Command at Sea - Jumpstart

Fourth Edition

An Introduction to the *Command at Sea* System

Introduction

This Jumpstart guide is designed to show you how to play *Command at Sea* in as short a time as possible. It includes a rules summary, a sample scenario and the rules necessary for playing the battle. The charts and tables needed to play the game are not included here, so you cannot play a game without the full rules set. You can, however, read this summary and then play, using the full rules as a reference.

These rules are extracts from the fourth edition rules booklet. Most of the explanation, and all of the illustrations, sidebars, and optional rules have been removed. They are repeated in the full rules set. You do not need this booklet to play the full game.

This battle concentrates on the movement, visibility, gunnery, torpedo, and damage rules. Although the game could be simplified by ignoring visibility, it was such an important part of WW II at sea that playing battles without it produces unrealistic results.

Rules Summary

If you are familiar with wargaming, you can probably get most what you need from this one-page summary and use the rules booklet as a reference. Wargamers are an impatient lot.

Tactical Turns are three minutes long, with movement and fire simultaneous and plotted in advance. A thirty-minute non-combat Intermediate Turn is provided for long movements.

Plotting is followed by movement, then planned fire, detection, and reaction fire phases. Reaction fire allows players to fire at targets detected that turn, with reduced effectiveness. The phases are performed simultaneously by both players.

Gunnery attacks against surface targets have a fixed chance to hit with modifiers based on the range band: Short, Medium, Long (normal “effective” range), and Extreme. One roll is made for each attack. The damage per mount is fixed, and is affected by range.

Armor penetration is fixed and is based on range. Ships have a belt and deck rating, which is compared with the penetration ability of the shell. If it is greater than the rating, then the shell penetrates. Non-penetrating hits halve their damage.

Anti-aircraft fire is abstracted, with two values: An Area AA strength for 75 mm and larger calibers and a Light AA strength for 65mm and smaller. Area AA fire can be used any time an aircraft is within range, and to defend other ships. Light AA can only be used against planes directly attacking that ship or passing within 2,000 yards. For both types, a single die roll is made for each firing ship, and the result shows how many aircraft are shot down.

Surface ship and submarine torpedo attacks are made by a using table to find the correct lead angle, then firing the torpedoes along that line, marking the spot of launch. Torpedoes move at their rated speed along their course line until they are within 500 yards (optional: flexible danger zone depending on the run length). Players roll on hit tables based on the apparent size of the target, the length of the torpedo run, and the number of weapons in the spread.

Aerial torpedo attacks are based on the number dropped and modifiers. A single die roll then gives the number of torpedoes hitting the target ship. Dive bombing attacks are made in the same way, with the number of bombs dropped and a die roll indexed to find the number that actually hit. Planes can also strafe ships, but with limited effectiveness.

Air-to-air combat is abstracted, with all dogfights occurring inside an imaginary circle. Within that circle, an aircraft’s exact position is undefined. Players compare aircraft Maneuver Ratings to find out who attacks first. The attacking player chooses an opponent, compares his Maneuver Rating with the target’s, then rolls dice to see if he gets in position to fire. Aircraft speed and pilot experience are both important modifiers. The attacker’s gun attack ratings are then matched against the target’s damage rating and a die roll to see if the target is shot down. There are rules for formation flight.

Maneuver Ratings are also used in determining an aircraft’s climbing abilities.

Rules are provided for night combat, including searchlights, aircraft flares, starshells, and radar.

Ships can attack submerged subs with depth charges or ahead-thrown weapons. Unless the ship is fitted with a depth-finding sonar (rare in WW II), the attacking player must estimate the sub’s depth. The effectiveness of individual depth charges is combined into a single pattern, with a single die roll for its effect. Ships can lay different types and sizes of patterns, depending on how many depth charge launchers/rails they carry.

Planes can attack subs with rockets, depth charges and homing torpedoes; rolling percentile dice to see if they hit.

What has Changed in the Fourth Edition

It's been ten years since the third edition of *Command at Sea*, and countless games have raised just as many questions. Rules questions generate clarifications, corrections or expansions, and ten years of those would be reason enough for a new edition.

We've also "harmonized" the three games in the *Admiralty Trilogy*, unifying annexes, damage scales, formats, and making rules consistent in all three systems. Units listed in *Harpoon* or *FG&DN* can now be used in *CaS* without change. Sensors work the same way in all three games, as do weapons. Many changes, like a new formula for damage points, are transparent to the players, but others, like adding a signature the ship listings, require new rules.

We've also folded in the game expansions that have been published: The land attack and coast defense rules that first appeared in *No Sailor But a Fool*, and the small craft rules that were published in *Mighty Midgets*, and the mine warfare rules from *Baltic Arena*.

First, read a rules section before using it. There are many small changes besides the major ones discussed here. For example, we've changed the rules for submarine battery endurance to better account for the German late-war Type XXI and XXIII subs, Until you've actually read a section of the rules, don't assume it's the same as the earlier edition.

The turn sequence is the same, except that there is no longer a second air movement phase. The rules for air attacks on surface targets and dogfighting have been simplified, so that the second air phase is no longer necessary.

The movement rules are unchanged except for minor refinements. The altitude levels have changed slightly, and VLow and NOE are no longer separate altitude levels. They are defined as special flight modes in the Low altitude band. Impulse movement has been added, a simplified version of what was first published in *Mighty Midgets*.

Visual detection now incorporates the rules from *Mighty Midgets*. There are now two types of modifiers to visual detection. Some change the visibility table that the players use, based on the physical sighting conditions, others change the chance of detection on a table. The variation is now a percentage of the base visibility distance, rather than a fixed number of yards.

Radar now includes rules for "clutter," which can be caused by land, nearby weather, or jamming. By rating and comparing the different effects before a scenario starts, players can find out which is dominant and how effective their radars will be.

Sonar has been simplified, as well as unified with the more complex systems in *Harpoon*. The three detection bands are based on a 75% detection chance at half listed range, 50% at listed range, and 25% at one and a half times the listed range. Modifiers for active and passive sonars have been changed, and like radar clutter, some environmental modifiers will reduce detection range.

Gunnery still uses the four range bands and a D100. The biggest change the players will see is that there are two sets of modifiers, one for Gunnery Standards (GS) 3 and 4, and the other for GS 4m (small caliber weapons). The modifiers work differently: The player totals them up and then multiplies them by a percentage: 4% for short and medium and 2% at long and extreme ranges. This allows the modifiers to have greater effect close in.

Air combat has seen the greatest changes. A new dogfight system uses the old Maneuver Ratings, but is simpler and takes into account both the energy of the aircraft and pilot experience. Initiative is determined by Maneuver Rating and maximum speed. There are three (count them) ways of resolving aircraft damage.

Air attacks on surface targets and AA fire are also simplified, with planes now declaring their attacks at a distance from the target, then moving directly to their targets in three-minute steps. Defending players get the same number of AA shots as before.

Critical hits are now rolled with a D20, which allows more detail on the critical hit table. A new system for fires and flooding models the capacity of the ship's damage control teams, and what happens when they are overwhelmed. The bridge and rudder criticals have finally been deconflicted, and the effects of almost every critical have been refined. Check the listed effects before applying them.

Small craft are now an integral part of the game, and rules for their movement, detection, gunnery, and damage can be found in the appropriate chapters. They are similar to the rules in *Mighty Midgets*, but not exactly the same.

The mine rules in Chapter Ten allow players to design a minefield, either as a referee before the game, or as a player attempting to lay one as part of a scenario.

As always, we are ready to answer any question you have about the rules, new or old.

Rules Extracts

Chapter Two- Game Mechanics

2.2 Preparing for Play. After choosing a scenario, the players need one completed Ship Reference Sheet for each ship and one completed Air Data Card for each aircraft or group of aircraft. Permission is granted to photocopy the master Ship Reference Sheet and Air Data Card for use in playing *CaS*.

2.2.1 Weapons. Each weapons line in Annex A shows the weapon's firing arc, number of barrels/rails/tubes per mount, the number of mounts on the ship, the weapon name, the ammunition available per mount, and any weapon director present. The Weapon Data Line Examples shows this format and helps decipher this information.

If more than one mount is present, the mounts are equally split between the available arcs. Similarly, if more than one director is present, they are split between the available arcs.

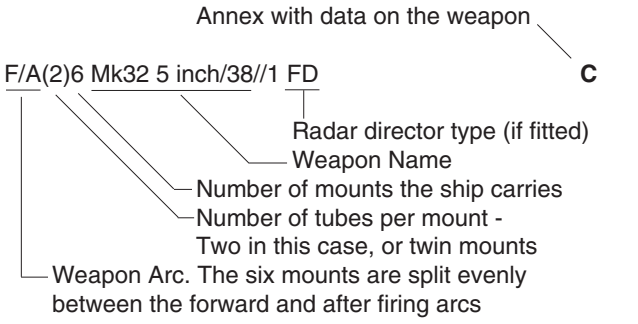
Some weapons do not have firing arcs. Some are catapults or aircraft, that do not require an arc. Others have a predefined arc, and cannot pivot. This includes such things as depth charges, which are rolled off a ship's stern. These will be discussed in the rules for their use.

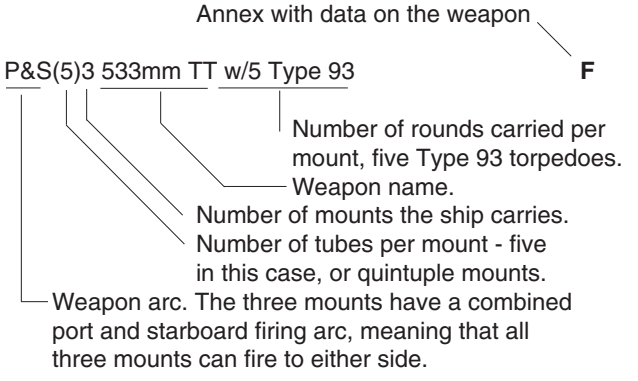
2.2.2 Weapon Firing Arcs. Most weapon mounts have an arc of fire. A weapon mounted forward cannot fire directly aft because part of the ship's structure blocks its fire. Some weapons may not be able to pivot, and the arc is limited by the weapon's ability to turn after launch. The arc which can be used by each weapon mount is shown in the ship listing in Annex A. If a target is not within the firing arc of a weapon, that weapon will not be able to fire at that target.

Some weapons can fire into more than one arc: a gun mount may be able to fire into both the Port Quarter and the Port Arc; its firing arc is expressed by combining the appropriate abbreviations with an ampersand (in this case, P&PQ).

A stroke (/) splits the arcs of multiple mounts: P/S(1)2 indicates that there are two mounts, one firing into the Port Arc and one into the Starboard Arc. The parentheses refer to the number of tubes each mount has.

WEAPONS DATA LINE EXAMPLES





2.3.1 Turn Concept. All play in *CaS* is simultaneous. Both players plot their actions, reveal their orders, move their vessels, and fire their weapons at the same time.

Each Turn is divided into phases. These organize the turn into periods when specific actions may be taken.

Turns should be recorded in units of real time. For example, if the first Tactical Turn is 0115, the next would be 0118 then 0121, and so on.

2.3.4 Tactical Turn Sequence. The following sequence of phases is executed by the players each Tactical Turn.

• *Plotting Phase*. Players write down (plot) movement, firing, and other orders for their forces. Players may plan fire for the coming Planned Fire Phase only against targets detected in the previous turn's Detection Phase.

• *Movement Phase*. Surface ships, submarines, and torpedoes move a distance equal to three minutes of travel. Aircraft launches and landings take place. Torpedoes and missiles that reach their target in this phase have a chance to hit their target and have their attacks resolved immediately.

• *Planned Fire Phase*. All weapons ordered to fire in the Plotting Phase are fired simultaneously. Gunfire and attacks by aircraft are resolved immediately during this phase. Ahead-thrown ASW weapons and depth charge attacks made in this phase are resolved immediately.

• *Detection Phase*. Players attempt to detect other units. A unit can react only to detected threats, even though the controlling player may be aware of others on the game board.

• *Reaction Fire Phase*. Shipboard guns and antisubmarine weapons which have not been used so far this turn may now fire at any target, including ones just detected. Torpedoes may not be fired in this phase. Aircraft fire as before. Gunfire and attacks

by aircraft are resolved immediately. Guns fired in the Reaction Fire Phase inflict half normal damage. Urgent depth charge attacks made in this phase are resolved immediately. Ahead-thrown ASW weapon attacks may not be made in the Reaction Fire Phase.

• *Resolution Phase*. Damage points caused by fire and flooding critical hits are inflicted in this phase three Tactical Turns after the critical hit occurs.

2.4 Ship Size Classes. Many rules are based on the size of the ships involved. This includes maneuvering, detection and damage. To simplify things, ships are grouped into size classes. The rules will refer to either a letter (e.g., Size Class "A") or a description (e.g., Large, Small). The classes are:

Naval Unit Size Class Table

Size Class	*Displacement*	*Size Description*
A	18001+	Large
B	5501- 18000	Medium
C	1501 - 5500	Small
D	351 - 1500	Small
E	86 - 350	VSmall
F	21- 85	VSmall
G	≤20	VSmall

2.5 Target Aspect. Gun and Torpedo fire depend on the apparent aspect of the target. A bow-on battleship is a smaller target than a destroyer broadside to an observer.

Using the target aspect diagram (page 2-6), players can determine whether they have a broad, quarter, or narrow aspect on the target.

2.6 Plotting Movement Orders. Since the players move simultaneously, movement must be plotted ahead of time. For surface ships, players record course and speed, which cannot be changed during the turn. Any increase or decrease in speed should be checked against the ship's acceleration/deceleration ability (section 3.1.1). If the player wants the ship to steer evasively (section 3.1.5), he applies the modifier to figure out the ship's final speed over the water.

Direction and course changes can be written in any clear, consistent manner. It may be in terms of a destination ("Head for Lunga Point") or be based on another ship's movements ("Close on enemy battleship, turn to parallel its course at 1,500 yards.") Remember to keep it simple and focus on the goal of the movement, not the process itself.

2.6.2 Torpedo Movement. Torpedoes move in each Movement Phase starting the Tactical Turn after they are fired. Torpedoes are moved like any other units, however, the firing player can invoke proportional movement if it looks like the torpedo has a chance of hitting (see sections 3.0.1 and 6.3.1).

If torpedoes are fired, or it is expected that torpedoes will be used in a game, the players should plot their moves one Tactical Turn in advance (the current and one more). If new units are detected, or a ship suffers damage, the affected player can alter his movement plot at that time, writing a new set of orders for that Tactical Turn and the next one.

Chapter Three - Ship Movement

3.1 Ship Movement. Ships, including submarines, have a maximum speed listed in Annex A. This is reduced by damage received in combat. Ships may move at any speed up to the maximum speed available to them.

As it accumulates damage, a ship's speed is automatically reduced. Each 25% of its maximum damage reduces its speed by 25%, until it reaches 90% damage, when its speed is zero (it is "dead in the water").

The break points for each damage percentage are included in each ship's listing in Annex A.

3.1.1 Speed Change. Players order speed changes in the Plotting Phase of a Tactical or Intermediate Turn. The amount of acceleration or deceleration is limited by the type of ship, and for acceleration, its starting speed must also be considered.

A ship can move from a dead stop to high speed quickly, but as speed increases, so does water resistance (it's a square function) and the rate of acceleration is less. Acceleration rates are listed in the Ship Acceleration/Deceleration Table (page 3-2). There are separate tables for warships and merchants. There are no special rules for submarines.

Speed changes ordered in a Tactical Turn happen immediately. For example, if a Fast A-sized ship at 20 knots is ordered to increase speed to 30, its acceleration of 6 knots means that it will move at a speed of 26 knots in the upcoming Movement Phase.

3.1.4 Course Changes and Turning. Ships need a minimum distance to turn. Called "advance," it is the distance the ship moves in the original direction as the rudder bites and the ship changes direction. Large ships need more space than small ones.

In most cases, such as maneuvering in open water, advance distances will not be an issue. At other times, such as at slow speed or in restricted waters, the exact amount needed will be very important.

The Ship Turning Distance Table (page 3-2) lists the advance for each ship by size class for both a Standard and Hard rudder. Merchants are less maneuverable than warships, and have their own table. Most turns are made with Standard rudder, but in emergency situations a player can order Hard rudder, "putting it over to the stops." There is a 5% risk of the rudder jamming (5 or less on a D100). If it does jam, treat it as a critical hit (Jammed, roll for direction, see Rudder in 8.3). The ship continues to circle in that

direction with the rudder hard over until the critical hit is fixed.

Unless otherwise plotted, all turns are assumed to use Standard rudder.

To turn, first move the ship the required distance, based on its size class and the rudder used, then pivot it in place up to 45°. A turn greater than 45° must be made in steps of 45° or less. There is no reduction in the distance required for a turn of less than 45°, except that adjustments of 10° or less per turn do not need to be accounted for.

Even if a ship has moved in a straight line for several turns, the player must still move it the required advance in a straight line before changing course. Advance is the distance the ship moves along its original course line after the rudder is put over. If a player knows ahead of time that he will turn in a particular spot, and there is sufficient maneuvering room, he can order the turn ahead of time, and the ship can turn at the start of its next Movement Phase.

Ships also lose speed when they turn, because of the drag of the rudder and hull. The speed lost per 45° turn is shown on the Turn Distance Table. In most cases, the ship's acceleration per turn automatically cancels speed lost from a single turn, but it may not be enough if the ship is moving slowly or makes several course changes in one turn.

The Ship Acceleration Deceleration Rate Table shows how much a ship can accelerate in one three-minute Turn. For example, a Size Class C destroyer, moving at 35 knots, makes two 45° turns with standard rudder. This causes a speed loss of 2 knots, while it can accelerate 3 knots at the same time. The normal acceleration of 6 knots is halved because the destroyer turned. Each 45° course change a ship makes in a Movement Phase incurs a speed loss, up to the fourth change. After that, there is no additional speed loss.

If the total speed loss from the ship's turns in a Tactical Turn exceeds the acceleration for the ship in the same turn, reduce its speed for the present turn by the difference.

3.1.5 Evasive Steering. Ships can steer irregular courses, or "chase salvoes." By turning toward the shell splashes from the last enemy salvo, a ship can throw off the enemy's gunfire corrections. It isn't foolproof, but it helps. Of course, the rapid, unexpected turns throw off the maneuvering ship's gunners as well (except for light weapons, 65mm or less), and ships steering evasively cannot fire torpedoes.

A ship that wants to maneuver evasively plots it and declares it at the start of the Movement Phase. The ship is actually moving at its ordered speed, but covers only 75% of the distance it normally would.

A ship must move at 20 knots or more to steer evasively. Only ships of size class B or smaller can steer evasively. Ships with rudder or bridge critical hits cannot use evasive steering.

Evasive steering modifies the gunfire hit chance for both the target and the shooter. The modifiers are listed with the gunfire hit chance modifiers, in section 6.1 Surface Gunnery.

3.3 Torpedo Movement. Torpedoes are fired in the Planned Fire Phase, after movement for the turn is completed. When fired, place two counters next to the firing ship. One marks the torpedoes' starting position, the other is for the torpedo salvo itself. The torpedo salvo marker is not moved until the following Movement Phase.

On one side of the torpedo salvo counter, put a letter or symbol showing that it is a torpedo salvo and its speed. On the other, put the number of weapons and the type.

In the turns following the launch, the torpedoes move in a straight line in a direction chosen by the firing player (within firing arc limits).

3.3.1 Speed. Some torpedoes have two or more speeds listed in Annex F. Slower speeds give the torpedo a longer range. Any speed can be chosen at the time of launch. It cannot be changed once the torpedo is launched.

3.3.2 Course Changes. An unguided torpedo can make one course change to anywhere within the firing arc of its mount. Torpedoes were fitted with gyros which were set before launch, and surface ships had trainable tubes. Once on course it will not turn.

3.3.4 Range. The maximum range for each torpedo is provided in Annex F. If the torpedo reaches maximum range without hitting anything, it runs out of fuel and stops. It does not explode.

Minimum arming range for all torpedoes is 250 yards (1/8 nm). If one strikes a target inside that distance, it has not had time to arm and will not explode.

Chapter Five - Detection

5.2 Radars. Radars use pulses of electromagnetic or radio waves to detect and track objects. Objects in their the pulse's path reflect some of the energy back to the antenna, where the direction of the reflection gives the bearing, and the time the echo takes to travel to the target and back gives the range.

5.2.1 Radar Specifications & Availability. Radars are listed in Annex J1 (for naval vessels). They have a detection range that depends on the contact's size and the radar's function. The function describes the kind of contacts a radar can see. Surface search radars are designed to detect surface contacts, although very low flying aircraft can also be seen. Air search radars look principally for aircraft. Height-finding radars are used to find the altitude of an air target; extremely important for fighter interception.

5.2.2 Detection by Radar. Early radars were not easy to use, primarily because of their display. First generation, or Gen 1, radars used A-scopes, an oscilloscope which only displayed range information in the direction the antenna was pointing. These radars have a 60% chance of detecting targets within range. Second generation, or Gen 2, radars used the more familiar Planned Position Indicator or PPI display. These radars have a 70% chance of detecting targets within range.

The die roll for each radar to detect a contact is made during the Detection Phase. If the roll is unsuccessful, players can try detecting the same unit on following turns, as long as it is within the radar's range. Once detected, the contact will not be lost unless the radar is put out of action, turned off, the contact moves out of detection range, moves below beyond the radar horizon, or is masked behind terrain.

Radar gunfire directors could also be used as search radars, but they were not designed for this purpose. The controlling player must pick a sector 90° wide for the radar director to search. The sector can be changed each Tacti-cal Turn. Because these radars use A-scopes, the probability of detection is 60% regardless of generation. Gunfire control radars were not designed to be operated for very long periods of time in a search mode. When a fire control radar is used for search, there is a 10% cumulative chance each Intermediate Turn that the radar breaks down. See equipment serviceability in section 8.4 for repair rules. Gunfire radars do not have to make a die roll to detect a target if they are cued and placed on the target by another sensor (another radar or an optical director).

The range of a radar depends as much on the size of a contact as it does on the size of the antenna or transmitting power. The larger the contact, the farther away a radar can detect it. The detection ranges (in nm) are given in Annex J for Large, Medium, Small, Very Small, or Stealthy contacts. These sizes are described in section 2.4 and will be listed in Annex A or B for each unit.

5.2.3 Shipboard Radars. The characteristics of shipboard radars are listed in Annex J1. Surface search (SS) radars are medium-range sets that can pick up ships, land and air contacts at Very Low altitude.

5.2.6.1 Sea State Effects. The detection range of a radar searching for contacts on the sea surface and at Very Low altitude is reduced by "sea clutter." This effect is caused by the radar beams striking the wave tops and being reflected back. The bigger the waves, the more clutter that appears on the scope. Larger waves also cause a ship to pitch and roll, causing the antenna to point in the wrong direction. Sea clutter is all around the ship and will affect a radar's performance regardless of the contact's bearing.

5.2.6.3 Land Mass Effects. Nearby land is a much better radar reflector than waves. Ground clutter can cause a significant reduction in a search radar's range. Air search radar beams are angled up, so they are only affected by land clutter if they are attempting to detect contacts at Low altitude.

The magnitude of the ground clutter depends on the type of terrain that the radar beam sees. Ground clutter is directionally dependent and is only effective if it is present within the radar's maximum range and within ±5° of the target's bearing.

5.2.6.4 Clutter Effects. In *CaS*, only the largest clutter value is used to find out the reduction to a radar's range. The other sources are low enough that they can be ignored without significantly affecting accuracy.

At the beginning of a scenario, note if there is any land or rain present in the setup and environment sections. If so, record the type of terrain and/or the type of rain. Also note the sea state. Consult the Radar Clutter Value Table on page 5-4 and find the clutter values for each source. During the Detection Phase of each turn, note which clutter sources are applicable to the particular situation and use only the largest value to reduce the radar's performance.

Although limited, early radars could reject or reduce the effects of clutter. This "clutter rejection" was mainly done though gain control (reducing the power in the radar signal) and, in later radars, better displays. First generation radars have a clutter rejection value of 2, while second generation radars have a clutter rejection value of 5.

Subtract the radar's clutter rejection value from the largest clutter source to find the net clutter value for the radar. Take this value to the Clutter Effects Table and cross-index to find the radar range modifier.

Example: A US destroyer with an SC radar attempts to detect a Japanese DD at night as it speeds along the coastline of Guadalcanal (terrain type is flat land with light woods). The seas are a little rough at sea state 4, and there are moderate rain squalls in the area. During the Detection Phase, the US destroyer is 11 nm away from the coastline with the Japanese destroyer at a range of 3.5 nm. Presently, there is moderate rain between the two ships.

First, the maximum SS range of an SC radar is 10 nm. With the coastline farther away than 10 nm, ground clutter is not a factor. The clutter values from sea state and rain are "3" and "5" respectively. Since the rain effect is the largest, the clutter value used is "5". Note: if the US was one mile closer to Guadalcanal, then the ground clutter would have taken over with a value of "6".

Next apply the clutter rejection value of the radar. Since the SC is a Gen 1 system, it has a clutter rejection value of 2. Subtract this from the rain clutter to find the net clutter value, which in this case is 3.

Referring to the Clutter Effects Table, the radar's range is reduced to 60% of its listed value. The SC's range for a small target is 4 nm. The modified range is thus 2.4 nm, and the Japanese destroyer slips by out of range.

If the US ship had been equipped with an SGb (Gen 2) SS radar, then the results would have been:

- Max Range of SGb = 22 nm, ground clutter is within range
- Clutter Value = 6 (dominated by ground clutter)
- Gen 2 Clutter Rejection = 5
- Net clutter = 1 and results in a radar modifier of 0.85.
- SG range to a small target = 15 nm
- Modified radar range = 12.8 nm
- The Japanese DD easily within range

5.4.1 Making Visual Detections. First, refer to the Surface-to-Surface Visibility Tables on page 5-11 and find the table for the scenario's sighting conditions (e.g., 50%). Then, apply any sighting conditions modifiers listed on page 5-12. These cover situations that actually improve or degrade the visibility conditions, and may increase or decrease the effective visibility, and the table that is actually used.

Example: At night with a half moon, visibility is normally 30%. A small craft (size class E - G) at 5 knots or less lowers the effective visibility by one table, making the effective visibility 20%.

Second, on the appropriate Visibility Table, cross-index the size class of the two vessels involved to find the base sighting range.

Third, find any applicable modifiers to the detection chance on page 5-12. Roll D10, adding or subtracting any modifiers, and refer to the Visibility Variation Table at the bottom of this page. Multiply the base sighting range by the value from the Variation Table. This is the modified sighting range for that Tactical Turn.

Any unit within the modified sighting range is detected. Submarine periscope "feathers," or wakes, (speed 5 knots or more) are treated as size class G targets. See 5.4.2 for detection chance.

5.4.1.1 Sighting from Ships. The farthest sighting range for a ship is affected by its "height of eye," the distance of the observer above the water. The higher the observer, the greater the visual horizon.

This horizon is reduced by the sighting conditions to give the effective range in the existing sighting conditions. The Surface-to-Surface Sighting Table includes the modified horizon distances.

5.4.1.4 Sighting Torpedo Launches. Players have a chance to see an enemy ship launching torpedoes. Even though torpedoes were launched by various means, all had some telltale signature. This might be the flash of a pyrotechnic charge or a cloud of vapor from condensed air.

Torpedo launches are detectable at twice the distance of a periscope. Roll Visibility Variation normally. If the ship is also firing its main or secondary batteries, reduce the detection chance by 20%.

Example: On a clear day, a Japanese DD fires a torpedo from 10 kyds against a cruiser. For 100% visibility, the torpedo firing could be seen at 8 kyds (twice 4 kyds), modified by the visibility variation roll.

5.4.1.5 Sighting Torpedo Wakes. Torpedo wakes could be detected by alert lookouts, sometimes in time for the ship to maneuver and 'comb the wake' of the incoming weapons. Torpedo wakes are detectable at the same distance as a periscope, but with no visibility variation.

If the torpedo is within sighting range, then roll D100 to see if the wakes are spotted:

If the attacking torpedo uses steam propulsion, the chance of seeing it is:

In daylight:	20%
In morning or twilight:	15%
At night:	25%
Launch sighted	+50%
"Flaming Datum"	+35%

Electric torpedoes are wakeless, and cannot be visually detected.

Torpedo wakes cannot be visually detected in sea states greater than four.

If an attacking torpedo is detected, the threatened ship is allowed to disregard its plotted movement and maneuver freely in the following Movement Phase.

Aircraft torpedoes are considered to be automatically sighted, and this is built into their attack table.

5.4.5 Nighttime Illumination. A unit can be detected visually at night, but it is still a poor gunnery target. Without a light source of some kind, a ship is only a shadow, with its shape, course, and even its direction uncertain. A target must be illuminated for visually-controlled gunfire to be fully effective. There are many ways of doing this.

Searchlights can be manually or radar-controlled. Radar-controlled searchlights are land-based. Flares include aircraft-dropped flares and starshells fired by guns. Searchlights, flares, and starshells are limited by weather. If the weather conditions include precipitation, then halve the illumination radius.

Ships or land bases may also use their own lights. Normal running lights and other nighttime illumination were usually kept off, "blacked out," if there was a chance of attack. Use of lights will allow operations at night or poor weather, but the units using them are illuminated.

Any ship which is illuminated by any means is treated as a normal daylight gunnery target, ignoring the visibility modifiers (less than 20% and less than 40% visibility, see Gunfire Hit Chance Modifiers Table, page 6-2 and 6-3).

5.4.5.1 Ship-Based Searchlights. Ships were equipped with searchlights to illuminate targets in night surface actions. Searchlights have a range of 8 kyds (4 nm). Any ship in the beam of a searchlight is illuminated. Any ship using searchlights is also illuminated itself.

Small Craft were normally fitted with a small, low-power searchlight. These can be used like other ship-mounted searchlights, but have a range of only 2,000 yards (1 nm).

Searchlight illumination is ordered during the Plotting Phase, and is available for targeting in the Planned Fire Phase of that turn. A searchlight can only illuminate a target once it has been detected, either by radar or visually. New targets found in the Detection Phase cannot be illuminated until the following Planned Fire Phase. It takes a little time to coach the searchlight operator onto the target.

5.4.5.5. Firing Starshells. Starshells can be used to illuminate a surface target. They may be fired by a minor combatant's primary battery, a major combatant's secondary battery, or sometimes by a special gun. In the Plotting Phase or Reaction Fire Phase, choose one mount (it must be able to fire in the desired direction) to fire illumination rounds (starshell). That mount may do nothing else while the target is being illuminated.

Resolve the starshell gun for hits or misses and the location of the illumination. In the next fire phase, either the Reaction Fire Phase or the Planned Fire Phase of the next Tactical Turn, the rest of the ship's guns can fire and benefit from any illumination the starshells provide. Other ships can also fire at the illuminated target.

Starshell illumination actually requires a series of shells, fired over the entire three-minute Tactical Turn. Individual starshells burn out quickly and if the mount ceases fire, the light quickly fades. If the mount stops at the end of a turn or shifts to another target, the target ceases being illuminated in the following fire phase. Starshell must be renewed for each Tactical Turn.

Starshells have a minimum range of 4,000 yards (2 nm). Inside that range, the shell is moving too fast for the chute to deploy without shredding. Starshells cannot be fired into the Extreme range band. In addition to accuracy problems at Extreme range, at this distance the altitude of the shell is so low when it ignites that there is no useful illumination. If a starshell misses a target and goes into the Extreme range band, it automatically fails.

The player rolls the chance to hit for the gun normally, except that he should ignore the target's aspect. If it is a hit, the starshells land at the desired location, either a plotted point on land or a designated ship. If they miss, roll D10 again. On a 1-5, the fire lands 1,000 to 3,000 yards short. On a 6-10, it lands 1,000 - 3,000 yards long.

Starshell Miss Table

D10 roll	*Miss distance*
1	3000 short
2	2500 short
3	2000 short
4	1500 short
5	1000 short
6	1000 long
7	1500 long
8	2000 long
9	2500 long
10	3000 long

If the modified range is inside the starshell's minimum range of 4,000 yards (2 nm), the chute shreds and it fails to function.

Any unit within 1,000 yards (one-half nm) of the point is immediately illuminated for the next fire phase. Units between the starshells and another unit are silhouetted to a range of 6 kyds from the point of impact.

5.4.6. Smoke Effects. Smoke was used in WW II to obscure a target and reduce its chance of being hit during an attack. It could also reveal a target's location.

Smoke generators could be land-based, positioned around some valuable installation. They were also carried by destroyers, and used to screen other ships from gunfire attack or accurate torpedo fire. Visibility in or through a dense smoke screen is reduced to 1,000 yards (.5 nm) in the daytime and 500 yards (.25 nm) at night. That is, to see a ship in a smokescreen the observer must be within 1,000 yards in the daytime and 500 yards at night. On the last turn that the smoke exists, it is dissipating and the surface visibility is reduced to 1/4 of the unobstructed visibility.

Smoke does not block radar detection, so radar-controlled gunfire or bombing is not affected by smoke. Gunfire spotting aircraft are not affected unless the target is actually in the smoke screen.

If a ship moves into smoke during the Movement Phase, and ends the phase within the smoke, it may still be fired on if it spent at least half of its movement outside the smoke. If the ship is obscured for more than half but not all of the turn, all gunfire suffers a -4 dead reckoning penalty for that turn only. This is less than the normal blind fire modifier (-6), since the ship's location was known before it became ob-

scured. If the ship remains hidden on following turns, it can't be fired on at all.

5.4.6.1. Shipboard Smoke Screens can be created in any Plotting Phase. In the Movement Phase of that turn, a ship will leave a smoke screen in its wake. The smoke screen can be turned on or off each turn as the player desires. The screen extends only a few hundred feet into the air. It does not block line of sight from aircraft at Low altitude, but will block planes flying at VLow. The smoke screen will remain for four Tactical Turns (in calm weather), then disperse.

Reduce this time by one turn for every 10 knots of wind. (e.g., If it is from 1 - 10 knots, it will last three turns. If the wind is 11 - 20 knots, the smoke screen will only last two turns.) Smoke is removed at the end of the Plotting Phase of the turn in which it disappears.

Chapter Six - Surface Combat

6.1.1 Directors. Main batteries on all combatants and secondary batteries on major combatants are fitted with optical directors. If a gun battery is fitted with fire control radar, it will be listed on the weapons line in Annex A. If a ship is fitted with more than one GFC radar for a battery, it will be listed as such. GFC radar is also lost when the fire control is knocked out.

Major combatants are fitted with more than one director for their gun batteries. This was necessary because one director could not provide complete 360° coverage, and it also allowed the ship to engage more than one target with a battery.

Major combatants will always have two directors for their main battery, arranged with F/A arcs. The forward director is the primary one, and the after director was usually lower, so that when it is used the ship should be treated as one size class smaller for detecting targets for that director to engage.

Major combatants will also have two secondary battery directors, usually arranged P/S. If the secondary battery is arranged so that it includes the forward and after arcs only, then the directors will also have F/A arcs. If the secondary battery includes both the forward, aft, port, and starboard arcs, then there will be four secondary battery directors, with F/P/S/A coverage.

Minor combatants will have one director with a forward arc for the main battery. This means that if the player wishes to have an aft mount engage a target to the rear, it must do so in local control.

6.1.2 Gunfire in Local Control. Guns can be fired without their director, in "Local Control." Any gun mount can be put in local control by ordering it in the Plotting Phase. In local control, the crew of the gun mount aim and fire the gun themselves. This is the normal procedure when the director has been knocked out.

Depending on the gunnery standard, a negative modifier is applied when firing in local control.

The gun director is located at one of the highest points on the ship, while the gun mounts and their sights are mounted much lower, usually on the main deck itself. This meant that if the gun crew depended on the mount's sights, the visual horizon and spotting range was reduced. In local control, reduce the ship's size one class.

6.1.3 Gunnery Procedure. Gun ranges are divided into four range bands: Short, Medium, Long, and Extreme.

In Gunnery Standard 4 (GS4), a gun firing at Short range has a base 60% chance to hit. A Medium-range shot has a 40% chance, a Long-range shot has a 15% chance, and an Extreme-range shot is only 5%. These chances can be changed up or down by various modifiers. The chance to hit cannot be raised over 90%, even with modifiers.

While the base hit chances are the same, the size of the range bands vary for each gun. A US 16"/50 has a "short" range of 8,500 yards, over four nautical miles, while a Japanese 10th Year Type 4.7"/45 has a short range of 5,300 yards.

Procedure: Measure the range from the firing ship to the target and note the target's aspect (broad, narrow, or quarter). Choose the proper range band (short, medium, long, or extreme) by comparing the measured range with the numbers for that gun in Annex C. Count the number of barrels firing. Be sure to check arcs of fire (section 2.2.2) and that the guns can actually fire on the target.

Adjust the chance to hit up or down by using the Gunfire Hit Chance Modifiers Table (page 6-2). To do this, total up the modifiers that apply to the shot, and multiply it by 4% at short or medium range, and 2% at long or extreme range, and then add or subtract it from the base chance to hit.

If a target is at long or extreme range, and the modified hit chance is zero, a ship can fire a "ranging shot." This counts toward the consecutive turn gunfire modifiers, but it has no chance of hitting. If the modified hit chance is less than zero, there is no fire control solution, so there would be no benefit from a ranging shot.

Roll D100. If the roll is less than or equal to the modified chance to hit, the target has been hit.

Note the number of damage points inflicted by the gun in that range band (found in Annex C). Look on the Gun Damage Multiplier Table (page 6-5) and cross-index the number of barrels firing and the range band. This gives a multiplier for the damage inflicted in Annex C. Multiply the two numbers to get the number of damage points suffered by the target. Guns that fire only in the Reaction Fire Phase (in response to a newly-detected target) have their damage halved.

Players do not have to keep track of gun ammunition, unless required by a scenario. It is very rare for a naval gun mount to run out of ammunition during an engagement.

6.1.4 Overconcentration. Optical directors and even radar could only get the shells close to the enemy ship. Adjusting the fire required being able to see the shell splashes and correct the next salvo based on whether they were long or short of the target. These corrections were added manually, by the director operator.

If a second ship fires at the same target, the director operator will have a hard time telling which shell splashes belong to him and which belong to the other ship. A third ship makes the problem even worse, and so on.

Overconcentration will occur if the shell splashes are roughly the same size. No battleship would be confused by the splashes of a destroyer firing at the same target, but a battleship with 16-inch guns would not be able to tell its splashes from those of 15-inch guns also firing at the same target. For figuring overconcentration, large shells are 11 to 18 inches, medium shells are 5.9 to 10.9 inches, and small shells are less than 5.9 inch diameter.

If more than one ship fires at the same target, all the ships firing the same size guns at that target at Long and Extreme range are subject to a gun hit chance modifier equal to the number of ships firing at that target minus one.

Example: A heavy cruiser is fired on by a battleship's main (15 inch) and secondary (5 inch) batteries, two heavy cruisers' main (8 inch) and secondary (4.5 in) batteries, and one destroyer (4 inch). All guns are firing at Long or Extreme Range. The overconcentration penalties are:

• BB main battery: no overconcentration, only one ship firing shells of that size.

• CA main battery: Two ships firing medium-sized shells, penalty of -1.

• DD & BB & CA secondaries: 1 DD + 2 CA +1 BB, four ships total, penalty of -3.

6.1.6 Line of Fire Restrictions. A ship's line of fire to a target may be blocked. This will happen if another ship is in the gun's Short or Medium range band and is within 10° of the line of fire (20° total arc).

Land of 100 m elevation or more will block a ship's line of sight, although a plane may provide over-the-horizon spotting to replace it. Land of less than 100 meters elevation may still block line of sight. This will be specified in the scenario description.

Ships carrying floatplanes on after catapults have their line of fire blocked ±30° of centerline aft for main and secondary batteries. The muzzle blast from even a medium-caliber gun was enough to damage a plane or even start a fire. If a ship's main or secondary battery fires within 30° of the aft centerline when there are floatplanes on aft catapults, there is a 50% chance they will be damaged (roll each Tactical Turn). Treat it as an aircraft critical hit.

6.3 Surface-Launched Torpedoes. Torpedoes must be fired against a detected target, or a fire control solution against a "blind" target must be achieved. They cannot hit small craft, such as PT boats or barges (size classes E-G).

Range for torpedoes is measured from the geographic point of firing to the torpedo's current position. If the distance traveled by the torpedo since its launch is greater than the listed range, the torpedo runs out of fuel and automatically misses. A ship may reveal its bearing when it fires a torpedo against any ship with effective sonar.

The following rules apply to torpedo attacks from surface ships and submarines.

6.3.1 Straight-Running Torpedoes. Most torpedoes used in WW II can have their gyro set to run on a particular course, which need not be the same direction as the launching tube is facing. They can be set to a course anywhere within the tube's firing arc.

The Soviets were still using an earlier form of straight-running torpedo, which required that the launching tube (and the submarine) be pointed directly along the intended course. These torpedoes are noted in Annex F as being "non-gyro" straight runners.

In most cases, the speed of a torpedo is not that much greater than that of its target. This means the "Deflection Angle", the amount of lead, must be very large. *CaS* players can use the Torpedo Deflection Angle Table to compute their own "lead angle" and fire their spreads.

On the turn of launch, a ship is allowed to make one turn (within normal maneuvering limits) at the beginning of the three-minute Tactical Turn, but afterwards must steer in a straight line. Surface ships cannot use evasive steering, and submarines cannot evade depth charges.

Torpedoes must be set at the time of launch to run shallow or deep. Shallow weapons will hit any size class D or larger ship, but will strike the belt armor of size class A or B ships, which reduces their effectiveness. Deep torpedoes will run under size classes C and D, but will hit an A or B ship on the underwater hull, instead of the armor.

On the turn of launch, unless hidden movement is being used, place a torpedo counter next to the firing ship, along with a Datum marker that will let the player measure the length of the torpedo's run. Move the torpedo marker in the Movement Phase of following turns.

There is a chance that the torpedo launch can be seen (see section 5.4.1.4).

After a torpedo is launched, its course cannot be changed.

• *Torpedo Movement to Target.* In every Movement Phase of the turn after they were fired, torpedoes move at their rated speed in a straight line on the course ordered by the player (within the tubes' firing arc). Depending on the targets' maneuvers after launch, it may or may not be at the expected point of intercept. In addition, another ship (friendly as well as enemy) may be struck by the torpedoes if it gets in the way.

If a torpedo spread comes within 500 yards (1,000 yards total width) of any eligible torpedo target, that unit is attacked by the spread, and the torpedo attack should be resolved against it.

Torpedoes move like any other surface ship or sub. If there appears to be a chance of a torpedo spread and a ship's path intersecting, use proportional movement to see if the torpedoes pass close enough to resolve an attack. If the players are not using a referee, they will have to plot movement one turn ahead. See section 2.6.

6.3.2 Resolving Torpedo Attacks. When a torpedo reaches a ship (its intended target or another that gets in the way) the attacking player must roll to see how many torpedoes actually hit. This is based on the target's size (battleship, cruiser, destroyer, etc.) and the angle from which the torpedoes attack. A side shot on a destroyer stands a better chance of hitting than a bow-on attack on a battleship.

Find the target's effective length by using the Aspect Table on page 6-15.

First look at the diagram to see from what angle the torpedoes are attacking the ship. The degree numbers around the edges of the box refer to relative bearing, in other words, the bearing of the torpedo relative to the ship's bow. Most shots will be on one of the quarters. Broad is the best, narrow is the worst.

Cross-indexing the ship's real size with its angle, the resulting Roman numeral is the table to use to resolve the attack. Attack Table I is the best, Attack Table VI is the worst.

Once on the correct Torpedo Attack Table (pages 6-13 through 20), choose the appropriate chart for the number of torpedoes in the spread. There are six charts, the maximum spread being six weapons.

Now measure the range from the impact point back to the firing point. *Note:* torpedo run at impact is not necessarily the same as target range at time of fire. The range that matters is not the range at firing, but at impact. This is how far the torpedo has actually traveled, and this is what affects its chance to hit.

Look down the range column for the range closest to the torpedo's run. Round even splits up, i.e., 8,500 yards becomes 9,000 yards.

Roll D100, and starting at the right, compare the result to the hit chances in the corresponding row. If the die roll is less than or equal to that value, the number at the top of the column is the number of torpedoes that have hit the target. If the die roll is greater than that number, look at the next number to the left in that row and compare the die roll with it.

As the number rolled gets bigger, the number of torpedoes hitting gets smaller. If the die roll is bigger than the number in the column with "1" at the top, all the torpedoes in the spread missed.

Any torpedoes in the spread that miss the intended target have the opportunity to hit other nearby targets, if they exist. However, only the first target is attacked by the full spread. All remaining torpedoes are treated as individual weapons i.e. spread size =1. The only exception to this rule is if the salvo misses the first target completely, then the second target in the torpedoes path would be attacked by the full salvo.

If the target ship is stationary (speed zero, dead in the water), move two lines up on the torpedo table.

6.7 Combat Considerations. Combat is restricted by the following considerations.

6.7.1 Weapons Danger Space. Surface ships may not fire their guns at other surface targets if friendly ships are in the line of fire. The danger area between the firer and the target is within 10° of either side of the line of fire in the gun's Short and Medium range band. By the time a shell has passed into the Long range band it is high enough so that it will pass over any friendly ships.

For a friendly ship to be included in the weapons danger space surrounding an enemy ship, it must be inside the space for at least half of the enemy ship's Movement Phase.

There is a second danger space directly around the target. It lies within 5° of the line of fire and ten percent of the range between the firer and the target.

If a friendly or enemy ship passes through either danger space, it is also subject to an attack at half the modified chance to hit and if hit, half the damage for that range band.

This danger space represents the occasional shell that does not follow a predicted ballistic path, an unexpected roll that a stabilization system cannot account for, or aiming errors by the director. Such errors would usually just include a single shell or a single salvo, but the damage values in Annex C actually represent only a few shells out of the many fired actually striking an intended target.

6.7.2 Rates of Fire. If a weapon does not have a rate of fire listed in the remarks section of Annex A for that ship, it may fire once per rail or tube per turn. Guns may be firing many rounds, depending on their bore, and multiple-barreled weapons, like the Mouse-

trap series, will fire all their tubes in one "salvo" or pattern.

Chapter Eight - Damage

8.1. Applying Damage. Whenever a Size Class A - D ship is hit by a weapon, subtract the damage points inflicted by the weapon from the ship's damage point total. When the ship's total reaches zero the ship sinks.

When a weapon inflicts damage on a target, the weapon must penetrate any armor in the location of the hit before it can do internal damage. Non-penetrating hits will cause less damage (see 8.1.6).

The effects of damage, including critical hits, are applied simultaneously to both sides at the end of the phase.

Damage from fire or flooding critical hits is applied in the Resolution Phase of the third turn after the critical hit is inflicted, with two exceptions: Flooding from torpedo hits is applied immediately, in the Movement Phase the torpedo hits. Flooding and Fire criticals are inflicted on Small Craft (Size class E - G) immediately.

Secondary effects from criticals, like explosions, are applied immediately, in the phase in which the damage is resolved.

• *Movement Phase*. Resolve torpedo and mine attacks.

• *Planned Fire Phase*. Gunfire, ASW ahead-thrown weapons, and depth charge attacks made in this phase are resolved in this phase, including damage effects.

• *Detection Phase*. No combat resolution occurs.

• *Reaction Fire Phase*. Resolve gunfire and depth charge attacks made in this phase.

• *Resolution Phase*. Fire and flooding criticals are resolved.

8.1.1 Speed Reduction. As a ship or sub's damage point total is reduced, its speed goes down as well. Loss of structural strength may force a ship to slow down. Drag on the hull will slow it as its smooth lines are broken by holes and other damage, and general damage to the propulsion plant will affect its efficiency.

A ship's speed is reduced by one quarter each time it takes one quarter of its original damage point level, and is reduced to zero at the 90% damage level.

The break points for damage are 0%, 25%, 50%, 75%, 90%, and 100%. The speed percentages are 100%, 75%, 50%, 25%, 0%, and sunk.

Each ship class has a different table which is included with its other characteristics in Annex A. The top line represents the damage point levels where the speed is reduced, while the bottom line shows the new maximum speed at that level of damage.

Example: The Japanese heavy cruiser *Myoko* takes 346 points of damage. Its damage and speed breakdown table is shown below:

Damage and Speed Breakdown:

Dam Pts:	0	87	173	260	311	346
Surf Speed:	33	25	16	8	0	Sinks

With no damage (0), *Myoko's* max speed is 33 knots. With 86 points of accumulated damage, she can still do 33 knots, assuming no propulsion criticals or other restrictions. At 87 points, though, her maximum speed is reduced to 25 knots. From 87-172 points of damage, she can make 25 knots. The 173rd point reduces her speed to 16 knots, and so on.

Acceleration/Deceleration rules (section 3.1.1) apply here, so the ship slows, coasting to a slower speed at half the deceleration rate, so its speed next turn would be 33 - (12/2) = 27 knots. The following turn it would slow to its new maximum speed, 25 knots.

If a ship has taken propulsion criticals or other damage that also reduces its speed, these are applied to the ship's current maximum speed.

8.1.2 Ship & Sub Critical Hits. A ship can be destroyed by sinking it, but it can also be rendered useless by destroying the equipment that makes it a warship. This is called a "mission kill."

Damage to a vital component of the ship is called a critical hit. These include not only weapons and sensors, but engineering (propulsion), the rudder, and flight decks.

In each phase that a ship takes damage, divide the damage points taken by the points the ship has remaining after that phase's damage points are applied. This is the damage ratio used to figure out how many critical hits a ship may have suffered.

Example: A *Fletcher* class destroyer has 84 damage points. If it takes 22 points of damage from gunfire in the Planned Fire Phase, the damage ratio is 22/(84-22) or 22/62 = .35. Since the damage ratio is always rounded down, this will be rolled on the .30 line.

Minimum Damage: Ships must suffer some measurable damage before they must roll for critical hits. If the critical hit ratio is less than 1% of the ship's original damage points, then no criticals are inflicted. This prevents destroyers from being sunk by a submachine gun.

Roll D6 and cross-index the result with the damage ratio on the Damage Ratio Table (page 8-2). The result is the number of critical hits inflicted on the ship.

Example: After suffering damage, a *Fletcher* class destroyer has a damage ratio of .35. The attacking player rolls D6, using the .30 line (always round down). The result is a 4, and the *Fletcher* suffers two critical hits.

Once the players know how many critical hits have been inflicted, find the nature of each on the Critical Hit Table (page 8-2). Each type of ship has its own column. Roll D20 for each critical hit on that column to see what its effect on the ship is. The critical hit types with asterisks (*) are protected by the ship's armor, if it has any. If the armor was not penetrated that turn, the critical is ignored.

Some weapons will automatically inflict some types of critical hits, in addition to any generated by damage points:

• Each contact-fused torpedo that hits a ship will automatically inflict a flooding critical, in addition to any other critical hits. A ship's torpedo protection system (see section 8.1.7.2) must be penetrated before the automatic flooding critical hit occurs.

• Any ship that takes 75% or more damage from a single bomb, torpedo or mine hit must roll D10. For torpedoes or mines, on a 1 - 8, and for bombs on a 1 - 4, the keel has been broken and the ship will sink per section 8.1.8.

8.1.6 Effects of Armor. In World War II, ships larger than a destroyer carried armor covering the magazines and engineering spaces (belt), major weapons (turret top and faces), and the deck. Other critical items, such as the conning station, could also be armored. The armor belt provided protection against close-range shell fire and shallow torpedoes. The deck provided protection from bombs and plunging fire at long ranges.

Each weapon has a **penetration rating** as part of its statistics. These values are precalculated for each gun at each range bracket, and are listed in Annex C. To find a gun's penetration, measure the range and find the appropriate range band in the annex for that gun and shell type. The most common shell types are Armor-Piercing (AP), High Explosive (HE), Semi-Armor Piercing (SAP), Common (COM), and Special Common (SpCOM).

Short and Medium-range gunfire has a relatively flat trajectory, and will strike the side of a ship on its armor belt. Long and Extreme-range fire must arc much higher and is called plunging fire. At Long range, there is a 40%/60% chance the shellfire will strike the belt or deck armor, and the firing player must roll to see which armor value must be penetrated. Extreme-range shellfire has a 30%/70% chance of striking the belt or deck armor.

Deck and belt **armor ratings** are provided for each ship. For example, *Baltimore* class heavy cruisers have a rating of 13/6, meaning a belt thickness equivalent to 13 centimeters, and a deck armor equivalent to 6cm. The deck is much thinner than the belt, but shells at Long range do not penetrate as much armor and the chance of getting a hit is much less as well.

Compare the penetration ability of the weapon with the armor rating where it struck (deck or belt). If the weapon's penetration is greater than the armor rating, it inflicts full damage. If it does not penetrate, halve the number of damage points inflicted.

If the weapon does not penetrate, certain critical hits cannot happen. These are marked with an asterisk (*) on the critical hit table.

8.1.7 Armor and Torpedoes. Torpedoes can be set to run shallow or deep. Torpedoes must run shallow to hit size C-class (destroyer) and smaller ships. A shallow torpedo will strike a larger ship's belt armor, however. Deep torpedoes will run under small ships and will strike larger ships below the belt armor, on their torpedo bulges if they have any. While some large ships carried torpedo protection systems many did not.

Whatever their depth, torpedoes that strike a ship from the narrow aspect (see the diagrams on 2-6 or 6-15) strike outside the armor belt or the torpedo protection system. Divide the torpedo's damage by two. An extreme bow or stern hit wasted a lot of its energy moving water and not damaging the ship.

If the narrow aspect hit is in the stern, the first two critical hits (beside the automatic flooding, which doesn't count against the critical hit number) are automatically engineering and rudder hits. Roll the remaining critical hits as per sections 8.1.2.

8.1.7.1 Shallow-Running Torpedoes. If a shallow-running torpedo strikes the armor belt, its damage is reduced according to the following table.

Target's Belt Armor	*Damage Point Reduction*
0-5	None
5-10	10%
11-20	25%
21-30	40%
31-40	50%

8.1.8 Sinking. A ship or surfaced sub that has received damage sufficient to sink it rolls D10*10 for the number of minutes it will take to sink; the final disappearance occurring during the Movement Phase. Submerged submarines and ships that have magazine explosions sink immediately.

8.1.10 Massive Damage. Even though some of a ship's weapons may still be intact, there is a time where overall damage to a ship will prevent their operation.

When a ship has only 25% of its original damage points left, all main, secondary, and tertiary (if fitted) battery weapons are out of action. Subs must sur-

face. Aircraft carriers cannot launch or land aircraft on the flight deck.

When a ship has only 10% of its original damage points left, all of its weapons, including light AA and catapults, are out of action.

8.2 Fire & Flooding Critical Hits. Either a fire has started, or the ship's watertight integrity has been violated (that sounds better than, "there's a hole in the hull").

For each flooding or fire critical, roll to see how severe the casualty is:

Ship's in service date	*Fire & Flooding Severity*
1907 and earlier	2D6+2
1908 - 1924	D6+2
1925 and on	D6

Modifiers:

1) Halve the result if the hit is non-penetrating.

2) Halve the result if it is caused by guns of 76mm or less

The result is a percentage of the ship's original (undamaged) DP. These damage points are inflicted on the third Tactical Turn after the critical hit and on each Intermediate Turn after that, until the critical is removed (*exception:* flooding critical hit damage caused by mines or torpedoes is applied immediately).

Example: On turn 1506 of a gun battle, the heavy cruiser *Prinz Eugen* succeeds in hitting the battlecruiser *Hood* (commissioned in 1920). The British player rolls for the type of critical hits, and one of them is a fire. Using the second line of the table, the British player rolls a 5, meaning the fire inflicts 7% of *Hood's* undamaged rating each Intermediate Turn. However, because the hit didn't penetrate *Hood's* armor, the damage is reduced to 3% (3.5% rounded down). *Hood's* undamaged DP rating is 753, so she suffers 22 damage points in the Plotting Phase of turn 1515. *Hood* will have to roll in the Resolution Phase of 1515 to see if the fire damage causes any new criticals.

Record the time the critical was inflicted and its severity as a percentage.

When figuring out what line of the table to use, look at the ship's in service date in Annex A. Also check the remarks to see if the ships has been reconstructed. For instance, the Japanese battlecruiser *Kongo* entered service in 1913, but was rebuilt in 1937, improving her resistance to fire and flooding. She should use the third line, covering 1925 and on.

• *Fire & Flooding Severity Levels.* Total up the percentage of the fire and flooding critical hits from either existing or newly inflicted hits. For example, a ship with two fires at 4% and 9% and a 3% flooding critical has a total percentage of 16%. This is the severity level. It affects how well the damage control teams will be able to fight the casualties, and if it's bad enough, will affect the ship's ability to move and fight.

The ship's damage control ability is affected by its size:

	Severity Level			
Size Class	*Minor*	*Major*	*Severe*	*Overwhelmed*
A - B	1 - 10%	11 - 15%	16 - 17%	18%+
C - D	1 - 8%	9 - 12%	13 - 14%	15%+
E - G	1 - 6%	7 - 10%	11 - 12%	13%+

These levels are modified by the age of the ship. Over time, designers have made ships more resistant to damage.

Ship In Service Date	*% Reduction*
≤1907	-2%
1908 - 1924	-1%
1925 - 1941	0%
1942 - 1959	+1%
1960+	+2%

Example: HMS *Hood* was built in 1920, so her severity levels would be 9%/14%/16%/17%

• If the severity of the fire criticals adds up to:

Major or worse: Ships must cease flight operations, maneuver to put the wind 30° on either bow and slow to 15 knots or less. If they do not maneuver and reduce speed, add +2 to the die roll for reducing the fire.

When applying gunfire and visual detection modifiers at night, treat the ship as illuminated. It will also illuminate or silhouette other ships similarly to a flare or starshell.

Overwhelmed: The ship is suffering a "conflagration." There is a 25% chance, cumulative per Intermediate Turn, of the fire reaching the ship's magazines and causing an earth-shattering kaboom. A ship's player can prevent this by ordering the magazines to be flooded in the Plotting Phase. The ship loses all main battery, secondary battery, and aircraft ordnance. Only Light AA ammunition is unaffected.

• If the severity of the flooding criticals adds up to:

Major or worse: Ships must slow to 15 knots or less.

Overwhelmed: The extensive flooding may cause the ship to capsize. There is a 25% chance per Intermediate Turn of the ship capsizing. The only

way to prevent this is to reduce the level of the flooding to severe or less.

If the die roll fails, the ship will capsize.

• *Controlling Fires and Flooding:* Players can try to reduce/control fire and flooding critical hits in the Plotting Phase of the third Tactical Turn after the casualty is inflicted and the Plotting Phase of each Intermediate Turn that follows.

The ability of a ship's damage control parties to effectively fight casualties depends on how much stress they are under. On a large ship, one or two small fires are relatively easy to deal with. On the other hand, several large fires and flooding will be harder to manage. Therefore, the severity condition (the total of all fires and flooding on the ship) affects how well the damage control parties deal with the casualties.

Fire and Flooding Reduction Table

D10	*Minor*	*Major*	*Severe*	*Over-whelmed*
1	-2D6%	-2D6%	-2D6%	-D6%
2	-2D6%	-2D6%	-D6%	-D6%
3	-2D6%	-D6%	-D6%	-D6%
4	-D6%	-D6%	-D6%	NC
5	-D6%	-D6%	NC	NC
6	-D6%	NC	NC	+D6%
7	NC	NC	+D6%	+D6%
8	NC	+D6%	+D6%	+D6%
9	+D6%	+D6%	+D6%	+2D6%
10	+D6%	+D6%	+2D6%	+2D6%

"NC" means "No Change"

Players try to reduce fires and flooding by rolling a D10 once for all fires and once for all flooding (or roll red and blue D10s at the same time). This happens in the Resolution Phase of the third turn after the critical is inflicted and in each Intermediate Turn after that.

Compare the D10 rolls with the ship's severity level. This is how many dice must be added or subtracted from the fire and flooding criticals.

Example: A Royal Navy *York*-class heavy cruiser has suffered two fire critical hits (5% total) and one flooding critical hit (4% total). The cruiser has a total secondary damage of 9%, which for a 1930s-built Size Class B ship puts it in the Minor severity condition. Rolling D10 for the fire casualties results in a "4" and the two fires will be reduced by D6%. Rolling another D10 for the flooding casualties results in a disappointing "9" and the flooding will increase by D6%.

• Assigning more men to fight the casualties: A ship can increase its damage control capability by taking crew from the weapons. A player can choose to draw people from the main or secondary batteries, which prevents the ship from firing those guns, or from the Light AA crews, reducing the Light AA value to zero.

This will modify the effective total percentage of the casualties by half of the minor severity level. For example, a size class A or B ship has a minor rating of 10%. This means that he can reduce the total of the fire and flooding casualties by an additional 5%, which may be enough to reduce the severity level and improve his chances of controlling the casualties.

A ship can only do this once. There is not enough room to send more men, so the player can only increase the percentage once, by half the minor rating.

• Assistance from other ships. If another ship maneuvers within 100 yards of the damaged ship and matches its course and speed, it can assist in battling fires. Up to two ships may assist, one per side. As long as the ships' speed is below 10 knots, there is no risk of collision.

Each ship assisting in firefighting lends one-half of its minor rating to the other vessel.

Ships which themselves have any fires, including minor ones, or which have more than 50% damage, cannot assist in fighting fires on another ship.

Example: A US *Lexington*-class carrier has been hit by several bombs and has suffered a number of fire and flooding critical hits. The combined fire percentage is 16% and the flooding damage is 8%. The total of the two is 24%, which puts the carrier well over the 18+% level. The carriers damage control teams are overwhelmed.

The CO orders all flight deck crewmen (a carrier's main battery) to fight the casualties and ceases any further aviation operations - not a hard decision when your flight deck has holes in it. More air attacks are likely so he cannot abandon the secondary or light AA batteries. Two escorting DDs also approach to lend assistance.

By augmenting his damage control teams, the carrier CO reduces (for purposes of the damage control rolls) his combined fire and flooding total to 19% (24% - 5%: half of the carrier's Minor capacity). Unfortunately, this is not enough, and the teams are still overwhelmed.

The two DDs assist the carrier. Each DD lends 4% (half of the DD's Minor capacity value) to her and this drops the carrier's percentage (19% - 8%) to Major with an effective percentage of 11%. The carrier's crew now has a good chance to reduce both the fire and flooding critical hits and save the ship.

Note: Fleet tugs and similar vessels can lend their entire minor capacity to another vessel.

8.3 Effects of Other Critical Hits. Critical Hits result in systems going out of action, affecting the fighting capability of the ship.

• *Aircraft.* An aircraft aboard the ship has been destroyed. There is also a chance that a fire has stared. Roll D6-2% for the severity of the fire. A result of less than one means there is no fire.

• *Bridge.* The main conning station has suffered a catastrophic hit. It takes D6/2 Tactical Turns to correct casualties and re-man the bridge. After the casualty has been corrected, all changes to course and speed take Two Tactical Turns to execute. There is a fire critical hit, subtracting two from the severity roll, in the bridge/control room.

• *Cargo.* Some of the ship's cargo has been destroyed. If possible, allocate cargo to a hold/tank, then determine which hold or tank was hit. Refer to the Cargo Damage Table (page 8-8) to see what the results are.

• *Communications*. One of the ship's communications spaces has been hit. Roll D6 on the following table:

1 - 2: Long-range radio communications
3 - 4: Short-range radio communications
5 - 6: Aircraft radio communications

Loss of long-range comms prevents the ship from communicating with units beyond the horizon. Losing short-range communications prevents ships from using radio with other ships in the same formation. Aircraft radio is necessary to communicate with any planes, whether it is a destroyer controlling interceptors or a cruiser talking to its floatplanes or a carrier marshalling aircraft for landing.

• *Engineering.* The ship's engineering plant has been damaged. Reduce speed to the next lower level on the Damage and Speed Breakdown chart. A fire critical hit, subtracting two from the severity roll, has started in the engineering spaces.

• *Light AA Battery.* The ship's Light AA strength is reduced by 0.5.

• *Main Battery.* Roll D10. On a 1-2, the fire control for the main battery has been knocked out (armor penetration not required). On a 3-0, one of the gun mounts/turrets in the main battery is out of action. Roll D10 again. On a roll of 10 the magazine detonates, destroying the ship. Ships within 500 yards of the exploding ship suffer damage equal to the battery's HE damage at Short range.

If a main battery mount/turret is hit, roll randomly to see which one is destroyed. All mounts/turrets are counted, even if they are already out of action. If the mount has already been destroyed, there is still a chance of the magazine detonating, but no further damage is inflicted.

• *Other Weapon.* One of the weapons listed for the ship in Annex A, except main or secondary battery guns, has been knocked out. Roll randomly to find out which mounts have been hit. Previously hit mounts can be hit again. If the mount has already been destroyed, there is still a chance of the magazine detonating, but no further damage is inflicted. If there are no applicable weapons, ignore the critical.

If it is a torpedo tube or an ASW weapon, refer to that critical hit. If it is an aircraft, refer to that critical hit.

• *Rudder.* The ship's steering or control surfaces have been damaged. Surface ships roll D6:

1 - 3: *Jammed:* The rudder is jammed in whatever direction the ship is currently moving. If the ship is steering evasively or otherwise maneuvering with both left and right rudder, roll randomly for the direction of the jam: 1-2 port, 3-4 straight, 5-6 starboard.

4 - 6: *Disabled:* The ship's steering engine has been hit. Maximum speed is reduced to 1/3 of the ship's undamaged speed. Maximum course changes after moving the required advance are reduced from 45° to 15°.

• *Secondary Battery.* Roll D10. On a 1-2, the fire control for the secondary battery has been knocked out (armor penetration not required). On a 3-0, one of the gun mounts/turrets in the main battery is out of action. Roll D10 again. On a roll of 10 the magazine detonates, inflicting four times the mount's Short Range damage points (HE shell) on the ship.

If a secondary battery mount/turret is hit, roll randomly to see which one is destroyed. All mounts/turrets are counted, even if they are already out of action. If the mount has already been destroyed, there is still a chance of the magazine detonating, but no further damage is inflicted.

• *Sensor/Communications.* Roll D6: 1 - 3 Sensor critical hit, 4 - 6: Communications critical hit.

• *Sensor.* One of the radars, sonars, ES, HF/DF, or searchlights is destroyed.

• *Torpedo or ASW Weapon.* A torpedo mount, depth charge rail or thrower, or ahead-thrown ASW weapon has been hit. Roll D10. On a 10, the mount's ammunition explodes. Multiply the damage points for one weapon times half number of weapons loaded in the mount. If the mount has fired all of its weapons, there is no danger of explosion.

If a torpedo or ASW weapon does detonate, and the mount is above the waterline, resolve critical hits from the warhead damage as a bomb or gunnery attack. In other words, do not roll on the DC or torpedo attack table, since these columns assume underwater impacts. Use the critical hit column that best matches that ship's type.

If a torpedo in the tube detonates, and is below the waterline (either on a sub or a surface ship) it inflicts an automatic flooding critical, and the damage points should be applied as underwater damage. Battleships with submerged torpedo tubes should ignore any torpedo protection system they are fitted with.

Startup Battle

Location: Iron Bottom Sound, Solomons Islands, 0000, Late 1942.

Operational Situation: American forces on Guadalcanal are struggling to defend their position around the island. Japanese naval forces attempt to resupply their garrison during the night, while US forces do the same in the daytime.

Tactical Situation: The Japanese Bombardment Group is screening a run of the "Tokyo Express," carrying reinforcements and supplies. The US force is screening the Marine positions from bombardment and also interdicting Japan-ese resupply efforts.

Environment: Night, visibility 40%, sea state 3. Dawn is 0430. There is a low overcast precluding the use of scout planes. The islands are largely flat and lightly wooded.

Japanese Forces:

Bombardment Group,
Aoba, *Kinugasa* (both *Aoba* class CAs)
Reinforcement Group
Kinryu Maru, *Kinka Maru* (both *Kinryu Maru* class transports), each carrying 4 companies of infantry and supplies.
Screen
Asashio, *Oshio*, *Michishio*
(all *Asashio* class DDs)

Japanese Orders: The Bombardment Group is to shell Henderson Field. The Reinforcement Unit is carrying troops for the offensive to retake the airfield. The reinforcements can be landed at Tassafaronga during the bombardment.

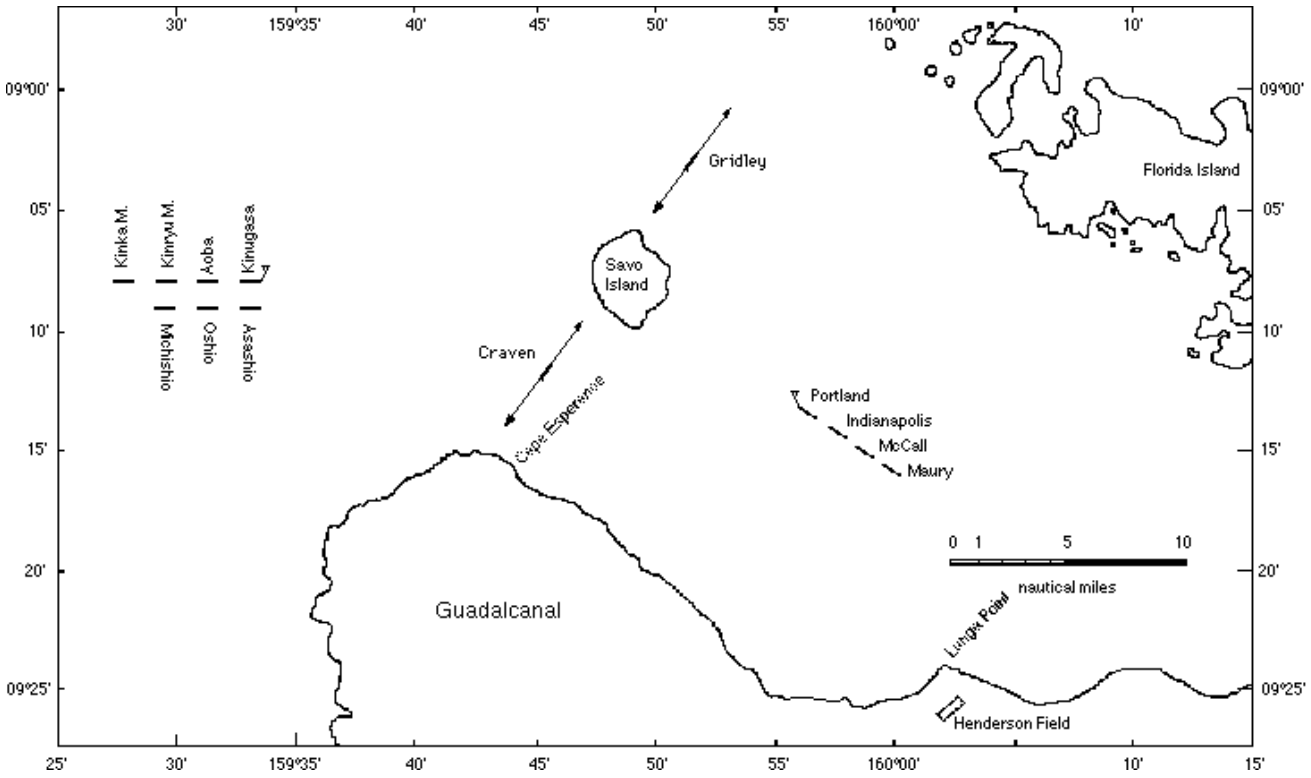
Japanese Victory Conditions: *Decisive:* Both transports reach Tassafaronga by 0300 hours and Henderson Field receives 500 points of damage. *Tactical:* At least one transport reaches Tassafaronga by 0300 hours and American damage points are double those sustained by the Japan-ese (counting Henderson Field).

Allied Forces:

Screening Force
Portland, *Indianapolis* (both *Portland* class CA)
Gridley, *Craven*, *McCall*, *Maury*
(all *Gridley* class DDs)

Allied Orders: Intercept and prevent the Japanese from bombarding Henderson Field, and also prevent enemy resupply efforts in the vicinity of Tassafaronga Point.

Allied Victory Conditions: *Decisive:* Allies damage both transports over 50%, and Henderson receives zero damage. *Tactical:* The Allies prevent Japanese from shelling Henderson field.



Setup: Place two of the American destroyers on picket duty, one between Savo Island and Cape Esperance, the other to the northeast of Savo Island. They are patrolling a 5-nm long track at 10 knots, and start at the southern end. The two American heavy cruisers and the other two destroyers should be placed in column 5-10 nm southeast of Savo Island. The Japanese are placed 10-15 nm west of Savo Island. Courses are shown on the scenario map. Both formations are steaming at 15 knots.

The Japanese player places his ships 14 nm from Savo, while the US player is 7 nm SE of the island.

Annex A- Ships

Aoba (1940) — CA

Displacement: 9000 std
Size Class: B/Medium
Propulsion: Steam Turbine
Signature: Medium/Loud
In Class: 2
In Service: 1940
Crew: 657 - 680
Armor Rtng: 6/4

Weapons:

2F/A(2)3 3rd Year Type No. 2 20cm/50	**C**
P/S(1)4 10th Year Type 120mm/45	**C**
P/S(4)2 610mm TT w/8 Type 93 torp	
[4 reserve torp/mount available for quick reload]	**F**
1 Midships catapult	**--**
E13A1 [Jake]	**B**
Area AA: (1)4 10th Year 4.7 in/45	**(0.6)**
Light AA: (2)4 Type 96 25mm, (2)2 Type 93 13mm	**(1.2)**

Sensors: F/A 2 Type 94 LA fire control directors

Remarks: Aoba, Kinugasa. Originally commissioned 1927; rebuilt 1937 - 40. laid down before 1925, special damage modifier of -15%. Configuration listed above is after 1940 refit.

Damage & Speed Breakdown:

Dam Pts:	0	55	110	164	197	219
Surf Speed:	33	25	16	8	0	Sinks

Asashio — DD

Displacement: 1992 std
Size Class: C/Small
Propulsion: Steam Turbine
Signature: Small/Noisy
In Class: 10
In Service: 1937
Crew: 200
Armor Rtng: 0

Weapons:

F/2A(2)3 3rd Yr 5 in/50	**C**
2 DC rail w/8 DC	**E**
(2)2 Model 94 Y-gun w/8 DC	**E**
P&S(4)2 610mm TT w/ Type 93 torp	**F**
Area AA: (2)3 3rd Yr 5 in/50	**(0.7)**
Light AA: 4 Type 96 25mm/60	**(0.5)**

Sensors:

Type 93 (passive), Type 93 Model 1 (active) sonar	**K**

Remarks:
Four Type 93 torp reloads carried for each mount. Carried special reloading gear for TT, reload time 6 min. Total of 36 DC carried.

Damage & Speed Breakdown:

Dam Pts:	0	19	39	58	69	77
Surf Speed:	35	26	18	9	0	Sinks

Kinryu Maru — AP

Displacement: 9310 grt
Size Class: B/Medium
Propulsion: Diesel
Signature: Medium/Loud
In Class: 2
In Service: 1937
Crew: 47+12
Armor Rtng: 0

Remarks:
Ex-civilian merchant ships. Merchant construction, special damage modifier of -50%.

Damage & Speed Breakdown:

Dam Pts:	0	26	53	79	95	105
Surf Speed:	21	16	11	5	0	Sinks

Portland — CA

Displacement: 9800 std
Size Class: B/Medium
Propulsion: Steam
Signature: Medium/Noisy
In Class: 2
In Service: 1932
Crew: 1382
Armor Rtng: 7/5

Weapons:

2F/A(3)3 Mk14 8 in/55	**C**
P/S(1)8 Mk23 5 in/25	**C**
2 Midships catapult	**--**
4 SOC Seagull	**B**
Area AA: (1)8 Mk23 5 in/25	**(1.7)**
Light AA: 8 .50 cal	**(0.6)**

Remarks:
Portland, Indianapolis. Also *Indianapolis* class. 8 inch gunhouses lightly armored, treat as deck armor at all ranges.
• 1941: *Portland* fitted with (4)1 1.1 in, Lt AA 0.9.
• Apr-May '42: *Indianapolis* refitted, .50 cal removed, (1)8 20mm and (4)4 1.1 in added, Lt AA 3.3.

Damage & Speed Breakdown:

Dam Pts:	0	69	138	207	248	276
Surf Speed:	32	24	16	8	0	Sinks

Gridley — DD

Displacement: 1590 std
Size Class: C/Small
Propulsion: Steam
Signature: Small/Noisy
In Class: 4
In Service: 1937
Crew: 158
Armor Rtng: 0

Weapons:

F/A(1)4 Mk24 5 in/38	**C**
P/S(4)4 Mk12 533mm TT w/4 Mk15 torp	**F**
2 Mk3 DC rail w/6 Mk7 or 8 Mk6/9 DC	**E**
6 Mk6 K-guns w/6 Mk6/9 DC	**E**
Area AA: (1)4 Mk24 5 in/38	**(1.1)**
Light AA: (1)6 20mm	**(1.5)**

Sensors:

SC radar	**J**
QC series sonar	**K**

Remarks:
Also known as *Craven* class. Built by Bethlehem yards, were originally to be identical to *Dunlap* and *Fanning*. Defective stability plagued all units of class throughout most of their careers. It also prevented class from being fitted with 40mm. Total of 23 Mk7 and 16 Mk6 or 41 Mk6/9 DC carried.

Damage & Speed Breakdown:

Dam Pts:	0	16	32	48	58	64
Surf Speed:	38	28	19	10	0	Sinks

Annex C1 - Surface Naval Guns

Country	Mount Name Bore/Calibre	Shell Type	Short Range kyds	Belt Pen	Shell Dam	Medium Range kyds	Belt Pen	Shell Dam	Long Range kyds	Belt Pen	Deck Pen	Shell Dam	Extreme Range kyds	Belt Pen	Deck Pen	Shell Dam
Japan	10th Yr Type 4.7 in/45	COM	0 - 5.3	4	15	5.4 - 10.6	3	12	10.7 - 14.1	2	1	11	.14.2 - 17.6	1	2	10
		HE	0 - 5.3	1	17	5.4 - 10.6	1	14	10.7 - 14.1	1	0	13	14.2 - 17.6	0	1	11
Japan	3rd Yr 5 in/50	COM	0 - 6.0	5	16	6.1 - 12.0	3	13	12.1 - 16.0	2	1	11	16.1 - 20.0	2	2	10
		HE	0 - 6.0	2	18	6.1 - 12.0	1	14	12.1 - 16.0	1	1	13	16.1 - 20.0	1	1	11
Japan	3rd Yr Type No. 2 20cm/50	APC	0 - 7.0	34	26	7.1 - 16.0	23	20	16.1 - 25.6	16	5	17	25.7 - 32.0	12	10	15
		HE	0 - 7.0	3	28	7.1 - 16.0	2	23	16.1 - 25.6	2	1	21	25.7 - 32.0	1	2	18
USA	Mk23 5 in/25	COM	0 - 4.4	3	16	4.5 - 8.7	2	13	8.8 - 11.6	2	1	12	11.7 - 14.5	1	1	10
		HC	0 - 4.4	1	19	4.5 - 8.7	1	15	8.8 - 11.6	1	0	14	11.7 - 14.5	0	1	12
USA	Mk24 5 in/38	SpCOM	0 - 5.5	7	18	5.6 - 10.9	4	13	11.0 - 14.6	3	1	12	14.7 - 18.2	2	2	10
		COM	0 - 5.5	5	18	5.6 - 10.9	3	14	11.0 - 14.6	2	1	13	14.7 - 18.2	2	2	11
USA	Mk14 8 in/55	APC	0 - 7.0	33	25	7.1 - 16.0	22	19	16.1 - 25.5	15	5	16	25.6 - 31.9	12	10	14
		SpCOM	0 - 7.0	15	23	7.1 - 16.0	10	18	16.1 - 25.5	7	2	16	25.6 - 31.9	5	4	14
		HC	0 - 7.0	3	26	7.1 - 16.0	2	22	16.1 - 25.5	2	1	19	25.6 - 31.9	1	2	17

Annex F - Torpedoes

Country	Name	Guidance/ Generation	Range (kyds)	Speed (kts)	Diam (mm)	Warhd Wt (kg)	Warhd Fuzing	Dam vs. ship	Launch Platforms	IOC	Remarks
Japan	Type 93 Model 1 Mod 1/2	None	22	49	610	490	C	95	Surf	1933/36	
			35	41							
			43.8	37							
USA	Mk15	None	6	45	533	374	C	87	Surf	1935	TNT Warhead
			10	34							
			15	27							

Annex J1 - Naval Radars

(Ranges in nautical miles)

Country	System	Function	A Large	B Medium	C, D Small	E, F VSmall	G Stealthy	Gen/ FC Mod	IOC	Remarks
USA	SC (CXBD)	AS	30	25	18	7	2.1	1	1942	
		SS	10	7	4	2.3	1.3			