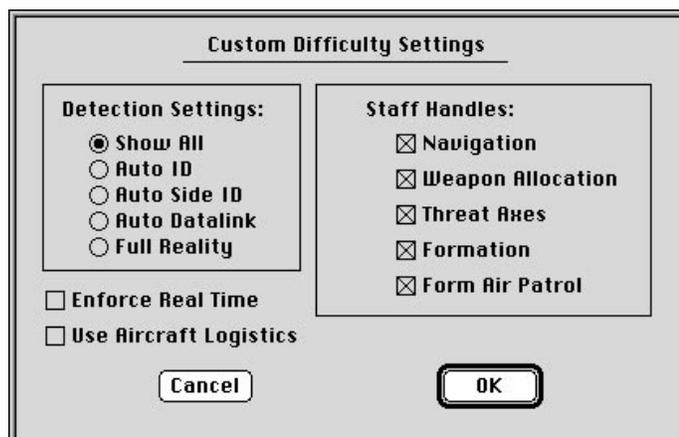
Macintosh™ Difficulty Settings dialog box

Resign

Select Resign when you wish to quit a scenario and obtain an evaluation of your efforts to achieve victory conditions. The End of Scenario Evaluation also provides information about losses suffered by each side in the scenario and whether or not any rules of engagement were violated. From the End of Scenario Evaluation screen it is possible to quit the game, or load another scenario. Clicking on the Load Scenario Button will bring up the Load Battleset dialog box. Quitting the game will close **Harpoon3** and exit to your computer's operating system.

Quit

Clicking on Quit exits **Harpoon3** and returns you to your computer's operating system. You will be prompted with an "Are you sure?" message. If you want to use the Save or Save As command click on **CANCEL** and then save your game before quitting.

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Settings

Clicking on **Settings** in the menu bar will produce a menu with the following eight items:

Start/Resume or Pause

This line has two different configurations, depending on the status of the game at the time you open this menu. If the game is running, it will show Pause, and clicking here will pause the game. If the game is paused, it will show Start/Resume, and clicking here will unpause the game. Consult the **Harpoon**3 Command Card to learn about the hot key that can be used to toggle between Pause and Resume.

Time Compression

Clicking on Time Compression brings up a dialog box that allows you to adjust the time compression ratio, from 1 second equals 1 second to 1 second equals 30 minutes. (Note: if the scenario is large, the effective time compression may slow down, as the program has more work than can be done in one second). To set the time compression in this window, click on the radio button next to the desired ratio; a dot will appear in the circle. Consult the **Harpoon**3 Command Card to learn about the hot keys that can be used to increase or decrease time compression, as well as return the game clock to 1:1 with a single keystroke.

Toggle Rng/Bearing [ON/OFF]

This menu item has two configurations. If ranging is currently turned off, it will show Toggle Range/Bearing [**OFF**]; if ranging is currently turned on, it will show Toggle Range/Bearing [**ON**]. Turning ranging on causes the distance and bearing between consecutive mouse clicks within either the main map or a zoom window (or even across windows) to be displayed in the Incoming Message window. To determine the distance between two groups, for example, you should turn on this feature, click on one group, and then click on the other group. When you click on the second

group, the range, bearing, depth and position (in latitude and longitude) will appear in the message window. This function can also be toggled by using the correct hot key.

Set Flagship

This command allows you to change to a new flagship (which is essentially the center of your communications network); this feature is useful if your current flagship is threatened or has moved to a disadvantageous position. To set a new flagship, click on the desired ship and then select "Set Flagship" from **Settings** in the menu bar. Setting a new flagship moves the center of your side's communications net to the newly selected platform (note that a flagship can be any manned platform with communications gear - ships, subs, airplanes, but not missiles or the group symbol). The newly selected flagship must be on the current communications network for this function to work.

Edit Waypoint Orders

To edit the orders assigned to a particular waypoint, first select a waypoint and then click on Edit Waypoint Orders. A box will appear with a listing of the orders assigned to the currently selected waypoint. You may delete any order by selecting it and then clicking on the Discard Order button. To add a different order, select the waypoint and use the toolbar button for the particular order you wish to assign to that waypoint.

Colors

Harpoon3 provides the user with the ability to change the colors used to represent the interface, maps, and the game elements (such as symbols). There are three ways to change the colors:

> • **Load a Default Palette**
> • **Load a User Palette**
> • **Create a New Palette**

The Colors selection on the **Settings** pull-down menu produces a sub-menu that includes the following choices:

Save Current Palette

Clicking on Save Current Palette allows you to save a customized palette for later use. Once you click on this button, a dialog box will appear where you can specify a file name.

Load User Palette

Clicking on Load User Palette allows you to load a previously saved palette. This palette can be either from your use of the Create New Palette procedure described below, or one of the palettes provided with **Harpoon3**. To choose a new palette, click on the appropriate file name and then click on **OK**.

Using a Default Palette

Harpoon3 has several pre-set palettes that can be used. There are five of these default palettes available:

Aegis Display

Similar to what is displayed on the main screens in the Combat Information Center of a U.S. Aegis cruiser or destroyer. A light blue background for the maps.

Amber Display

The palette uses various shades of amber. It is reminiscent of earlier amber screens found on radar scopes. The map background is black with amber coastlines.

OJ-663 Display

An approximation of the display used with the U.S. Navy's OJ-663 tactical display system. The map background for this display is black with bright green coastlines. This palette is the default palette for **Harpoon3**.

Greyscale Display

Uses various shades of grey. Good for use with less capable video displays found on notebook computers. The map background is gray with black coastlines.

Conventional Display

A more conventional display that is similar to the palette found in most business software that uses Microsoft® Windows™.

The Macintosh™ version offers two additional options: **Display Default Colors** and **Set Default Colors**. Display Default Colors simply loads the default palette. Set Default Colors saves what is currently being displayed as the new default palette.

Creating a New Palette

The user can create a custom palette by editing the colors used for the following areas:

Interface Colors

Includes the window borders, title bars, window backgrounds and foregrounds, buttons, menu items, highlights, and others. The Interface Colors selection produces an additional sub-menu that breaks the interface choices into two categories, Windows/Frames, and Widgets/Text.

Interface colors cannot be modified on the Macintosh™.

Map Colors

Includes the map background, coastlines, depths & elevations, threat zones, ice data, longitude & latitude lines, and borders.

Weather Colors

Includes wind & sea state, precipitation, and cloud cover.

Game Colors

Includes unit & group symbols, weapons & sensor range circles, and others. Clicking on Game Colors allows you to change the colors of the units, their paths and way-points, and drag boxes.

Selecting Individual Colors on the PC

Clicking on any of the four areas listed above produces a color palette editor that displays each individual component of either the interface, map, or game. The color matrix displayed is the 256 color choices that can be selected to represent the individual components. To choose a color, enter its corresponding value from the color matrix. To determine a color's value on the matrix, read down the left to the appropriate row to get the first two digits; then read across the top to the appropriate column to get the last digit. This process produces a three-digit number that corresponds to the color you desire. For example, bright white is color 15 (note that the first digit is unnecessary if it is 0), so its row is 01 and its column is 5; its number is 015. To ease checking your choice, the color you choose will appear next to the number entry box.

Selecting Individual Colors on the Macintosh™

Clicking on the color you wish to change will bring up a selection box displaying all the available colors from the Harpoon3 palette. Releasing the mouse button over a color changes the selected color to that color, while dragging the mouse off of the box will return the selected color to the original unchanged.

Symbol Set

Harpoon3 comes with two sets of platform (ship, sub, aircraft, and base) symbols: Stylized and NTDS. NTDS stands for Naval Tactical Display System. The NTDS symbols are adapted from the symbols actually used by the United States military and many other western navies. Stylized symbols are the images of boats, ships, planes, etc. familiar to most wargamers.

Setting Game Preferences

Click on the Game Preferences selection under the **Settings** pull-down menu to bring up the window containing a variety of preferences that you can set for the following areas:

Staff Handles

When selected, your Staff will handle operations related to the following:

Navigation

When drawing a course across land for a ship or sub, or through a Nav Zone for affected units, the Staff will navigate the portion of the course that is restricted and proceed with an alternate course to reach the desired destination.

Weapon Allocation

When attacking, the Staff will automatically allocate the proper weapon(s) to the selected target(s).

Threat Axes

The Staff will assign the ASuW, and AAW threat axes for the Formation Editor to use.

Formations

The Staff will create formations for any groups. Patrol Zones will be established for each unit in the group.

Formation Air Patrols

The Staff will assign aircraft attached to the units or bases in the group to automatically conduct AAW and AEW air patrols within the group's formation.

Staff Message Settings

Text Message Boxes can be used in addition to sounds to announce the following events:

Platform Hit/Destroyed

Any time a platform is hit, damaged, or destroyed.

New Contacts

Any time a new contact is detected.

Contact Change

Any time a contact is lost.

General Info

Information about units being damaged, damage control activities, aircraft ready status, and many other routine messages.

If you do not have sound capability for your computer it is recommended that you configure all the staff messages to be presented in message boxes.

Weapon State

Units in Harpoon3 that are not assigned to a mission will automatically engage incoming air and missile threats if the Weapon State is set to Weapons Free. To prevent units from engaging air and missile threats on their own, the Weapons State can be set to Weapons Tight. The initial default setting for Weapon State is Weapons Free. There is a hot key that will order all of your units to Weapons Free. Consult the **Harpoon3** Command Card to learn the Weapons Free hot key for your computer type. If you wish to set Weapons State to Weapons Tight you must use the Game Preferences window, there is no hot key for Weapons Tight. CAUTION: Setting the Weapons State to Weapons Tight will prevent your forces from defending them selves against air and missile attacks. Also note that closing to intercept effectively places those units on a mission, meaning they will react as if Weapons Free is selected.

Weapons Tight

All weapons launches will be executed by the user except for units assigned to a mission.

Weapons Free

Units and groups will attack air and missile threats on their own. The user may still intervene and launch weapons as well.

Video Options

Show Video

Select to display launch and hit videos during the game.

Video Persist

An "X" in this box sets the video display to remain open

following an event that activates a video sequence, such as a weapon launch. Having the video display remain open provides the user the ability to drag the video display box to any location on the screen. To move the video display grab the top bar of the video box, drag it to a new location and release the mouse button. Once the video display has been moved, all video sequences will be displayed at the new location unless moved again. While the video display is persistent, it may be closed by clicking on the center of the box. Turning the Video Persist selection off will enable the video display to close itself following a video sequence.

Video Persist is not available on the Macintosh™ version.

Sound Options

Sounds/Music

Select to enable sound effects to play during the game. Sound effects include the following:

- **Weapons Firing or Launching**
- **Aircraft Launching**
- **Explosions**
- **Button Clicks**

Voices

Select to enable voice sounds to play during the game. Voice sounds are used to announce the following:

- **New Contacts**
- **Contacts Lost**

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• **Incoming Missiles**
• **Incoming Torpedoes**

Missions

The **Mission** pull-down menu is used to access the **Harpoon**3 Mission Editor feature which allows units or groups to perform a variety of different task organized missions. Assigning units or groups to missions offers the user the flexibility of allocating various assets to perform specific functions continuously during a **Harpoon3** session. Once units or groups are assigned to a mission, they will automatically launch, transit, patrol, detect, and in most cases, prosecute enemy contacts. Missions are more than just patrols. They can also be modified as the tactical situation changes during a scenario. There are four types of missions: Transit, Strike, Area, and Reconnaissance Missions. The Mission pull-down menu allows you to add, move, and delete reference points. It also allows you to create and edit missions. Since many missions require reference points, placing reference points will be discussed first.

Reference Points

Reference Points can be placed anywhere on the map. Besides the obvious use in marking a particular location, Reference Points play an important role in mission planning. Use the Add Reference Point selection from the **Mission** pull-down menu to add a Reference Point to the map. Once Add Reference Point is selected the mouse cursor will change to a pointer finger. Place the cursor where you want the Reference point to appear and click once. Reference Points may also be added using a hot key. Consult the **Harpoon3** Command Card for information about the hot keys.

Selecting a Reference Point

If the reference point is selected by clicking on it once it will change into a small triangle with a dot inside. The triangle is used to designate Reference Points that have been selected. More than one Reference Point can be selected at the same

time by using the drag-select method or by clicking on each point individually.

Reference Point Naming

Reference Points are numbered in the order in which they are placed on the map. The name of the Reference Point will appear with a data block name of "Ref X" where "X" is the number of the Reference Point. Reference Points can be renamed by selecting the Reference Point and using a hot key. It will bring up the Rename Reference Point dialog box. You can enter a name up to four characters long, and it will rename the last reference point you have selected. Consult the **Harpoon3** Command Card for information about the hot keys.

Move Reference Point

Reference Points can also be moved to another location. Select the Reference Point you want to move and then click on the Move Reference Point selection from the **Mission** pull-down menu. The mouse cursor will change to the pointer finger. Place the mouse cursor on the new location and click. The selected Reference Point will move to the new location. Note : there are some reference points in the scenario that have a 'locked' status. These points cannot be moved.

Delete Reference Points

To delete a Reference Point, click on the Delete Reference Point selection from the **Mission** pull-down menu.   The mouse cursor will change to the pointer finger. Place the mouse cursor on the Reference Point you wish to delete and click. The Reference Point will disappear from the map. Reference Points can be deleted using a hot key. Consult the **Harpoon3** Command Card for information about the hot keys.

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Creating a Mission

Some missions require Reference Points while others require a target type be designated.

Missions Requiring Reference Points

To create any Transit, Area , or Reconnaissance mission, place and select the Reference Points to be used to define the area in which the mission will take place. The minimum number of Reference Points required for a mission that uses Reference Points is 3. The mission area is defined by the number and location of the points selected when a mission is created.

Missions Requiring a Target or Destination

If you are creating a Ferry or Strike mission, select the target or destination for the mission. If no target is designated for a strike mission the mission will be executed against the first target of opportunity that meets the mission profile. (Note: Ground Strike missions created without specified targets will attack the first base detected. This will not necessarily be the nearest base.) A Ferry Mission requires that you designate the destination airfield. Select the target or destination by clicking on it once with the mouse.

After you have selected either the Reference Points, destination, or the target, select the Create Mission selection from the **Mission** pull-down menu. The Create Mission window will appear in the center of the screen.

Mission Name

An operation name will be randomly assigned to the mission. This name is generated from a list of words. If you wish, you can click on the text block and type in a name of your choice. It can be helpful to name the mission based upon its type.

Mission Type

To choose the mission type, click on the small circle next to the name of the mission type you wish to create. See below for a complete list of the available mission types.

Transit Missions

Transit missions are used to move units from one area to another in a primarily neutral posture with regards to enemy prosecution.

Transit

Units or groups assigned to a Transit Mission will plot a course to the designated area and proceed to that area at cruise speed. This type of mission is appropriate for ships and submarines. Aircraft should not be used for this type of mission. When assigned to a transit mission, ships in a group with aircraft on-board will automatically assign various aircraft to Patrol Zones around the formation. If a threat is detected as the assigned group is transiting, the patrol aircraft will attempt to identify and prosecute. Once the assigned unit or group arrives in the designated area it will begin to traverse between the reference points.

Ferry

Ferry missions should only be assigned to aircraft. Although this type of mission does not require the use of Reference Points, it does require that a specific destination be designated for the mission. Aircraft on a ferry mission will take-off and fly directly to a designated air facility and land. If the aircraft are already in the air, they will proceed to the designated facility and land. To create a Ferry Mission, first select the destination for the aircraft, next select the Create Mission selection from the **Mission** pull-

down menu. Choose Ferry Mission from the Create Mission window and set Emissions to Passive. Assign the appropriate aircraft and press **OK**. The aircraft will either launch or change course to land at the designated field if the target air facility is in range for the ferrying aircraft.

Strike Missions

Strike Missions are used to assign particular units or groups to attack either a designated target or the next target detected. If a specific target is not designated when creating a Strike Mission, the units or groups assigned to the mission will automatically intercept and attack the next enemy contact matching the mission type. For example, an Air Interception mission can be created to attack a particular air threat that has been detected, or the mission can be created and will execute once an enemy air threat is detected. The following are Strike Missions:

Air Intercept

This type of mission can only be assigned to aircraft. Aircraft assigned to this mission will close with the target and attack it. Assignment of either airborne or landed air assets is possible. If an active enemy target is designated, landed aircraft will take-off from airbases or carriers and intercept. Airborne aircraft will close with the target and engage. If no target is designated the assigned aircraft will wait until the next air threat is detected and then proceed with the mission.

Ground Strike

Ground Strike missions can only be assigned to aircraft, ships, and submarines that have a capable loadout. Plat-forms assigned to this mission will close with the target and attack when their weapons are in range. Assignment

of either airborne or landed air assets is possible. If an active enemy target is designated, landed aircraft will take-off from airbases or carriers and strike the target. Airborne aircraft will close with the target and attack. If no target is designated the assigned aircraft will execute the mission against the first enemy base that is detected. Submarines will change course and depth to launch missiles at an assigned ground target. Ships will move to the range of either their land attack missiles, or naval guns.

Ship Strike

This mission can be assigned to aircraft, ships, or submarines. Units or groups assigned to this type of mission will close with the target and attack it. Assignment of either airborne or landed air assets is possible. If an active enemy target is designated, assigned units or group will close with the target and engage. If no target is designated the assigned units or groups will wait until the next surface ship threat is detected and then proceed with the mission.

Sub Strike

This type of mission can be assigned to aircraft, ships, or submarines. Units or groups assigned to this type of mission will close with the target and attack it. Assignment of either airborne or landed air assets is possible. If an active enemy target is designated, assigned units or group will close with the target and engage. If no target is designated the assigned units or groups will wait until the next submarine threat is detected and then proceed with the mission.

Area Missions

This type of mission requires that a set of Reference Points (minimum of 3) be placed to designate the region in which the mission takes place. The following are the various types of Area Missions:

Anti-Air Warfare Patrol

Units or groups assigned to an AAW patrol mission will patrol a particular area as defined by a set of Reference Points. Ships and aircraft may all be assigned to this mission type. Submarines should not be assigned this type of mission.

Anti-Surface Warfare Patrol

Units or groups assigned to an ASuW patrol mission will patrol a particular area as defined by a set of Reference Points. If capable, the units or groups assigned to this type of mission will also intercept and attack enemy aircraft or subs, however, the intercept and targeting priorities for assigned units or groups will be surface ship threats. Ships, submarines, and aircraft may all be assigned to this mission type.

Anti-Submarine Warfare Patrol

Units or groups assigned to an ASW patrol mission will patrol a particular area as defined by a set of Reference Points. If capable, the units or groups assigned to this type of mission will also intercept and attack enemy aircraft or ships, however, the intercept and targeting priorities for assigned units or groups will be submarine threats. Ships, submarines, and aircraft may all be assigned to this mission type. Aircraft assigned to this type of patrol will proceed to the mission area and if so equipped, begin dropping sonobuoys. After laying down a line of sonobuoys the aircraft will loiter for about 30 minutes while evaluating the data being sent from the sonobuoys. After loitering, the aircraft will lay another line of sonobuoys and keep repeating the cycle until either detecting a sub or running low on fuel or sonobuoys. **CAUTION: Units or groups assigned to this type of mission will attack any sub contact detected regardless of side. They will not attempt to identify a sub contact. If you have a**

submarine operating in the patrol zone, it could be attacked by aircraft or ships from its own side. Because of this "shoot first and ask questions later" posturing, a submarine exclusion Nav Zone will automatically be placed around the Patrol Zone for this type of mission. This will prevent your submarines from navigating into the zone. If you already have a submarine operating in the area it will become trapped in the Nav Zone unless you tell it to ignore the zone as explained in the Nav Zone section of this manual. If you assign a submarine to this type of patrol mission, <u>do not</u> assign any other subs to the same mission as they will attack one another if not in communication.

Support Mission

This type of mission should only be assigned to aircraft. Aircraft assigned to this type of mission will patrol between the designated Reference Points only. It is a non-combat mission, useful for stationing tankers or, with sensors active, for early warning detection.

Reconnaissance Missions

Reconnaissance Missions are used to assign units to gather information about enemy ground facilities or surface ship contacts. Units assigned to Reconnaissance Missions will attempt to gather information about a contact's exact location, condition, composition, heading, and speed. Units assigned to this type of mission will not engage enemy targets. Their mission will be to gather intelligence on the enemy target. The following are the two types of Reconnaissance Missions:

Reconnaissance Ground

Aircraft only should be assigned this type of mission. Aircraft assigned to this type of mission will fly to the

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nearest of the selected reference points and then proceed from one to the next. Once the last point has been covered, the craft returns to base.

Reconnaissance Ship

This type of mission can be assigned to aircraft, ships, or submarines. Units assigned to this type of mission will patrol within a designated area defined by Reference Points until a ship contact is made. If a ship threat is detected within the unit's sensor range the unit will attempt to identify the contact. Once identified, if the contact is the enemy, the assigned unit will fall back and attempt to shadow the contact by moving away and then back towards the contact every 30 minutes. During this time the user can order other assets to engage the target while the reconnaissance unit keeps tabs on the contact.

Emission Control

Click on the sensor status you want the assigned platforms to use during the mission. There are three types of Emission Control:

Passive

No active sensors to be used on the mission.

Intermittent

Active sensors will radiate intermittently. The interval, duration, and variance of the emissions varies between mission types. These settings can be changed from the Edit Mission window.

Active

Active sensors will be used for the duration of the mission.

Edit Now

The Edit Now selection box in the Create Mission window allows the user to go directly to the Edit Mission window. Select this box if you wish to edit the mission you are creating as soon as it is created. If the Edit Now box is not selected and the **OK** button is pressed, the mission will be created, but you will have to use the Edit Mission selection from the **Mission** pull-down menu to edit the mission. Editing a mission is how you will assign units to perform the existing mission.

The 1/3 Rule

When the 1/3 Rule check box is marked, the mission handler AI maintains 1/3 of the aircraft assigned to the mission in the air. This applies only to area missions. If the 1/3 Rule check box is not marked, the handler will launch all of the aircraft assigned to the mission.

Time Delay

Missions can be given a time delay so that they commence at a set number of days, hours, and minutes from when the mission is assigned. To assign a time delay simply click on the time delay text blocks and type in the desired delay. **CAUTION**: Once you set a time delay it can not be changed after you leave the Create Mission dialog box. If you need to change the time delay you will have to delete the mission and re-create it.

Edit Mission

After a mission has been created, units or groups need to be assigned before the mission may commence. The Mission Editor can be accessed two ways: first by selecting the Edit Now box when creating a mission with Create Mission window and pressing **OK**, secondly by selecting the Edit Mission selection from the **Mission** pull-down menu. The Edit Mission window has three columns:

Missions

This column lists all missions that have been created. The

listing of "Plotted" is where units that have been manually directed are listed.

Assigned Units

This column lists all units that have been assigned to the mission currently selected in the Missions column. Note: Assigned units that are out of communication range will not be listed.

Unassigned Units

This column lists all units not assigned to a mission. Anything listed in this column can be assigned to a mission. Individual aircraft will not be listed here. If the word "Aircraft" appears in the column it means that there are aircraft available for missions at one or more of the bases, ships, or ship groups listed.

Note: Only unassigned units may be placed on a mission. If a unit is currently on a mission, there are three ways to unassign it:

> **• select unit and press the unassign hotkey**
> **• delete the mission**
> **• remove unit from the mission**

Assigning Ships & Submarines

To assign a ship, submarine, or group to a mission, select the mission in the Missions column and then double-click the desired platform or group listed in the Unassigned Units column. The unit or group selected will now be listed in the Assigned Units column. To delete a unit or group from the mission double-click the assigned unit or group and it will return to the Unassigned Units column. When finished, click on **OK** to confirm the assignments made and the mission will commence.

Assigning Aircraft to a Mission

To assign aircraft to missions select the desired mission in the Missions column and click on the Add AC button at the bottom of the Edit Missions window. The Assign Aircraft window will appear on the screen with of a list of aircraft, their current loadout, ready status, and current assignment. Also displayed in the bottom half of the window are details concerning the loadout of the aircraft currently selected. Click on the aircraft that are to be assigned to the mission and then click on the Assign button at the bottom of the window. A small dialog box will appear asking how many of the aircraft should be assigned to the mission. Type in the number you want in the text block and hit **OK**. The current assignment for the aircraft will now read "O/T Mission" which stands for "Ordered To Mission. Repeat this assignment process for each of the aircraft types and loadouts needed for the mission. Aircraft can be readied from this Assign Aircraft window. To clear an assigned aircraft from being ordered to a mission select the aircraft and press the Clear button. The aircraft will return to being unassigned.

Ready Aircraft from the Assignment Window

To ready an aircraft from the Aircraft Assignment window select the aircraft and press the Ready button. The Ready Aircraft window will appear. Aircraft given new loadouts will reload and then launch on the assigned mission. Press **Continue** when finished with the Ready Aircraft window to return to the Assign Aircraft window.

Whether you have used the Ready Aircraft function or not, click the **Continue** button for the Assign Aircraft window when you are ready to confirm the assignment of aircraft to the mission. The Assign Aircraft window will close and the Edit Mission window will appear again. Click on the mission again and notice that the word "Aircraft" will now appear in the Assigned Units column with the number of aircraft in parenthesis. This means that there are now aircraft assigned to the selected mission. Press **OK** and the mission will commence.

Removing Aircraft from a Mission

To remove aircraft from a mission use the Edit Mission selection from the **Mission** pull-down menu. Select the appropriate mission from the Missions column and then click on the Remove AC button. The Remove Aircraft from a Mission window will appear with a listing of every aircraft currently assigned to the mission. Highlight your choice of aircraft and press the Unassign button. Doing this will remove that aircraft from the mission returning it to an unassigned status. Press **Continue** to confirm and you will return to the Edit Missions window.

Mission EMCON Setting

As with the Create Mission window, the mission's emission settings can be set or changed by selecting the desired setting of either On, Intermittent, or Off, from the Edit Missions window. Select the mission from the Missions column and then click on the desired EMCON setting for that mission.   Press **OK** when finished.

Add or Remove Reference Points from Missions

After a mission has been established, the area covered by the mission can be modified by using the Add Ref. Points and Remove Ref. Points buttons that are part of the Edit Missions window.   To increase or modify the mission area simply add additional Reference Points to the map, select the points, and then use the Edit Mission window. Select the mission that you wish to modify and then press the Add Ref. Points to add the additional points to the mission area.   To remove Reference Points from a mission area select the points no longer needed for the mission and press Remove Ref. Points. The mission area will no longer use these points to determine its size and shape.

Deleting a Mission

To delete a mission, select it from the Edit Mission window and press the Delete button. Platforms assigned to the mission will now be available for other missions.

Freeing Units

Units must be removed from their current mission before they can be assigned to another. Also, manually plotting a course for a units places those units on a plotted mission, therefore they must be unassigned, or removed from that mission. As mentioned above, deleting the mission will free all assigned units.

Window

Clicking on **Window** in the menu bar will produce a menu with the following ten items:

Game Status

Clicking on Game Status in this menu either opens the Game Status window or, if it was already open, brings it to the front. This window displays the current game time, date, and the time compression ratio.

Unit Status

Clicking on Unit Status in this menu either opens the Unit Status window or, if it was already open, brings it to the front, making it the active window in the process. The Unit Status window provides information about a selected unit's status including speed, course, altitude or depth, and emission state. A Report can be accessed from this window that provides details about a unit's weapons and sensors. Clicking on the Database button brings up the Platform Display dialog box.

Platform Display

Clicking on Platform Display in the Window pull-down menu opens the Platform Display dialog box. The Platform Display displays text and picture information about the individual plat-forms contained in the **Harpoon3** database. The selected plat-

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form is listed in the text block on the left and the text information about the platform is displayed in the other text block to the right. Press either the Mount or Sensor button to view the text information about the weapons and sensors. A photograph and drawing of the selected platform can be viewed by pressing the Picture button. To view other platforms, press the button representing the platform type you wish to view. The platforms are divided into five categories: Ships, Weapons, Submarines, Aircraft and Facilities. Press the Show All/Show Selected button to toggle between the unit you have selected and all the units of that platform type in the database.

Order of Battle

Clicking on this selection will open a box containing a complete listing of all of the groups, units, and bases currently under your command.

Legends

There are four sets of legends that can be selected from the Legends sub-menu.

Symbol Legend

Clicking on this menu selection will bring up a legend showing what the various unit, group, and base symbols represent. The Symbol Legend also displays the various colors used for friendly, hostile and neutral units or groups.

Map Legend

Clicking on this menu selection will bring up a legend showing the various colors used to represent land elevation, water depth, coastlines, and several other map features.

Tactical Legend

Clicking on this menu selection will bring up a legend showing the various colors used to represent weapon and sensor

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range circles.

Weather Legend

Clicking on this menu selection will bring up a legend showing the various colors used to represent weather features on the map.

On the Macintosh™, there is a symbol legend under the Windows pull-down menu. The other legends can be found in the Settings Color menu item.

Memory Remaining

Clicking on Memory Remaining in this menu either opens the Memory Remaining window or, if it was already open, brings it to the front. The Memory Remaining window then becomes the active window. This window provides information on the amount of memory being used by **Harpoon3** and the memory available for use.

Message

Clicking on message in this menu either opens the Message window, or if it was already open, brings it to the front. Naturally, the Message window becomes the active window. General information about contacts, unit status, range & bearing information, and much more, is displayed in this window. It is recommended that you always have this window open while playing **Harpoon3**.

Current Orders

Clicking on Current Orders in this menu either opens the Current Orders window, or if it was already open, brings it to the front. The Current Orders window contains the same orders that are available from the scenario selection menu.

Scenario Info

Clicking on Scenario Info in this menu either opens the Scenario Information window or, if it was already open, brings it to the front. The Scenario Information window then becomes the active window. This is the same information that is displayed from the Load BattleSet dialog box.

Close

Clicking on Close in this menu deletes the currently active window (unless it's the main map, which can't be closed).

Windows Currently Open

At the bottom of the **Window** pull-down menu, all of the windows currently open are listed. Click on any of them to bring that window to the front of your display. This feature is useful when you have many windows open and some are obscured by others and you need to view a window that is "underneath" others.

Zoom In button

Toolbar Buttons

Toolbar buttons are used to give commands to your forces and configure the game maps. Toolbars are found only with Map Windows. In most cases, a unit or group must be selected before using a toolbar button to issue commands. Below is a listing of each toolbar button and its function:

Zoom In

Clicking on this button causes the area displayed by the Zoom Window to become smaller, producing a close-up view of the area; this button can be clicked on many times, creating a steadily closer view. Note that **Harpoon3** is capable of displaying a map area of a few feet across if you zoom in far enough. There is no Zoom In button for the Main Map window.

Zoom Out button

Zoom Out

Clicking on this button causes the area displayed by the Zoom Window to become larger. There is no Zoom Out button for the

Zoom Window button

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Main Map window.

Creating Zoom Windows

A Zoom Window can be created by first clicking on the Zoom Window toolbar button. The mouse cursor will resemble a "+". Place the mouse cursor at any location on the map area and drag a box as you hold the mouse button down. Once you release the mouse button, a new map window will appear. The new window is a Zoom Window labeled "Zoom Map X." Note that this new window has its own toolbar buttons and that a Zoom Window will have the same preferences as the map from which it was originally created. For example, if the original window has water depths turned on, then this same map preference would be active in the new Zoom Window. You can use the Map Preferences button (PREF) for this new window to give it its own display parameters. A Zoom Window can be created from either the Main Map window or another Zoom Window. Zoom Windows can be renamed using the Map Preferences button and typing in a new name in the text block provided.

Track Window button

Track Unit/Group

To turn a Zoom Window into a Tracking Window, first click on the unit you would like the window to track. Then click on this button; the title bar will change to indicate that this window is now a tracking window. You can change a Tracking Window back into a Zoom Window by clicking on the Track Unit/Group button again. Use the Map Preferences toolbar button to rename the Tracking Window.

Preferences button

Map Preferences

To activate the various map display options, click on the toolbar button marked **PREF**. This is the Map Preferences button and will display a dialog box with a variety of display options which may be selected. It is important to note that you may set a combination of display preferences in each individual window. Each window may have an independent set of preferences. Use

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this feature to create windows containing a variety of display information. The following map display options are available:

Window Name

To change the name you see displayed in the title bar of a window, click on the text field containing the current window name and type the name you desire. You can change the window names to whatever you want during a game to keep track of various areas, units, or groups. Be aware that large window names will not be practical when you have the map window in icon form. Use small names or abbreviations when naming windows.

Water Depths

Water depths are represented by colored tick marks every 30 minutes of map distance. The water depth scale is represented for three levels: 10, 100, or 1000+ meters. The colors used to represent the depth bands may be changed using the Map Colors sub-menu from the Colors selection of the **Settings** pull-down menu.

Land Elevations

Land elevations can be displayed in 500 meter bands starting at sea level (0 meters) and going up to 2500 meters. Each band can be represented by a colored tick mark. Tick marks are placed in 30 minute (one-half degree or 30 nautical miles at the equator) intervals on the map. The color of the tick mark indicates the elevation for that particular area on the map. The size of the tick mark will depend on the size of the map area represented by the map window and the level at which the map is magnified. The colors used to represent the elevation bands may be changed using the Map Colors sub-menu from the Colors selection of the **Settings** pull-down menu.

Ice Pack Borders

To display the polar ice pack borders, click on the Ice Packs Borders selection. The ice packs will only be displayed in

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scenarios taking place close to the polar regions of the world. Surface ships cannot traverse across polar ice. The ice packs are represented on the map as a line similar to coastlines. Think of it as a variable coastline that changes with the seasons.

Polar Ice Data

Polar Ice Data is provided every half-degree of map distance. When this selection is ON, the entire area defined by the Ice Pack Borders will be displayed.

National Borders

To display national borders on the map click on this item in the Preferences window. Borders are represented as lines within the land masses on the map.

Latitude/Longitude Lines

Latitude and longitude can be represented on any map. You can choose to have no lines, or lines at either 1, 5, or 10 degree intervals.

Weather Data

Harpoon3 contains a global weather model that creates the weather conditions most likely to be found in the geographic region in which the scenario takes place. The following weather display choices are available:

No Weather

No weather information will be displayed on the map.

Wind/Sea State

Color coded tick marks similar to the land elevation and depth information will be displayed. The colors vary with the speed of the wind in each half degree interval.

Cloud Cover

The color tick marks represent the type of cloud cover in a given area. The categories for cloud cover are clear, scattered, partly cloudy, and overcast.

Precipitation

The color tick marks represent nine categories of precipitation. The categories include three levels of fog, three levels of rain, and three levels of snow. No precipitation is present if no tick marks are displayed.

On the PC, the colors used for weather data can be found in the Weather Legend under the **Window** pull-down menu. The colors may be changed using the Weather Colors sub-menu from the Colors selection of the **Settings** pull-down menu.

On the Macintosh™, the weather colors can be found and changed under the Settings pull-down menu.

Nav Zones

Navigation or "Nav" Zones are areas that you can designate as off-limits to all or some of your units.

Surface Threat

A Surface Threat Nav Zone will exclude all surface ships from entering the zone. Aircraft and submarines are unaffected by this type of Nav Zone. You may create, modify, or delete this type of Nav Zone.

Sub Threat

A Sub Threat Nav Zone will exclude all submarines from entering the zone. Aircraft and ships are unaffected by this type of Nav Zone. You may create, modify, or delete this type of Nav Zone.

Aircraft Threat

An Aircraft Threat Nav Zone will exclude all aircraft from entering the zone. Submarines and ships are unaffected by this type of Nav Zone. You may create, modify, or delete this type of Nav Zone.

General Exclusion

A General Exclusion Nav Zone will exclude all units, aircraft, ships, and submarines, from entering the zone. You may create, modify, or delete this type of Nav Zone.

Neutral

Similar to a General Exclusion Nav Zone, a Neutral Nav Zone will exclude all units, aircraft, ships, and submarines, from entering the zone. You may not create, modify ,or delete this type of zone. Most Neutral Nav Zones will be created when the scenario is designed and will be present from the start of the scenario.

To display the various Nav Zones, you would select each one so an "X" appears in the boxes.

Weapon Ranges

Weapon ranges are displayed for units, not groups. To display the approximate ranges of your units' weapons, place an "X" in the boxes next to the following:

Anti-Air

Displays a ring depicting the approximate range of the farthest reaching AAW weapon for each platform.

Anti-Surface

Displays a ring depicting the approximate range of the farthest reaching ASuW weapon for each platform.

Anti-Submarine

Displays a ring depicting the approximate range of the farthest reaching ASW weapon for each platform.

The colors used for weapon range circles can be found in the Tactical Legend under the **Window** pull-down menu. The colors may be changed using the Game Colors sub-menu from the Colors selection of the **Settings** pull-down menu.

On the Macintosh™, the colors used for weapon range circles can be found and changed in the Game Colors dialog box in Colors under the **Settings** pull-down menu.

Sensor Ranges

Like weapon ranges, sensor ranges are displayed for units only. To display the approximate ranges of your units' sensors, place an "X" in the boxes next to the following:

Air Search

Displays a ring depicting the approximate range of the farthest reaching AAW sensor for each platform.

Surface Search

Displays a ring depicting the approximate range of the farthest reaching ASuW sensor for each platform.

Sonar

Displays a ring depicting the approximate range of the farthest reaching ASW sensor for each platform.

The colors used for sensor range circles can be found in the Tactical Legend under the **Window** pull-down menu. The colors may be changed using the Game Colors sub-menu from the Colors selection of the **Settings** pull-down menu.

On the Macintosh™, the colors used for sensor range circles can be found and changed in the Game Colors dialog box in Colors under the **Settings** pull-down menu.

Endurance Range

Place an "X" here to show the approximate range each platform has based upon its current fuel state and speed. This applies to units only.

Data Links

Attack button

Data Links are used to relay communications, sensor, and contact information between platforms. Data links can only be established between units with operational communications equipment that are in range of one another. A data link provides the ability to "see" things from the point of view of another platform. Think of a data link system as a network of sensors and communications equipment. If you select the Show Data Links selection, the links will be represented by thin lines between the data link capable platforms on your side.

Show Sonobuoys

Place an "X" here to display individual sonobuoys on the map. Sonobuoys are dropped into the water by Anti-Submarine aircraft and have their own sensor range circles and data link lines. Because many sonobuoys on the screen can clutter the view, it is a good idea to only use the Show Sonobuoys display option in windows that are being used for ASW operations.

Attack

There are several ways to attack targets in **Harpoon3**. An attack can be a manual engagement where the user orders a specific unit or group to engage a target. Attacks can also be made automatic by assigning units or groups to either a Strike or a Patrol Mission. Attacks can be made against a known target that is currently in

range, or when the exact location of the target is unknown, an attack can be made as a bearing-only launch. Units or groups can also be ordered to close and attack when they are currently out of range of a target.

Manual Engagements

To engage a target manually, select the unit or group from which the attack will be launched. Next, click on the Attack toolbar button. Finally, double-click (or drag select) on the target unit(s) or group(s). If the target is in range of any of your weapons, the Weapons Allocation dialog box will appear. The Weapons Allocation dialog box allows you to assign specific weapons from each attacking platform to some or all of the designated targets.

Close-to-Attack

If a target you have designated is not in range, a dialog box will appear asking if you wish to have the attacking units close with the target and attack when they are in range. If you select yes the attacking unit will attempt to navigate an intercept to the target and engage it as soon as weapons are in range. Note: This effectively places those units on an intercept mission.

A Note About Groups

Any units selected while in unit mode and ordered to attack will split off from the group to do so. If an order to attack is given while in group mode the group will stay together and move to engage the target. (Consult the **Harpoon3** Command Summary card)

Staff Allocation

Each time you attack a target your Staff will automatically allocate a number of appropriate weapons unless you do not have Allocate Weapons selected in the Staff Preferences settings found under the **Settings** pull-down menu. Even if

you have the Staff allocate weapons, you can still manually edit the allocation by clicking on the various selections in each panel on the Weapons Allocation box.

Manual Allocation

The Weapons Allocation dialog box has four sections containing lists: the attacking units, the weapons available for the unit selected, the designated targets, and a list of weapons that have been allocated to the selected target.

The four sections in the Weapons Allocation dialog box are interdependent. For example, if you click on one of the targets in the lower left list, the listing for allocated weapons in the lower right list will change to show the number and types of ordnance allocated by all attacking platforms against the currently selected target. If you click on one of the attacking platforms in the upper left list, the listing of available weapons will change to reflect the weapons available from the particular attacker.

To allocate weapons, make sure that the desired target is selected in the target listing and the unit you are attacking with is selected in the attacking platforms list. Next, double-click on the weapon you wish to allocate in the weapons listing. Each time you click, you will notice another weapon being allocated in the weapons allocated listing. To "de-allocate" a weapon double-click on that weapon in the weapons allocated listing. Each time you click, one unit of the weapon type will no longer be allocated. When de-allocated, the number of the particular weapon will increase in the weapons available listing. You can allocate weapons from each individual attacker to each individual target. When you are finished allocating, press the **OK** button and the weapons will begin launching.

Bearing Only Attacks

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Some weapons can be launched without designating a target. Bearing Only Attacks allow the player to designate a point on the map where the weapon's targeting sensors will activate and begin searching for a target. This can be useful if you have lost a contact but have a good idea where it is located and want to launch an attack even though you do not have a fix on the target. To launch a Bearing Only Attack press the Bearing Only Attack hot key. Consult the **Harpoon3** Command Card to find out what key to use for your computer type. The cursor will change to a pointer finger cursor. Move the cursor to the point you want the weapon's seeker to activate. Click once with the mouse button to designate the activation point. The Weapons Allocation Box will appear with a list of Bearing-Only capable weapons. Allocate and launch in the same manner as before. The weapon's activation point will be listed as the target.

Surface-to-Surface Missiles

Surface-to-Surface missiles are used to engage ships and land targets. Surface-to-Surface missiles are found on ships, some types of submarines, and in rare cases, bases with coastal defenses. No special procedure is required to launch surface missiles, however submarines must be at a depth of shallow or less. Most surface missiles can be launched bearing-only.

Air-to-Air Missiles

Air-to-air missiles are used by aircraft to engage other aircraft. There are basically two types of missiles, heat-seeking, and radar homing. These types of missiles cannot be launched bearing-only.

Surface-to-Air Missiles

Surface-to-Air Missiles (SAMs) are used to engage aircraft and missiles. In most cases, the platform launching SAMs must have radar active for SAMs to acquire their targets. Some types of SAMs, such as the Standards, can be used to

engage surface targets as well. Most SAMs can not be launched bearing-only.

Anti-Radiation Missiles

Anti-Radiation Missiles (ARMs) are weapons that guide on radiated energy. They can be used to destroy an enemy's radar system. An ARM will lock-on to the signal radiating from an enemy radar or jammer and fly directly to that source. ARMs can be launched from surface ships and from aircraft. A specialized dialog box is used conjunction with the Weapons Allocation dialog box. It lists the number of ARMs allocated and the various types of emitters radiating from a target. You can then allocate each individual ARM to a particular emitter. ARMs can be launched bearing-only, but since they guide on a radiating target, it is not a wise use of ordnance.

Torpedoes

Torpedoes can be launched from torpedo-equipped ships, submarines, and aircraft. Launching a torpedo is similar to any other type of weapon. The exception is the wire-guided torpedo. These types of torpedoes are available on certain submarines. A wire-guided torpedo can be steered by the user. To steer a wire-guided torpedo, select the torpedo symbol and alter its path in a manner similar to modifying a platform's course. The best method to steer is to grab the torpedo's waypoint and move it to where you want the torpedo to go. The torpedo has both a passive and an active sensor. If, while steering the torpedo, your torpedo detects a target it will home in on that target. To improve the ability to detect, press the Sensor toolbar button and turn on the torpedo's active sonar. Eventually, the torpedo will run out of fuel and be lost if it does not hit a target. The ability to steer and use torpedo sensors is limited to wire-guided torpedoes only.

Aircraft Guns

Aircraft with guns will engage both air and ground targets when all other ordnance has been expended. Since the range for these types of guns is limited, be very careful that your aircraft are not endangering themselves trying to engage a surface target that has air defenses. Aircraft guns can be very effective against soft ground targets or ships without air defense capabilities.

Naval Gunfire

Naval Gunfire does not have the range of surface-to-surface or surface-to-air missiles. You have to get in closer to use guns. Each allocation of a gun is a burst that fires several rounds. The number of rounds per burst varies with each weapon.

Air Intercepts

Air Intercepts are functions of the Air Ops toolbar button. Please consult that section of the manual to learn about Air Intercepts.

Automatic Engagements

If the Weapons State is set to Weapons Free (part of Game Preferences under the **Settings** pull-down menu), units will automatically defend themselves against air and missile threats. If you do not want your units or groups automatically defending themselves, select Weapons Tight in the Game Options. Units or groups on strike and intercept missions, ordered to close-and-attack, or plotted intercepts will automatically engage enemy contacts.

Active & Passive Counter-measures

Close-in Weapons System (CIWS)

Many ships are equipped with a Close-in Weapons System (CIWS) that is used as a last resort. CIWS is a rapid-fire Gatling gun that engages inbound missiles at close range. This defensive system is automatic.

Naval Guns

Some naval guns may also be used to engage an incoming missile or air threat. In **Harpoon3**, this type of point defense is automatic.

Chaff

Chaff is made of strips of radar reflective material which is fired from launchers on ships and airplanes to confuse enemy radar. The most common use of chaff is to decoy inbound missiles. The launching of chaff is automatic.

Flares

Flares are very hot incendiary devices that are launched from ships or aircraft to decoy heat seeking missiles. Flares are used in the same manner as chaff.

Jamming

Sensors button

Some ships and aircraft have the ability to jam enemy radar by transmitting powerful signals that interfere with the enemy radar. To turn on jammers, press the Sensors toolbar button and select active for the Electronic Counter-Measures (ECM) selection.

Blip Enhancers

Some helicopters are equipped with blip enhancers. A blip enhancer is an electronic device the sends out a signal that seduces incoming enemy missiles by providing a signal that resembles that of a ship. Some enemy missiles can be lured using blip enhancers. To use a blip enhancer a helicopter must be flying near the ship that is targeted by enemy missiles. Use

the Sensor toolbar button and select Active for ECM to activate blip enhancers.

Sensors

To change the sensor settings of a unit or group, select a unit, group, or base and click on the Sensor toolbar button. Doing so will produce a small dialog box with several options including: Radars, Sonars, ECM and Comm Link. These sensors can be set to Active, Passive, or Intermittent.

Active Sensors

An active sensor is a radar or sonar that has been powered and is emitting either electric or sound energy. An active radar sends out an electronic pulse that is reflected off of a target and interpreted by the radar and displayed on the screen. The same is true for active sonar which uses sound energy instead of electric energy in the pulse. For more on active and passive sensors, read the appropriate section in the Guide to Naval Warfare in the latter portion of this manual.

Passive Electronic Support Measures

Passive sensors do not radiate energy, instead they detect the emissions or sounds from other sources.. Passive sensors are sometimes referred to as Electronic Support Measures (ESM). If a detection is made by ESM, the contact will appear as an "ESM cut" which will be displayed on the map as a line or wedge radiating from the detecting platform in the direction of the contact. The location of the contact is somewhere on the line or within the area represented by the wedge. A unit symbol will appear in the center of the ESM cut; this is not the exact location of the contact. As a contact is solidified, the area or line representing the ESM cut will decrease and the contact symbol will be closer to its exact location. Selecting the contact and pressing the Report button will list the type of

emission being detected.

Intermittent Setting

When intermittent is selected, the sensor will become active for a certain duration and then passive for a certain duration. Numerical values are entered to determine the active sensor duration and its variance and the passive sensor duration along with its variance.. If for instance, you enter a value for passive of 10, a % variance of 50, a value for active of 20 and a % value of 75, the sensor will be active for 10 minutes plus or minus 50 % (5-15 min.) and then go passive for 20 minutes plus or minus 75% (5-35 min.). Once the sensor has been active, then passive, it chooses another number randomly within the range for each and begins the cycle again.

Passive Sonar

Passive sonar listens to the ocean attempting to detect the sound of an enemy ship or sub. Many ships and subs have both a hull-mounted and a towed sonar array. The quality and range of passive sonar is affected by noise in the water. If a ship or sub using passive sonar is moving through the water at a high speed then the quality and range of its passive sonar is diminished by the noise created by moving through the water. In **Harpoon3** passive sonar is always turned on for platforms that are so equipped

Electronic Counter-Measures (ECM)

If a ship or aircraft is equipped with ECM equipment it can be used to degrade enemy sensors. Select Active from the Sensor dialog box to activate the ECM. Remember that in many cases, using ECM will degrade your side's sensors as well. When a unit or group is being jammed a small "X" will appear in the upper-right side of the unit or group symbol. If a unit or group on another side is using jammers a small "Q" will appear in the upper-right side of the symbol for the unit or

group using the jammer.

Communications

If you wish to cease datalinks and communications with your other units you can turn your communications off. Turn them back on to re-establish communications.

Sonobuoys

Anti-submarine aircraft, both fixed-wing and helicopters use sonobuoys to detect submarines. Sonobuoys are dropped in the water from the aircraft and transmit to the aircraft what they sense in the water. There are basically two types of sonobuoys: active and passive. A passive sonobuoy listens to the ocean and transmits any passive detections it makes directly to the aircraft. An active sonobuoy remains passive until it is turned on. To turn on an active sonobuoy, select it and then press the Sensor toolbar button and set the Sonar selection to Active. Sonobuoys have a service life and will eventually cease to function and sink. There are three types of sonobuoys used in Harpoon3:

DIFAR

A passive sonobuoy that provides directional information on a contact. A contact will appear in an uncertainty region in the direction it is located from the DIFAR.

DICASS

Both a passive and active capable sonobuoy. This sonobuoy provides directional information when passive and both directional and range information when active. A passive contact will appear in an uncertainty region in the direction it is located from the DICASS. A contact made with the active setting will appear with range and directional information.

LOFAR

Navigation button

A passive sonobuoy that only indicates a detection has been made within its passive sensor range. No range or directional information is provided on a contact. A contact will appear with an uncertainty region around it when detected by a LOFAR.

Dipping Sonar

Some ASW helicopters have a dipping sonar capability. A dipping sonar is a sonar set that is dipped into the ocean from a hovering helicopter and activated. A contact will appear with both directional and range information. Dipping Sonar is deployed automatically by equipped ASW aircraft that are operating on an assigned mission or as part of a formation air patrol. To manually deploy Dipping Sonar set the helicopter to hover at Very Low (VLow) altitude, press the Sensor toolbar button and choose the Active sonar selection.

Navigation

The Navigation toolbar button allows you to tell a unit or group where to go. To use the Navigator, click on the unit or group you want to move, then click on the Navigation toolbar button; the mouse cursor will change to a pencil shape. Using the pencil cursor, click on where you want the unit or group to go. You can enter several points for a unit at a time by continuing to click on new places on the map. Each time you click you will place a small circle with line segments connecting the circles. These small circles are called waypoints. After a course has been plotted, the user can select individual waypoints to either move or delete them. To move a waypoint, first select the waypoint and then drag it to its new location. To delete a waypoint, drag it to the previous or next waypoint. The current location of the unit or group is considered Waypoint 0. To insert additional waypoints, drag the small triangle that exists midway between two waypoints and release it where you want a new waypoint to appear. The small triangles are called midpoints. To exit the Navigator, click on the

Navigation toolbar button again or double-click the last point in the path.

For air units, the Navigator's operation is simple; the unit flies from its current location to the new location, avoiding only threat polygons. For surface and submarine units, the operation is more complex, since the Navigator must determine a path around whatever land masses may be in the way, as well as threat polygons. **Harpoon3** has a very good navigation routine, but it can be confused by a long course around a lot of land masses (such as an island group); if it can't figure out the whole course you had in mind, do it in stages. Also, the more complex the task, the longer the navigation routine will take; so navigating around several islands may cause a unit to "sit and think" for quite a while. Note that a small "N" appears next to the unit when the navigation routine is working on its path.

*Speed/Altitude/
Depth
button*

Setting Waypoint Orders

At each waypoint in a unit's or group's path, you can have it Change Speed, Altitude, Depth and Sensor Settings. To do so, select the unit you want to execute the orders, provide a path for it (if you haven't already), and click on the desired waypoint. With the waypoint selected, use the appropriate toolbar button to give the unit or group a delayed order. The unit or group will execute the order when it reaches the waypoint. A waypoint order can be deleted by either deleting the waypoint or using the Edit Waypoint Orders option from the **Settings** pull-down window.

For more information about using the Navigation functions in **Harpoon3**, read the tutorial section about Course and Speed.

Speed/Altitude/Depth

To change the speed of a unit or group, select the unit or group and then click on the Speed/Alt/Depth toolbar button. Doing so produces a dialog box with settings appropriate to the type of unit or group you've

chosen. Thus, surface and submarine units can have speed settings from Stop to Flank, while aircraft units can have speeds from Loiter to Afterburner (if that speed is available for that type of aircraft). Subs will have depth settings and aircraft will have altitude settings. Also, you can enter an exact speed, depth, or altitude in the text block as appropriate.

Throttle Settings

Air Ops button

Air	Surface & Sub Surface
Loiter	Stop
Cruise	Creep
Full	Cruise
Re-heat (Afterburner)	Full
	Flank

Altitude Settings	Depth Settings
Very Low (V-Low)	Surface
Low	Periscope
Medium	Shallow
High	Intermediate
Very High (V-High)	Deep
	Very Deep(V-Deep)

Air Operations (Air Ops)

All of the operations involving aircraft in **Harpoon**3 can be controlled by using the Air Ops toolbar button. The Air Ops toolbar button is one of the most versatile controls used in **Harpoon3** allowing you to perform the following Air Operation tasks:

- **Ready Aircraft**
- **Launch Aircraft**
- **Land Aircraft**
- **Air Interception**

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• **Air Strikes**
• **Aerial Refueling**

Ready Aircraft

Aircraft can be configured to carry a variety of different weapons, fuel tanks, and jamming pods. The type of mission the aircraft will perform dictates the particular loadout it will use. To ready aircraft, first select an airbase or ship that has aircraft landed on it. Press the Air Ops toolbar button to bring up the Launch/Ready Aircraft window. This window displays all of the aircraft currently available at the base or ship. Click on the aircraft you wish to ready and press the Ready button. A list of various loadouts will appear. When you click on a loadout in the top portion of the dialog box, the components of the loadout are displayed in the text list at the bottom. Click on the desired loadout and press the Continue button. You will return to the Launch/Ready Aircraft window where you will be prompted for the number of craft to ready. Enter a different value or accept the default and click **OK**. The aircraft you ordered to ready are now listed with the selected loadout and the number of minutes until the aircraft can be launched.

Launching Aircraft

Select a base, group, or unit with available aircraft. If the base, unit, or group has available aircraft, the Launch/Ready Aircraft window will appear, showing the available aircraft and their current loadouts. Select the aircraft you want to launch and press the Launch button. A dialog box will appear asking how many of the aircraft you want launched. Enter the number of aircraft desired. If you change your mind about launching aircraft, click on Clear. Using the Clear button allows you to clear aircraft from launching without leaving the Launch/Ready Aircraft window. The Cancel will clear all the launch orders you have issued and close the Launch/Ready Aircraft dialog box. The launch orders you issue will only be carried out when you click on **Continue**.

Landing Aircraft

Select the aircraft you wish to land. Then click on the Air Ops toolbar button; the mouse pointer will change to a target crosshair. Finally, double click on the base, group, or unit where you want the unit to land. Aircraft on missions or intercepts will automatically return to their point of origin when they reach Bingo Fuel (enough fuel to return to base) or Winchester (all ordnance has been expended). If you do not want an aircraft to return at Bingo or Winchester, you will have to give the aircraft new orders (a path, target, or mission).

Manual Air Interception

Enemy or unknown aircraft can be intercepted by aircraft that are currently airborne. To assign an air interception, select the intercepting aircraft and then press the Air Ops toolbar button. The mouse cursor will change to a targeting crosshair. Double-click on the target aircraft and the interception will commence. The intercepting aircraft will fly to intercept and engage the Bogies (unknown target aircraft).

Air Interception Missions

Air Intercepts can also be conducted using the Mission Editor. Please consult the Mission Editor section of this manual to learn more about using Air Interception Missions.

Manual Air Strikes

Air strikes can be ordered against ships, subs, or bases. To order airborne aircraft to attack one of the above types of targets, click on the aircraft and then click on the Air Ops toolbar button. The mouse cursor will change to a targeting cursor. Click on the target. The aircraft will fly to the target, and when in range, launch or drop weapons.

Mission Editor Strike Missions

Air Strikes can also be conducted using the Mission Editor. Please consult the Mission Editor section of this manual to learn more about using Air Strike Missions.

Aerial Refueling

To refuel aircraft that have the capability to be refueled in the air, select the aircraft to be refueled and press the Air Ops toolbar button. The mouse cursor will change to a targeting cursor. Now, double-click on the tanker aircraft. The aircraft requiring fuel will fly to the tanker to begin refueling. Once it has refueled (the amount of time depends upon the size of the aircraft), the recipient aircraft will continue to loiter with the tanker until it receives orders, or it will return to the mission it was assigned to before the refuel order.

Using the Formation Editor

To effectively use the Formation Editor, it is important to understand the difference between a unit and a group. A unit is an individual ship, sub, or aircraft. A group is two or more units.

The Formation Editor is used to position your units in the best possible configuration to meet potential threats. Units properly configured and assigned to their most capable missions will provide the best possible defensive and offensive capability for the group.

Beside the obvious placement of units in relation to each other, the Formation Editor also allows the user to assign individual units in the formation to specific Patrol Zones. These Patrol Zones are created, then associated with one of the following Threat Axes:

    • **Anti-Submarine Warfare (ASW)**

Formation Editor button

      • Anti-Air Warfare (AAW)
      • Anti-Surface Warfare (ASuW)

Patrol Zones maintain a position relative to their assigned Threat Axes, therefore they move as the Threat Axes moves. There are three types of patrol movement patterns for ships:

      • Sprint-Drift -a series of high speed runs followed by a reduction of speed to drift. Used to make passive sonar observations during the "drift."

      • Station Keep - speed and course are constantly changed to maintain an exact distance and heading in relation to the center of the patrol zone.

      • Random - the unit randomly selects a side of the patrol zone, finds the midpoint of that side, then transits to that location.

Aircraft will loiter in their Patrol Zone stations and will conduct one of the following types of patrol profiles:

      • Combat Air Patrol (CAP)
      • Airborne Early Warning (AEW)
      • Dipping Sonar - For equipped Helicopters
      • Sonobuoy - For equipped Aircraft/Helicopters
      • Surface Combat Air Patrol (SUCAP)

The Formation Editor can only be used with groups. To create a group from two or more units, you should start by selecting all the units you wish assigned to the group. Select all these units by using the drag-select or by using shift-click to select each one individually. Once all of the units are selected, use the hot key to create a group with all of the selected units. Consult the **Harpoon3** Command Card to learn which hot key is used by your type of computer. Another way to create a group is by selecting a single unit and holding the mouse button down and dragging a line from the selected unit to another unit. A group symbol will appear after you let go of the mouse button. If this

symbol does not appear, try toggling the Group/Unit hot key.

Note: When grouping aircraft, keep in mind that the units must be the same platform type, have the same loadout types, and be on identical missions. In addition, submarines are never included in a Harpoon3 formation.

After you have a group symbol (either the double circle symbol NTDS or the three-ship symbol for Stylized) displayed, select it and press the Formation Editor toolbar button. This action will create a Formation Editor window containing everything in the area covered by a group's patrols or units. There will also be several range circles of varying distances from the center of the formation. To change a circle's distance from the center, grab it with the mouse cursor and drag it to a new location. You will see the outline of the range circle move as you drag the mouse cursor. Let go of the circle and it will appear at a new distance from the center There will also be three small triangles of differing colors. These represent the three Threat Axis designators. To display any of the three Threat Axes, it is necessary to click on the small triangles one at a time to activate each one individually.

The ASW Threat Axis will be locked to the Path of Intended Motion (PIM) which is the heading of the group. You cannot move the ASW Threat Axis from the PIM. However, the position of the AAW and ASuW Threat Axes can be altered. The AAW and the ASuW Threat Axes are locked into the compass direction they are facing. They will stay pointed in that direction until either you or the Formation Controller (see section on CPU) moves them. You can also move a Threat Axis designator by "grabbing" the arc portion of the designator and moving it to another location.

Once you have moved or adjusted each of the Threat Axes (remember, the ASW axis can not be moved), you will need to designate Patrol Zones for each of the individual units of the group.

To assign a unit to a Patrol Zone select the unit in the Formation Editor window, then activate the Threat Axis that you wish to associate with

PZ

Patrol Zone button

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the patrolling unit. Next, click on the Patrol Zone toolbar button. After you have activated the Patrol Zone button position the mouse cursor in an area on the Formation Editor and hold the mouse button down while you drag the mouse to form the Patrol Zone. You will see that a representation of the area you are selecting will appear and move as you move the mouse while continuing to depress the mouse button. Once you are satisfied with the Patrol Zone you have created, release the mouse button and the Patrol Zone will be drawn into place. You will now be asked how the unit should maneuver once it arrives at its Patrol Zone station. Select either Sprint-Drift, Station Keep, or Random.

CPU button

If the unit you are assigning to a patrol is an aircraft, select the unit or the platform on which the unit is based. Then, activate the Threat Axis to which you wish to associate the patrol. Click on the Air Ops toolbar button, then draw the Patrol Zone. After creating the Patrol Zone, and selecting the patrol type, a dialog box will appear prompting you to assign an aircraft.

Threat Axis
Tracking button

Each unit will make course adjustments relative to their respective Patrol Zones. Some of the units will have courses that may look as if they are going in a different direction than that plotted for the group. This happens because each of the individual units is transiting to get to its new station. The Formation Controller will get the units to their assigned stations, and maintain the stations as needed.

Patrol Zones can also be assigned to each unit using the computer-assigned patrol feature. To have the computer select and configure patrols it is necessary to select each unit individually and click on the "CPU" Formation Editor toolbar button. This action will allow the computer to modify that unit's station and Threat Axis. Keep in mind that a computer designed formation is somewhat limited when compared to a formation controlled by a human player.

Detach Unit button

The Threat Axes can be configured in a manner that allows them to track a contact. For example, suppose you have an enemy or unknown aircraft operating in your group's area. You can select the threat and assign one of the Threat Axes to remain fixed on that particular unit. This does not apply to the ASW threat axis, which as mentioned

before, is aligned permanently with the group's PIM.

To assign a Threat Axis to a contact, you must first select a unit in the Formation Editor window. Then, activate the Threat Axis you wish to make a tracking axis and click on the Threat Axis tracking button. Single click in the map window that is displaying the target to activate that window, then double-click on the target. This will keep the selected Threat Axis on the contact. As the bearing to the contact changes because of the motion of the group and the contact, the Threat Axis will move in relation to the group and the contact.

A unit assigned to a group can also be split from the group by selecting that unit in the Formation Editor and clicking on the Detach Unit toolbar button. The unit will no longer be assigned to that group and will not conduct any previously assigned patrols. The unit will also need new orders and will be independent from that point on, unless it is reassigned to another group.

To join a unit not assigned to a group, you need to select the unit and drag a line from the unit to any unit in the group or to the group icon. The joining unit will then be placed in the Formation and can be assigned a Patrol Zone.

Like map windows, the Formation Editor has a Preferences button. Use this button to change what is displayed in the Formation Editor window. The following items differ from the map window preferences and can be toggled on or off:

Logistics button

- **Range Rings -** the distance rings that can be moved in and out to display distances.

- **Threat Axes -** the three wedge projections representing the AAW, ASW, and ASuW Threat Axes.

- **Threat Axis Labels -** the text that labels each Threat Axis.

- **Current Station -** the assigned Patrol Zone for the unit currently selected.

Logistics

If the Aircraft Logistics difficulty setting is set to ON, the Logistics toolbar button can be used to refuel and resupply ships. Ordnance for carrier-based aircraft can be provided to carriers. The ability to conduct aerial refueling, while a logistical operation, is executed using the Air Ops toolbar button and is covered in the Air Ops section of this manual.

Underway Replenishment

Ships can be refueled and rearmed at sea provided that there are ammunition ships and oilers in the operating area. To refuel or rearm a ship, click on the ship requiring fuel or weapons, then click on the Logistics toolbar button. The mouse cursor will change to a targeting cursor. Double-click on an oiler or ammunition ship and the ships will rendezvous and match course and speed. When the two ships are along side of each other they will continue on a parallel course with each other while fuel or ammunition is transferred. If orders are given to either ship while they are conducting replenishment operations, the resupply will cease.

Magazine Allocation

A ship magazine is where its ordnance is stored. Each combat ship has a set amount of ordnance at the beginning of a scenario. As the various ordnance is expended during a scenario, weapons mounts are reloaded automatically from the ship's magazine. Some types of mounts have the ability to load a variety of different weapons. A good example is a torpedo tube. Some submarines can fire both torpedoes and surface-to-surface missiles using their torpedo tubes. A mount will reload the same type of weapon each time it is fired unless it is allocated with a different type of weapon. It is possible to reload a mount with another type of ordnance, provided the mount is multi-weapon capable and is compatible

with the type of ordnance to be loaded.

Reloading Mounts

To reload a mount with weapons from the magazine, select the ship and double-click on the Logistics toolbar button.   The Reload Weapon Selection window will appear. This window contains the following lists:

Mount List

A listing of the ships mounts, their load status, and capacity. Each mount is listed in the following manner:

Mount x # loaded / mount capacity

Mount Weapons List

A listing of the various types of weapons that can be loaded into the selected mount. The current weapon loaded will have a number listed in the "# loaded". Each weapon is listed in the following manner:

Weapon x # loaded / mount capacity

Magazine Weapons List.

A listing of the current on-board stock of ordnance available.

Weapon x # loaded / magazine capacity

To unload a mount double-click the mount listing in the Mount List. The # loaded will be reduced each time you double-click until it reads 0.

Nav Zone button

Nav Zones

Navigation or "Nav" Zones are areas that you can designate as off-limits to all or some of your units. Nav Zones are used to prevent your

units from navigating into areas because of threats, rules of engage-
ment restrictions, or to avoid detection ranges of known enemy units
or facilities. The following are the types of Nav Zones that may be
created:

- **General Exclusion**
- **Ship Threat**
- **Sub Threat**
- **Air Threat**
- **Neutral**

Create a Nav Zone

Prior to creating a Nav Zone, make sure that you have Nav Zones
set to display from the Map Preference window. To create a Nav
Zone start by clicking on the Nav Zone toolbar button. Your
mouse cursor should change into a pencil cursor identical to the
one used while in navigation mode. Place the mouse cursor at a
point on an area of the map where you want the starting point of
the Nav Zone to appear. Draw a polygon by clicking points on the
map. Similar to drawing a course for a unit, line segments are
created each time you click. When you reach the point where you
are ready to close the polygon, click on the Nav Zone button again
and the polygon will close automatically.   A dialog box should
appear with a variety of exclusion zones to choose from. Each
type of exclusion zone listed has several lettered boxes next to it
allowing you to create multiple versions of the same type of zone,
each with its own letter designator. For Example, you could create
to Ship Exclusion Zones, one would be labeled "A", while the
other could be designated "B". Select the type of zone you want
and then click on the **OK** button. The line segments should change
into one line making up the polygon with a small circle at the point
where you first clicked to begin drawing the polygon. This circle
is used to select the Nav Zone to edit or delete it.

Editing a Nav Zone

To edit a Nav Zone, select the circle that marks the starting point
of the polygon. Note that when selected, the individual points you
used to create the polygon appear. These polygon nodes can be

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moved and deleted exactly like the navigation waypoints.

On the PC, **double clicking** on the Nav Zone toolbar button will bring up a dialog box with the Nav Zone exclusion options. Clicking **once** on the Nav Zone toolbar button changes the mouse cursor to the drawing pencil and allows you to lay in a the points of a completely new Nav Zone.

On the Macintosh, clicking **once** on the Nav Zone toolbar button will bring up a dialog box with the Nav Zone exclusion options.

Navigation Around Nav Zones

Affected units or groups will navigate around the Nav Zone in a manner similar to a ship or sub navigating around a land mass, unless you specifically set the unit or group to ignore that type of Nave Zone.

Navigation Through Nav Zones

You may require that a unit ignore a Nav Zone because it is critical for the successful completion of the mission to get to a spot inside. To navigate through the zone, start by selecting the unit or group that you want to navigate through the zone. Next, double-click on the Nav Zone toolbar button. The menu box used to designate Nav Zone types will appear with an "X" in every type of Nav Zone that the selected unit or group currently respects. Clear the "X" from the type of exclusion you wish the unit to ignore and press **OK**. The selected unit will now ignore any Nav Zone of the type that was cleared from the Nav Zone dialog box. If the polygon has other types selected, the unit may avoid a zone for those reasons. It is important to check and see if a polygon has multiple types before attempting to navigate through with the ignore feature. To restore the original settings for the selected unit, simply repeat the process and place an "X" in the box as it was before.

Deleting a Nav Zone

To delete a Nav Zone, select the Nav Zone you wish to delete and then double-click the Nav Zone toolbar button. The Nav Zone type menu will appear again. Click on the "X" representing the

Technical Notes

Memory Management for the PC

In **Harpoon3** we used a 32-bit DOS-Extender allowing us to set aside the pseudo-24-bit addressing limitations of MS-DOS. This provides us with the ability to directly use all of the RAM on your computer without having to "jump through hoops." The native 32-bit addressing of the 80386/486 family of processors makes **Harpoon3** run much faster than similar sized applications running under DOS in "real" mode. In addition to the 32-bit operation, we have used the Virtual Memory features of the DOS Extender. This allows machines with only 4 Megabytes of RAM run **Harpoon3** with far less risk of running out of memory. Virtual Memory uses a portion of your hard drive (in a temporary file) as RAM. When a program's memory usage grows beyond the capacity of your RAM, the Virtual Memory routines find seldom-used variables or data blocks and puts them onto the hard drive. This frees up some RAM for more items. If the program later needs some of those variables or data blocks, the Virtual Memory routines swap them back into RAM. While this process can be slow, it allows play to continue where the simulation would otherwise be unable to do so.

Navigation

In the original Computer Harpoon, as well as in many other wargames, the ability of a computer AI to plot a course on its own was a risky proposition at best. When the objects to be avoided (usually terrain) are large and regular, or perhaps simple bitmaps, a simple right/left path algorithm will work just fine. However, in **Harpoon3** we model coastline polygons whose vertexes are a minimum of 1000 yards apart, but vertexes from different polygons can be placed within 18 <u>inches</u> of each other. When a scenario may be thousands of <u>miles</u> across and your coordinate scale is 18 inches, the math becomes a little more complex. The **Harpoon3** Navigator uses many different methods for finding a least-cost path for platforms. In many cases, (such as planes) the restrictions are not as stringent, but ships transiting straits or traveling great-circle paths on multiple map projections

were extremely difficult to write. As it was, we used multi-threaded events to break up these calculations over a minute or more of real-time. The game progresses normally while the navigator gets a share of the CPU every few microseconds to complete its tasks without stopping play. Even with all the hoops and tricks we used, sometimes the Navigator will be forced to give up trying to solve a complicated navigation problem so it can service requests from other platforms. The moral of this story is "Don't select your ship in the Black Sea and ask it to navigate to Gibraltar on its own".

Database

The **Harpoon3** database was designed with future expansion in mind. One of the great traumas in our lives was maintaining and expanding the database annexes used in Harpoon 1 BattleSets. In order to prevent this kind of dead-end approach from limiting our future growth with **Harpoon3**, we designed an object-oriented database with an intrinsic ability for expansion from the start. The database design is simple and elegant, and allows rapid update or expansion by letting us quickly add or modify new records. Additionally, whole new types of data can be added with minimal fuss. The modular design of **Harpoon3** in C++ allowed us to build a graphical database editor into the program, giving us a special version of **Harpoon3** which was both the game, scenario editor and a graphical database editor all in one. This valuable tool allows our staff researchers to create not only scenarios, but whole new BattleSets with record time and with minimal programmer support.

Weather

The weather model in **Harpoon3** is more complex than might appear on the surface. When a scenario is first created, the weather model is run on its map. This generates a set of low and high pressure cells based on a set of environmental rules. The map itself has a set of meteorological information that represents the base values for the map region and season depicted by the scenario. When the game is run, these low and high pressure cells interact with the base values present on the map, producing pressure changes and thus cell "move-

ment" across the map. The interaction of these cells produces boundary effects along their edges, including various types of cloud cover and precipitation. The relative movement of these pressure cells also generates wind speeds, which effect the sea state for that area. One of the most important things about weather in **Harpoon3** is its effect on sensor performance. Radar and other electromagnetic sensors (including eyes) are effected appropriately by precipitation and visibility levels. Sea State is another example; it has a terrific effect on sonar performance, both passive and active. Sea State is a general measure of ocean conditions, both in terms of wind speed and wave height, and is represented by a number from 0 to 9. A Sea State value of 1 would represent a light breeze with flat, calm (maybe rippled) seas, while a value of 9 indicates almost fifty foot waves and a wind strength of over sixty-five knots! Each increase in Sea State reduces passive sonar ranges by about 15%, depending on the operating frequency of the sonar. High and medium frequency sonars are affected more severely than low frequencies. Active sonars are affected even more by Sea State. Rough seas tend to fill the ocean with tiny air bubbles, even at great depths. Since air bubbles reflect sound, the reverb effects make active sonar almost useless above Sea State 5. A similar effect can be demonstrated by turning on your automobile high-beam lights in a dense fog bank.

Maps

We are especially proud of the maps in **Harpoon3**. While we could have produced a pretty bitmap for you to wonder at, we chose to not imitate the Rand-McNally[tm] Atlas look and feel. Instead we looked at how a variety of actual tactical systems displayed topographic and bathymetric data and went for realism instead. Additionally, vector maps offered free scaling and sizing without any data loss, and gave us any projection type we were willing to write math for. Since those addressed two of the major limitations with the maps in Harpoon 1, we elected to implement maps in this fashion. After much research and heart-ache, we discovered no one source for global vector map data that met all of our needs, so we had to settle on several different sources. We wrote many conversion and integration programs and finally developed a base set which we could work from. Then came

the corrections. A quick check revealed glaring inaccuracies in much of the original data so we had to compare (by hand) much of it using high resolution survey maps and charts. Eventually a composite database arose that contained integrated data from the following sources; The Defense Mapping Agency, The Central Intelligence Agency, The National Oceanic and Atmospheric Administration, The National Geophysical Data Center, The Governments of Great Britain, Canada, and Australia. The polygon data represented coastal points on a 1000 yard scale for the entire planet and topographic and hydro/bathymetric datapoints every 30 miles (at the equator). Our internal data structures also yielded lookup and render times several orders of magnitude faster than those provided by the original data sources. This map scale fit in nicely with our basic internal unit of distance in **Harpoon3** (about 18" apart) and allows us as fine a resolution of detail as could be desired.

Sensors

Two extremely complex sensor models needed to be developed for use in **Harpoon3**: The Electromagnetic and the Acoustic. Both models needed to be as detailed and as accurate as possible, yet still capable of running in real-time with dozens for interacting platforms. After examining the existing sonar model from the original Computer Harpoon, we found the methods sound (no pun intended) in principle, but not in application. They were too slow and used too many abstractions for our liking. So, we went back to the experts, got some advice, then set off to create a new system. In a nutshell: Every platform radiates broadband as well as frequency specific acoustic energy into the water. We store three base noise levels for every platform: Front, broadside and rear aspect values. These base noise levels are then increased as a function of the platforms speed. Certain other transient activities will also increase a platform's base noise level for a short period of time. Examples include firing a weapon or changing depth rapidly. Many platforms can also suffer a noise penalty due to propeller cavitation when they travel rapidly through shallow water. This is a function of depth and speed as well.

The thermocline is a sharp boundary between the warm water at

shallow depths and the relatively cold, still water at intermediate depths. Sound energy tends to reflect off this "layer" and has the effect of reducing some direct path ranges if the two searching platforms are on opposite sides of the thermocline. In **Harpoon3**, acoustic searches which cross the layer have an appropriate signature reductions.

Acoustic energy is attenuated between platforms as a function of the distance and the frequency of the source. Since low frequency sources carry much further than medium or high frequency sources, we attenuate based on different formulas and tables. Background noise (sea-state, shipping, biological activity, etc.) is used to wash out discrete source signals (based on location and season) and so the final signal arrives at a sensor. Each sensor has a given sensitivity which is compared to the signal for the purposes of detection. Multiple successive detections over time yield further information about the contact such as speed, course and classification/identification.

While low frequency sources tend to travel much, much further than higher frequency sources, sonar detections for long range, low frequency sources must be accomplished with a signal processor. The processor integrates a vast amount of ocean noise over time, looking for anomalous sources which are consistent over time. This method allows man-made sources to stand out against the relatively random background ocean noises. On an average, this integration takes about five minutes for a meaningful initial detection-level sampling. So, in **Harpoon3**, low frequency sound sources are re-examined approximately every five minutes or so. If a detected target radically changes its acoustic signature, another attempt may be made earlier, but a steady, constant source will only be looked at every once in a while. This is only an issue with a long range, long frequency source however. When a contact is close to a detecting platform, the radiated medium and high frequency noises can be clearly heard as well, and those are examined every 15 seconds, just like every other detection in **Harpoon3**.

Another sonar phenomenon is Convergence Zones (CZ). As you go down deep (1000 meters or more) into the ocean, the temperature,

pressure and salinity content of the seawater changes. These changes result in different depths having different speeds of sound. As a sound wave travels down into these depths, one portion of the wave will begin moving faster than another. This causes the sound wave to bend back towards the surface in a long, graceful curve. When this sound reaches the surface, if conditions are right, it will bounce back down and start another long curving path. These regions where the sounds come back up from the depths are called Convergence Zones. They generally occur about 66,000 yards (33 nm) apart and are about 5 miles wide each. CZs tend to produce an annular pattern of concentric rings around a noise source at 33 mile intervals (e.g. 33 nm, 66 nm, 99 nm, etc.). The relative stability of deep water tends to conduct sound energy with far less attenuation than would be found in direct path propagation. In short, good sonar suites can sometimes detect noises made several CZs away. **Harpoon3** models the acoustic conditions that allow CZs to occur and permits the detection of sufficiently noisy contacts at CZ distances.

Electromagnetic Sensors

This brings us to the electromagnetic detection models. Every platform and weapon in **Harpoon3** has a visual, infrared and radar cross-section for various aspects (front, side and rear). These are stored as unit-adjusted values based on square meters. They are a measure of how large or reflective the platform appears in each of the respective frequency bands. Every electromagnetic sensor has a value which indirectly describes its range vs. target cross-section resolution. Once again, background noise on the appropriate frequency is added in (ECM, etc.) and this will cause some targets to become uncertain or undetected. Visible light, infrared, microwave (radar) sensors all use this system for detection. ESM sensors are receive-only systems that detect and classify electromagnetic signals. They generally will reveal a bearing to the detected emitter and will automatically determine sensor type. ESM sensors are principally limited in range by line-of-sight restrictions. Due to atmospheric scattering and ducting of electromagnetic radiation, ESM sensors can generally detect emitters a bit beyond the actual line-of-sight.

Technical Notes

Harpoon3 directly models 'Noise' Jamming techniques (both 'Spot' and 'Barrage'), which attempt to saturate a particular set of frequencies by raising the background noise above the level of any returned target signals. This is significant when you consider that radar signals lose power (path loss) as a function of the inverse^4 power times range. This is because radar signals must go out to the target and then come back to the receiver. Jamming signals need only go one way, and therefore only degrade as a function of the inverse-square of the range. Radar which are being jammed have their performance greatly reduced along the bearing to the jammer. While jammers are more effective the closer they get to a radar, at a certain range the radar will be powerful enough to detect targets along that bearing, overcoming any jamming that might be behind those targets. This distance is referred to as the "burn-through" range. Because jamming signals tend to mask out other contacts, jammers should try to remain along the same relative bearing as the platforms they are attempting to conceal. They are most effective when they remain fairly close to these platforms so their jamming signals overwhelm any radar target returns.

Incidentally, platforms employing active jamming instantly reveal their bearing to anyone caring to listen, if not their exact location through triangulation.

As an additional side effect of jamming, radar which are being jammed have a reduced range in the direction exactly <u>opposite</u> from the jammer. This is referred to as "rear-lobe" jamming and is caused when jamming signals coming through the back of the radar antenna (when it's facing the other way) strike the receiver from behind. While not nearly as severe as the degradation suffered by frontal (main-lobe) jamming, it should not be forgotten by the user, lest there is a tricky AI attack from an unexpected direction.

A radar can completely avoid being affected by a given jammer if they use different frequencies, or if the jammer cannot cope with a particular type of anti-jamming method a radar might employ.

Weapons/Ordnance

Here are some insights into how various weapons and ordnance are being employed in **Harpoon3**. One of the trickiest pieces of modeling we did in **Harpoon3** was the employment of semi-active radar homing missiles (SARH) which, due to engagement geometry, were forced to share illuminators. It was a simple enough problem when confined to illuminate-all-the-way missiles, but several real missile systems had inertial/command guided fly out and only required illumination in the terminal phase of their flight. This meant we had to keep track of when each director would be busy (in the future) and prevent a missile from firing if no directors would be available at the intercept time. So each director/illuminator got a rolling bit field representing a 15 second engagement timeslice and we wrote a simple timesharing system to keep the launchers honest. When you also consider that each mount has a rate-of-fire (ROF) cycle and finite reload time, the whole affair has suddenly grown beyond the users ability to effectively micro-manage. In real life, a trained Air Warfare Officer and his crew will have a very hard time keeping up with the multi-dimensional geometry of even the simplest engagements. Since the average **Harpoon3** user would probably have even less training, we had to let the computer handle a lot of the functionality for them. The design paradigm of **Harpoon3** states clearly that "Once the missiles start to fly, the user is mostly out of the loop". While this may be less fun than shooting each missile yourself (a la most flight simulators), the emphasis is really on learning about and employing modern naval tactics, and not how quick your mouse hand reflexes are.

In real life, a SARH missile tracks reflected microwave energy that has bounced off its intended target. This energy usually originates from an 'illuminator'. An illuminator is a generally a radar emitter that produces a tight microwave beam used to guide a SARH missile. A typical missile engagement using SARH missiles would probably go like this: A search radar will detect a target and tell the illuminator where to point. The illuminator then emits a microwave beam which reaches out to the target. Some of the energy bounces off the target and is visible to the radar seeker head in the missile (which is still on

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the rails). The missile says to the fire control computers "I can see the reflected energy". The missile is fired towards the target and will steer itself towards the reflected energy, eventually intercepting the target and exploding. If the illuminator is turned off for some reason, the missile will no longer see any reflected energy and will miss the target. Some missiles will self-destruct when they lose their illumination. There are some problems with this system. First, the illuminator must be constantly pointed at the target during the entire flight of the outbound missile. This means you may only shoot at as many targets as you have directors to guide them.

Some missiles and torpedoes employ search patterns in the terminal phase of delivery. This means if they do not see an appropriate target when they have reached their activation point, they will alter their course to search for one. Missiles and sub-launched torpedoes will initiate an expanding 'snake' pattern. A snake pattern simply zig-zags back and forth every few minutes by about 45 degrees left and right of its base course. In contrast, aerial delivered torpedoes launched at uncertain submarine contacts will almost always begin an expanding circle pattern (a spiral), occasionally changing depths in its search for a submarine. Care must be taken not to launch at an uncertain target in an area where friendly or neutral platforms might be spotted by the weapon's seeker head. The weapon cannot tell friend from foe or combatant from civilian and will engage any platform matching its target parameters.

Air-delivered gravity bombs may be tossed ballistically. This simply means that the higher and faster an aircraft is flying, the greater the distance from the target the bomb can be released. This allows aircraft to avoid heavy concentrations of point defense weapons (like hand-held SAM launchers and small arms fire).

Propulsion

While some of the weapons and platforms in **Harpoon3** share common propulsion systems, most do not. To simulate the vastly different operating parameters and performance of all these different engines, boosters, batteries, rockets, etc. we keep an extensive data-

base on all the propulsion systems used in **Harpoon3**. We track the name and type, as well as valid fuels and consumption rates for each system. Each propulsion system may have many different operating altitudes, each offering different speeds and consumption coefficients. This is one area where object oriented programming helped immensely while writing **Harpoon3**. Every mobile platform in the simulation contains a propulsion system (or perhaps more than one). These propulsion systems know what type of fuel they can utilize and how fast they will consume it. Since each platform also carries around appropriate quantities of the fuels it expects to use, things work well. These layered models allowed us to simulate UNREP (underway replenishment) and air-to-air refueling with relative ease. In one test run, we found a ship with a voracious gas turbine engine, which, when all of its fuel was gone, started in on the fuel stores for its embarked helicopters. The gas turbines used by this ship really were capable of efficiently burning almost anything, and thought the helo fuel would make a lovely dessert.

PART TWO:

Guide to Naval Warfare

Written by
Ed Dille
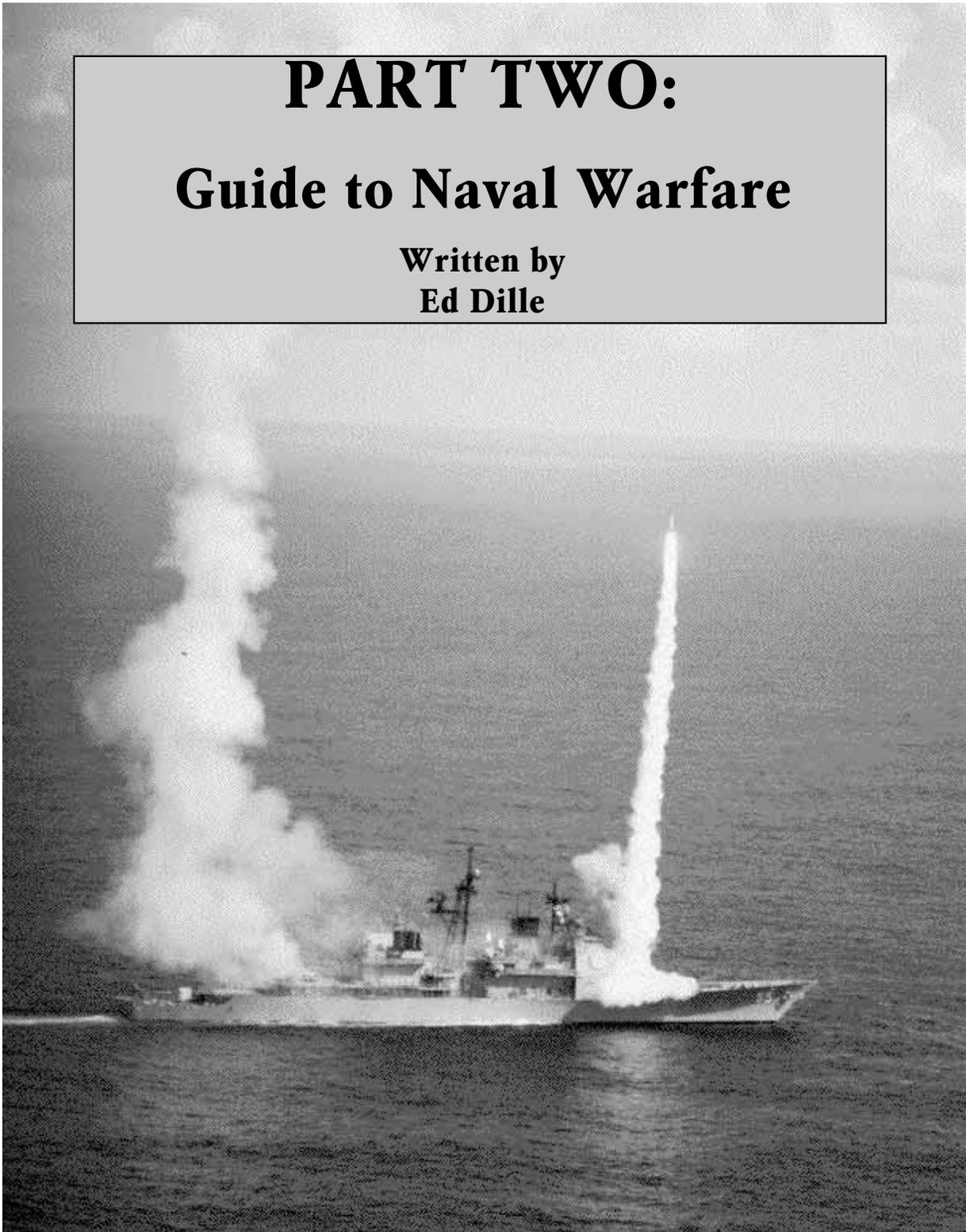
Author's Introduction

Condensing fifteen years of experience into a seventy-five page document is never easy, but I hope that I have done so in a manner that makes it easy for you, the reader, to gain the skills that will allow you to enjoy **Harpoon3** to the fullest. In the sections that follow, you will be presented with a wealth of tactical and strategic insight, all of which is easy to assimilate when examined singularly. Unfortunately, **Harpoon3** will never allow you to operate in such a luxurious vacuum, where one need only consider a single aspect of the battlefield in any given moment.

Harpoon3 will require you to develop the associations, thought patterns and insight of a naval professional to survive. To aid in your transition from civilian to silicon warrior, I have organized the major warfare areas topically. Each segment will teach you the required skills to manage the planning and engagement of that type of encounter, but no segment can be viewed exclusive of the others. As such, if you are already playing **Harpoon3**, there is nothing wrong with flipping to a particular section to gain some insight, but at some point you should invest the time to read the entire guide. Only through that investment will you be able to fully piece together the complex puzzle that is modern naval warfare.

Fair winds and following seas in the journey that lies before you!

Ed Dille

Section I:
Mission Planning

Mission Planning

"In war every problem, and every principle, is a duality. Like a coin, it has two faces. This is the inevitable consequence of the fact that war is a two party affair, so imposing the need that while hitting, one must guard."

   -B.H. Liddell Hart

War is not a set piece affair, in which contestants walk politely within striking distance of one another and then exchange blows according to a set of pre-ordained rules. War is a dynamic process without hard and fast rules to guide the combatants. Analysts tend to use maxims or principles in the discussion of warfare, but their usefulness lies not in being constants, as Mr. Liddell Hart so aptly pointed out, but rather in being malleable sources of inspiration that an enlightened commander can apply at a decisive point in the engagement.

All tactical thought, from Sun Tzu to the modern day, contains contradictory elements if viewed exclusively from an academic standpoint. To practitioners of the art of war, however, the dichotomy is easily held, because they understand that each part of the contradiction is equally true at different points in time. As such, it is more important to understand battlefield dynamics than to memorize lists of tactical axioms. Without knowledge of the former, it is impossible to know when the application of any of the latter is relevant.

Fire and Movement

Although many of the comparisons between ground and naval warfare tend to oversimplify the peculiarities of each to reach a common ground, the basic tactical precepts of fire & movement are equally important in each arena. The objective of the tactical commander is the delivery of firepower in support of the mission. Maneuver is the method that allows the commander to attain position to deliver that firepower. Mobility is also significant to naval forces as an enhancement to survivability. Forces may strike decisively on a given day, avoid counter-detection, and mass for another strike hundreds of miles away the next day.

Intelligence Gathering

The ability to mass decisive firepower and move it quickly through the theater of operations is irrelevant if one cannot find a target to employ it on. Excluding land-based assets, which are all considered pre-targeted anyway, enemy forces enjoy the same degree of safety through mobility as your own forces do. As such, he who finds the enemy first while avoiding detection generally wins. Thus, from the initial stages of planning to post-mission egress, the primary focus of the commander must be on scouting.

Once located, the threat posed by an enemy force is diminished severely, and not only because they have lost the element of surprise. If sufficient force exists, the commander may mass it against the threat to eliminate it. If you have limited resources against a superior threat, then avoidance of the threat becomes the best option. If you know the enemy's whereabouts, and they remain uncertain of yours, then avoidance is not difficult to achieve. In that latter example is a fundamental truth that must be internalized. Scouting and intelligence gathering are not one-sided propositions. As the commander attempts to gather targeting data on the enemy, it is also necessary to make every effort to deny him the same luxury. The approaches one considers in this struggle depend on the geography of the area of operations, his assessment of enemy capabilities, and the specifics of the mission.

A Lesson in Geography

The Naval Officer assesses the impact of geography on the area of operations a little differently than his counterparts in the other services. Conventional topography is important in two instances: first, when one will send airstrikes ashore and seeks to use this topography to advantage in planning ingress and egress routes of the strike elements and, second, when one is forced to operate close to the shore and the topography delays detection of outbound enemy airstrikes. Bottom topography is critical if the enemy possesses either a mine or subsurface threat or if your own force will employ these assets. Finally, other continental features are important whenever they compress the battle space afforded the commander.

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To explain, battle space is a theoretical bubble around a force in which the commander feels comfortable in detecting, tracking, and engaging threats before they can pose a significant danger to the main body. Whenever units are forced to operate in confined waters (e.g. the Tsugaro Straights off Japan or the Persian Gulf), the battle space has been compressed. Because the units are limited in the option of maneuver, the enemy can establish effective barrier patrols or minefields more easily. Also, the commander is constrained by physical borders, such as reefs or shallows, or legal borders like the 12 mile limit, in the positioning of pickets and screening units, which further reduces the reaction time allotted any threat which does materialize.

Know the Enemy

The significance afforded geographic features also varies based on the enemy's capability to capitalize on any of these areas. If, for example, one faced an adversary without a known subsurface or mine threat, then the only precautions necessary to sanitize a chokepoint prior to passage might be a surface or air sweep to identify and eliminate surface threats. Conversely, the possible presence of even an antiquated diesel boat in narrow, shallow waters is too deadly a contingency to be ignored. As such, the prudent commander must study the enemy order of battle and understand their capabilities. As one can never know enemy intentions with any acceptable degree of certainty, contingency planning must always remain focused on capabilities, no matter how remote their realization may seem. This does not mean that the commander never enters the straits on the premise that a diesel boat might be lurking, as such timidity is tantamount to failure, but rather means that all prudent precautions are taken before risking the critical asset.

Laying the Course

Having invested considerable thought into the geographic anomalies of the area and the capabilities of the enemy order of battle (OOB), it is now time to plan intended movement. Keeping in mind that

maneuver is the achievement of scouting and firing position over time, one must consider any time constraints imposed by the original mission on the ultimate objectives. Do the critical high value units of the force have sufficient time to make a leisurely, cautious approach to the objective, or is it necessary to serve political expediency and rush to the fore? The answer to that question determines the degree of planning flexibility afforded the commander in determining the eventual timeline of engagement. Further, the timeline has a direct impact on tactics.

The geographic and navigational models of Harpoon3 allow unprecedented realism in performing these stages of mission planning. Players who are willing to invest the planning time to consider the specific geography of the area of operations will be rewarded with commensurate improvements in their tactical success rate. Consider the satisfaction of the commander who correctly anticipates the presence of enemy forces and develops a contingency plan to eliminate that threat compared to one who destroys them only after their weapons are expended. In the latter case, even if the enemy units inflict minimal damage, they have achieved a degree of mission success by attriting the commander's defensive weapons magazines, which could prove crucial in subsequent engagements.

Summary

Once mission objectives are known, and the commander has identified the high value units necessary to achieve those objectives, the next step is to plot the Path of Intended Motion (PIM) to achieve position and deliver the force necessary to complete the mission. In determining the PIM, it is critical that commanders consider the specific geography of the operational area and evaluate the enemy's ability to use that geography to advantage.

Section II: The Order of Engagement

The Order of Engagement

If you have developed a flawless plan, which the enemy resolutely cooperates with, then the topic of this section is moot. You will already be engaging the enemy in the order desired. The frequency of this occurrence, however, is too infinitesimal to be measured. As stated previously, war is a dynamic process. As such, you must be capable of altering the existing battle plan on the fly and redefining the order of engagement instantaneously. To do so, you must evaluate the threat of each new contact in terms of potency and immediacy.

Potent threats are those forces which, if left unchecked, are capable of precluding mission accomplishment. Naturally, there are varying degrees of potency within this grouping. Some units may be eminently capable of executing the threat, others only noteworthy on a good day with a lot of luck. Either way, it is the commander's task to examine every new contact against the enemy OOB and assess the degree of threat it offers to friendly forces. Immediate threats may or may not be capable of precluding mission accomplishment, but they do pose a clear and immediate danger to friendly forces, usually stemming from the fact that they have already attained weapons launch positions.

Remembering that the commander has already been cautioned to know the enemy, platform specific guidance as to the level of threat will not be presented here. Indeed, the number of variables inherent in such an analysis would require volumes for all the ships, aircraft and submarines depicted in Harpoon3. Instead, the player should employ their knowledge of sensor and weapons ranges to categorize each contact within the threat class hierarchy depicted in Table 1.

THREAT CLASSES	
Class	**Description**
A	**POTENT AND IMMEDIATE** (eg. Inbound Cruise Missiles)
B	**IMMEDIATE ONLY** (eg.: Diesel Boat detected in Outer Screen)
C	**POTENT ONLY** (eg.: Surface Action Group detected at 350nm)
D	**NEITHER POTENT OR IMMEDIATE** (eg.: Gunboat at Anchorage)
TABLE 1	

The appearance of a Class "A" threat is occasion to drop everything else and eliminate the interloper. Class "B" threats also require swift action, but one should prosecute them without pulling assets off the main tasking. Class "C" threats should be the naval commander's bread and butter, as they are detected before they have achieved launch positions. This allows for a methodical massing of force over the horizon to destroy them or, if their defenses are too strong, then enough time has been purchased to maneuver to avoid the threat. Class "D" threats are also known collectively as targets of opportunity. Their destruction can aid the overall effort in some way, but it is not essential to success by any stretch of the imagination.

Please note that firepower is not the only criterion for threat classification. An ocean-going tug can be a class "A" threat if it is providing targeting data to one or more shooters somewhere over the horizon. Similar concerns must be exhibited with flag merchants of the hostile nation. Remember to assess enemy capabilities rather than intentions.

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Section III:
Formation and
Stationing Considerations
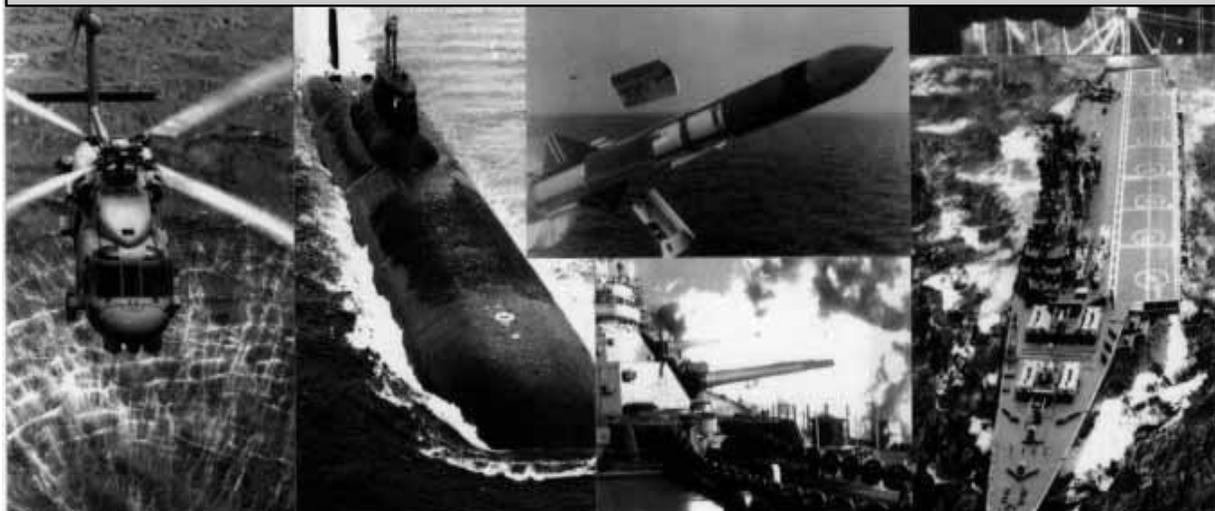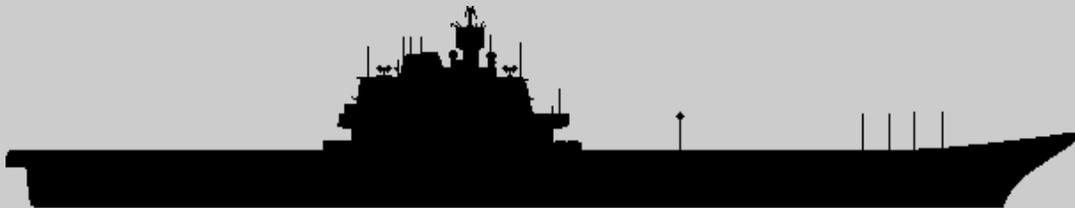
Formation and Stationing Considerations

Dispersal vs. Concentration

Once the PIM is established, the commander must determine the general disposition of the force. Naval warfare differs from its ground counterpart in this respect, because the geographic proximity of unit placement is a function of defensive strength versus offensive strength. Thanks to passive targeting and over-the-horizon missile capability, it is no longer necessary to form a line of battle to concentrate force on the enemy. With proper command and control, widely dispersed units can put their missiles on target within seconds of one another, as evidenced in Operation Desert Storm. These same units, however, are less capable of defending themselves as individuals when compared to their ability to support one another in a well-designed formation with overlapping missile coverage. Given that condition, you would expect the use of supporting defensive formations to serve inferior and superior force equally well. Reality does not bear this out, however, and the use of defensive formations is actually more critical for the superior force. Consider the rationale that supports this conclusion by examining the following hypothetical conflict between big water navy Blue and coastal nation Orange.

Blue sacrifices superiority if their forces are divided such that they might be engaged piecemeal. Yet, by massing the forces to support one another defensively, Blue simplifies Orange's targeting once the force is located. Orange is better off to disperse their units in the face of Blues superiority. Why? This dispersal forces Blue to detect, classify, and engage each individual element of the Orange force, which precludes simultaneous action against all of them. While the first elements are being engaged, Orange is buying time to get his other units into position to conduct a coordinated offensive strike against the Blue Force.

By adding names to the faces, astute players will note that the classic example of the aforementioned discussion is the war that never was. U.S. wargames focused on how they would use CV Task Forces to

project power on the Soviet mainland, while their Soviet counterparts built their bastion concept around the very approach illustrated for the inferior player. The lesson to learn and apply in all mission planning, regardless of the nationalities involved, is that unit concentration universally favors the superior side and dispersal is the tactic of choice when outnumbered or outgunned.

The Threat Axis

The threat axis is the commander's estimate of the likely direction from which an attack can emanate. The threat axis always exists, whether it applies to a single unit or a group of units, but it is really most significant in formation planning for groups. Although this sounds simple to understand, there are nuances to the establishment and operational use of a threat axis that must be clarified from the outset to alleviate later confusion.

Figure 1: Threat Axis from Carrier Battle Group to Threat Aircraft.

Force Composition

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the Mediterranean Sea.

The major factors in determining station assignments in a formation, other than the location of the threat axis, are the capabilities of the platforms themselves. Although virtually all modern ship designs emphasize multi-mission capability (i.e.: the ability to conduct AAW, ASW, and Anti-Surface Warfare - ASuW), the reality is that each class has a specialty within the three warfare areas and some limited ability to conduct the other missions. Commanders must analyze their force mix and categorize ships accordingly before proceeding deeper into stationing considerations. Because of the aforementioned emphasis on the defensive nature of formations, and the knowledge that ASuW is primarily offensive in nature, this categorization should focus on AAW and ASW abilities.

Formation Structure

A formation is a method of layered defense. Picket ships, Combat Air

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Patrol (CAP), and airborne early warning (AEW) aircraft provide surveillance to 200 nm and beyond. The outer screen typically occupies sectors between 12 and 24 nm from the main body. The inner screen is stationed within visual contact of the High-Value Units (HVU), usually under 10 nm from the formation center.

Since the employment of detached action groups, such as surface action groups and surface action units or picket ships, are specialized tactics, the placement of these assets will be excluded from this discussion. The circumstances for their use, as well as the proper stationing in relation to the threat axis, will be addressed in the appropriate warfare section of this manual. At this stage, it is important for the commander to focus exclusively on the functions of the inner and outer screens. Standard placement of the high value unit(s) in the center of the screen is assumed.

The Outer Screen

The function of the outer screen is to detect and engage any units that have leaked through the pickets and threaten the main body. To accomplish this mission, the outer screen must be capable of performing in all the mission areas. ASuW is a given, so the composition of the outer screen should be equally capable in the other mission areas, skewing any advantage toward ASW. Also, the ASW platforms chosen for the outer screen should have the best passive detection suites and the capability for stand off engagement of contacts with helicopter assets.

ASW assets are more effective in the outer screen because their separation from the ambient noise generated by the main body is critical to passive detection of submarines. Also, because the sizes of the sectors in the outer screen are so much larger, ASW assets can sprint to the forward corner of their area and drift at bare steerage back through the sector. Their vulnerability is increased while sprinting, but they are extremely effective on the return leg. A ship like a Spruance with a towed array sonar, operating at five knots or less, is virtually undetectable to submarines. AAW assets are present in the outer screen for two reasons: to provide covering fire for the relatively

vulnerable ASW platforms and to engage short range ASuW missile equipped aircraft before they reach their launch points against main body assets. In evaluating platforms for this role, maximum effective range of the SAM battery is more important than salvo rate. Aircraft are slower than missiles, and by employing greater range missiles, the outer screen AAW asset can conduct more engagements within the fixed amount of battle space. The more engagements, the greater chance the strike will jettison ordnance and go home.

The Inner Screen

ASW units selected for the inner screen should have the best active sonar suites, to allow for delousing (combing the area beneath the HVU) and an immediate targeting solution on any contacts that have penetrated the outer screen. Helicopter capability is important, but only if two or more inner screen assets are helo capable. This restriction is due again to the need for immediate and decisive action, which negates the effectiveness of a helicopter asset chocked and chained to the deck. With one helo always in the air in an ASW configuration, the commander can use it to "pounce" on any contacts generated by the inner screen.

The emphasis for assignment of AAW assets to the inner screen should be rate of fire, rather than range. It is assumed that any air contacts penetrating to the inner screen will be missiles. As such, they will be traveling faster than the platforms that launched them and there will be more of them as well, as each aircraft generally launches more than one missile. The more defensive firepower you can put in the air, the more inbound missiles will be attrited, and the smaller the burden of point defense systems like Phalanx becomes.

Aegis is the premier AAW suite for inner screen defense because of its all-aspect engagement ability and lack of launcher limitation for vertical launch equipped systems (VLS). Because of this fact, no modern U.S. CVBG puts to sea without a VLS cruiser tethered on a 4,000-yard leash to the carrier. Cruiser skippers who were used to the relative independence of picket duty prickle at the current situation, but it is a reality of modern tactical doctrine.

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Section IV:
The
Electronic
Battlefield

The Electronic Battlefield

Electronic Scouting

Any serious student of military history will point out countless examples of how technological improvements have driven changes in tactics. Throughout it all, however, the commander's prime objective of delivering firepower in support of the mission has remained unchanged. Further, in order to accomplish this objective, the commander must still locate the enemy, track him, and target him. The effort to do so involves all methods of surveillance, from visual sighting to electronic intercept of emissions, and it is known collectively as scouting. Scouting involves gathering data, active and passive, from all friendly forces for use by the tactical commander. The degree of effectiveness of scouting is a function of the area covered per unit of time. Command & Control functions, for the purpose of this discussion, are those which allow the commander to correlate scouting information on enemy force strength and disposition and disseminate that information to his own forces for exploitation in a battle plan.

As technological improvements have driven the envelope of engagement from the visual horizon out to 600nm, the scouting problem has been complicated exponentially. Why? Simply because of the increased area that must be covered for the commander to feel safe that any units within striking distance have been discovered. Also, because of the increasing lethality of weaponry, the Battle of the First Salvo is a realistic consideration. The commander who finds the enemy first and gets off an effective attack, while precluding the opponent from doing the same, will ultimately succeed. As such, the electronic battlefield, once referred to as the battle of the airwaves, holds the key to victory.

The Electronic Warfare Triad

Electronic Warfare (EW) is actually composed of three distinct subsets: Electronic Support Measures (ESM), Electronic CounterMeasures (ECM) and Electronic Counter-CounterMeasures

(ECCM). All legs of the triad are modeled in Harpoon3, but the commander will have varying degrees of control over each portion. ESM will afford the greatest degree of user specified doctrine, while ECM offers a lesser degree of selectability, and ECCM efforts are modeled almost exclusively within the algorithms which control combat resolution. It is assumed that forces will employ all ECCM capabilities they possess, so the results of these efforts will be displayed automatically without user intervention.

ESM

ESM involves the passive reception of enemy electromagnetic emissions. By processing these emissions against a database of known emissions, and comparing the frequency, pulse repetition rate and other details too extensive to cover here, modern ESM suites like the SLQ-32 are capable of identifying the class of emitter which produced the transmissions. Some emitters are unique to a single class of ship, aircraft, or submarine; as soon as that emitter is detected, the commander will be able to classify the threat exactly. Most emitters, however, are carried on numerous platforms. As such, a single emission may only produce a list of possibilities as to the originating platform. When this occurs, prudent commanders must assume the worst possible case of all the potential threats.

Subsequent emissions of other radar types from the same bearing may allow one to narrow the list of possible threats, by excluding those platforms which do not have both emitter types, but formations of many vessels may still make this evaluation unreliable. Indeed, it is possible for far-sighted commanders to radiate emitters on two separate ships in proximity, possibly leading the enemy to believe a third, stronger vessel is present.

A unit which radiates, and is subsequently classified by the enemy, is not necessarily targeted or even located with any degree of certainty. If a single unit in the force receives the transmission, a line of bearing to the source is generated. If multiple units in the force receive the intercept, they may correlate their bearings to define an ellipse known as the area of probability, within which the radiating unit must be.

This technique is known as passive cross-fixing. See Figure 3. The greater the physical separation between the units coordinating for the passive cross fix, the greater their bearing separation will be and the more accurate and narrow the area of probability.

One thing should be readily apparent already: For ESM efforts to be effective, the enemy must cooperate by radiating their emitters. Given the potentially deadly effect of a passive, over-the-horizon missile attack, in which the first warning is illumination by missile seeker heads in their terminal phase of flight, one might reasonably question if it is ever worthwhile to radiate and risk this possibility. The answer is yes, but radiating must be done when it is tactically advisable to do so and avoided when it is not. As the battlefield is a dynamic environment, the situations which dictate changes in emission posture are also fluid. As such, a thorough understanding of subsequent material in this section is essential to success in Harpoon3.

Detectability vs. Survivability

The manner in which commanders determine who may radiate, and under what circumstances, is known as the EMCON (EMissions CONtrol) posture. The tactical commander, even in periods of unrestricted emissions, must consider the impact of that decision in terms of the targeting data provided any potential adversary. In the U.S. Navy, EMCON posture is typically generalized in operations orders as follows:

Figure 3: The effect of geographic separation on generating ESM cross-fixes. Note that the widely separated ships are much more effective.

EMISSION CONTROL CONDITIONS	
EMCON A	NO EMISSIONS
EMCON B	LIMITED EMISSIONS (NO UNIQUE EMISSIONS)
EMCON C	UNRESTRICTED EMISSIONS
TABLE 2	

It is important to understand, however, that different components of a force may be in different EMCON conditions. Consider a CVBG, for example, that desires to remain untargeted but wants a good surface picture out to 250nm. The task force commander may opt to keep the surface units of the task force in EMCON Alpha, while launching an E-2C to conduct an active surface search. If the E-2C is detected by enemy forces, its presence will denote that a carrier is somewhere within the area of operations, but the enemy will be denied specific targeting data on the location of the carrier as long as the E-2 is not radiating on the deck or in close proximity to its parent.

This example brings up the common problems with the quality of information obtained through ESM. The quality of an ESM fix is directly related to the separation of the detecting units, as denoted in earlier in Figure 3, and the duration of the enemy emissions. The longer the enemy complies by radiating, the higher quality fix one may obtain. In general, the following classifications are applied to ESM fixes:

CLASSIFICATION OF ESM FIXES	
DETECTE-D	**The unit has emitted long enough** that its presence is known, but it cannot be attacked with any significant degree of certainty.
TRACKING	**The unit has emitted long enough for** opposing forces to establish an area of probability and possible course and speed. Attack is possible but with a reduced degree of success due to uncertainty.
TARGETE-D	**The units position, course, and** speed are known. Detecting units may attack at will.
TABLE 3	

Commanders must realize that the enemy seeks to target them in the same fashion. As a result, determination of an active or passive posture falls to other considerations.

Inferiority vs. Superiority

Consider the earlier example of an inferior vs. a superior force. In that discussion, we determined that a superior naval force should mass to provide mutual defensive support, while an inferior force should disperse, both to divide the offensive capability of the opponent and to increase survivability of the remaining assets until they reach firing positions. Examining that model in terms of EMCON posture might lead one to conclude that logic would lead the superior force to radiate without restriction and the inferior force to favor stealth and surprise.

Taking the place of the superior force commander, hereafter referred to as Orange, your defenses are massed, but they are only effective if any incoming enemy raid is detected. This would mean that the defensive posture adopted by a close formation is only effective if one

surrenders the initiative to the enemy by radiating without restriction. If one elects to do so, then the dispersed adversary, which we will call Blue, has a geographical separation which makes passive cross fixing very effective, and he may conduct a coordinated first strike, which could prove decisive. Conversely, if Blue is denied targeting data because Orange remains in a strict EMCON Alpha configuration, he may be forced to conduct an active search, which could lead to defeat in detail of his dispersed assets by Orange's massing of force.

Herein lies the tactical dilemma faced by all naval commanders. The struggle to obtain a targeting solution must be weighed against the enemy's ability to do the same. The answer lies in your estimate of whether or not he has already been detected. As the superior force commander, if you have reason to believe that you are undetected and, more importantly, untargeted by the enemy, then you should continue to pursue offensive operations against them without hesitation. If, however, you are reasonably certain that your position is known, a shift to active emissions is necessary to increase survivability.

ECM

Electronic Counter Measures involve all techniques designed to deny the enemy specific targeting data. Some of these techniques are actually mechanical, such as Chaff and Soids, but they are classified within this subset of warfare nonetheless. ECM can be both offensive and defensive, and the fluent tactical commander must understand the role of each.

Chaff cannisters contain thousands of thin metal strips which are exploded into a cloud after deployment from the firing ship. These strips fall slowly to the ocean, drifting with the wind and expanding as they do to provide a large, reflective radar signature to active missile seeker heads. Chaff may be employed as either a deceptive or seductive countermeasure. To act as a deception, it must be deployed prior to the launch of the inbound missile group, so that more targets appear than actually exist. (See Figure 4.) Once missiles have been launched, however, chaff clouds only exist to seduce missile seeker heads away from their eventual target. (See Figure 5) Soids, which are

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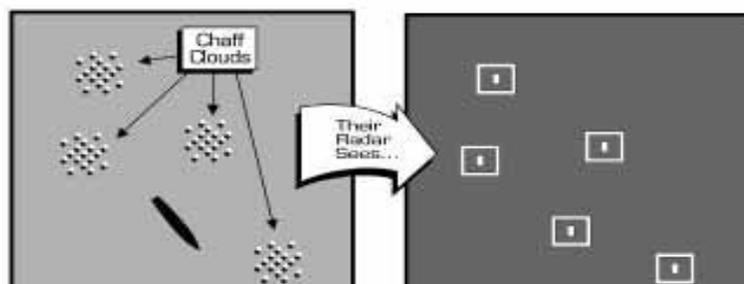
***Figure 4: Deceptive Chaff - One ship surrounded by chaff clouds,
which the enemy sensors detect as multiple ships.***

floating flares, are only effective in the terminal phase of missiles with infrared signature seeker heads. In Harpoon3, the employment of Chaff and Soids are automatic functions which reduce the effectiveness of inbound missile groups.

Offensive ECM involves the use of jamming in support of strike operations to preclude the enemy from determining the composition of the strike and targeting specific elements with counter-battery fire. In Harpoon3, the player will note that inbound air strikes escorted by ECM-capable assets appear only as electronic noise on their tactical displays. This denies targeting of the missile-equipped strike aircraft until the jamming platform is destroyed. Further, a savvy tactical opponent will strike from several directions, complicating the AAW effort with jamming decoy groups and chaff corridors. The Harpoon3 commander will also be able to employ ECM in strike planning.

Defensive ECM includes the employment of Blip Enhancement, Chaff, Soids, and jamming of terminal homers. Blip enhancement is a selectable tactic employed by properly equipped helicopters to produce a radar signature equivalent to an aircraft carrier for missile terminal seeker heads. Similarly, Chaff and Soids are employed to provide larger, more attractive targets to missile seekers than their real
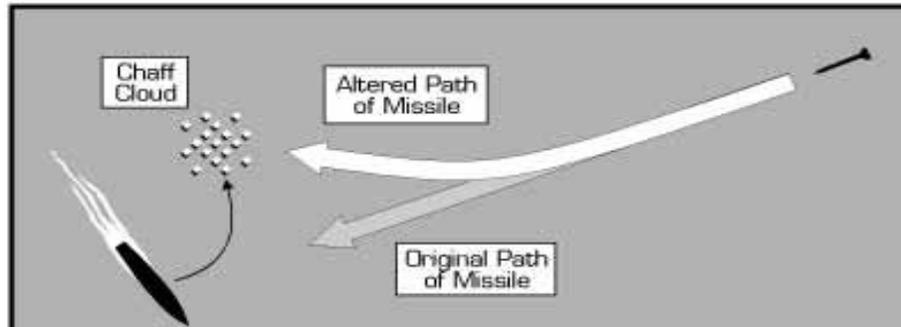
Figure 5: Seductive Chaff - The ship has been locked on to by the missile seeker head, so it fires a seductive chaff cloud, which draws the missile away.

world counterparts. Eliminating a missile through any of these countermeasures is termed a "soft kill", as opposed to a "hard kill" in the form of a traditional intercept.

ECCM

Electronic Counter-Counter Measures involve manipulative techniques designed to seduce a missile seeker head that has locked-on away from its intended target and toward an imaginary target at another point in space. The use of this and most other defensive ECM functions are handled internally in the Harpoon3 tactical model.

Command & Control

Communications transmissions are also electromagnetic emissions subject to detection and exploitation by the enemy. Again, however, some types of transmissions are more detectable than others. Data links, which are used extensively by U.S. Forces, are line of sight transmissions that are virtually undetectable unless an enemy unit is between the transmitting and receiving units. In Harpoon3, data links are modeled as connecting webs of lines between the units in contact. Only one unit, such as the E-2C used in the earlier example, may be radiating and therefore targetable by the enemy, but all units connect-

ed to the web are capable of using the targeting data provided by the link for any subsequent attack.

Satellite communications, because they are also directional in nature, are difficult to intercept. Traditional radio frequencies, such as UHF, VHF and HF are progressively more susceptible to intercept, and HF transmissions have been localized from thousands of miles away. As a result, the prudent commander must balance the need to disseminate targeting data to his forces with the corresponding intelligence he reveals to the enemy in his method of doing so.

Section V:
Anti-Submarine Warfare

Anti-Submarine Warfare

Because of their inherent capability for stealth and surprise, submarines are the most deadly adversary faced by modern naval commanders. Until recently, the bulk of U.S. ASW doctrine focused on countering a Soviet submarine threat out of the Norwegian Sea and the G.I.U.K. gap intended to interdict the sea lines of communication (SLOC) in support of a ground war in Europe. With the dissolution of the Soviet Union, this possibility has virtually evaporated. In its place, however, looms a broader, potentially more devastating threat.

With the loss of an obvious challenger for open ocean supremacy, and a political climate emphasizing budget reduction, the U.S. maritime structure is being incessantly whittled away. Further, the naval hierarchy is shifting mission emphasis away from strategic control of the oceans to support of joint operations in coastal conflicts. In this capacity, the blue-water turned brown-water navy is viewed as a method of quick power projection ashore, via air and missile strikes as well as amphibious ground forces. Astute naval commanders are aware that, in order for power projection operations to be undertaken with an acceptable degree of risk, sea control of the objective area must first be obtained. Therein lurks the new danger.

The CIS is strapped for cash and its most readily available export commodity is hardware from its once-mighty military machine. Although their arms sales efforts have already extended to all platform types short of nuclear weapons, we will focus exclusively on their support of submarine proliferation. Most notable amongst current negotiations are the purchase of several Kilo submarines by Iran. These boats represent some of the most advanced diesel electric technology in the world, which gives them a very quiet acoustic signature. One need not be a military analyst to appreciate how the presence of such platforms would complicate naval operations in any future Gulf conflict. Additionally, Libya, Syria, and Algeria, all of whom already operate Soviet submarine designs, may obtain additional modern boats.

When you add these developments to the fact that shallow-water ASW is the most difficult type of ASW to conduct, one develops an appreciation for how any new maritime strategy must place additional emphasis on this warfare area. In the remainder of this section, you will find detailed briefings on the impact of oceanographic conditions on tactics, area vs. local ASW, how to assess your own force's capabilities, and other topics of vital importance to battlefield survival.

The Environment

Sound propagation in the ocean is affected by temperature, pressure, and salinity. Of these, temperature is the dominant characteristic. The ocean temperature varies greatly with depth, but somewhere between 100 and 300 feet there is usually an abrupt change between the relatively warm surface waters and the cold, still depths beneath. This rapid change in temperature is known as the *thermocline*, or sometimes 'the layer'. Beneath the layer the water temperature tends to be isothermic, or relatively constant. The layer is tactically significant for several reasons. First and foremost, sound emanating from a source on one side of the layer (either above or below) tends to remain trapped on that side of the layer. Simply put, the sudden change in water temperature causes sound waves to bounce back from the layer. It is not an impenetrable barrier; there is some leakage, particularly with very high frequency noises like cavitation (the effect where bubbles produced around propellers collapse noisily in the wake) and active sonar transmissions. A general rule of thumb however, is that most noises will be greatly attenuated (reduced) if they must pass through the layer. You will therefore hear noises made on your side of the layer much easier than those emanating through it.

In reality, layer depth varies from location to location and submarines try and stay comfortably beneath it to help hide from surface ships. In Harpoon3, the thermocline always defines the boundary between the Shallow and Intermediate depth bands.

Active vs. Passive

Commanders must constantly assess whether their sonar emissions policy should be active or passive, based on the tactical situation. To understand the basics, it is important to first illustrate the influence of the layer in a generic encounter between a surface ship (Blue) and a submarine (Orange). In the first case, (Figure 6) Blue is operating at 5 knots towing a passive sonar array above the layer. Orange is also operating at 5 knots below the layer. Note that the sound waves emitted from both platforms are minimal, so only those crossing the layer at an acute angle (e.g.. straight down or up) will penetrate, while the bulk of the sounds will be reflected or refracted. Those sound waves that do penetrate directly through the layer form a narrow cone of sound. In this case for either Blue or Orange to detect the other, they must physically pass through the direct path cone, which means they would virtually be on top of one another, and detection would be almost simultaneous.

In our second example, (Figure 7) Blue is towing his passive sonar array below the layer. All other conditions remain the same. Blue is now be able to directly receive any sound waves emitted by Orange, which means that he would detect Orange at a considerably farther
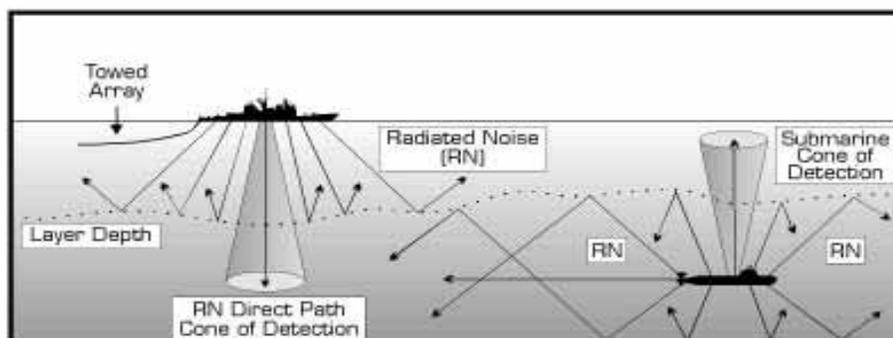
Figure 6: The effect of the layer on sonar detection.
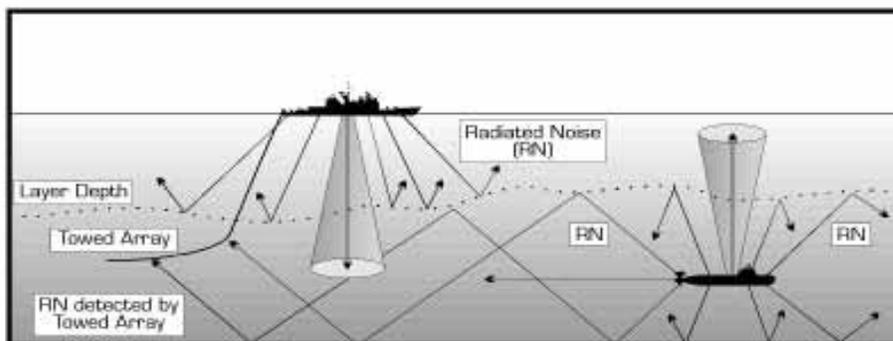
Figure 7: The effect of a towed array below the layer.

range, while remaining undetected himself. The actual detection ranges will vary with the amount of noise emitted by Orange, as well as the sensitivity of Blue sonar suite. Base noise levels will also differ from platform to platform (some subs are quieter than others) and will be increased by noisy activities such as moving quickly or firing weapons.

In our third example we'll look at how Convergence Zones (CZ) work. As you go down into the ocean depths, the pressure steadily increases. This change in pressure also equates to a change in the speed of sound, which rises as the water becomes more dense. Different depths end up having a different speed of sound. Sound waves which travel down into these depths are bent by this effect and slowly refracted back towards the surface in a long sweeping curve, surfacing many miles away. If conditions are right, these sounds will bounce off the surface and start back down into the deeps again on another long curve. The locations where these sounds reappear near the surface is called the convergence zone. CZs occur about every 66,000 yards (33nm), centered on the location where the sounds originated. They form an annular pattern of concentric circles around a noise source. Sounds traveling on a direct path from A to B might fade out relatively quickly (after a few miles perhaps), but sounds caught in a convergence zone might propagate for over a hundred miles with much less attenuation. Sensitive sonars capable of recog-
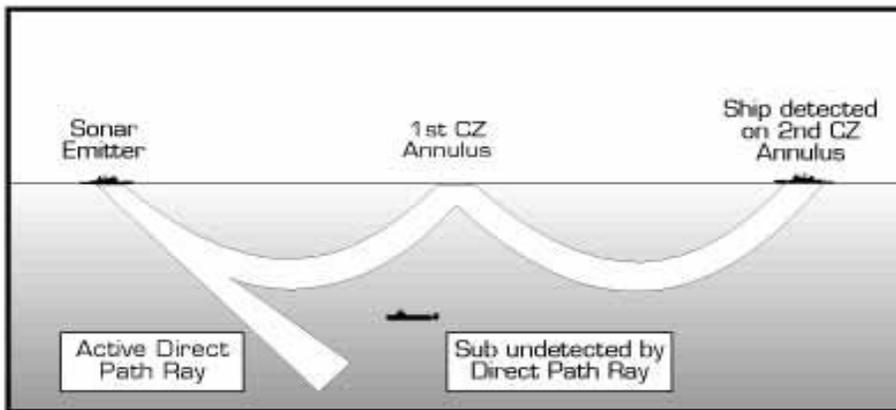
Figure 8: The effect of a hull-mounted active sonar.

nizing CZ signals are very important sources of tactical information. The picture in figure 8 shows a Blue surface ship using its active sonar. Modern active sonar transmissions are extremely powerful (about 250 dB) and are capable of literally boiling the seawater surrounding the transducer. Power outputs any higher than this are useless because boiling seawater makes for a lousy conductor of sound. Generating this much noise in the water makes this ship counter-detectable at ten times its own range. As such, Blue is considered to have surrendered the initiative to any subsurface threat within 100nm, as his transmissions act like a giant homing beacon.

Blue will get reflections (detections) from his active sonar out to about twenty miles. The submarine in this figure is hiding beneath the layer however, and is still relatively safe from the bulk of Blue's active sonar signal (which is bouncing harmlessly off the layer). Some of Blue's sound energy will penetrate through layer and travel down into the deep sound channel. There it curves back towards the surface and reflected down once again. Eventually, some of the noise that Blue is making finds its way to the surface ship in the second CZ. While Blue is deaf to anything but the short range echoes of his active sonar, the possibility exists that this other surface ship will hear him from many miles away.

Note that some of Blue's sonar energy does penetrate the layer at an angle which might allow for a direct path detection, were the submarine close enough. In this case however, the angle of incidence is not enough, and the submarine will escape detection, so long as he stays away. Active sonar is good for immediately localizing a near target, especially one on the same side of the layer with you. For more information on how Harpoon3 models sonar and convergence zones, see the technical notes at the end of your manual.

Let us consider now another case, where Blue possesses a variable depth sonar (VDS) in conjunction with his towed array. By putting the combination of active and passive capability on the same side of the layer as Orange, Blue can listen for Orange as before, but as soon as he feels Orange is within striking distance, he may selectively go active for one or two transmissions from the VDS and obtain an immediate targeting solution on Orange. The range at which a return echo is strong enough to provide this solution is again variable, depending on the type of sonar, the aspect of the target, the presence or absence of anechoic coatings, and numerous other factors. While listening below the layer as noted above, the hull mounted sonar is still capable of passive or active operations above the layer. This configuration is optimum for the conduct of blue-water ASW.

Shallow-Water Operations

Earlier, it was indicated that shallow water operations are the most difficult to conduct. It is now important to explain why. In the examples just presented, you may have noted that, as a rule, passive detection ranges far exceed active ranges. When an active contact is held, both parties are usually within striking distance of one another. Naturally, the commander would prefer to expand his battle space and engage the enemy before he gets within striking distance. As such, passive operations are the norm in most cases. Shallow water operations are an exception to this rule.

Although biological noise sources are present throughout the ocean, and are frequent sources of false contacts (i.e.: whale blowing sounds

like ballast tanks being blown), the highest concentration of biological activity is in shallow water. Further, wave and tidal action, the influx of rivers and estuaries, and other natural phenomena combine to make passive ASW virtually impossible for either side, although submarine sonar operators are a little more adept at sorting out background noises than their surface counterparts.

The second factor to consider is that shallow waters have a minimal thermal gradient and none of the aforementioned layer of CZ effects. As such, both surface and subsurface units are always on the same side of the layer. Although no sub commander would ever surrender his only advantage (stealth) by using active transmissions to search for contacts, surface forces are virtually required to use active sonar whenever a shallow water submarine threat exists. Again, while this must be done with counter-detection ranges in mind, the task force commander obviously must have some other reason to sacrifice strategic mobility and operate close ashore. Therefore he must assume he is already detected, if not targeted. Given that, the logical choice is to adopt the best defensive posture for the force and hope his surface search radars pick up any periscopes from lurkers setting up a shot. What we have not explored up to this point, however, are the measures he may have taken to minimize that threat during his transit to the area of operations.

Joint ASW

For a theater level ASW campaign to be successful, the commander must correctly employ all available ASW assets: surface, air, and subsurface. Each component of the ASW triad has strengths and weaknesses that must be clearly understood for proper tactical use. Of the three, submarines are the most effective at finding and killing other submarines. The root of their strength lies in stealth as well. A low self noise means they can hear sound just as well as their prey. Because submarines can best accomplish this mission area as solo players, the use of SSNs as Hunter-Killers will be discussed separately, in the section below entitled "Commanding a Submarine". Here we will focus on the interplay of surface and air assets attempting to

detect, localize, and target submarines in a layered defense. These phases of an engagement are analogous to the aforementioned qualities of passive cross fixes, and understanding their meaning is critical to subsequent discussion:

ASW PHASES OF ENGAGEMENT	
DETECTED	**Regardless of the source of data,** active or passive, the Commander has reason to believe that the presence of a submarine is possible (POSSUB) or probable (PROBSUB).
LOCALIZE–D	**The submarine contact has been** localized to a small enough area of probability to allow attack with a reduced chance of success.
TARGETE–D	**The bearing and range to the target,** as well as the target's aspect, course and speed are known with sufficent certainty to attack with a high expectation of success.
TABLE 4	

Area ASW

Area ASW has several applications, but the specific platforms and tactics used to conduct it remain constant throughout the range of applications. The platforms of choice are maritime patrol aircraft (MPA), like the P-3 Orion, and towed array equipped surface ships, because each possesses endurance and potency, in terms of weapons load. SSNs also conduct area ASW, but, again, their use will be explored later. Of the two, towed array assets cover a greater area, but require more time to do so, while MPA assets cover more area per unit of time, providing a quicker search of a smaller area. An alternative choice for area ASW are CV-based aircraft. Although they have a shorter endurance and lighter weapons and sonobuoy loads, they make up for it by being close to the action and having shorter transit

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times.

Area ASW is the coordination of search efforts ahead of the main force on specific areas of ocean holding tactical significance. The objective of Area ASW is to detect and localize any submarines within the area as a minimum, and to destroy them should the tactical situation and rules of engagement allow. Within the concept of layered defense, area ASW provides the first opportunity for a commander to attrit enemy submarines.

Examples of area ASW would be the sanitization of chokepoints, such as straits and narrows, by a ship equipped with a towed array operating 30-50nm ahead of a task force along the PIM. Also, a task force required to transit at high speed is less vulnerable to subs closing in from behind the force, but much more vulnerable to subs laying ahead and to the sides of the PIM. These task forces may use patrols of MPA assets 150nm in advance of the force and on either side for the duration of the transit.

In the conduct of area ASW in Harpoon3, the commander may specify the area of interest for the MPA asset to prosecute by laying out a patrol area bounded by reference points.

Local ASW

Once submarines have penetrated past the units conducting area ASW, their next obstacle to overcome would be the outer screen. As was discussed briefly in the section on unit positioning, outer screen assets should consist of ASW and AAW platforms, to allow for mutual defense in conjunction with their picket duties. Assets of the outer screen should be passive and conducting search operations above and below the layer.

Because of their separation from the main force (12-24nm with a preference for even more distance), any contacts generated by units of the outer screen will generally pose an immediate threat only to those units and not to the main body. Cruise-missile-equipped submarines may be an exception to this rule; though if the main body stays in strict

EMCON Alpha (no betraying emissions), it is likely the submarine does not have enough information to fire on them. Still, prudent commanders will turn the main body away from the contact while the screening units attempt to prosecute it.

Screening units should jump all over the submarine contact with helicopters. With at least two ships and a helicopter holding passive contact, the targeting solution should come rapidly enough to conduct a torpedo attack with aerial delivered weapons. A stand-off weapon, such as an ASROC, may be used if the submarine is in too close. Alternately, if the passive contact is of sufficient strength that the on-scene commander believes the submarine is within his active envelope, then he may elect to go active with the sonar and conduct an immediate over-the-side shot. Whether this attack is effective or not (and it generally is one of the least effective methods), it does succeed in putting the submarine on the defensive, buying the commander time for a more thorough follow-up attack.

The tactic just discussed is also the tactic of choice should a submarine be fortunate enough to penetrate to the inner screen. Because it has already achieved firing position on the HVU of the force, any and all efforts must be made to distract that submarine from attacking. Time is of the essence in getting weapons in the water, even if they are not accurately targeted. Concurrent with these attacks, the commander must execute all appropriate torpedo evasion maneuvers based upon his knowledge of the loadout carried by the class of submarine contacted.

Task Force Defensive Tactics

The scenario of a prowling submarine inside the boundaries of a formation is the nightmare of every task force commander. As such, there has evolved a body of doctrine that may be selectively employed by the Harpoon3 commander to complicate enemy efforts to achieve this position. Obviously, all of the considerations relative to EMCON posture and counter-targeting still apply, but the commander may also decide to invoke a zig-zag plan. A submarine commander may not wish to risk sticking a periscope out of the water or using active sonar,

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so he must perform a passive Target Motion Analysis (TMA). Simply put, a submarine commander will determine the course and speed of his targets by observing them passively and calculating relative motions from the bearing changes he sees. Since passive sonar consistently gives a direction to a target, but no other information, the submarine must perform this TMA on targets for several minutes before they are certain of their information. If the target suddenly decides to zig-zag, all this careful work goes right out the window and the submarine must start all over again. Once the submarine commander has a working solution on his targets however, he may fire modern homing torpedoes or missiles. This targeting solution is what the task force commander is trying to deny the submarine commander.

Harpoon3 does not include any preset zig-zag plans, but the user can easily create them via the navigational plotter. Occasionally introducing a zig-zag in your group's course will further complicate any submarines attack against you.

Summary

Submarines pose the greatest sustained threat in the multi-threat environment. Commanders must consider their ASW posture as an integral part of all mission planning. To successfully prosecute submarines, one must have an understanding of the tactical elements of the environment they operate in, and use every ASW asset at hand to counter their inherent advantages of stealth and surprise.

Section VI:
Commanding
Submarines

Commanding Submarines

"The San Luis was at sea, and at times in the area of the British force, for an estimated 36 days. The threat from the Argentine submarine was a continuous concern for the British Task force commander, and numerous attacks were made against suspected submarine contacts, with a large number of ASW weapons being expended. In any event, San Luis survived all British ASW efforts."

-From the briefing prepared for the Secretary of the Navy, The South Atlantic Conflict Lessons Learned

What the Harpoon3 commander should garner from this observation on the Falklands War is not only that ASW is difficult, which should already be internalized, but that a single undetected submarine can complicate the battle plans of the adversary considerably. Also, similar to mine warfare, the suspicion of the threat is sufficient to force the commander to commit large numbers of resources to eradicating it, resources which would otherwise be available to support his primary mission.

Thus far, the focus of this guide has been on countering the submarine threat to your own force. In this section, we will reverse tack and become the threat. By learning the optimum employment of submarines from a commander's perspective, one will not only possess a potent new force multiplier, one will also gain further insight into how enemies will attempt to use this platform to advantage.

Out of Sight, but Not Out of Mind

The first major leap of faith required of those who will muster subs on the battlefield is that they cannot be micro-managed to the degree that other forces permit. Although earlier releases of Harpoon allowed the commander to issue orders to submarines whenever the mood struck, this is inconsistent with real-world constraints. For submarines to be in constant communications, they would have to remain at periscope

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depth all of the time with their communications mast raised. Natural-
ly, such a posture would eliminate virtually all of the tactical advan-
tages a submarine possesses. The trade off with stealth is not being
aware of the sub's activities at all times. The most important thing to
understand is that, in the case of missions with extended durations, the
commander will not know for certain until the battle is over if the sub
is still active; the only indication will be the loss of contact. After the
scenario ends, the tote board of casualties will be updated to reflect
actual losses of friendly submarines.

The Special Case: SSNDS

In some instances, a commander will have a submarine in direct
support of a task force (SSNDS). This asset is usually stationed in a
distant sector on the formation editor as an ASW barrier patrol.
Because of special communications gear contained in the active sonar
suites of surface ships, submarines operating directly with the battle
group may be alerted to come to communications depth at any time.
Again, if the submarine skipper is not in contact with an enemy sub
(which would now be alerted to the presence of the friendly, if not its
precise location), he will come to periscope depth for communication.
There is a delay based on the actual time it takes to change depths, but,
once the sub is there, the commander may alter ROE, mission tasking
and movement orders as above. One other tactical tip before moving
on - because the special sonar transmission used to call SSNDS assets
to the surface is recognizable to the enemy, it is sometimes beneficial
for a commander without an SSNDS asset to radiate it anyway,
making any enemy subs in the area think another sub is present.

Submarine Missions

Excluding SSNDS, most missions assigned to submarines reflect
their ability to operate independently and respect their ability to strike
effectively without additional guidance. As such, the prudent com-
mander will consider the need for stealth and surprise and capitalize
upon the strengths of submarines in mission planning without placing
them in unwarranted risk.

Prior to the commencement of hostilities, submarines are the platform of choice to conduct reconnaissance of enemy strength and disposition, as well as conduct offensive operations like the mining of enemy sortie routes. From this inshore position, these same submarines can act as linebackers for their minefields, conducting follow-up attacks on enemy assets transiting the area. Also, if missile equipped, these same submarines can either conduct preemptive strikes on enemy airfields or ports or lay in wait to strike in conjunction with air elements of the main task force.

Additionally, when the enemy has limited ASW capability, as is the case with many coastal nations, a submarine may be positioned close ashore with its periscope raised to report the movements of enemy air groups coming offshore against the main force. This is a new method of passive airborne early warning that has been used with success by Sixth Fleet assets in the Mediterranean. Also, as a scout, submarines can provide ESM cross fixes and visual surface searches from their area of operations. The latter can be critical in monitoring traffic through congested areas like straits and narrows and identifying contacts of interest to preclude fire on neutrals. Finally, submarines are also capable of performing battle damage assessment when used in conjunction with other forces in a joint attack.

 With hostilities in progress, submarines may be used in their traditional role of Hunter-Killers. Submarines are the most effective platforms at locating and destroying enemy submarines, so they should be considered for all area ASW plans. Do not discount the diesel boat in this equation either. The Batfish located and destroyed 3 of 4 Japanese submarines operating around the Philippines in as many days in WWII. Modern diesel boats are much more capable than their predecessors and are a match for the most capable SSNs if handled properly. Also as Hunter-Killers, submarines may seek and destroy enemy warships or cripple the war effort of the adversary by pursuing a Guerre de Course. A commerce war on merchants and auxiliaries is a great fear of western nations, as these assets are in much shorter supply than during WWII, when Nazi U-boats almost succeeded in breaking the Allied back in the North Atlantic.

"If we would have had more U-boats, we would have won the war!"
    -Admiral Doenitz, Commander of the German submarine forces in WWII from his book, The Modern Diesel Boat

Though some analysts would point to Germany's Type 209 diesel boat as an example of modern technology, this very quiet submarine still requires six hours of snorkel time to charge, is limited to about 100 meters depth and must patrol at 1-2 knots to retain its stealth advantage. The Russian Kilo design, on the other hand, is capable of going without snorkeling for as many as 2-3 days at a 2-3 knot patrol speed. As such, it is a much more capable adversary.

Despite the ability of the diesel boat to be a devastating threat, U.S. analysts discount their effectiveness in the hands of third world crews due to a lack of training. Whether these assumptions would prove out in the real world or not remains to be seen, but the Harpoon3 commander can learn from the reasoning behind this assumption and employ the antithesis to make his diesel forces stronger.

The presumption is that these crews will expose their masts much more than necessary, because they do not know how to conduct a passive plot correctly. Further, there is a great deal of skepticism that they are capable of making a deep submerged approach on batteries, the most advantageous tactic, because of a constant need to refine their position estimates in relation to the target. It is also assumed that diesels resting on the bottom would snorkel at least once a day to preserve the amount of battery power they would need to escape after an attack. This line of reasoning reflects a dangerous tactical arrogance. Whether or not these potential adversaries are currently capable or not, they could become so in short order under the right circumstances. The prudent commander can never discount this threat on the presumption that it will be improperly employed.

Summary

If used properly, with forethought and patience, the commander of submarine units possesses a powerful force multiplier. Further, in the correct tactical placement, submarines can contribute to all of the warfare mission areas, including Strike, AAW, and EW, not just ASW and ASuW as in the past.

Section VII: Strike Warfare

Strike Warfare

Strike Warfare is the art form that supports the power projection mission. Although all the warfare areas are art forms to the aficionado, Strike Warfare is elevated above the others in many practitioners' minds because it requires precise coordination and timing. Like an orchestra conductor, the strike planner must blend a number of diverse elements into a harmonious whole, building to a crescendo designed to leave a lasting impact on the recipient of the art.

The audience of the strike planner may consist of enemy surface or ground forces, each requiring a slightly different finesse in prosecution. The tools of the strike planner are expendable assets (i.e.: missiles) and retrievable assets (i.e.: manned aircraft). Fiscal realities force a limited supply of each asset, but the latter are more significant because they may be employed repeatedly, provided the strike planner has performed his duties correctly. We will now arm the Harpoon3 strike commander with all of the skills necessary for mastery of this art.

Elements of Strike Planning

Every strike plan is composed of several steps. The commander must progress through each of these in the formulation of a viable plan. In order of execution, the elements requiring consideration are as follows:

> **1. Target Value**
> **2. Target Location, Composition, and Defenses**
> **3. Strike Composition, Armament, and Support**
> **4. Ingress and Egress Routes**
> **5. Timing of the Strike**
> **6. Battle Damage Assessment (BDA)**

Each of these elements will be examined in detail below. For the purpose of continuity, a land strike is assumed. Special considerations for strikes against naval task forces in support of the ASuW mission are discussed in that warfare section. As you progress

through the text, remember that, although each topic is examined individually, none of them operates exclusively of the others. In the formulation of a plan, if you are unsatisfied with your assessment of any of the planning steps, then it is generally wisest to scrap the plan until the limiting factor that gave you pause has been eliminated.

Target Value

One of the inherent advantages afforded the strike planner is that of timing and initiative. Because his is a proactive rather than reactive commitment of force, he has the ability to decide when and where this should occur. Keeping that thought in mind, the second point to ensure is the strategic value of the target. For the commander to be willing to commit portions of his force to the destruction or reduction of a target, the target must have some significance to the achievement of mission objectives. While this may seem a moot point, in reality it is a common mistake.

Remember the earlier point that the conduct of war is never static; while one is attacking, one must also guard. With this axiom in mind, consider astute opponent Blue, who offers a sacrificial lamb to the strike planner, Orange, who is closing Blue's coast to attack a port or airfield. This offering might take many forms, but we will consider it to be an attractive surface action group that is out of position to contribute to the immediate tactical situation. As Orange nears his primary objective, Blue directs the SAG to radiate and make its presence known. Blue hopes that the SAG, though not an immediate threat to Orange, will prove so tempting a target that it cannot be passed up. If Orange complies with Blue's deception and commits a significant portion of his strike package to the target of opportunity, he has unwittingly shifted the tactical advantage of initiative to Blue.

As a minimum, Blue will delay the attack on the prime objective and attrit portions of Orange's strike package directed at the SAG. This reduces the number of missiles and aircraft available for Orange's subsequent efforts against the primary target, which increases Blue's chance of survival. In the optimum case of this deceptive effort, however, Blue is now in position to strike Orange's main force first,

while his attention and the bulk of his forces are directed elsewhere. Blue could be decisive in this action or, even if marginally successful, his efforts could reduce the Orange force to the point that its commander deems it unwise to continue operations against the Blue base. While this case illustrates a potential use of strategic deception, the required lesson for the strike commander in Harpoon3 is to ensure that the target of your efforts support the mission objective; don't attack something just because it seems to be an easy target.

Target Location and Composition

Although strike planning against fixed targets like port facilities and airbases is simplified due to their lack of mobility, location and composition still require analysis. The location of a target is important because it determines both the line of demarcation of the striking force and the envelopes of engagement of supporting forces. The line of demarcation is the maximum range at which a strike commander can begin to employ force on the intended target. Because this line reflects the extended ranges of attack aircraft at reduced weapons loads, it is most often not the effective strike range. To obtain the maximum effective strike range, the commander must consider the feasibility of in-flight refueling for all of the fully loaded strike elements he has determined necessary to conduct the strike. The inverse of the line of demarcation is the maximum engagement envelope of enemy long range air assets and land based surface-to-surface missile systems. Within this context, it should be apparent that the strike commander must not only be concerned with the capabilities of the targeted base, but must also consider the proximity of other bases to the target which could multiply enemy defenses.

The composition of land targets has also been modified considerably in Harpoon3. Previously, the commander faced a generic AAA capability, a radar, and runway-based aircraft. In Harpoon3, bases possess discrete targetable components. There are individual SAM and AAA sites, ground radar installations, command and control bunkers, weapons storage bunkers, fuel and oil storage facilities,

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hangers, runways, and other support facilities. The destruction of any of these targets will impede the enemy commander in performing the relevant functions until repairs are affected.

Strike planning now requires the commander to divide components of the striking force to deal with each of these elements in turn. Although it may seem that this complicates the strike planning process (and it does to some degree), it also provides greater flexibility in terms of tailoring strikes to support specific needs. For example, if one is attempting to preclude a secondary base from supporting the object of a main attack, it isn't necessary to strike that base's runways to keep aircraft on the ground. The naval commander will seldom have enough aircraft and missile resources on hand to conduct a simultaneous attack on two or more land facilities. The strike package aimed at the secondary base may consist exclusively of jamming and fighter aircraft. The jammers can confuse the command & control of the base's radar picture, engage active radars with home-on-radiation missiles (HARM) and distract airborne interceptors away from the main group. The fighters can conduct an offensive sweep of the interceptors, again to preclude their efforts to support the base which is the object of the primary attack.

Another example of this approach would be a strike targeted specifically at the weapons bunkers of an installation. If destroyed, the enemy would have only those assets at the SAM sites or already on the hardpoints of aircraft to conduct further offensive or defensive operations. Plus, there is always the chance of some beneficial secondary explosions. As you can see, the possibilities are endless. As a strike commander in Harpoon3, the important thing to remember for this phase is to match the specific target types to the mission requirements and to always remain aware of both the line of demarcation and the enemy's zones of engagement.

Target Defenses: Understanding IADS

All developed nations of the world employ some form of IADS (Integrated Air Defense System) to govern their air defense network. Although the sophistication of IADS networks varies with the tech-

nological capability and economic resources of the nation modeled, the basic components of an IADS system remain the same.

At the heart of the system is the command & control bunker(s), the number of which depends on the number of assets to be managed and the area covered. Multiple bunkers imply a chain of command between the least secure (i.e.: those managing front line assets) and the most secure (i.e.: regional and national command sites). Each bunker coordinates the efforts of two or more of the following assets: fighter/interceptors, radar sites, and SAM and AAA batteries. The deployment of the latter three may be fixed or mobile. Naturally, the presence of mobile assets complicates strike planning, and the commander must make every effort to have the most reliable intelligence on enemy force dispositions as the plan is developed. To ensure the success of the strike, and minimize losses during the strike, the commander must evaluate enemy IADS capabilities and suppress or destroy these defenses as a part of the strike package.

Strike Composition, Armament, and Support

With a firm grasp of the aforementioned factors, the commander may now analyze what elements of the force are best suited to conduct the mission and what weaponry they will carry to do so. In discussing these dispositions, one will hear references to the strike force, the strike group, and the strike element. Understanding their relationship is important. A strike element is a single sortie group of 1-6 aircraft of the same type. Strike elements may be larger, but it is generally not advisable, as this simplifies enemy intercept and counter-targeting efforts. Strike groups are composed of all strike elements, regardless of type, originating from the same unit. A strike force is all of the assembled strike groups that will attack the same target, regardless of their point of origin.

Some targets may be prosecuted by a single strike element, such as a pair of Harpoon-equipped A-6 Intruders engaging a group of missile patrol boats operating outside the enemy air defense envelope. In this scenario, since the weapons of the strike aircraft outdistance the range of the enemy's best AAW weapon, and the strike planner need not be

concerned with enemy air intercept, a small aircraft group is sufficient to deliver decisive force. Other targets may require the coordination of all aircraft and Tomahawk Land Attack Missiles (TLAM) within one or more CVBG's to penetrate and saturate enemy defenses. The more sophisticated the IADS, the more diverse your approach must become.

Consider the approach adopted by the Coalition Command at the outset of the air war against Iraq. Iraq's IADS at the commencement of hostilities was estimated by Intelligence to be seven times more lethal than the one deployed around Hanoi at the height of the Vietnam War. Hanoi's concentration of SAM sites virtually precluded low-level precise delivery of munitions throughout the war due to unacceptable loss estimates, yet Iraq's system exacted 1/3 the casualty rate per 1,000 sorties during Operation Desert Shield/Desert Storm. The reason behind this seeming inconsistency between expectations and results lies in the systematic reduction of Iraq's IADS through proper strike planning.

Major General John Corder, U.S. Air Force, Director of Central Command Air Operations, employed a comprehensive, yet easy-to-understand, approach. Harpoon3 commanders should use it as a guideline in their planning of major coordinated strikes by diverse elements. The precursor of the attack was a massive barrage of communications and radar jamming by coalition aircraft. The jammers remained in position to engage and destroy enemy radar sites with HARM, ALARM and other anti-radiation homers as they went active. From behind the wall of electronic noise emerged 100 TLAM's directed at fixed radar sites and command & control facilities. F-117's supplemented the TLAM's against the most hardened facilities and succeeded in severing the head from the IADS structure. Lacking central coordination and targeting information, the remaining pieces of the IADS were left to operate independently against the successive waves of strike aircraft operating with supporting fighter escort. With their eyes and ears destroyed, however, all shots fired at aircraft by these facilities were unguided and, therefore, inaccurate. The results of successful planning, timing, and coordination are telling: one F/A 18 lost on the night of the strike for virtual destruction of an entire nation's air defense system.

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Ingress and Egress

As was mentioned previously, it is critical for the strike planner to make every effort to ensure survivability of retrievable assets. One of the simplest methods of doing so is to plot ingress and egress routes for the strikes to avoid ancillary defenses, remain undetected for as long as possible, and minimize the time spent within the enemy zone of engagement. In the next few paragraphs, we will highlight how to accomplish these simple, yet often overlooked, tactics.

Although it is not always possible, due to the overlapping nature of defensive air networks, the strike planner should strive to avoid entering the weapons envelopes of units other than the primary target, and avoid theirs as well if sufficient stand off weapons exist. To do so, refer frequently to the tactical overlays provided for the Harpoon3 map.

Plot air group movement to avoid overlapping circles of enemy air coverage. Further, if you must pass through these circles, do so as close to tangentially as possible. This approach presents the enemy with a long range crossing shot, the least effective possible engagement posture.

Also, one may note that many coastal facilities now have ecliptic cones of radar coverage versus circles to more closely reflect their real world counterparts. For an equivalent signal strength, a directional radar has much greater range than an omni-directional radar. Since a threat is perceived to be coming from outside the country's borders, as opposed to within, the focal point of these radars will be directed off shore and the portion of the ellipse behind the installation may be tens of miles deep rather than hundreds. When this occurs, if the strike planner has the opportunity to cross the enemy coast elsewhere and strike these targets from behind, it is always a sound tactical move to do so with at least one strike element, if not more.

When the transit phase is complete and forces are in position to conduct the attack, then the planner should allow for a direct path from

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the edge of the enemy weapons envelope to the launch range and back again. This approach minimizes the time during which strike elements may be counter-attacked. Further, by adopting a multiple-axis attack (some of which can be deceptive groups), the strike planner spreads the enemy defenses among the strike elements, which again increases the chance of success.

Remember also that, to be targeted, one must be detected. The longer the strike planner can delay that detection, the more survivable the strike elements become and the greater chance of success for the strike force as a whole. The primary methods of influencing these variables in the Harpoon3 model are via altitude assignment and EMCON posture. The section on electronic warfare should have emphasized the tactical trade-offs related to EMCON posture adequately, so we will focus exclusively on altitude affects here.

Radars are essentially horizon dependent when it comes to maximum range. This fact explains why a surface search radar has very limited maximum range in comparison to an air search radar, some of which are capable of detecting inbound aircraft at hundreds of miles, provided the aircraft are above the radar horizon. To understand the importance of the radar horizon, consider the depiction in Figure 9.

Both elements are from the same strike group and are 150nm from their intended target, represented by the generic surface ship. Note that the higher aircraft are already detected by the air search radar of the target, because, by being at high altitude, they are above the radar horizon. The other aircraft, however, are operating at very low altitude. As a result, they will not cross the radar horizon until about 25nm from the target, minimizing enemy reaction time and allowing for a more effective attack. If the lower aircraft were cruise missiles instead of aircraft, this range could be even shorter, on the order of 15nm, because of the extremely small radar profile and sea skimming altitude of the missile.

Note that the radar horizon generally extends beyond the visual in the lower atmosphere, particularly at sea level. This phenomena would
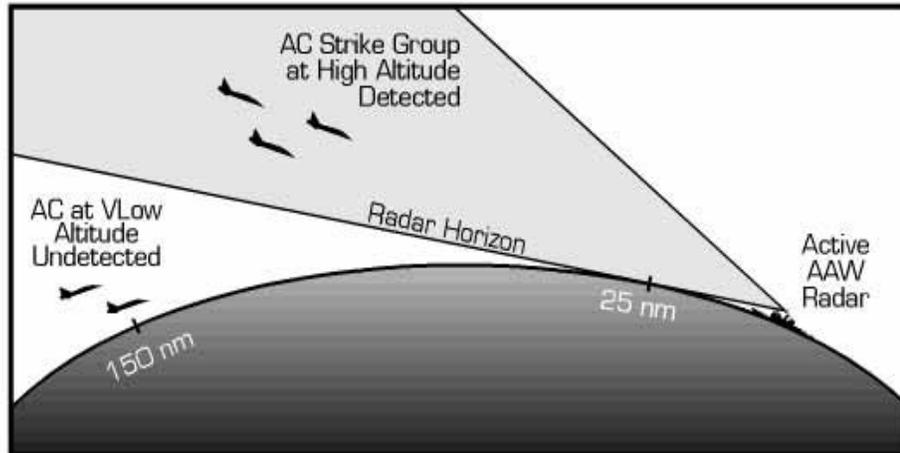
Figure 9: The effect of altitude on the detection ranges of radars.

be insignificant if it did not have tactical implications. Remembering that radar requires the reflection and return of the transmitted signal to the antenna, the strongest returns are generated in the center of the transmitted waves. Argentine A-4 pilots utilized this knowledge to perfect low level approach patterns during the Falklands War. In essence, what they did was adopt a very low profile similar to the lower aircraft in the preceding example. As soon as the ESM threat warning gear lit up, however, to indicate their crossing of the radar horizon, they would drop in altitude. The momentary exposure was insufficient for British radar operators to discern the contact and skilled Argentinian pilots were able to conduct this maneuver up to three times on a standard approach at progressively closer ranges. The technique came to be known as "pecking the lobe", and it was employed with great success to compress the battle space and reaction time afforded the British commander. Were it not for fusing delays associated with the Iron Bombs carried by the A-4s, it is very likely that many more hulks of British warships would litter the ocean bottom around the Falklands.

Strike Timing

In larger strike packages, it is necessary that the commander divide these forces into distinct groups and elements, and assign each a mission that supports the concerted effort. This practice increases the survivability of individual elements, as the enemy's counter-targeting is complicated and decreases the amount of ordnance lost due to jettisoning when the enemy does intercept, but it also complicates the coordination effort of the strike planner. As noted in the beginning of this section, the strike planner is analogous to an orchestra conductor. In that role, if even one element of the whole fails to show up on time, or plays out of concert with the others, the entire movement is jeopardized.

The easiest method of establishing the timeline for the strike is to work it backwards, from the moment the last weapon would be delivered to the launch times for the various elements. The planner can discount flight deck limitations to a degree in the Harpoon3 model, as the staff assistant allows for the assembly of each strike element in loiter before proceeding to target. The critical considerations will be missile time of flight (if one is using these assets as a part of the strike package), aircraft time of flight (which can vary between strike elements if the planner has implemented circuitous maneuver or a multiple axis attack), and weapons time of flight for the aircraft armament packages selected. Naturally, if one is using point weapons like free fall bombs and munitions canisters, this latter consideration can be discounted. Otherwise, with guided or precision munitions, their time of flight must be considered.

By starting with a time of impact and considering weapons' flight time, including TLAMs, from the selected launch points, the commander knows what time the launch platforms must arrive at those points. When this is known, the commander can again work backward along the plotted movement leg for each aircraft element and determine when they must clear the deck to commence the mission. The objective of all this number crunching is to achieve a condition known as Simultaneous Time On toP (STOP), the equivalent of strike planner's nirvana. When STOP occurs, it means that all of a strike's ordnance arrives at the same instant, which is guaranteed to saturate

the most cohesive enemy defenses.

Battle Damage Assessment (BDA)

After any attack, the commander must conduct reconnaissance to assess the effectiveness of the attack and determine the need for any follow-up attacks on the same target. If manned aircraft were part of the strike package, then an initial assessment of the damage inflicted will be provided. This assessment may be inaccurate, and the commander can refine its authenticity (in the case of ASuW attacks) by including a reconnaissance aircraft as one of the last elements to enter the target area. In strikes against land based targets, the commander may obtain accurate satellite data on the effectiveness of his strikes after a period of a few hours.

Summary

Strike Warfare is the heart of power projection. All strike warfare planning must progress through the six steps delineated above. The commander ensures that sufficient force exists to accomplish the mission while husbanding limited resources. Understanding the strengths and limitations of the enemy IADS, as well as the strategic placement of those forces, is essential to planning. There may be some application of force prior to the main strike, such as the HARM attacks discussed previously, but the prudent commander will always plan the main effort to STOP the enemy dead in his tracks.
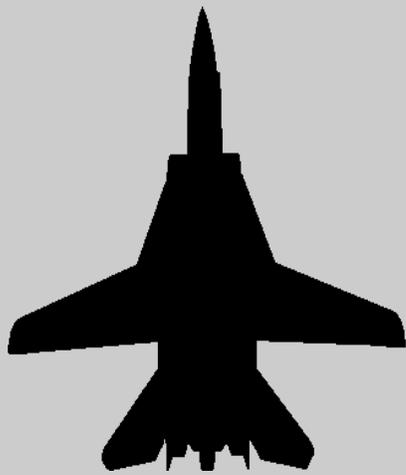
Section VIII:
Anti-Air Warfare

Anti-Air Warfare

Anti-Air Warfare (AAW) posture should be a constant concern of the naval commander, as a missile threat can materialize from all types of contact: surface, subsurface, or air. Further, with anti-surface missile speeds ranging from subsonic, in the case of sea skimmers like TASM, to Mach 4, like the HARM, an AAW threat may present an attack window with engagement time measured in seconds. If the commander has not invested the forethought and planning to be in position to take advantage of the period of vulnerability, the missile strikes home and further actions, even the destruction of the launch platform, are academic.

In determining the AAW force posture, the commander must remember the tactical axiom to "Shoot the Archer, not the Arrow", whenever possible. If the Rule of Engagement (ROE) and other constraints allow, it is always better to engage the firing platform before it reaches its launch point, thereby killing many missiles with a single attack, instead of attempting to deal with groups of multiple inbound missiles. Although this is the optimum case, it is not always attainable. As a result, the prudent commander balances the effort and resources committed to the outer air battle just described, with those necessary to provide cohesive mutual support in the inner air battle.

To illustrate the conduct of the inner and outer air battles, we must return to our earlier comparisons of the inferior and superior force. In the case of an inferior force, which has adopted dispersal as the best tactic, AAW defense is a single unit or small group proposition. In essence, it is every man for himself, and the best chance for survival in the face of enemy air superiority is to avoid detection in the first place. Conversely, remember that superior forces favor concentration and massing for mutual defense, which fits the more complicated model of integrated AAW at sea.

For the remainder of this section, the case of the superior force commander is assumed.

AAW Weapon Basics

Before examining the flow of events that occur in the outer and inner air battles, the commander must become fluent in the technical constraints which govern the employment of Surface-to-Air Missile systems (SAMs). The majority of the world's surface-to-air missile systems employ semi-active homing for in-flight guidance and course corrections. Semi-active homers require the firing platform to actively illuminate the target throughout the intercept with a missile fire control director. The number of directors a ship possesses governs the number of intercepts that may be simultaneously prosecuted. Thus, as a rule, director assignments are more limiting than launcher cycle rates in evaluating engagement potential. If the guiding radar shuts down for any reason, such as attempting to avoid an inbound HARM or being struck by the same, then all defensive missiles in flight self-destruct.

The exception to the aforementioned limitations is the Aegis fire control suite employed by the Ticonderoga and Arleigh Burke class ships. The SPY-1 radar system employs phased-array and time-sharing technology to allow simultaneous tracking and targeting of hundreds of contacts and each of the four array faces can manage three missiles in flight. This means that the Aegis platform suffers none of the delays associated in switching between targets and can manage 12 missiles in a 360 degree area of coverage at any instant. Further, as an intercept is completed, if other targets remain, the system can automatically and instantaneously put another missile in the air from the vertical launch system to refill the engagement queue.

Also, because the SM2-MR missile possesses an inertial mode, if the guiding radar shuts down for any reason, all missiles in flight will continue on their last course until an intercept occurs or fuel is expended. Maneuvering aircraft can, as a rule, escape this "death gasp", but non-maneuvering missiles will generally still be intercepted. Given these capabilities, it is not surprising to see why Aegis is referred to as "The Guardian of the Fleet".

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Airborne Early Warning

The first consideration for proper AAW management is Airborne Early Warning (AEW). If you cannot see them coming outside their launch points, then the outer air battle is already lost, and the commander is forced to play catch up in the inner screen. The premier platform for AEW is the E-3 AWACs, but it is constrained by being a land-based asset. If they are available, use these aircraft to the maximum extent possible. If not, E-2 Hawkeyes are the weapon of choice to keep savvy CVBG Commanders apprised of the air threat. A well positioned E-2 eliminates the need for the CVBG to use active emissions altogether, thereby confounding the enemy's targeting efforts. He will know you are in the area, because E-2s don't materialize out of thin air, but he won't be able to localize your ships well enough to attack them without resorting to methods other than ESM.

To employ one of these AEW assets, station it in a race track loiter pattern covering the area of interest. In the case of a rapidly transiting CVBG, for example, this might be 100nm ahead on the PIM. Also, since there are a limited number of these valuable aircraft, and they are very vulnerable to enemy intercept, it is always prudent to also provide one or two fighters to escort the AEW platform.

The Outer Air Battle

The primary player in the outer air battle is the fighter/interceptor aircraft on a Combat Air Patrol (CAP) mission. CAP may originate from a CVBG or a land base. Further, CAP may protect their unit of origin or any other unit. CAP assets stationed to protect units other than their home base are known as LOng Range Combat Air Patrol (LORCAP) assets.

The proper positioning of CAP or LORCAP is to either side of the expected threat axis at 160-180nm from the units to be protected. Use the loiter command to prolong their time on station and reduce the amount of relief CAP that must be launched. From this vantage point,

the CAP assets will usually be in position to engage incoming groups with AA missiles, destroying portions of strike elements and possibly causing others to jettison their ordnance to increase maneuverability and survivability. The pilot's dictum is that it is far better to flee and fight another day than press forward with a suicidal or non-decisive attack. When this latter case occurs, it equates to a "mission kill", even if the CAP does not succeed in eliminating any of the inbound aircraft.

Players must watch these engagements closely and dispatch relief CAP to the units on station as soon as they occur, so that follow up waves of attack aircraft are met with full weapons loads. Once inbound aircraft have penetrated the outer defenses, the player may have a second opportunity to engage them with CAP aircraft in ready-5 (ready to launch quickly) status, but the bulk of them will become the responsibility of formation AAW assets.

The Inner Air Battle

In this area, the player has a little latitude tactically. Within the main body, shooters should be positioned such that they can provide a layered defense and overlapping coverage to protect the high value unit(s) (HVU), which is usually the CV, LPH, LCC, support ship, or merchant group. Each class of AAW ship usually has several methods of defeating inbound aircraft or missiles, including either long or medium range missile systems and point defense systems like Phalanx. They also have electronic countermeasures, which provide a "soft kill" on missiles by luring them away from their actual targets to explode harmlessly over the ocean.

To protect the HVU, the optimum position for the firing platform is directly between the HVU and the inbound missile group. The reason for this constraint relates to the probability of kill (Pk) for the missile as a factor of the aspect of engagement. Although the ship is plotted with a circle denoting maximum effective range of the AAW weapon system, when viewed with Pk in mind, the circle becomes an ellipse. The highest percentage shot is against a directly inbound missile (Figure 10). As one nears the tangent or closest point of approach of a missile flying past the ship (known as a crossing shot), regardless of

range, the Pk drops under 20%, as a rule. This reduction is because the relative motion of the intercept is at the peak speed, and most AAW missiles cannot do course trajectory changes fast enough to complete the intercept for a crossing shot as just described. As the missile continues toward other ships in the formation, the defenders may obtain an opportunity for one more attack on the missile. These tail chase engagements have a slightly higher Pk than crossing shots, but they are still below acceptable standards.

Figure 10: Pk-biased weapons envelopes.
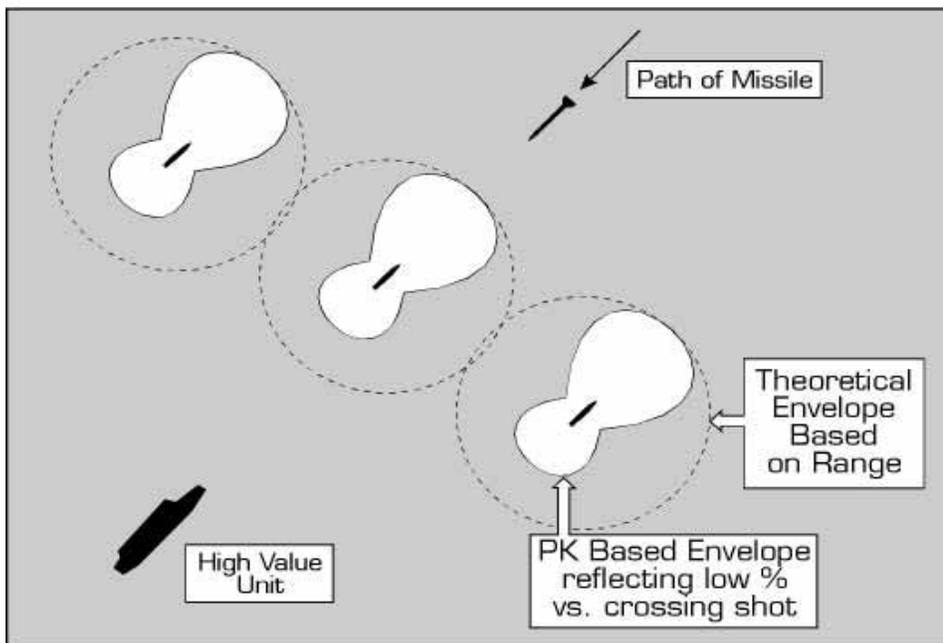
either a missile trap or silent SAM configuration. When the tactical situation dictates the main body adopt an active emission posture (i.e.: their detection and localization is assured to enemy forces), positioning one or two cruisers 100-150 NM from the main body on the threat axis in total emission silence is ideal. In this configuration, the cruiser(s) can act as a missile trap, going active with their air search radars only when the incoming raid has been detected by other means and is within their engagement envelope. The hazard to this tactic is that, once these assets go active and are detected, they lack mutual defensive support and become vulnerable to individual attack.

Silent SAM is similar in terms of stationing distance, but it is a tactic that never requires the shooter to illuminate the target. Cruisers equipped with the New Threat Upgrade (NTU) SM2ER missile can receive targeting data from other sources and shoot inbound aircraft silently 75-90nm from their position, which equates to 175-240nm from formation center depending on their station. Because these assets remain electronically silent throughout the attack, their survivability in an extended picket station is greater than the conventional cruiser employing missile trap tactics.

Calculating Defensive and Staying Power

Occasionally, it is beneficial for the force commander to calculate the defensive power of a unit against missile attack, particularly when making stationing decisions. A reasonably accurate, yet simple to obtain, method of obtaining these figures follows.

Take each ship of the force and examine its AAW weapons systems. Assign numeric values to the following attributes based upon factors listed in the **Harpoon3** database.

> **A = The maximum number of intercepts per engage-
> ment cycle**

> **B = The number of engagement cycles based on
> maximum range**

> **C = The base Pk value of the missile system**

Figure 11: Carrier Battle Group traveling east with AAW Threat Axis to northeast.

D = The effective number of engagements.

Manipulation of these variables yields the equation:

A x B x C = D

Assign B a value of 1 for short range shooters (i.e.: 25nm or less), 1.5 for medium shooters (30-45nm) and 2.5 for long range shooters like the SM2 ER used in the earlier example. Continuing that example here, let's assign a value of 4 to variable A, to reflect the number of

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directors and a base Pk to the missile of 80%. By inputting these numbers we arrive at the following value:

$$4 \times 2.5 \times .8 = 8$$

Thus, we have determined that an SM2 ER unit should be capable of engaging 8 inbound targets with its missile system alone. As a rule of thumb, if the unit is the subject of the attack, one may be added to D for the presence of a point defense system, such as Phalanx, one may be added for chaff, and one may be added if the unit has defensive ECM capability such as that provided by the SLQ-32. Thus, a Leahy or Belknap class, if optimally positioned, could increase force defensive posture by 8 kills, yet has a higher saturation value of 11 in defending against an attack on itself. Beyond that, any surviving missiles will strike their target.

AAW gun systems are discounted for all classes when considering missiles, as the constraints related to proximity fuzing make such employment a low Pk proposition. Their effectiveness is higher against manned aircraft, provided the latter are cooperative enough to fly within the relatively short zone of engagement.

Finally, the commander must understand that these estimates assume early detection of the threat, so that the first engagement occurs at the maximum effective range of the SAM system. When the enemy succeeds in compressing the battlespace using one or more of the tactics discussed throughout this manual, reaction time and the maximum number of AAW engagements are reduced considerably.

Summary

The AAW commander must constantly update the threat axis to reflect the most reliable intelligence available. In formation considerations, invest the time necessary to actually analyze the capability of your own force's units. Balance resources between the outer and inner air battles, but strive to shoot the archer, not the arrow, whenever

possible. Finally, station assets relative to the threat axis with Pk-biased weapons envelopes in mind. This tactic will increase your chances of living up to the Aegis motto: "If it flies, it dies."

Section IX:
Anti-Surface Warfare

Anti-Surface Warfare

ASuW is slightly more difficult than AAW, because one must invest more time establishing hostile intent and refining the over-the-horizon targeting solution. Several factors must be considered when one is contemplating an ASuW strike, including target composition, delivery platforms, which ordnance package(s) will best accomplish the job, and timing. Because surface units begin with a limited number of ASuW weapons, it is generally advisable to husband these resources if air groups are available to prosecute the attack.

Not just any air group constitutes an appropriate strike, however. Proper strike planning requires the player to consider the enemy's defenses and the amount of ordnance that must be delivered to achieve the objective of the strike. Weapon types must be matched to target types, but, more importantly, the strike aircraft must be given a reasonable chance of reaching their launch points.

In the previous section, the player viewed an ASuW strike from the receiving end, with the goal of destroying that strike before it could prove decisive. In this section, we will reverse roles and capitalize upon this new found AAW expertise to exploit it for our own purposes. The Harpoon3 commander must learn how to evaluate enemy defenses and develop a plan to overwhelm them in support of the ASuW mission area, first through air assets and then with surface ships.

Over-The-Horizon Targeting

Since enemy surface task forces are mobile, the first step to prosecuting them is to find them. Some guidance has already been provided on passive cross-fixing, which is a form of Over-The-Horizon (OTH) targeting, in the section on electronic warfare. As such, this section is designed to supplement that information by discussing the role of ship based helicopters in OTH targeting.

As a stand-alone search platform without any initial locating information on the enemy force, the helicopter has limited effectiveness.

Armed with even a single ESM detection of a sensor on a platform of interest, however, the helicopter can begin a line of bearing search to attempt to acquire that target. If the helicopter flies out the line of bearing to its maximum radius and doesn't discover anything, it was not a wasted journey. At least the tactical commander has good reason to assume that the enemy platform is beyond that maximum range.

Helicopters are best employed, however, when a rough area of probability has been obtained on the enemy force, such as when they are radiating intermittently. In this instance, the helicopter approaches the area of probability from off axis, so as not to provide the enemy a line of bearing to its launch platform should it be discovered. Once the pilot estimates that he could be above the radar horizon (see the strike warfare section for a full explanation of this concept) of the enemy group should they radiate, he must slow down and reduce elevation.

For the duration of the approach, the helicopter should fly slowly and under 50 feet to make detection difficult, using their small radar and visual cross section to remain undetected, even when within sight of the formation being targeted, and while maintaining a directional data link back to the parent platform. If these same helicopters are also ASuW missile capable, such as the British Lynx, then the commander may use them to conduct the first pulse of his strike package from their undetected position at short range. Indeed, such tactics proved devastating to the Iraqi Navy during Operation Desert Storm, which has prompted considerable open debate by policy makers in other purely coastal navies.

Alternately, the helicopter may conduct a search tactic known as *jumping jacks*. From the standard search profile of 150 feet at cruising speed, the helicopter pops up to between 500 and 1000 feet, does a visual scan and a couple of quick radar sweeps; if nothing is spotted, then it dives down to the deck again. The process is repeated about every 7-9nm during the search at the pilot's discretion. This tactic

puts the helicopter at greater risk but increases the scouted area.

Evaluating Enemy Defenses

Commensurate with the effort to refine the targeting solution for the conduct of an ASuW strike, the commander must also classify the composition of the enemy force to the best of his ability. The more accurate this assessment, which is based on the correlation of sensor and bearing information (as explained in the Electronic Warfare section), the more correctly the commander may determine the defensive power of the formation to be targeted.

When several asset types are possible, the prudent commander always assumes the worst case scenario. Applying this logic to all of the discrete platforms that have been detected, the commander comes up with a composite picture of the enemy force. Using the Harpoon3 database and the formula presented to calculate a ship's AAW capability, the commander can reliably estimate the required saturation level for the intelligence composite he has developed. Armed with this knowledge, the commander may begin strike planning in earnest. One note of caution must be mentioned, however: The saturation estimates are only as accurate as the classifications of the target types. It is possible to either overestimate, wasting precious weapons, or underestimate, endangering the strike elements themselves.

The ASuW Strike Group

Once the target has been classified and targeted, the commander must have a strike package ready to assign to the threat. We have already noted that it is best to conduct ASuW strikes with air assets, whenever possible. Bearing that advice in mind, let us consider a strike against an enemy CVBG, to illustrate one possible composition and approach. First, you should launch 4-8 fighters in two groups on patrol missions in the area you expect to encounter enemy CAP. You cannot launch them on strike missions because their ordnance does not match the target type. Immediately following this, the commander should launch all ARM or HARM capable aircraft to engage any air search

radars that go active in the target group. If these units succeed in blinding the enemy, the remainder of the air groups will have a milk run. Follow this with the main body of the strike force, employing stand-off and guided munitions. Iron bombs should be reserved strictly to mop up critically wounded ships after the main attack or, in the case of limited air resources, as weapons of last resort. Concurrent with the fighter sweep, but as a discrete group, the commander may also commit electronics support aircraft, such as the EA-6B, increasing the survivability of the strike as a whole. If several types of strike aircraft will be used, each should be launched as a separate group, to complicate the enemy's AAW effort and maximize the chances of the strike achieving its objective.

Ship-to-Ship ASuW

When air assets are unavailable to prosecute the target, surface forces must consider other factors to maximize their attacks. It is important to ensure that you have a refined, complete targeting solution prior to committing the limited assets in the magazine. Further, you must be certain of the composition of the target group. Do you know they are hostile? Will the number of weapons you are about to employ ensure saturation, based on the intelligence you have at that point? If the answer to either of these questions is no, then hold off on the attack. If you are certain that conditions are right to proceed, the next step is to establish both the timeline and the axis of the attack.

The timeline is easy to calculate using the method delineated in the Strike Warfare section. As noted there, when coordinating multiple firing platforms, the objective should be to obtain *simultaneous time on top* to saturate the enemy defenses. In considering the axis of attack, firing straight down the bearing to the target may be the fastest method of getting ordnance on the target, but it also allows the enemy to shoot a bearing only attack down the reciprocal course of the inbound missiles once he detects them. This is known as a "quick shot" and it is an exercise practiced routinely by surface ships. It is rarely a conclusive attack, but if fired down the correct bearing (i.e.: the original shooters did not fire off axis), it can force the enemy ships to bring up the AAW radars. This tactic would allow surviving

members of the original target group to quickly counterattack with any remaining ASuW missiles.

Composition and Employment of Surface Action Groups

If enemy forces have equivalent launch ranges for ASuW weapons, then prudent commanders will dispatch a Surface Action Group (SAG) instead of endangering their HVU. SAGs are good for taking the battle to the enemy. As a rule, they can transit faster than the entire battlegroup and prosecute the attack more quickly. The commander must ensure, however, that SAG composition is adequate both to accomplish the mission and to defend itself against potential threats.

A strong SAG should be capable of posing a viable threat to a CVBG. To do so, it should include at least four medium range ASuW shooters, one long range AAW shooter, one medium range AAW shooter and, if an ASW threat is present, a couple of helo equipped platforms to counter the subs and provide OTH targeting services. Towed array assets are not important because SAG transit speeds render this sensor useless. This composition ideally means four ships of proper capability, not eight total, because each ship class should be multi-mission capable. Two- and three-ship SAGs may also be used against smaller groups or less capable ships with a corresponding expectation of success.

The optimum formation for a SAG is a scouting line abreast with 10-12nm spacing between units. This allows for maximum swept coverage of the scouted area, covert communications via flaghoist and semaphore relay, as well as optimum separation for passive cross-fixing, as described in the section on Electronic Warfare. Also, when the target group has been located and classified, this formation provides an inherent multiple axis for your ensuing missile attack.

Summary

Effective ASuW requires passive cross-fixing and other over-the-horizon targeting techniques. Once forces have been detected, classified, and targeted, the commander must conduct a detailed estimate of the salvo size required to achieve saturation. Finally, in the prosecution of the attack, make every effort to conceal the origin of the attack to avoid counterattack.

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Glossary
of
Terms

Glossary

AAA

Anti-Aircraft Artillery (see below).

AAM

Air-to-Air Missile (see below).

AAW

Anti-Air Warfare (see below).

Active

In naval warfare, any device that transmits a signal. The term is generally applied to sensors, though communications devices are generally active as well.

Actual Course

The direction a vessel is actually traveling - thanks to the tactic of zig-zagging (see below), this direction may be different from the base course (see below).

AEW

Airborne Early Warning (see below).

Air Defense Envelope

The area around a base or ship into which it can deliver anti-air weapons, generally missiles - in other words, the area around a base or ship in which enemy aircraft are vulnerable.

Air-to-Air Missile (AAM)

A missile designed to be carried by an airplane and used to shoot down another airplane - the primary weapon of fighters.

Anti-Air Warfare (AAW)

The art and science of finding and destroying airborne platforms.

Air-to-Ground Missile (AGM)

> A missile designed to be carried by an aircraft and used to attack land targets.

Air-to-Surface Missile (ASM)

> A missile designed to be carried by an aircraft and used to attack a vessel.

Airborne Early Warning (AEW)

> Term used for both the tactic of putting planes with powerful radars aloft over a group of vessels and the aircraft that are designed for that mission. Typically, this mission is performed by the E2-C Hawkeye.

Airborne Warning And Control (AWAC)

> As Airborne Early Warning (see above) but with the added mission of directing the forces engaged in air-to-air combat. Typically, this mission is performed by the E3 Sentry, though the Hawkeye can do so as well.

Anechoic Coating

> A composite material made of rubber and other sound-deadening materials that is applied to submarine hulls and other surfaces (e.g. interior decking) to lessen the effectiveness of active sonar signals.

Annulus

> The donut-shaped area that a convergence zone (see below) can search.

Anti-Aircraft Artillery (AAA)

> Generally small-caliber, high-rate-of-fire weapons intended to shoot down aircraft and missiles. Human-operated weapons of this type are now obsolete, thanks to the speeds of aircraft and missiles, but automated systems like (see Close-In Weapon System, below) have proven useful.

Anti-Submarine Warfare (ASW)

> The art and science of finding and destroying submarines - the job of Maritime Patrol Aircraft (see below) and many surface vessels.

Anti-Surface Warfare (ASuW)

> The art and science destroying surface vessels and land targets - the job of bomber pilots and a great many naval officers.

ASM

> Air-to-Surface Missile (see above).

ASROC

> Anti-Submarine Rocket - a torpedo on a rocket, regarded as a weapon of last resort, as established doctrine calls for keeping the submarine farther away than this weapon's range.

ASuW

> Anti-Surface Warfare (see above).

ASW

> Anti-Submarine Warfare (see above).

AWAC

> Airborne Warning And Control (see above).

Base Course

> The direction the vessel is really traveling, though it may deviate from the base course for tactical reasons.

Battle Space

> The area a commander has to work in, it effects many other factors in a battle, including decisions about formations and deployments, detection, and tactics.

Battle Damage Assessment (BDA)

> The art and science of finding out how much damage a strike actually did to a target - justly famous for being a difficult task, as pilots nearly always over-estimate the damage and the target is generally covered in smoke and on fire when the camera-carrying planes go over.

BDA

> Battle Damage Assessment (see above).

Bingo

> "Bingo Fuel" - A pilot term indicating that there is just enough fuel to Return to Base (RTB).

Blip Enhancement

> A device carried by many helicopters that makes their radar signature as large as a ship's, thus confusing missiles into attacking the helicopter rather than a much more valuable ship.

Blue Water

> A synonym for deep water or large bodies of water. A blue-water navy is one whose forces operate far out to sea and in many different parts of the world. The United States Navy is a blue-water navy.

Bogie

> An unknown air contact

Brown Water

> A synonym for shallow or coastal waters. A brown-water navy operates close to home - generally in or near its own coastal waters. The Argentinean Navy is one example of a brown-water navy.

CAP

> Combat Air Patrol (see below).

Cavitation

> At high speeds (the speed varies with the kind of vessel), propellers turn fast enough to form air bubbles. These air bubbles produce noise as they collapse, making the vessel noisier and easier to detect.

CG

> Designation for a Guided Missile Cruiser.

Chaff

> Thin foil strips dropped by airplanes or fired by ship-mounted mortars to confuse radar-guided missiles.

CIS

> The Commonwealth of Independent States (see below).

CIWS

> Close-In Weapon System (see below).

Close-In Weapon System (CIWS)

> A small-caliber, extremely high-rate-of-fire, automated weapon system designed to shoot down missiles as they approach a ship. The premier example is the U.S. Navy's Phalanx 20mm Gatling Gun - generally called "Sea Whiz".

Combat Air Patrol (CAP)

> The practice of stationing fighter aircraft near a group to protect the group from enemy aircraft and missiles. Also, the planes assigned to this mission.

Commonwealth of Independent States (CIS)

> Formerly the Soviet Union.

Convergence Zone (CZ)

> An effect of active and passive sonars - sound travels in miles-long arcs under the surface of the ocean, producing a donut-shaped detection area (the annulus - see above) many miles from the detecting unit.

CV

Designation for an aircraft carrier.

CVBG

Designation for a Carrier Battle Group - the primary surface formation of the United States Navy.

CZ

Convergence Zone (see above).

DDG

Designation for a Guided Missile Destroyer.

ECCM

Electronic Counter-Counter Measures (see below).

ECM

Electronic Counter Measures (see below).

Electronic Counter-Counter Measures (ECCM)

The devices and tactics developed to interfere with the enemy's Electronic Counter Measures - generally, with a lot of effort, the enemy's position can be determined by determining what kind of ECM he's using. Failing that, ECCM can at least help to insure that the enemy isn't getting any information.

Electronic Counter Measures (ECM)

The devices and tactics developed to prevent the enemy from determining the locations of friendly forces by detecting signals, including employing Emissions Control (see below), Airborne Early Warning (see above), and either tight beam communications or non-electronic communications (e.g. semaphore). ECM also includes jamming (see below).

Electronic Signal Measures (ESM)

The devices and tactics involved in gathering information

about the enemy from detecting the enemy's signals - generally, ESM involves getting bearings to the enemy's vessels from multiple locations to generate a more-or-less exact position at which to launch weapons.

Electronic Warfare (EW)

The devices and tactics involved in gathering information about the enemy and denying him the opportunity to do the same through the use of electronic signals - it includes Electronic Signals Measures (ESM - see above), Electronic Counter Measures (ECM - see above), and Electronic Counter-Counter Measures (see above).

EMCON

EMissions CONtrol (see below).

Emissions Control (EMCON)

The tactic of limiting the electronic signals produced by a vessel or group, the point being to deny information to the enemy. Also refers to the various Emissions Control states, which range from no transmissions to unrestricted transmissions.

ESM

Electronic Signal Measures (see above).

EW

Electronic Warfare (see above).

FFG

Designation for a Guided Missile Frigate.

Flares

Extremely hot objects suspended by parachutes, dropped by aircraft to draw away attacking missiles.

Goblin

Unknown Submarine Contact

Guided Weapon

A short-range weapon that is guided to its target by the aircraft that delivered it or by another aircraft. These weapons are intermediate in range between Iron Bombs (see below) and Standoff Weapons (see below).

Hard Kill

This term refers to incoming missiles that have been destroyed by gunfire or missiles, as opposed to Soft Kill (see below). It also refers to incoming enemy planes that have been destroyed (see also Mission Kill, below).

HF

High Frequency (see below).

High Frequency (HF)

A type of communication equipment, it is generally the least secure and the most detectable, as its signal tends to spread over a wide area.

High Value Unit(s) (HVU)

The units that a group of vessels have come together to protect and escort, examples include aircraft carriers, troop transports, and merchant ships in convoys. Generally, the High Value Units are the center of a group of ships. (See also Inner Screen and Outer Screen below).

Hunter-Killer

Submarine whose mission is to find and destroy enemy submarines. This term can also refer to a surface ship or group with the same mission.

HVU

High Value Unit(s) (see above).

IADS

Integrated Air Defense System(s) (see below).

Inner Screen

    The vessels escorting the High Value Unit(s) - see above - closest to those units, their primary mission is generally to provide air defense, while their secondary mission is generally to destroy or drive off approaching enemy submarines. (See also Outer Screen below)

Integrated Air Defense System(s) (IADS)

    The combination of radars, missiles, guns, and control structures that constitute a nation's defense against incoming enemy aircraft and missiles, it is centrally controlled to provide the greatest protection.

Iron Bombs

    Air-delivered weapons with neither propulsion nor guidance, these are the oldest kind of bombs. They are generally not used as the aircraft delivering them is rendered extremely vulnerable to the defender's weapons.

Jamming

    The devices and tactics involved in interfering with the enemy's detection signals, jamming makes the enemy's sensors less effective and even, done properly, totally ineffective.

Jumping Jacks

    A search pattern employed by helicopters. It consists of flying low for several miles with the search radar off and then popping up to a higher altitude while the search radar is activated.

Long-Range Combat Air Patrol (LORCAP)

    A variety of Combat Air Patrol (see above) that has the fighters deployed over a distant area (often a friendly force or likely enemy approach), it generally forces the fighters to carry fewer missiles and more fuel.

LORCAP

LOng-Range Combat Air Patrol (see above).

Mission Kill

An incoming enemy plane that was forced to turn away before it could attack, it survived but could not complete its mission.

Nautical Mile (nm)

The standard unit of measurement for distances at sea, it is 2,000 yards or 6,000 feet long. Each Nautical Mile is 1.14 standard miles long.

nm

The abbreviation of Nautical Mile (see above).

OOB

Order of Battle (see below).

Order of Battle (OOB)

The forces (ships, aircraft, and people) available to a commander. In some contexts, the forces of an entire nation.

OTH

Over The Horizon (see below).

Outer Screen

The vessels escorting the High Value Unit(s) - see above - farthest from those units, their primary mission is generally to destroy approaching enemy submarines, while their secondary mission is generally to provide air defense. See also Inner Screen above.

Over-the-Horizon (OTH)

A method of detection and attack. Surface units can achieve over the horizon detection either via radar (sometimes) or via other units, like aircraft (usually). Once the enemy units have been detected, an over-the-horizon attack can be launched with any suitable weapons, like Harpoon and Tomahawk

missiles.

Passive

A method of detection, it relies on detecting the noise and signals created by the enemy's unit rather than making noise or a signal itself. Passive methods of detection are much preferred to active (see above) ones.

Patrol Station AI

The computer controller responsible for maintaining user-created patrols. These patrols are replenished by launching an unassigned unit when the unit currently on patrol reaches Bingo fuel, Winchester, or is destroyed.

Path of Intended Motion (PIM)

The course that a vessel intends to follow, it is essentially the Actual Course (see above) that the ship will follow in the future.

PIM

Path of Intended Motion (see above).

Pk

Probability of Kill (see below).

Probability of Kill (Pk)

The likelihood that a weapon will be able to reach a target, this factor is used in calculating the effectiveness of missile defense systems and in making decisions about launching attacks.

Racket

Unknown ESM Contact

ROE

Rules of Engagement (see below).

Rules of Engagement (ROE)

> The conditions under which a commander and his forces must operate. For example, a commander can't order his forces to attack a potential enemy until that enemy attacks first in peacetime, whereas he can take preemptive action in wartime.

SAG

> Surface Action Group (see below).

SAM

> Surface-to-Air Missile (see below).

Simultaneous Time on Top (STOP)

> The goal of all strike planners, getting all the diverse elements of a strike (ship launched missiles, aircraft with different speeds, etc.) to the target at the same time.

Skunk

> Unknown Surface Contact

Soft Kill

> In reference to incoming missiles, luring the missile away from the ship, usually with chaff (see above) or soids (see below).

Soids

> Flares (see above) that float on the water to draw away heat-seeking missiles.

SSM

> Surface-to-Surface Missile (see below)

SSNDS

> Designation for a nuclear attack submarine tasked with direct support of a surface force. It is generally employed as a distant anti-submarine picket.

Standoff Weapons

Weapons that allow the aircraft delivering them to remain outside the target's air defense envelope (see above), they are invariably missiles, like the Harpoon.

STOP

Simultaneous Time On Top (see above).

Surface-to-Air Missile (SAM)

A missile launched from a ship or base to destroy aircraft, it is a pilot's worst enemy.

Surface-to-Surface Missile (SSM)

A missile launched from a ship or base to attack another ship or ground target, they are generally larger than SAMs and a lot larger than aircraft-carried missiles.

SURTASS

SURface Towed Array Sonar System - a large, long-range towed array used to patrol the ocean basins, it is essentially a strategic asset.

TASM

Tomahawk Anti-Ship Missile (see below).

Threat Axis

The direction from which a unit or group expects an attack. In Harpoon3, there are three threat axes: AAW, ASuW, and ASW.

TLAM

Tomahawk Land Attack Missile (see below).

Tomahawk Anti-Ship Missile (TASM)

The variant of the Tomahawk Cruise Missile designed to attack ships, it is the heavy hitter of the United States Navy's SSM arsenal and can be carried by aircraft (large ones), surface ships, and submarines.

Tomahawk Land Attack Missile (TLAM)

The variant of the Tomahawk Cruise Missile designed to attack ground targets, it is the premier cruise missile and can be carried by large aircraft, surface ships, and submarines.

Topography, Surface

The features of a region above sea level, it plays a large role in determining Battle Space (see above) and appropriate tactics.

Topography, Bottom

The features of a region below sea level, it plays a large role in determining the tactics of submarines and the forces that hunt them.

UHF

Ultra High Frequency (see below).

Ultra High Frequency (UHF)

A variety of communications signal, it is the most secure and the least detectable signal because it does not tend to disperse much.

Vertical Launch System (VLS)

The fastest way to get a lot of missiles in the air, this weapon system can be found on Aegis-equipped cruisers and destroyers and is scheduled to be installed on several other platforms as well.

Very Low Frequency (VLF)

This variety of signal is the only way to communicate with submarines more than a few feet below the surface. This signal requires an array of transmitters literally miles across to produce. It is also a very slow way to communicate, delivering only a few words a minute. It is mostly used to alert submarines to come to the surface for a UHF (see above) signal.

Very High Frequency (VHF)

A variety of communications signal, it is between UHF and HF (see above) for detectability and security.

VHF

Very High Frequency (see above).

VLF

Very Low Frequency (see above).

VLS

Vertical Launch System (see above).

Winchester

Pilot term for all weapons stores expended.

Zig-Zagging

The tactic of changing course on a seemingly random base to confuse the enemy about intentions and make attacks (especially from submarines) more difficult.

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