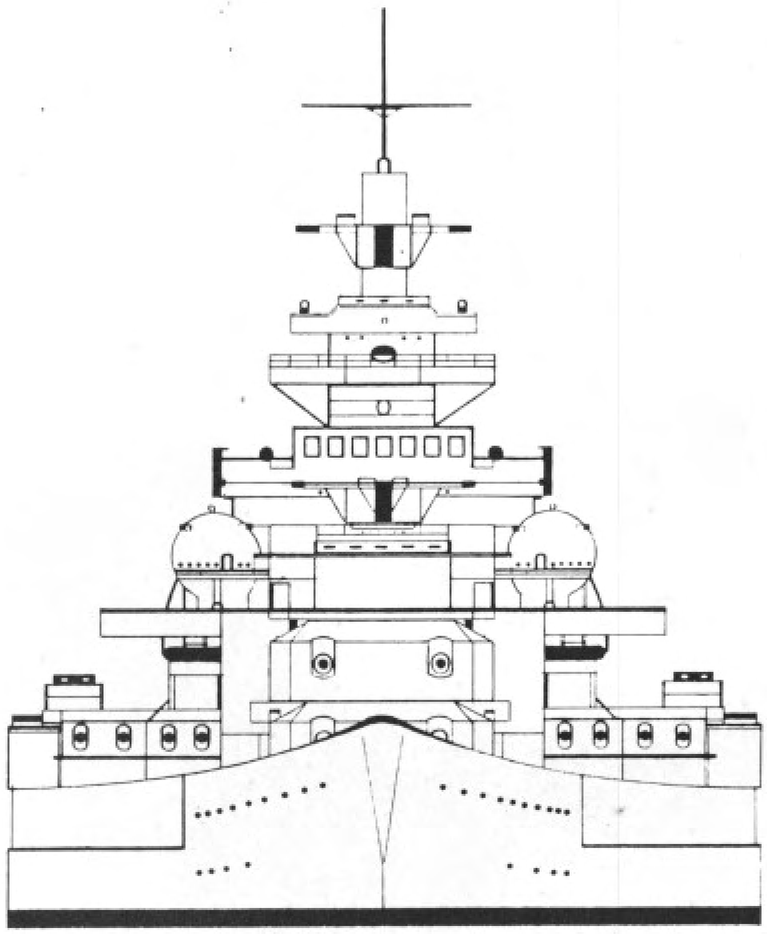
SEEKRIEG

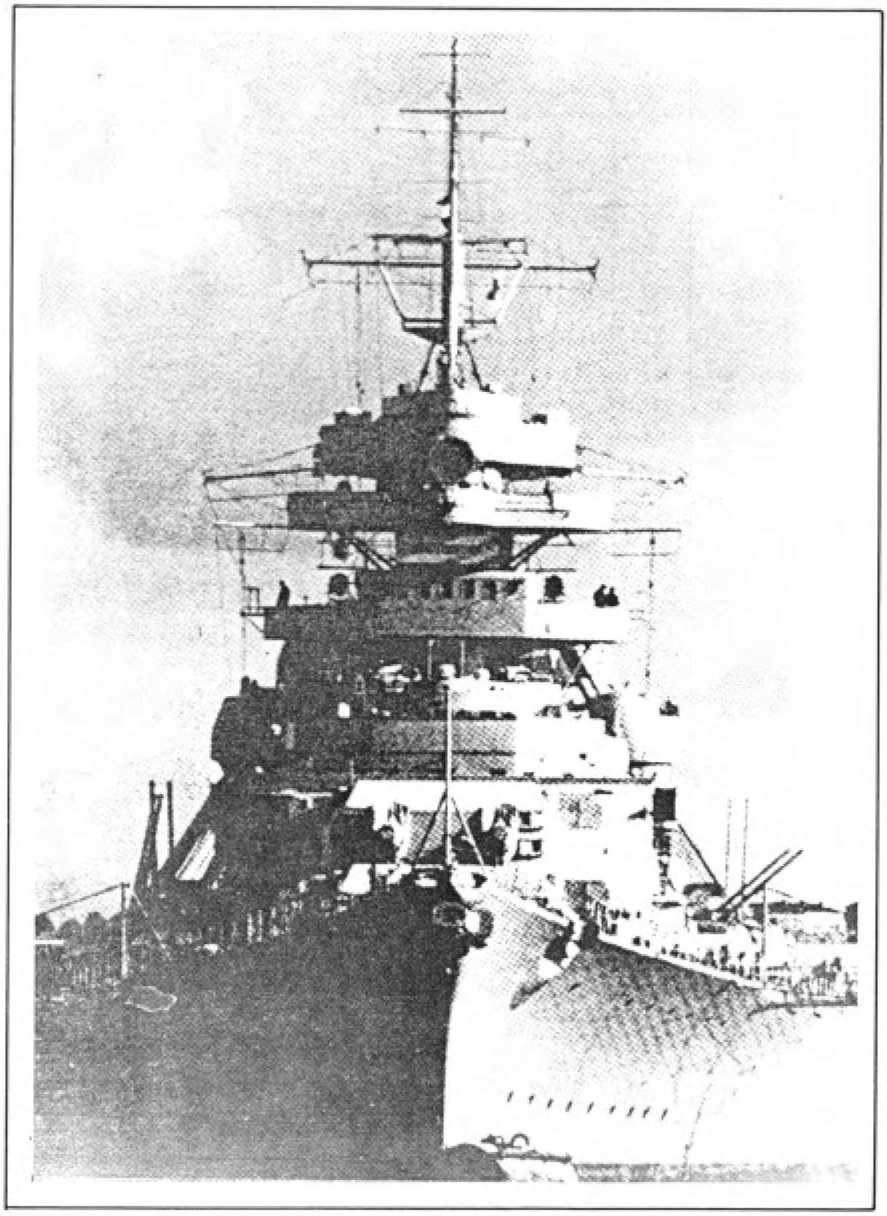
FOURTH EDITION



RULEBOOK

Richard R. Sartore & Jack L. Joyner

SEEKRIEG



BY

R. SARTORE **J. JOYNER**

SEEKRIEG

FOURTH EDITION

CONCEPT AND DESIGN

RICHARD R. SARTORE & JACK L. JOYNER

TEXT AND GRAPHICS

RICHARD R. SARTORE

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SEEKRIEG 4

PREFACE TO THE ELECTRONIC VERSION

The fourth edition has been out of print for a number of years, making it difficult for anyone interested in trying SEEKRIEG to locate and purchase a copy. However, in light of the fact that we had already begun development of SEEKRIEG 5, it did not make sense to go ahead with another printing of SEEKRIEG 4, especially since there are still many similarities between the structure and play of the two editions. In addition, during the development of SEEKRIEG 5, it became apparent that the new system, while still retaining much of the flavor of the earlier editions, would require that the charts and ship data be completely revised. This has been a massive undertaking, especially in light of the expanded and more detailed ship data. Consequently, we decided to make the components of SEEKRIEG 4 (Rulebook, Charts and Ship Data Volume 1) available via the internet as a free download from our web site so that those individuals that were unable to locate a copy would still have the opportunity to try the rules.

The online version of SEEKRIEG 4 was created from a copy of the second printing (1984). All the files were scanned and converted to Adobe Acrobat PDF format. We apologize for the quality of these files but in order to keep the file sizes small enough, we were forced to reduce the resolution. However, all the information should be legible when printed at 600 dpi. The following files comprise a complete set of the rules:

SK4Rules-Part1.pdf
SK4Rules-Part2.pdf
SK4Charts-Part1.pdf (Charts A through H)
SK4Charts-Part2.pdf (Charts H through N)
SK4Charts-Part3.pdf (Charts P through Y)
SK4ShipData1-Part1.pdf
SK4ShipData1-Part2.pdf
SK4ShipData1-Part3.pdf
SK4ShipLog1.pdf
SK4ShipLog2.pdf
SK4ShipLog3.pdf

In order to view and print these files after downloading, you must have Adobe Acrobat Reader installed on your computer. Acrobat Reader is free and available for download from the Adobe web site. We strongly recommend using a printer capable of at least 600dpi print quality to print the documents.

Richard R. Sartore
April 22, 2001

LIST OF GAME CHARTS

INTRODUCTION

Six years ago this month the first edition of SEEKRIEG was published. In that time, I have gamed or observed several hundred SEEKRIEG battles and judged at least that number. An equal amount of time has been spent in research and testing so that SEEKRIEG 4 will be the most comprehensive and realistic set of rules for naval wargaming ever produced.

However, such an effort cannot be the result of a single person's labors. This edition would not have been possible without the assistance of my co-author, Jack Joyner. In addition to his talents as a game designer, Jack posesses a thorough knowledge of mathematics and related fields (the result of a Masters Degree in Mathematics), all of which, as you will see, is an integral part in the design of SEEKRIEG 4. His interpretations of the more complicated equations which we encountered made possible their use in a much simpler form, thus allowing the use of these equations in the game system.

The efforts of John Shue and Jon Webb and other members of the Leviathan Wargaming Federation cannot be left unnoticed. Their assistance in the design and play-testing sessions was invaluable and allowed almost immediate testing of the new game systems.

SEEKRIEG (or "sea war") has been structured to enable gamers to refight past naval actions or to develop ficticious battles of their own. The new format allows the gamer to make his scenario as simple or as comprehensive and realistic as is desired. Rules and information for a complete campaign have been included so that, when used with our CNO SERIES scenario sets, a truly complete naval game can be fought. Although the system may seem a bit complicated at first, once SEEKRIEG 4 has been played several times, the mechanics of the game will come easier and the game will flow much faster. Take time to read the rules thoroughly and become familiar with the various CHARTS before attempting a battle. Every effort has been made to present the rules in a concise and logical manner and allow the player to find the information that is needed with a minimum of page-shuffling. However, there is no substitute for the knowledge gained by a complete reading of the Rulebook.

MR. SARTORE

SEEKRIEG 4 takes into account the total offensive and defensive capabilities of the ships as well as the tactical and strategic skills of the players. Luck is also an important factor in the game (although to a somewhat lesser extent than the other factors) since any recreation or simulation that includes variables must be expressed in terms of probability. SEEKRIEG 4 can be played solitaire or with any number of players that can be handled by the judge, the available space, the number of ships, or the amount of time! Any scale ship model may be used but SEEKRIEG 4 is best played using 1:1200 to 1:4800 scale ship models.

Few materials are needed aside from the ship models and among them are a tape measure (about 10 feet in length) and an inexpensive pocket calculator capable of the four basic functions (a calculator with a square-root and exponent function will be needed to calculate desired factors for guns and aircraft not included in the game).

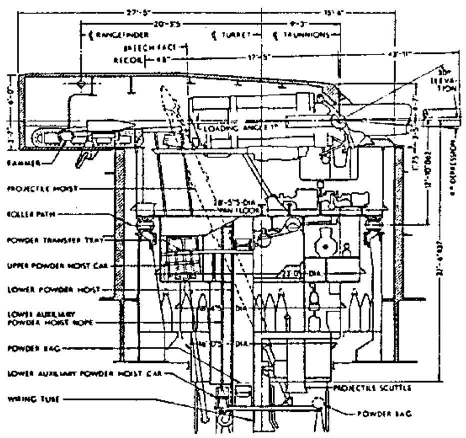
We sincerely hope you enjoy this edition of SEEKRIEG 4 as much as we enjoyed designing it. The best of luck and a fair wind to you always...

RICHARD R. SARTORE
November 9, 1981

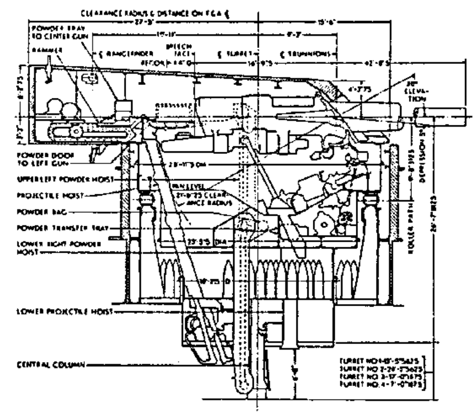
GENERAL NOTES

The large time frame covered by SEEKRIEG 4 (1890 to 1945) and the technical aspects of naval warfare do not allow more than a general interpretation of certain functions in order for the game system to remain playable. As a result, we urge the players to follow the spirit of naval warfare rather than the letter of rules if an odd situation should arise during play. Although regular supplements to SEEKRIEG 4 are being planned to cover these "minor" situations, a little common sense and knowledge of the particular aspect in question will be all you need to resolve the problem to everyone's satisfaction.

The research for SEEKRIEG 4 included hundreds of sources, including books, periodicals, official documents, and first-hand accounts. However, if you have some additional information, SEEKRIEG 4 may be easily modified to accept this data. All factors and formulas for computing the values used in the game have been included so that you understand why as well as how some of the systems were designed.



16"/45 DOUBLE TURRET



14"/50 TRIPLE TURRET

UNDERSTANDING THE PROBABILITY SYSTEM

An explanation of the system used in CHARTS I and Y is provided here because your understanding of the game depends upon your ability to understand and use these charts.

Those of you with a background in Mathematics will recognize CHARTS Y1 and Y2 as a modified version of the Cumulative Terms, Binomial Distribution Tables. Their primary function in the game is to save time by allowing the player to make one or two rolls of the percentile dice in a situation where he would normally be required to make up to nine or eighteen rolls. The top row of the chart lists percentages (in decimal form) and each column beneath it pertains to that percentage. Along the far left side of the chart is a number (from 2 to 9), to the immediate right of which are sets of numbers (ranging from 1 to 2 on up through 1 to 8). The number at the far left represents your total number of chances for a particular event and the numbers to the immediate right represent your chance of that many successes. The columns are composed of sets of numbers that can be rolled on percentile dice(01 to 00). Thus, if you have a probability of 35% (.35) for a particular event, and you have 9 chances to try, the event would occur once if you rolled from 89 to 98 on the dice. Likewise, it would occur twice if you rolled 67 to 88, three times if you rolled 40 to 66, four times if you rolled 18 to 39, and so on. Note that there no chance for a particular event to occur 8 times out of 9 or even 9 times out of 9 at 35% probability [Actually, there is a chance, but it is less than ½% and therefore not possible to simulate on percentile dice]. Also note that a roll of 99 or 00 at 35% probability means that the event did not occur at all.

If you should have more than 9 chances for a particular event, then you will have to roll the percentile dice more than once. If you should have 16 chances, then roll twice using the 8-chances. If you have 17 chances, then roll twice using the 7-chances and once using the 3-chances, and so on.

Although CHARTS Y1 and Y2 are designed primarily for Air to Air and Surface to Air Combat Resolution, they are used in several other cases during the game. CHART I1 is really the same as Y1 and Y2 except that the top row percentages are smaller and expressed in different terms.

THE SCENARIO

The scenario is nothing more than a game plan which sets up the tactical or strategic situation before the game begins. How detailed the scenario is will be determined by the type of game that is to be played and whether or not there will be a referee or judge.

Since the scenario set up will most likely be used for a campaign game, it is this type of scenario that will be discussed. A well-written campaign scenario should contain the following:

1. A list of ships that comprise each commander's fleet, separated into their command elements (such as Task Groups, Battle Divisions, Destroyer Squadrons, etc.). Each commander should have a list of his own ships which should not be seen by the other commander.
2. A list of available ports or starting positions for each group of ships.
3. A list of restrictions (if any) that are to be placed on a commander's ships (such as delayed start time, low fuel, prior damage, reduced speed, etc.).
4. A list of available carrier and land-based aircraft (if used).
5. An explanation of the situation which includes date and time.
6. An intelligence report on the enemy fleet which can be as accurate (or inaccurate) as the referee thinks appropriate based on the situation.
7. General operational orders from the High Command (these should not be so detailed that the High Command won't be able to court martial the commander in case he fails--in other words, keep the orders loose enough so that the High Command has an out).
8. The referee should provide himself with a list of objectives for each side and assign each objective a point score based on the orders given. This will make choosing the winner a bit easier at the end of the game.

Historical operations can be recreated if the proper amount of research is done by the referee. However, research can be too time consuming so we suggest the use of our CNO SERIES for historical naval operations. Each set of the CNO SERIES contains 15 different historical scenarios set up and ready to play. There are five sets for World War 2 operations and two sets for World War I operations as well as a set that includes 16 different charts for conducting search map operations.

LIMITED INTELLIGENCE

Perhaps one of the most effective tools available to the game referee is limited intelligence. One of the problems in designing a scenario is keeping the sides "even" to allow each commander a fair chance. A good referee with the use of limited intelligence can make even the most unbalanced set up a fair fight.

Basically, limited intelligence means not telling either commander exactly what forces the other commander has under his command. Intelligence reports may be either underestimated or overestimated at the discretion of the referee and any or all of several factors in the report may be varied or even completely left out. Location of the enemy force, its speed and direction of travel, and its composition in number and types of ships are some of the factors that can be altered by the referee and result in a much more interesting game.

THE SEARCH MAPS

The general area of operations for the scenario should be drawn on a sheet of paper and copied so that both commanders as well as the referee have a copy. Included with the set of CHARTS is a circle-based graph sheet that may be copied and used as a master on which search maps may be drawn. There are twelve circles per inch and the recommended scale is 1" equals 120 nautical miles. Thus, the distance from one circle to any of the surrounding six circles is 10 nautical miles. We recommend the use of our CNO SERIES #8 which contains 16 different charts in various scales using the circle system. If, however, you wish to produce your own charts, then a wide variety of scale maps may be obtained from the U.S. Defense Mapping Agency by writing to: Defense Mapping Agency Depot, 5801 Tabor Avenue, Philadelphia, PA 19120. Request catalogs 1-N-A and 1-N-L when writing. There is no charge for these catalogs

SEARCH PHASE TURN LENGTH

During the BATTLE PHASE, one turn is equal to 2 minutes of real time. However, during search map operations with a much larger scale, the length of the turn must be increased in order to show actual progress on the search map. CHART U1 lists eight different SEARCH PHASE turn lengths (in hours) along the top row and the various ship speeds (in knots) along the far left column. The CHART columns show the number of circles of movement on the map for a ship of a particular speed during a given SEARCH PHASE turn length. Thus, during a five-hour SEARCH PHASE turn, a 22 knot ship would move 11 circles on the map.

The length of the SEARCH PHASE turn can be decided before the game begins depending upon the map scale and the situation. Of course, it is possible to alternate turn lengths during the game in any manner that fits the situation.

SEARCH PHASE ENVIRONMENTAL FACTORS

Before any search map operations can take place, weather and visibility conditions must first be determined. When conducting operations with maps that cover a large area, it is best to split up the map area into weather 'zones' of 200 miles by 200 miles so that there will be some difference in weather conditions over a large area.

To determine weather conditions, choose the general weather area from CHART B1 (note that although the North Sea and Mediterranean Sea have not been assigned numbers on CHART B1, they have been included on CHART B2). If your search area should include an area that has not been assigned a number on CHART B1, then use the number of the area closest to yours in the same hemisphere. CHART B2 lists the weather probability for each of the 20 different areas by calendar quarters. The top row of the CHART lists the prevailing weather conditions in terms of the Beaufort Sea State Table (Force 2 through Force 12) and the far left column lists the four calendar quarters (January to March, April to June, etc.). Two percentile dice are rolled and the result is compared with the table for the proper area on CHART B2. Thus, if a 46 is rolled for Area 1 during the month of November, then the prevailing weather conditions will be Force 2,3, or 4 (the referee can decide which of the three is actually in effect). For a description of the actual conditions and their effects, see CHART B3. This same proceedure may be followed for each of the weather zones on the search map until it is complete.

It is probable that the weather conditions in a zone will change over a period of 6 to 24 hours, but rather than re-rolling each zone, roll again only for the zone (or zones) at the far left of the map and move the weather conditions from one zone to the zone to the immediate right. For game purposes, weather conditions move from West to East in the Northern Hemisphere and from East to West in the Southern Hemisphere. Movement of weather conditions may take place at evenly spaced intervals (every 6 to 24 hours) or may be staggered by the referee.

CHART B3 also lists reductions for visibility and shipboard operations (such as speed and rate of fire for guns). Thus, a 100 DP ship in Force 8 weather would have to reduce its maximum speed by 15% (i.e from 30 knots to 26 knots) and the rate of fire of its guns by 15% (i.e. from 20 rounds per 2 minutes to 17 rounds per 2 minutes). Its maximum visibility would be reduced by 10%.

CHART C2 shows the maximum visibility (in yards) as a function of the DP of the target and the DP of the searching ship. Thus, a 100 DP ship would sight (and identify) a 400 DP ship at a distance of up to 40,000 yards in perfect visibility. However, this distance must be reduced by the percentages listed on CHART C1 and on B3. Thus, the 100 DP ship would sight and identify a 400 DP ship at only 14,800 yards during Visibility Code 7 (at 37%). During Force 8 weather, this would be further reduced to 13,320 yards (10%). It must be remembered that the ranges provided on CHART C2 are the ranges at which a target can be seen well enough to identify and observe fall of shot. Masts and upper works will be sighted at greater ranges (about 15% to 25%)and funnel smoke at even greater ranges (25% to 40%). To convert the yard ranges to nautical miles for use on the search map, simply multiply by .0005 (1 nautical mile = 2,000 yards). This visibility range need not be calculated for each ship in a particular group during the SEARCH PHASE but only for the largest ship in the force.

CHART C2 is to be used only for ships without Surface Search Radar. For ships with this type of radar, use CHART C3. Since radar is largely unaffected by weather conditions, no reductions to the distances on CHART C3 need be made.

As important as weather and affecting visibility a great deal is whether or not the sun is up. Due to the fact that the sun rises and sets at different times at different latitudes on the same day of the year, CHARTS K1, K2, K3, and K4 have been included. CHART K1 lists the time of sunrise and CHART K2 lists the time of sunset. Thus, on April 1 at 50° North Latitude the sun rises at 0540 and sets at 1813. There is, however, some light before actual sunrise and after actual sunset and this is termed twilight. Using CHART K3, on April 1 at the same latitude, there would be about 2 hours and 7 minutes (0207) of twilight before sunrise and after sunset. The hours listed on CHART K3 are subtracted from the time of sunrise and added to the time of sunset to get the actual times of complete darkness.

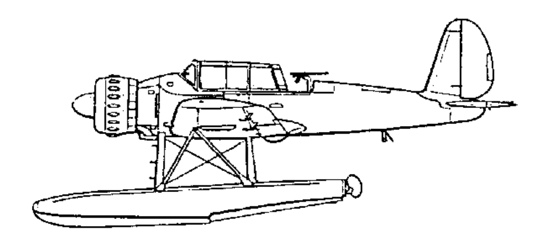
There is a slight difference between the Northern and Southern Hemispheres so the times listed on CHARTS K1 and K2 must be adjusted by the times listed on CHART K4.

The times listed are Local Civil Time which means that the times are correct to within a given Time Zone.

SEARCH PHASE SHIP MOVEMENT

Ship movement on the search map can best be accomplished by the use of an overlay (either acetate or tracing paper). The number of circles a ship can move is based on its maximum speed and the length of the SEARCH PHASE turn (see CHART U1). Players record their movement on their own copy of the overlay once each SEARCH PHASE turn and hand these to the referee who in turn checks them for any sightings according to the prevailing visibility (or, if using radar, checks for a radar contact). This procedure continues until a sighting or radar contact has been made.

Each player should have a cruising formation set up for each force under his command so that when a sighting has been made the referee can check the positions and determine which ship (or ships) has been sighted first and place the ships that are within the range of visibility on the playing area. If radar contact has been made, and visibility conditions do not permit the actual sighting of the contact, then a marker such as a domino should be placed on the playing area to represent the ship until it is within the limits of visibility.



ARADO 196

A player may decide not to engage an enemy force after sighting or contact but may elect to shadow instead. In order to shadow a force, the visibility range of the shadowing ship must be superior to that of the ship he wishes to shadow or, if using radar, the maximum range of his main battery must be greater than that of the ship he wishes to shadow. In either case, the speed of the shadowing ship must be equal to or greater than that of the ship he wishes to shadow.

SEARCH PHASE AIR RECON

When available, aircraft (either shipboard, carrier, or shore based) may be used to search for enemy ships. CHART D2 shows the various standard game search patterns (correct to scale of 1" = 120 nautical miles) and these can be drawn on the search map by the commander of the aircraft to represent the search pattern of one aircraft. CHART D1 shows the probability of detecting a naval force as a function of the total search area and the prevailing visibility. The percentage probability listed on the chart is per hour so that an aircraft searching an area of 20,000 square miles during visibility of 30 miles has a 26%

chance of detecting any ships cruising through that particular area in one hour. Aircraft equipped with Radar I or Radar II are not affected by current visibility but will give only general reports of ship types unless the ships are actually visible.

Of course, recon aircraft cannot remain in the air forever and for this reason the flight time of the particular type of aircraft must be determined. This is done by dividing the maximum range of the aircraft by 100. The result is the flight time in hours for search purposes. Thus, an American PBY-5a has a total SEARCH PHASE flight time of 20 hours and 48 minutes. Time to and from the search pattern boundary must be deducted from the total flight time, so that the PBY-5a would have a total search time of 18 hours if his base was 124 miles from the search pattern boundary.

More than one aircraft can be used in a single search area to increase the probability of a sighting and CHARTS Y may be used if it is desired to reduce the number of rolls. Remember that the probability on CHART D1 is <u>per hour</u> of search. Also, the visibilities listed on CHART D1 are air to surface and may be different than the prevailing surface to surface visibility (in all cases, except fog, the air to surface visibility should be much greater).

Search aircraft do not expose themselves to AA fire from ships and may shadow a fleet for as long as its flight time will allow. If, however, the fleet is under a CAP umbrella or launches a fighter floatplane, then the shadowing aircraft has a 35% chance of escaping and returning to base. If he fails this roll, then the shadowing aircraft is shot down and has a 50% chance of getting off a sighting report. All positions radioed by search aircraft must be adjusted by rolling the percentile dice and comparing the result with CHART L4. Adjust the actual position of the sighted ships by the factor listed on the chart before reporting the position to the commander of the search aircraft.

Operating conditions for aircraft may be found under AIR AND CARRIER OPERATIONS later in the rulebook.

BATTLE PHASE SHIP MOVEMENT

The BATTLE PHASE is based on a two-minute period of time and accordingly all movement and ship capabilities (such as rate of fire) found in the SHIP DATA SHEETS are expressed in a two-minute turn. The recommended game scale is 1,000 yards = 2" and 2 knots = ¼" (neither of which require a very large playing area), however, any of the scales listes on CHART A1 may be used if it is desired to keep the distance in scale with the ship models being used.

All firing and movement is considered simultaneous but players should alternate who moves his ships first during the movement phase of the turn so that neither player will have a continuous advantage. When fighting at close quarters or in tight formation, the referee may require written orders for any ships. These orders should include speed, direction of movement (including any turns) and the target at which the ship will be firing during that turn. These orders may not be changed once ship movement has started.

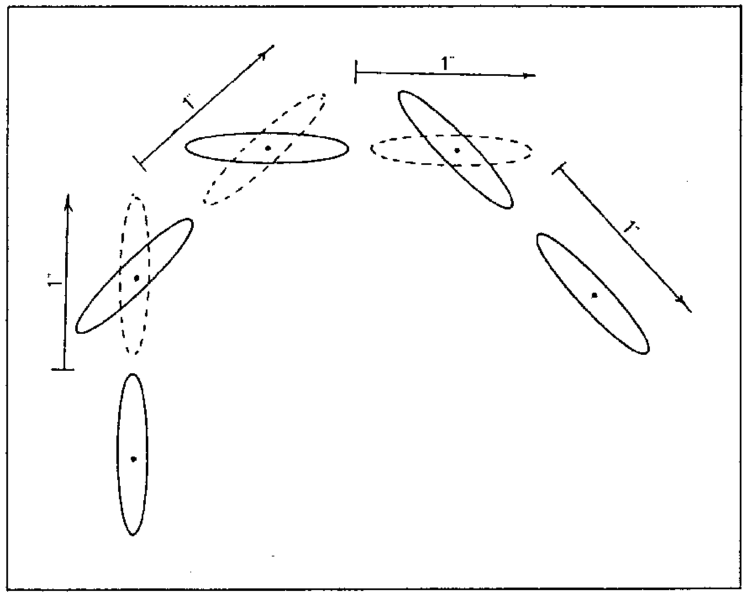
CHART A1 shows the maximum distance (in inches) that a ship can move during a single BATTLE PHASE turn at any given speed. Ships may decelerate under power at a rate of 0.40 x REMAINING SPEED AT END OF TURN, so that a ship moving 30 knots may slow down to 12 knots the next turn and then 4 knots the turn after. Ships not under power or that have lost power due to engine damage (or other similar damage) decelerate at the rate of 0.50 x REMAINING SPEED AT END OF TURN. Thus, a ship moving at 30 knots that loses power would slow down to 15 knots the next turn, 8 knots the following turn, and 4 knots the turn after. Ships may accelerate at the rate of 1/3 of its maximum capable speed per turn so that a 30 knot ship may accelerate from 2 to 10 knots per turn until it reaches its maximum speed. If, however, this same ship has its maximum capable speed reduced to 18 knots due to battle damage, then it may accelerate from 2 to 6 knots per turn.

In order to reverse speed, a ship must slow down according to the above rule to a speed of no more than 4 knots before being able to accelerate in reverse. The maximum reverse speed for any ship is 1/3 of its present maximum capable forward speed, and acceleration in reverse begins from 0 knots. All ships may accelerate in reverse at ½ of their maximum capable reverse speed per turn.

To move the ships, a ruler is placed at the bow of the ship and the ship is moved ahead until the bow of the ship reaches the appropriate number of inches on the ruler equal to its speed for that turn.

SHIP MANEUVERS

Although most large warships could complete a 180° turn in slightly more than two minutes, this must be reduced in order to allow simulation of maneuvering. The maximum degree of turn allowed in a single two-minute game turn as a function of the size of the ship (in DP) may be found on CHART U3. Turns are made in 45° increments so that movement must be split to accomodate each 45° turn. Thus, for a 45° turn the total movement must be split into 2 halves ; for a 90° turn into thirds; for a 135° turn into fourths; for a 180° turn into fifths. Actual turning of the ship model is done by pivoting about the center of the model after each portion of forward movement. The diagram at right shows the turning method for a ship moving at 32 knots (4") doing a 135° turn. Movement is split into quarters of on inch each so that the ship moves ahead 1", then pivots 45° about the center, moves ahead another 1", pivots 45° about the center, moves ahead another 1", pivots 45° about the center, and then moves ahead 1" once more. Notice that the ship does not make its first 45° increment until after it has made its first $\frac{1}{4}$ movement and that no turn is made after its last $\frac{1}{4}$ movement. Movement is split into equal parts and no forward speed is deducted from ships making turns of any degree.



Collisions, both intentional and acacidental may result from the movement of ships. If a collision is likely, then refer to COLLISIONS AND RAMMING later in the rulebook.

Ships do not always have to pivot a full 45° at one time but may pivot any number of degrees up to 45.

THE DAMAGE POINT [DP] SYSTEM

In SEEKRIEG 4, the amount of damage a ship can sustain before it is considered to be sunk is based on a calculation of its internal volume. The calculation is 0.033 x STANDARD DISPLACEMENT (in tons). The resulting number is called Damage Points (or DP). The armor protection on the ship will be considered separately as can be seen later in the rules. Since the larger the ship, the higher the Standard Displacement and, hence, the larger the amount of DP, DP is thus a fair measure of the size of the ship as well. A ship that has sustained DP equal to the total DP listed in the SHIP DATA SHEETS may not actually be sinking beneath the waves, but as far as the game is concerned it is useless as a fighting vessel.

LINE OF SIGHT

Before actual firing of a ships guns can take place, four different factors must be taken into account. First, it must be determined whether or not the line of sight is blocked. To check this, a straight-edge or string is lined up between the foremasts of the firing ship and the target ship (hereinafter referred to as FS and TS). Any part of any ship that intersects this line will block the line of sight only if that ship is the same size (in DP) or larger than the TS. CHART J2 shows examples of line of sight.

ARCS OF FIRE

The second factor which must be taken into account is whether or not the FS guns can be brought to bear on the TS. Actually, each ship had its own particular arcs of fire for it guns, but for game purposes the arcs of fire shown on CHART J1 can be used. Fore and aft mounted centerline turrets have an arc of fire of about 280° (or 140° on either side). Midships centerline turrets as well as beam secondary turrets and casemates have a maximum arc of fire of about 140° (70° on either side of the perpendicular). Some casemates such as those mounted in the superstructure or forward or aft inboard have an arc of fire of about 110° from the horizontal.

Turrets and casemates can rotate a maximum of 180° per game turn in order to change targets.

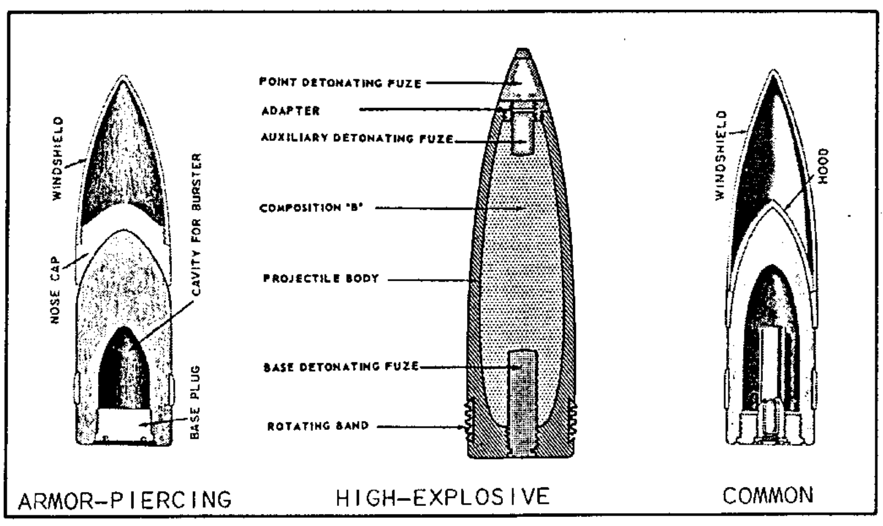
Any ship that intersects the line of sight within the lower 10% of the FS gun range will prevent the FS from firing at its target (regardless of size). Likewise, any ship within the lower 3% of the FS gun range cannot be fired upon due to the fact that the guns cannot depress enough to be brought to bear on the target.

HIT DETERMINATION

In SEEKRIEG 4, there are three different methods by which players may determine the number of hits scored on the target; the BASIC METHOD, the ADVANCED METHOD, and the RANGE ESTIMATION METHOD. Each system has its own Hit Probability Table (CHARTS H), however, it is recommended that CHART G3 be used with all three hit determination methods. Basically, CHART G3 shows the maximum rate of fire per gun during a game turn as a function of the range to the target. Although the gun may be capable of firing faster (or, in some cases, slower), these rates of fire assume that corrected fire is being used (in other words, the gun is not fired again until the shell splashes from the previous salvo have been spotted and gunnery corrections have been made). In some cases, large caliber guns firing at maximum range took well over 60 seconds for their shells to reach the target. Of course, if a particular gun has a maximum rate of fire of 4 as listed in the SHIP DATA SHEETS, then it may never fire more than that rate, even if the range is 10,000 yards or less.

HIT DETERMINATION [BASIC METHOD]

Once the rate of fire has been determined, that number is multiplied by the number of guns in the particular battery that can be fired at the target. The result is the total number of shells of that battery that will be falling around the target during that game turn. Of course, only a small percentage of these will actually be hits so the number of shells must be reduced by a factor which is calculated by the use of CHART H1. There are seven different aspects listed on CHART H1 and a number of categories are listed under each one. Each of these categories has either a plus or minus (or 0) value. One category under each aspect applicable to the situation is chosen and the listed value is added or subtracted from 0 (there is no base number). A running total is kept and the final total is then compared with the top row of CHART I1 (SURFACE GUNFIRE COMBAT RESOLUTION). The appropriate column is selected and the CHART is used in the same manner as explained under UNDERSTANDING THE PROBABILITY METHOD on Page 2. Thus, if the total from CHART H1 for a particular ship was 44 and there was a total of 8 shells falling around the target, on a roll of 01 three hits would be scored (a roll of 02 to 06 would result in two hits, and a roll of 07 to 34 would result in one hit).



If the resultant total from CHART H1 is a negative number (less than 0), then use the 01-10 column on CHART I1. The above procedure is followed for each gun battery (primary, secondary, etc.) that is capable of fire during that turn. Ships may fire their guns of a particular caliber (size) as an entire battery at one target or they may fire each battery turret at a different target (reductions must, however, be made in the number of shells falling around the target due to the fewer number of guns being fired). They may

NOT fire at more than one target with the same turret (even if there are two or more guns in the turret).

There are several ships that have a different number of guns in turrets of the same type (such as the HMS King George V of 1940 with three main battery turrets, two of them with four guns and one with two guns) so that it is important to note at which target each will be firing when firing turrets at different targets.

BEARINGS FROM TARGET SHIP (TARGET ANGLE)

The ease with which a target ship can be ranged upon with a rangefinder (optical) depends upon how much of the target ship's length is being presented to the rangefinder on the firing ship. In order to simulate this, a degree bearing from the target ship to the firing ship is taken (from center ship to center ship). CHART F1 (BEARINGS FROM TARGET SHIP) illustrates the bearings as used on CHARTS H. Thus, when a firing ship is located in the area of 15° on either side of the bow of the target ship, then the target ship is presenting a very small target area to the firing ship. The same is true if the firing ship is located in the area of 15° on either side of the stern of the target ship. It is important that these bearings be taken FROM THE TARGET SHIP and NOT the firing ship. This aspect on CHARTS H should also be taken into account even when using Radar Fire Control.

HIT DETERMINATION [ADVANCED METHOD]

The ADVANCED METHOD is generally similar to the BASIC METHOD except that CHART H2 is used for hit determination. As you will note, there are twice as many aspects listed on CHART H2 as there are on CHART H1 (14 as opposed to 7) and some of the categories are separated in finer detail. Since CHART H2 contains most of the aspects present on all the CHARTS H, an explanation of each aspect follows:

1. TARGET SIZE -- The total DP of the target ship as listed in the SHIP DATA SHEETS. This number does not change during the game regardless of the amount of DP inflicted on the ship.
2. BEARING FROM TARGET -- See CHART F1 and the explanation above.
3. FIRING SHIP UNDER FIRE -- This reduction is made only if the firing ship was HIT by any shells during the previous game turn.
4. OVER CONCENTRATION -- One of these categories must be added to the running total (due to the difficulty in spotting the correct shell splashes when more than one ship is firing at the same target). If desired, this can be modified to mean only shells of the same size (for example, it would be much easier to distinguish between the shell splash from 5" shell and a 10" shell than to distinguish between the shell splashes from a 15" shell and a 16" shell).
5. FIRE CONTROL SYSTEM -- A detailed explanation of this may be found under FIRE CONTROL SYSTEMS later in the rulebook.
6. RADAR ASSISTED FIRE CONTROL -- This aspect is added to the running total only when one of the first two categories listed under #5 above has been chosen. During the 1938 to 1945 period, only the United States, Great Britain, and Germany had Radar Assisted Fire Control.
7. RANGE TO TARGET -- The distance measured from the foremast of the firing ship to the foremast of the target ship (using the scale 2" equals 1,000 yards).
8. CHANGE OF TARGET -- This is deducted from the running total only when a ship changes targets (and only on the first turn of fire at the new target). This is not deducted on the first game turn of fire.
9. SPEED OF TARGET -- The speed at which the target ship moved during the movement immediately prior to firing.
10. SPOTTER AIRCRAFT -- This bonus is added only if a spotter aircraft is available to observe the fall of shot on the target. Single aircraft may spot fall of shot on only one target per turn. Airships may spot fall of shot for up to 3 different targets for one firing ship or one target for each of three different firing ships.
11. EVASIVE MANEUVER -- Information for this aspect may be found later in the rulebook under EVASIVE MANEUVER.

12. SEA STATE -- Based on the current weather conditions, adjustments are made to the running total. A full description of the sea state may be found on CHART B3.

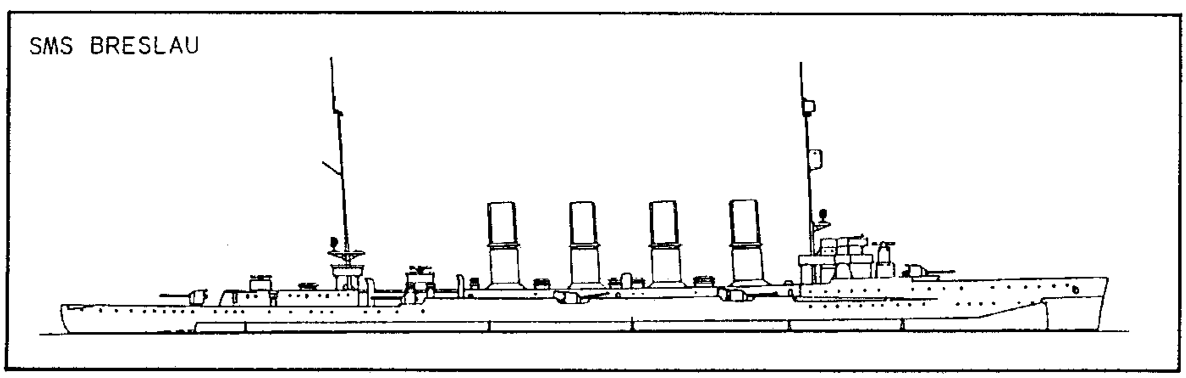
13. SMOKE SCREENS -- Any ship at least 50% covered by either funnel smoke or chemical smoke is considered hidden by a smoke screen. This does not apply to ships laying the screen.

14. VISIBILITY -- One of the 3 categories must be used according to the time of day. The same category should be used for all participating ships. The Codes listed under the DURING DAYLIGHT category refer to CHART C1. Under MORNING/EVENING TWILIGHT, most firing ships will reduce the running total by -4 unless their target is under the effects of a shipboard fire (+2) or silhouetted against the western sky (+2), or in the darkness against the eastern sky (-10). During NIGHT conditions, a target ship that is also firing will be considered a -18 or -9 (depending upon the amount of moonlight). A target ship that is under the effects of a shipboard fire or is in the approximate line of sight between the firing ship and another ship that is under the effects of a shipboard fire is considered a +2.

HIT DETERMINATION [RANGE ESTIMATION METHOD]

The method used to determine hits when using range estimation starts out quite a bit different than the other two methods. First of all, after ship movement and choosing targets, no measurement of the distances between the firing ship and its target are made until each commander has written down the range estimates for all of his ships. Range estimates can be accurate to the nearest 250 yards ($\frac{1}{2}$ inch) which allows a leeway of $\frac{1}{4}$ inch on either side of the actual range. Thus, if the estimate for the ship was $20\frac{1}{2}$", and the actual range when measured was 20-5/16", hits would still be scored. Ranges exactly on the $\frac{1}{4}$" can be given a 50% chance of hitting on the estimated range. All ranges should be measured from the foremast of the firing ship to the foremast of the target ship.

A ship is allowed one estimate for each turret (regardless of the number of guns in the turret) or gunmount comprising each battery (primary, secondary, etc.). Thus a ship with four primary battery turrets and six secondary battery turrets can estimate up to four different ranges for the primary battery and up to six different ranges for the secondary battery. Turrets can be combined to fire at the same range and there is no penalty for firing on more than one target ship from the same battery.



After the estimates have been checked for accuracy by actual measurement, if there are no correct estimates, then the turn sequence starts over. If, however, a correct estimate has been made, then go to CHART H3 to determine hit probability. This is used in the same manner as other CHARTS H , however, when the final total is compared with the top row of CHART I1, it must be remembered that the total number of shells falling around the target in this case are only the number fired from the turret (or turrets) for which a correct range was estimated (NOT the entire battery).

It will be noted that on CHART H3, there are no categories for SPEED OF TARGET, RANGE TO TARGET, or CHANGE OF TARGET since it is likely that these will have already affected the person making the range estimate. ACQUIRED FIRE on CHART H3 is a bonus added to the running total if the same battery of the same ship hit the same target on the previous turn.

Range estimation is an acquired skill (for most people) and will most likely improve with experience. If you find that too many hits are being scored by the players, then double (or triple for those of you with X-ray vision) the movement rates listed on CHART A1 for the GAME SCALE.

HIT LOCATION

The same method of hit location is used for all the different methods of HIT DETERMINATION. CHART G1 shows the various locations[for surface warships (BB, CB, CA, CL, DD) and aircraft carriers (CV)] which a shell can hit as a function of the range (long or short) at which the shell was fired. Short range is defined as the lower half of the maximum range of the gun and long range the upper half. The locations shown on the chart are not necessarily the exact location of the hit, but have been included because the armor information was readily available for the locations, and, for game purposes are the location of the hit. Thus, a turret hit may not mean that the turret was squarely hit, but a location on the ship having armor similar to that of the turret was hit.

Percentile dice are used to determine the hit location so that on a roll of 53, a Heavy Cruiser would be hit on the CON at short range. The location of each shell that hits the target must be determined by this method. A location roll resulting in [I] is considered a DUD and no damage calculation should be made for these shells.

ARMOR PENETRATION [ARMOR AVERAGE METHOD]

The damage caused by an AP (armor-piercing) shell will, in most cases, be greater if the shell can penetrate the armor on the ship before exploding. For this reason, two different columns are included on the AP SHELL DAMAGE table at the bottom of CHART H1, one column for damage caused by AP shells that penetrate the armor and one column for those that do not. Also, the larger the AP shell, the greater the amount of explosive contained within, and, hence, the greater the amount of damage that will be caused. Since damage is calculated in terms of Damage Points (DP), a 20" AP shell will cause 102 DP if it penetrates the armor on a ship, and only 34 DP if it does not penetrate the armor.

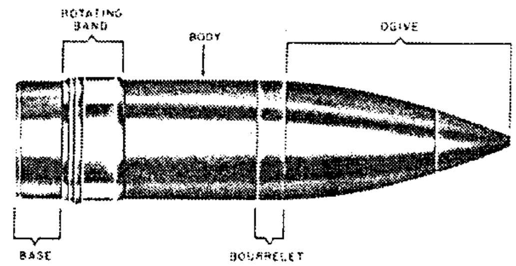
When using the Armor Average Method, it is not necessary to roll for hit location because all armor on all locations is considered to be the same. The average amount of armor can be found in the ship listing in the SHIP DATA SHEETS (item X).

To determine the amount of armor a particular shell will penetrate, use the Penetration Class listed for the gun in the SHIP DATA SHEETS (item E) and match this with the Penetration Class listed in the far left column of CHART R1. Along the top of this chart is a breakdown of the ranges (in yards). Thus, a shell that is Penetration Class J3 (11.0"/45) will penetrate up to 4.4" of armor at a range of between 17,600 and and 22,500 yards. According to the table at the bottom of CHART H1, this shell would do 48 DP to any ship with 4.4" or less of average armor when it hits. On a ship with 4.5" or more of armor this same shell would do only 16 DP when it hits.

The amount of armor penetration listed on CHART R1 is based on Types A and B armor. If using ships with armor protection other than Types A and B, then refer to CHART Q1. Some of the older types of armor were not as strong as Types A or B so the same shell will penetrate more armor at the same range. Along the far right column of CHART Q1, the reduction factor for each type of armor is shown. This number should be multiplied by the average amount of armor listed for the ship to show its true thickness in relation to Types A and B. Thus, a ship with an armor average of 11.5" Type F would be penetrated by any shell that can penetrate 6.9" of armor or more (11.5" x 0.6 = 6.9").

ARMOR PENETRATION [ADVANCED METHOD]

Advanced methods of armor penetration are handled in the same manner as the basic method with a few exceptions. Hit locations should be determined in the usual manner and the amounts of armor listed for each location on the ship should be adjusted by the factors on CHART Q1. If a more detailed and accurate factor is desired, the factors under column 1 near the center of CHART Q1 can be used to adjust the armor amounts listed. The thickness of armor on all Destroyers and ships for which no armor amount is listed for a particular location is assumed to be 1.0" for game purposes. This amount should not be reduced by any factor for armor type since at no time in the game are armor amounts of less than 1" permitted. Superstructure armor is considered to be $\frac{1}{2}$ the amount of the smallest armor on the ship (but not less than 1"). Thus, the superstructure armor on the German battleship Bismarck (1940) is 3.4" ($\frac{1}{2}$ x 6.7"). This same rule applies to armor for the island on aircraft carriers.



PROJECTILE TERMINOLOGY

Damage may be calculated in the same manner as explained under the Armor Average Method (using the table on CHART H1) but using the hit locations or damage may be calculated using the method explained under COMPUTING DAMAGE [ADVANCED METHOD] on Page 12.

The amount of armor a shell will penetrate depends a great deal upon the angle at which it strikes the armor. For example, the American 16"/50 Mark 7 (mounted on the Iowa Class) could fire an AP shell that would penetrate 29.39" of armor at 5,000 yards when striking at an angle of $87\frac{1}{2}^\circ$. However, that same shell could penetrate only 0.67" of armor at 5,000 yards when striking at an angle of $2\frac{1}{2}^\circ$. The angle at which the shell will strike depends basically upon the range and whether the armor on the location hit is vertical or horizontal. As a general rule, a shell will penetrate greater amounts of vertical armor at the shorter ranges and greater amounts of horizontal armor at extreme ranges.

To simplify things a little, the armor penetrations listed on CHART R1 are the average between the penetration of vertical and horizontal armor. CHART R2shows the penetration of both vertical and horizontal armor by the various shell sizes at different ranges. This chart is also averaged somewhat because to be completely accurate as far as the amount of armor penetration, one would need to go through an extremely complicated ballistics calculation that included the weight of the shell, the muzzle velocity, the angle of fall, the striking velocity, the aerodynamic form of the shell, and many other factors. This calculation would have to be computed for each type of gun made by each country. For this reason, use of CHART R2 will be sufficient. For game purposes, no shell penetrates less than 1.0" of armor at any range.

For game purposes, Deck, Flight Deck, and Turret armor are all considered horizontal armor when using CHART R2. Likewise, Sidebelt, Con, and Hangar armor are considered vertical armor. Superstructure and Island armor can be either vertical or horizontal armor, whichever will allow the greatest amount of penetration at the particular range.

It will be noted that some of the Penetration Classes assigned to guns in the SHIP DATA SHEETS do not match exactly with the size and caliber listed for the class on CHARTS R. This is due to the fact that the ballistic properties of the gun more closely match that of the Penetration Class assigned than that of the guns of similar size and caliber.

COMPUTING DAMAGE [ADVANCED METHOD]

Armor piercing shells were not the only shells used by warships. Basically, there were four different offensive types of shells; Armor Piercing Capped (APC), Semi-Armor Piercing (SAP), Commom (COM), and High Explosive (HE) or High Capacity (HC). Each of these shell types has its own particular characteristics, and the differences as they pertain to the game system are shown on CHART G2.

The first item is the penetration capabilities of the shells. CHARTS R are based on the use of an APC shell, so it follows that its penetration factor is 1. An SAP shell will penetrate about 70% of the armor penetrated by an APC shell, so the penetration listed on CHARTS R should be multiplied by 0.7 when using an SAP shell, and by 0.4 when using a COM shell. For game purposes, HE and HC shells have no penetration capabilities (actually they can penetrate armor equal to about 10% of the diameter of the shell before exploding).

The basic Damage Factor for the shell of a particular Penetration Class can be found in brackets directly across from the Penetration Class on CHARTS R (i.e. the basic Damage Factor for a shell of Penetration Class K1 is 14). This is the number of DP caused when an APC shell of that class hits any ship and does not penetrate the armor. Thus, a shell of Penetration Class K1 that hits a ship and does not penetrate its armor will cause 14 DP.

One of the reasons for the inferior penetration capabilities of SAP, COM, HE and HC shells is the fact that there is less weight taken up by the ballistic cap and consequently more weight and space available for explosive. Accordingly, SAP and COM shells will do somewhat more damage than an AP shell if all penetrate the armor. Thus, the Damage Factor for the shell must be modified by the Damage Factor Modifier (DFM) for the particular shell type. Note that there are different DFMs for both penetration and non-penetration hits so that a Class K1 SAP shell will cause 18 DP to a ship when it does not penetrate the ship's armor while that same SAP shell will cause 49 DP to a ship when it penetrates the ship's armor (1.3 x 14 = 18 and 3.5 x 14 = 49). HE and HC shells will always cause DP equal to 2 times the basic Damage Factor for the shell's Penetration Class regardless of the armor on the target.

There is a good chance that a shell penetrating the armor on a ship will pass through without detonating, thereby causing only minimal damage. For game purposes, any shell that penetrates more than twice the amount of armor at the location where it strikes, risks a 30% to 45% chance of not detonating (depending upon the type of shell as shown on CHART G2). Thus, an SAP shell that penetrates 6.4" of armor at a given range that hits a location on a ship protected by only 3.1" of armor, has a 40% probability of not detonating. Shells that fail to detonate will cause DP equal to the shell's basic Damage Factor (from CHARTS R)

When using the different shell types, it is a good idea to list how many of each type of shell makes up the total complement of ammunition aboard the ship before battle begins. Also, each commander should specify the type of shell that is being loaded at the end of one turn to be fired during the next turn.

THE EFFECTS OF DAMAGE

As the battle progresses, DP are accumulated by ships and they will begin to lose speed and guns. Listed in the SHIP DATA SHEETS are Loss Factors for speed, guns, and torpedoes which can be found in parentheses immediately after the speed and gun and torpedo batteries. Each time the total DP inflicted on the ship reaches the amount of the Loss Factor (or a whole number multiple of the Loss Factor), speed or guns are lost. Thus, after receiving a total of 200 DP, the Italian CA Bolzano would have lost 18 knots of speed (200/21 = 9 and 2 x 9 = 18), four main battery guns (200/45 = 4), nine secondary battery guns (200/22 = 9), and four torpedo tubes (200/45 = 4). Note that when dividing the total DP received by the Loss Factor for speed, the result must be multiplied by 2 since this Loss Factor is for 2 knots. Also, since only whole number multiples of the Loss Factor apply, all fractions resulting from the division by the Loss Factor are dropped and only the whole number is used.

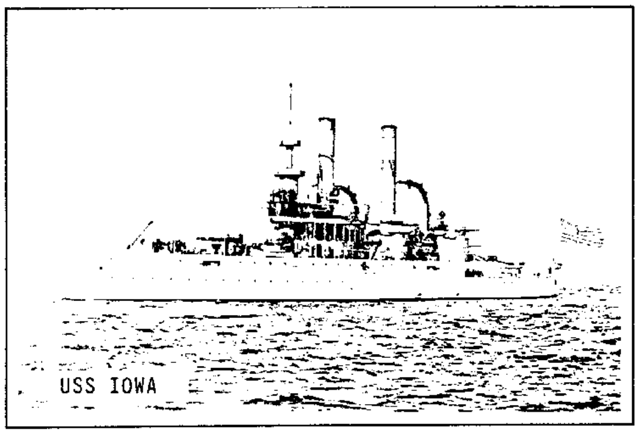
To determine the exact location of the gun or torpedo tube lost, a die with a number of faces equal to the number of guns in the affected battery may be used (i.e. an eight-sided die for a ship with an eight-gun battery). The loss may be determined by turret or torpedo tube mount, since it is possible for only one gun in a two-gun turret to be "knocked-out". All loss calculations are done at the end of the game turn and losses due to damage take effect at the end of the game turn before movement for the next turn.

CRITICAL DAMAGE

In addition to the regular damage as described above, every shell hit has a chance of causing additional or Critical Damage. CHART G2 shows two listings for PROBABILITY OF CRITICAL DAMAGE (one for shells that do not penetrate and one for shells that penetrate the ship's armor) based on the type of shell being used. Note that all shell types have an equal chance (20%) of causing Critical Damage if no penetration has occurred. Likewise, all APC, SAP, and COM shells have a 65% chance of Causing Critical Damage if they penetrate the ship's armor. Since HE and HC shells have no penetration capability in the game, the chance that they will cause Critical Damage (CD) is always 20%.

There are three different classes of CD; CLASS A (Any BB, CB, CA, CL, DD, etc.), CLASS B (Any Aircraft Carrier), and CLASS C (Any Submarine). If the roll to determine the probability of CD on CHART G2 was successful, then the dice are rolled again and the result is compared with the appropriate table on CHART N (N1 for CLASS A, N2 for CLASS B, and N3 for CLASS C). The location of the hit must also be used when determining the extent of the CD on CHART N1 and N2. Thus, if the shell causing the CD had hit the Turret (T) of the ship and the dice roll on CHART N1 was 33, then the CD Number would be 18 (from the far right column of N1). This number is then compared with the matching number on CHARTS N4 which reveal the actual extent of the Critical Damage (in the above case, the air search radar was destroyed).

Some of the CD Effects listed on CHARTS N4 use a Ñ symbol which means that a dice roll must be made in order to determine the length of time or duration of the effect. CHART N5 lists the results of the dice rolls in terms of duration. Thus, a roll of 24 would mean that the CD as explained on CHARTS N4 would be in effect for a total of six minutes (3 game turns). In cases where no Ñ symbol appears, the damage is considered permanent for the remainder of the game.


USS IOWA

The effects of Critical Damage are cumulative which means that a ship may receive the same CD more than once during a game turn (including permanent CD). Thus, a ship that has its aft main battery firing at $\frac{1}{2}$ its normal rate due to a previous CD would have to reduce its rate of fire to $\frac{1}{4}$ ($\frac{1}{2}$ of $\frac{1}{2}$) if it received that same CD again while still under the effect of the previous CD.

As with regular damage, all CD takes effect at the end of the game turn during which it was inflicted. All damage caused by CD is in addition to regular damage and loss of guns and speed due to CD is in addition to loss of speed and guns from regular damage.

Duds and Pass-throughs do not cause any CD.

SHIPBOARD FIRES

One very common aspect of the damage caused by shell hits was their chance of causing a fire aboard the ship. Any shell hit capable of causing Critical Damage is also capable of causing a shipboard fire. For this reason, when rolling to determine the probability of CD on CHART G2, a roll of doubles on the percentile dice (i.e. 11, 22, 33, etc.) indicates that a shipboard fire has started (regardless of whether or not there is CD). The severity of the fire is expressed in DP and is the total of the numbers rolled when added together. Thus, a roll of 77 would indicate the presence of a shipboard fire, the severity of which is 14 DP (7+7 = 14). This amount of DP is added to the total DP already inflicted on the ship at the end of the turn in which it was caused [the roll would also indicate that no CD had been scored--see CRITICAL DAMAGE on Page 13].

The severity of the fire will be added to the ships damage in DP at the end of each turn. Thus, a fire of severity 14 DP will cause 14 DP to be added to a ship's damage at the end of each game turn. However, it is likely that the ship's damage control will have a chance of putting out the fire or at least reducing its severity. At the end of the game turn after the fire had started, the percentile dice are rolled once for each fire aboard a ship and the result compared with CHART G4. The result can range from 4 being subtracted from the severity of the fire to the fire going out of control (OOC) and forcing the crew to abandon ship. This same procedure is followed each turn until the fire is put out (or goes OOC). Thus, in the above case, the fire would cause 14 DP at the end of the turn in which the fire started, only 10 DP at the end of the following turn (if the commander rolled from 01 to 20 for the fire fighting party of the Damage Control). All DP caused by shipboard fires is in addition to damage caused by regular or Critical Damage.

Additional shipboard fires may be caused as the result of Critical Damage effects if listed on CHARTS N4.

FIRE CONTROL SYSTEMS

In order to be completely accurate, each ship's fire control system should be considered separately and rated based on the individual merits of the system. However, this is beyond the original scope of these rules so only some generalizations will be included.

Prior to the turn of the century (and a few years after) many ships relied entirely on straight visual sighting of shell splashes. Of course, the higher the location of the spotter, the more accurate would be the ranging. If the higher position was destroyed, ranging would have to be accomplished from a lower spot or the gunmount itself. Ranging in both cases was, at best, poor (even in consideration of the comparatively short maximum ranges of the guns).

Circa 1895, optical rangefinders were installed aboard warships and this proved greatly superior to the straight visual system. Optical rangefinders were improved over the years (better optics and increased base lengths allowing more accurate ranging) and remained the standard installation for all warships built through 1945. However, during the First World War, the Director Control Tower (DCT) system was introduced. Basically, a DCT was an enclosed rangefinder with gunnery fire control calculators to solve ballistics problems for each battery. This provided a more accurate and better controlled means for ranging than the plain rangefinder (RF) which still remained the only means of fire control aboard some warships of this period.

Over the years improvements were made on the optics and the DCT system so that by World War Two, an extremely accurate and efficient system had been developed, some of which used the newly developed electronics called radar. Thus, a typical battleship of that period had two main battery DCTs (one for each battery - fore and aft), two or four secondary battery DCTs (one for port and one for starboard or one for starboard forward and one for starboard aft and a like installation on the port side) and a like number of DCTs or directors for the DP and smaller AA batteries.

Radar was probably the single most important development for assistance in fire control made during the 1890 to 1945 period. However, although most countries had radar in the form of search or warning models, only the United States, Great Britain, and Germany used radar as a form of fire control during the Second World War. In most cases, the radar set was mounted atop the DCT and improvements to radar during the course of the war allowed the United States and Great Britain a fire control system unmatched by any other powers. Should the DCTs be destroyed, of course, the ship would be forced to use the rangefinders located in the individual turrets (local RF).

Perhaps the single exception to all this is the Japanese Type 98 Firing Device which was installed on all Japanese Battleships and Cruisers during the Second World War. Although the device actually had nothing to do with gunnery ranging and calculations, it affected the firing circuits so that the salvoes fell in a much tighter pattern than would normally be expected. Optionally, when using CHARTS H for computing hit probability for a Japanese warship of this period, a +11 bonus may be given (if using CHART H2) or a +20 may be given (if using CHART H3).

A complete listing of the major types of radar in use by all countries can be found on CHARTS P.

EVASIVE MANEUVER

Any ship capable of moving faster than 13 knots can commence Evasive Maneuver (EM). In order to be considered in EM, the commander of the ship must announce that the ship is commencing EM at the beginning of the game turn before any movement takes place. Ships in EM move ahead at the rate of 75% of the normal movement(in inches)for their current speed. Thus, a ship moving at 28 knots that goes into EM may move ahead at only 2.6" (0.75 x 3.5" = 2.6") instead of the full 3.5" allowed for 28 knots speed. Ships that are not capable of at least 13 knots cannot commence EM due to the fact that their speed is too slow to allow the maneuverability needed to be considered in EM.

SMOKE SCREENS

Any ship is capable of laying a screen of funnel smoke, however, only ships fitted with screen projectors (such as Destroyers and some cruisers) can lay a screen of chemical smoke. Chemical screens, of course, are much more dense and provide better protection for those ships behind the screen. For game purposes, a ship at least 50% concealed (half of its length) by a screen is considered behind the screen.

To lay a screen, a marker (such as a penny or tack) is placed behind the model of the ship that is to lay the screen before ship movement takes place for that game turn. Another marker is placed behind the ship at the end of each movement for as long as the ship is laying the screen. These markers represent the extent of the smoke screen and when this screen lies in the line of sight, the reductions on CHARTS H are used. All ships may fire through the screen but have their fire reduced by the factors listed on CHARTS H under SMOKE SCREENS. Even ships with radar assisted fire control must reduce their running total by the factors listed.

NOTE: Due to the fact that radar assisted fire control was much more effective if the target was also in visual contact, all reductions found on CHARTS H for SMOKE SCREENS, BEARING FROM TARGET, SEA STATE, VISIBILITY, etc. must be deducted from the running total even when using radar assisted fire control.

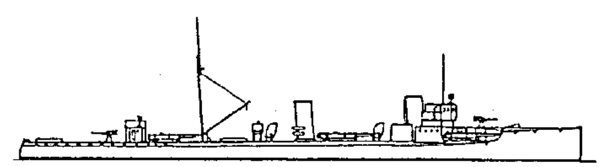
Smoke shells may be fired by any ship in lieu of regular shells (APC, SAP, etc.) fired during a game turn for a particular battery. The total screen area provided by smoke shells fired during a game turn is an area 2,000 yards by 2,000 yards (4" by 4") and their effect is the same as chemical smoke.

The duration any marker for a screen may remain on the playing area is 10 minutes (5 game turns). Optionally, screens may drift in the direction of the wind at a rate equal to ½ the speed of the wind in knots. Thus, an 8 knot wind from the West will cause a screen to drift 4 knots (½") to the East each game turn. All screens are considered ineffective when the wind speed reaches 20 knots or more.

OVERS AND UNDERS

Optionally, the chance that the shells intended for one target ship may also hit another ship close-by may be considered. When using the Basic or Advanced Methods of Hit Determination, any ship within 1½" of the target ship risks being hit by overs or unders (or rights or lefts!). This is determined by multiplying the final resulting hit probability from the top of CHART I1 by .25 (or 25%) and rolling for the number of shells that did not hit the target ship. Thus, if the target ship has been hit by two shells out of a total of 10 shells falling around her, then any ship within 1½" of her may be hit by some of the remaining eight shells. If the hit probability as determined from CHARTS H was 44, then any of those ships would roll on the 11-20 column on CHART I1 (.25 x 44 = 11) using 8 as the number of shells. In this case, the 1½" is measured from the closest portion of the actual target to the closest portion of the surrounding ships.

This same method may be used for the Range Estimation Method.[OPTION 2]Only parts of ships that actually intersect the range at which shells are falling should be considered. Hit determination should be calculated in the same manner as if that ship had been the intended target, however, reduce the number of actual hits scored by ½.



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MORALE

Optionally, crew morale may be considered. When the damage inflicted on a ship reaches 65% of the total original DP (the percentage being calculated by dividing the total amount of DP sustained by the total DP listed for the ship in the SHIP DATA SHEETS), then there is a 5% chance that the crew will abandon ship (without orders, that is). CHART U2 shows the different probabilities according to the amount of damage the ship has sustained. Morale is checked only once each time the percentages on CHART U2 have been reached. The 100% morale check is just for grins (to see if your ship's crew will go down fighting). Of course, when the crew abandons ship, all fire and movement ceases for the following turn (and all remaining turns!).

TORPEDOES [SURFACE SHIPS]

Surface ships that have torpedo tubes may fire any or all of these during a game turn. The commander of the firing ship must note the number of torpedoes fired (only one per tube) and the intended target immediately after ship movement has taken place and before any gunfire combat is resolved.

Fixed or submerged torpedo tubes (denoted by * in the SHIP DATA SHEETS) are not trainable and must be fired while the target ship is within a 30° arc (15° on either side of the mount) of the tube mounting. Most fixed mounts were located at the bow, stern, or on either side (some ships had tubes in all four locations). Trainable, or deck mounted tubes may be fired when the target is with a 45° arc forward of the mount position (45° from the perpendicular) or up to 15° aft of the mount position (15° behind the perpendicular.

Information on the various torpedo models used by the major powers is shown on CHARTS S1 and S2. The designation, year introduced, propulsion (Compressed Air types or Electric types), damage class (either A, B, C, D, E, or F), high speed run (yards/knots) and maximum range run (yards/knots), and notes regarding its its use may be found for most models listed.

A torpedo may not reach its intended target during the first turn of its run. For this reason, the time of arrival (expresses as game turns) must be figured based upon the distance to the target and the speed of the torpedo. Thus, a torpedo traveling at 30 knots may not reach a target ship that is 5" away on the same turn in which it was fired, but it will reach the ship next turn. It is not necessary to take the speed of the target into account when figuring the arrival time of the torpedo because the limitations on firing angles have been designed to take this into account.

During the turn in which torpedoes have been fired (usually right after gunfire resolution), certain information must be recorded before any ships are moved. Length of the target ship, the angle of bearing measured FROM the center of THE TARGET SHIP, and the range between the ships must be recorded for use in the calculation listed on CHART T1. Of course, name of the target ship, its speed, and the number of torpedoes fired should also be recorded. During the turn in which the torpedoes have been calculated to arrive, the formula on CHART T1 is calculated, plugging in the appropriate information. Thus, if the firing ship bears 40° from the center of the target ship, and the length of the target ship is 525 feet, then the result of the top line of the calculation would be 19343.047 [57.3 x 525 x .643 = 19343.047]. If your calculator does not have a sine function or you do not have a complete table of sines, the sines listed (by 5° increments) on CHART T3 may be used. This result must then be divided by the range between the ships <u>IN FEET</u>. Thus, if the two ships in our example were 6,000 yards apart (18,000 feet), then we would divide the 19343.047 by 18,000 and get 1.0746137. The 1.0746137 must now be divided by the RELATIVE TRACKING ERROR (or RTE). The RTE is basically determined by the speed of the target ship at the time the torpedoes were fired and may be found on CHART T2. The RTE can be modified by the addition or subtraction of the factors listed on CHART T2 before plugging it into the calculation. If the target speed was 28 knots, and the commander of the ship moved to comb the spread of torpedoes (by turning toward or away from the torpedoes so that he is on a parallel course with the torpedoes), then the total RTE would be 10.5 and the result of the calculation would be .1023441 (for game purposes, this should be rounded to .10).

This result, however, is not the actual percentage probability of a hit and must be adjusted by using CHART T4 to get the actual probability. Thus, our result of .10 would actually be an 8% probability of a hit. The percentile dice can be rolled a number of times equal to the number of torpedoes fired at the target (since the percentage is the chance that each torpedo fired will hit) or CHARTS Y can be used to reduce the number of rolls as explained on Page 2 (UNDERSTANDING THE PROBABILITY SYSTEM).

It will be noted that, when firing at targets at low angles (1° to 35°), very fast targets, or at long ranges, the probability of a hit will be low. Due to the workings of the formula, no angle of bearing of less than 1° may be used.

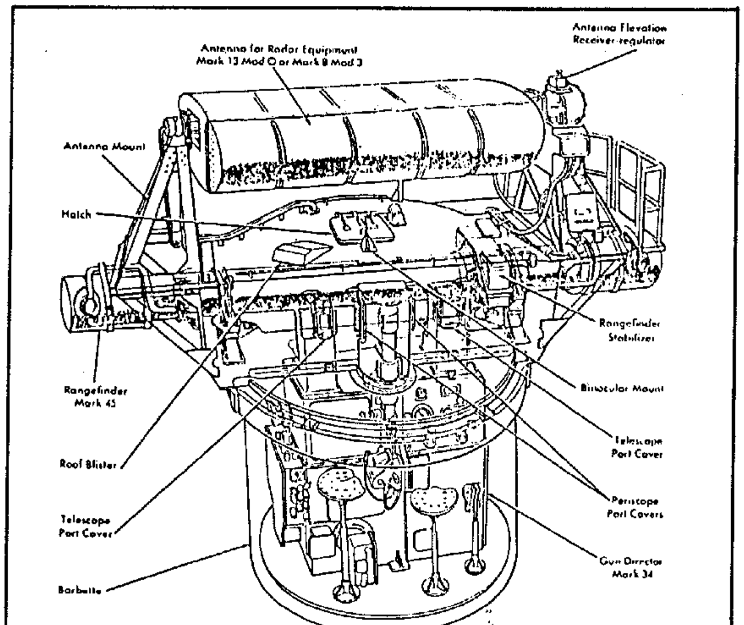
In many cases, torpedoes proved to be more of a problem than an effective weapon (especially the U.S. pre 9-43 models!). Torpedoes frequently ran wild, too deep, or failed to explode when they hit the target. In SEEKRIEG, this is termed the DUD FACTOR and ratings of the torpedoes by country can be found on CHART T5. One of the biggest problems causing torpedoes to be duds was the type of firing mechanism with which they were fitted. Early war developments of the Magnetic Pistol (designed to detonate the torpedo when passing beneath the ship) were, for the most part, poor and not until refinements had been made were these as reliable as the Contact Pistol. Thus, it is important that the commander of the firing ship specify which type of pistol he wishes to use on the torpedoes before actually firing them at the target. Any torpedo that hits a target must be checked for the dud factor on CHART T5. Any torpedo that fails this roll (rolls equal to or less than the percentage listed on CHART T5) is considered a dud and will cause no damage.

However, torpedoes that are not duds will cause damage to the target ship as a factor of the amount of belt armor on the ship and the amount of explosive contained in the torpedo warhead. The amount of damage caused by a torpedo hitting a ship is called the DAMAGE EFFECTIVENESS RATING (DER) and this may be found on CHART T6. The Torpedo Class is a rating given to each torpedo on CHARTS S based upon the amount and type of explosive contained in the warhead. Thus, the DER for a Class C torpedo hitting a ship with 6.1" of sidebelt armor would be 193 DP. Of course, the amount of belt armor should be adjusted by the Armor Type (see CHART Q1) before using CHART T6.

Due to the fact that a torpedo could hit a wide variety of places along the side of a ship (such as on the thickest part of the sidebelt, on a thinner portion of the sidebelt, or even underneath where there is little or no armor at all!), the DER must be modified according to the type of pistol installed on the particular torpedo. CHART T7 shows the various modifiers according to the types of pistols and the roll of the percentile dice. Using the above example, the torpedo fitted with a contact pistol would cause 116 DP to the target ship if 42 was rolled on the percentile dice. That same torpedo, if fitted with a magnetic pistol would cause 193 DP to the ship if the same number were rolled (193 x 0.6 = 116 for the contact pistol and 193 x 1.0 = 193 for the magnetic pistol). Torpedoes fitted with magnetic pistols will, as a general rule, cause greater damage per hit than one fitted with a contact pistol due to the fact that the magnetic pistol was designed to explode beneath a ship's hull (where the armor was weakest).

Critical Damage is determined in the same manner as explained on Page 14 except that the location is always considered to be the sidebelt. Every torpedo hit has a 100% probability of causing CD (as long as it is not a dud, of course).

Any ship that crosses the track of the torpedoes (either before or after they have reached the actual target ship) risk being hit by the torpedoes. Ships crossing the track before they reach the target have a probability of being hit equal to ½ the calculated probability for the actual target ship. Thus, a ship crossing the track before the torpedoes reach the target risks an 11% chance of being hit if the probability calculated for the actual target ship was 22%. A ship crossing the tracks after the torpedoes have hit the target (assuming the torpedoes have not run to their full range) has a probability of being hit equal to ¼ that of the probability calculated for the actual target. However, if six torpedoes were fired and one of them hit a ship before reaching the actual target, then only 5 would be calculated for the actual target. The same holds true for any ships crossing the track after the target ship had been hit. This same method may be used to determine hits on ships in convoy.

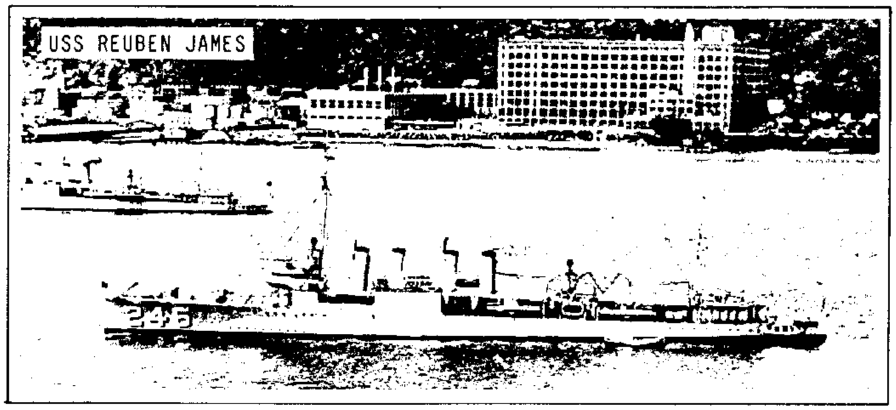


MARK 34 DIRECTOR

Torpedoes may be reloaded at the rate of one tube (NOT the entire mount) per 4 minutes (2 game turns). Like gunfire damage, DP caused by torpedoes will take effect at the end of the game turn and ships that are considered sunk due to torpedo damage do not "sink" until the end of the game turn.

LOSS OF RADAR

Radar was an extremely delicate piece of electronics and when subjected to the severe shocks that accompany battle damage or rough seas could easily malfunction (or just plain cease to function). CHART U4 shows the probability of loss of radar (either search or fire control) due to damage sustained. Thus, a ship that has received DP equal to 30% of the total DP as listed in the SHIP DATA SHEETS, will have a 50% chance that it will lose its search or fire control radar (or both). Each time a ship's damage reaches one of the percentages listed on CHART U4, a roll of the percentile dice must be made.



For loss of radar due to weather conditions, use CHART B3 and the percentages listed for EFFECT ON SHIPBOARD OPERATIONS. Rolls of the percentile dice must be made for each 2-hour period. Thus, a 200 DP ship during Force 9 weather will lose radar capabilities on a roll of 01 to 15.

RAMMING

Ramming, as a naval tactic, was on its way out by the end of the 19th Century. Its occasional use during both World Wars was primarily in cases of desperation or completely accidental rather than intentional. However, to compute the amount of damage done by intentional or accidental rams, the following calculations may be used:

1. Compute Momentum Factor (MF):

$$\frac{\text{DP OF TARGET SHIP}}{\text{DP OF TARGET SHIP + DP OF RAMMING SHIP}} = \text{MF}$$

2. Compute Base Damage (BD):

$$\sqrt{\frac{\text{DP OF RAMMING SHIP x MF}}{\text{TARGET SHIP BELT ARMOR (in inches)}}} \times \text{SPEED OF RAMMING SHIP (in knots)} = \text{BASE DAMAGE (DP) DONE TO TARGET SHIP}$$

$$\tfrac{1}{2}\sqrt{\text{DP OF RAMMING SHIP}} \times \text{MF} \times \text{SPEED OF RAMMING SHIP (in knots)} = \text{BASE DAMAGE (DP) DONE TO RAMMING SHIP}$$

3. Modify BD by sine of impact angle (impact angle being measured from target ship as on CHART F1):

BD x SINE OF IMPACT ANGLE = DAMAGE DONE TO SHIP (in DP)

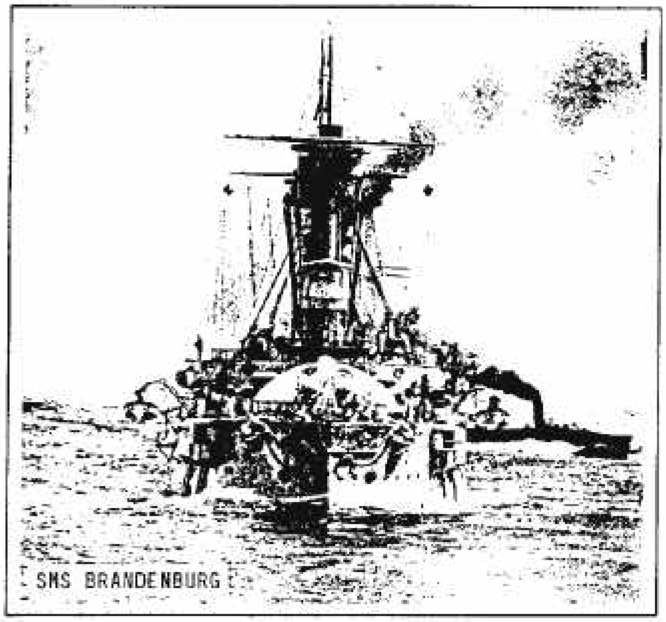
For game purposes, impact angles of less than 20^{o} are not considered collisions and cause no damage. When using the above formulas, all ships are considered to have <u>at least</u> 1.0" of sidebelt armor.

Collisions which impact within the forward or aft 25% of the ship's length are likely to hit an area of comparatively thinner armor than would be found amidships. In these cases, the target belt armor may be considered as ½ of that listed in the SHIP DATA SHEETS (but not less than 1.0") when using the above calculations. Belt armor thickness should also be modified by the Armor Type as listed on CHART Q1 before being used in the ramming calculations.

Ramming will also cause Critical Damage. CHART U5 shows the probability of CD being caused as a factor of the amount of damage (in percentage) caused by the ramming. Thus, if the target ship received from 26% to 50% damage [DP CAUSED divided by ORIGINAL DP = % DAMAGE], two dice rolls would be made using the side-belt as the location using CHART N1 (or N2 if the target was a CV). If 10% damage (or more) is caused on the ramming ship as a result of the ram, then one dice roll would be made to determine the effects of CD for the ramming ship.

OPTIONAL DAMAGE CONTROL

The game system as designed takes into account that average Damage Control is taking place. However, if one wishes to take into account the superior American Damage Control during the Second World War (and that of Germany during World War I), then CHARTS V may be used. Each ship is assigned Damage Control (DCO will be used for Damage Control because DC is being used for Depth-Charge) based on its total DP as listed in the SHIP DATA SHEETS (see CHART V1). This amount must be modified by the factors listed on CHART V2. Thus, a U.S. ship of 350 DP during World War Two has DCO of 28 (20 x 1.4 = 28).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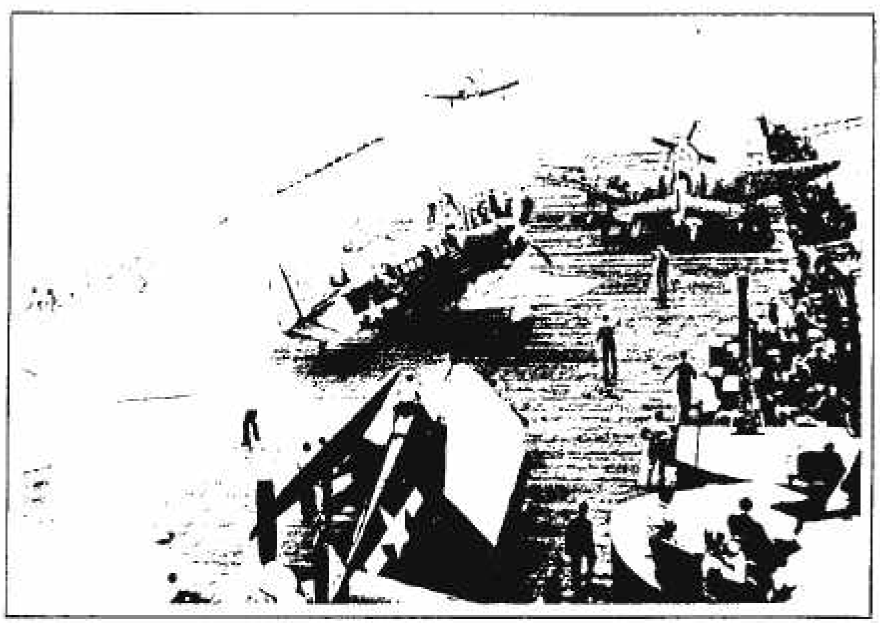
This amount is the TOTAL DCO available to the ship while at sea and once used, cannot be replaced until the ship puts into port. Up to 50% of this amount may be used during a single game turn. Thus, our U.S. ship above could deduct up to 14 DP from damage that the ship had received in battle. Note that DCO is expressed in DP and is deducted from DP the ship has received due to damage. When using DCO as explained above, it may also be used as an additional reduction to shipboard fires and applied in the same manner. This may be done in addition to any rolls made for shipboard fires.

Damage Control may be deducted only at the end of a game turn when all gunfire has been resolved and Loss Factors are being figured. Any ships that are considered sunk (reached their maximum DP in damage during that game turn) may not apply DCO and be "refloated". Likewise, a ship may not apply DCO in greater amounts than the DP that has already been sustained (i.e. a ship that has received only 9 DP may not deduct more than 9 DP in DCO even if available).

AIR OPERATIONS



In order to portray air operations with the proper degree of importance, a fair amount of detail is required in the rules simulating such operations. Almost any simpler game system can be plugged-in to SEEKRIEG in order to allow a more fast-paced air combat simulation, however, this will usually be a sacrifice to the realism intended by the rules presented herein.

Beginning on Page 63 of the SHIP DATA SHEETS can be found information for most aircraft produced by the major powers during the period covered by these rules. The majority of the listings are for naval aircraft although several of the more prominent army aircraft are listed as well. This data will be all the information you need to stage air to air and air to surface combat using SEEKRIEG.

ENVIRONMENTAL FACTORS

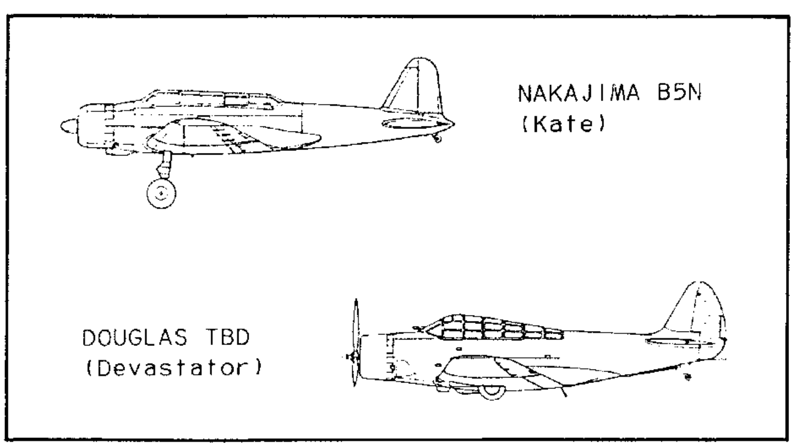
Before any air operations may take place, the environmental conditions must be taken into account. No aircraft may operate during Force 8 weather (or worse), and any aircraft accidentally "caught" in such weather risks a 60% probability of being lost. Only land based or carrier-based aircraft with radar may operate at night or during periods of visibility Code 5 or less. Carrier-based aircraft without radar that are "caught" by these conditions must use CHART L1 in order to determine the number of miles off course (this chart will be explained later).

For game purposes, carriers may launch aircraft at the rate of 4 per game turn (2 minutes) during normal weather. Weather conditions of Force 6 will reduce this to 3 per game turn and that of Force 7 will reduce launch rate to 2 per game turn. In order to launch aircraft, the carrier must turn into the direction of the wind (or to within 10° of the direction of the wind) and the total of the speed of the carrier and the velocity of the wind must equal at least 25 knots before any aircraft may be launched. Thus, a carrier moving at 20 knots into a wind of 10 knots has 30 knots of Wind Over Deck (WOD). The 25 knots of WOD is a requirement for most World War Two aircraft, especially important when flying off of short flight decks (such as the decks of escort carriers). Land bases may launch aircraft at the rate of 12 per game turn during normal weather and 8 per game turn during Force 7 weather conditions. Shipboard floatplanes may be launched at the rate of 1 per 4 game turns (8 minutes total) per available catapult during weather conditions of Force 0 thru 6 only.

PREPARING A STRIKE

Before launching a strike all aircraft must be armed and fueled. For game purposes, all carriers may arm and fuel aircraft at the rate of 2 per game turn. Rearming only may be done at the rate of 3 aircraft per game turn. Land bases may arm and fuel aircraft at the rate of 4 per game turn and rearm only at the rate of 6 per game turn. Any DP received by a carrier or base while engaged in these operations receive twice the normal damage in DP (multiply all DP received by 2). Ordnance may be selected according to the type of aircraft and its load capacity as listed in the SHIP DATA SHEETS. The number and types of aircraft aboard each carrier (or land base) should be designated before the game begins.

The number of aircraft per squadron aboard a carrier varied a great deal, but during World War Two, the typical squadron comprised 18 aircraft (of the same type). In certain circumstances, "half-squadrons" of 9 aircraft were embarked due to the limits imposed by the particular carrier's capacity. For game purposes, aircraft should operate in multiples of three or four when conducting strike operations. The original carrier complement should be decided with this in mind.



For game purposes, all aircraft are considered to be armed and fueled while on deck. Thus, a carrier may either be launching, recovering, or arming & fueling.

FLIGHT TIME

In order to make air operations easier, the flight time (or total amount of time in the air allowed for the particular aircraft) for each type of aircraft should be calculated. This is accomplished by dividing the normal range of the aircraft (in nautical miles) by the cruising speed and multiplying the result by 30 to get total flight time in game turns. Thus, a DOUGLAS TBD-1 Devastator has a total flight time of 143 game turns [535/112 = 4.777 and 4.777 x 30 = 143]. Deductions will be made from this time due to combat, navigational error, form up time, etc.

An estimated time of arrival (ETA) over the target should be calculated in game turns depending upon the distance to the target and the cruising speed of the aircraft. CHART V3 shows the approximate number of turns of flight time used in reaching a target a certain distance away at a given cruising speed. This may be calculated to a finer degree by dividing the distance to the target (in nautical miles) by the miles travelled by the aircraft per 2 minutes (listed to the immediate right of the cruising speed on CHART V3). Remember that this is only the time TO the target and that equal time will be used on the return flight. It should be noted here that since total flight time was calculated using the cruising speed, that speed must also be used when figuring time to target. Cruising speeds slower than those listed may be used at the discretion of the commander (especially when escorting attack aircraft with fighters that have a much higher cruising speed), however, faster speeds and the maximum speed should NOT be used. Thus, our TBD-1 above, if launched on Game Turn 10 would reach her target 140 miles away on Game Turn 48 (assuming everything else went as planned).

However, it will be desirable to send more than 4 aircraft in a single strike and when this is the case, some aircraft will lose flight time due to the time spent waiting for other aircraft to be launched and form up before proceeding to the target. One turn of flight time must be deducted from the total for each group of four aircraft launched after the first group if all are to form a single strike group. Thus, a strike group composed of 16 aircraft must deduct 3 turns of flight time from their total before deducting the time for the flight to the target. Our TBD-1 above, if part of that group, would not be over the target until Game Turn 51.

NAVIGATIONAL ERROR AND DROP-OUTS

There is a chance that, when unassisted by a radar equipped aircraft in the group, a strike group may not navigate perfectly to the target. There are several factors that might cause this, but two of the most important are the prevailing weather(and visibility) and the distance to the target (assuming, of course, that <u>correct</u> positions of the targets were given to the pilots). CHART L1 may be used to determine the number of miles a strike group of aircraft is off course (for strikes of 200 miles or less) as a function of the weather conditions. Thus, during Force 5 weather our strike group of 16 TBD-1s would be 40 miles off course (if there was no radar-equipped leader) on a dice roll of 71. This will have to be deducted from their total flight time and added to their ETA over target. Now, they will not be over the target until Game Turn 62 (since an additional 40 miles is another 11 turns) and will have to deduct 11 turns from their total flight time (their time remaining now is 91 turns[or 143 minus 52]). It is adviseable, therefore, to leave some extra flight time for the aircraft (either by reducing the cruising speed or waiting until the target gets closer). However, at this point, the mission may be aborted by the commander if he feels that his aircraft may not have enough flight time remaining to attack the target AND return safely.

It is also possible for some aircraft to be forced to drop out of the strike group and return to the base due to mechanical difficulties. CHART L2 shows the probability of drop outs as a function of the range (in nautical miles) to the target. Rolls may be made using the appropriate columns on CHART I1. Thus, for our TBD-1s, rolls of 12 and 83 (rolling twice using the 8 row since there are 16 aircraft total) would mean that 1 aircraft had to drop out and return to base--remember that our target is 140 miles away). This aircraft may be used again in a later strike since it is assumed to have been repaired by then.

Strike groups equipped with a radar-equipped leader (most U.S. and British aircraft from late 1942 on) are assumed to reach their target without any navigational error. Aircraft that are 50 miles off course are assumed to be completely lost and MUST return to base. Both navigational error and drop out should be figured for EACH STRIKE GROUP. Since the number of aircraft in a single strike group is up to the commander, this may affect any number of aircraft. For game purposes, a strike group is any number and types of aircraft that are proceeding to the target together (at the same speed, and same altitude level) and will arrive at the same time.

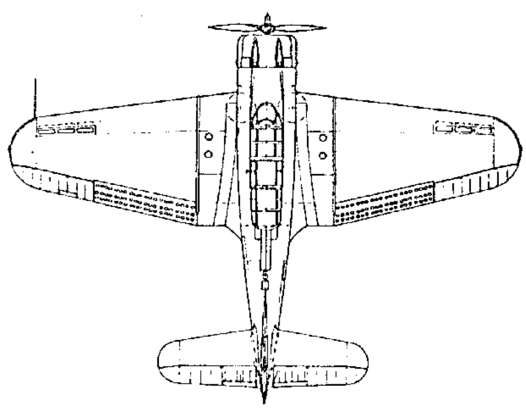
RAID DETECTION AND CAP VECTORING

One of the most important factors of naval air operations is the Combat Air Patrol (CAP). This is nothing more than a number of fighters assigned to protect a group of ships from attack by enemy aircraft. Launch of CAP is handled in the same manner described earlier. Total flight time should also be calculated but instead of a time to target, the time at which the aircraft should return (land) to base should be noted (allowing sufficient time for air to air combat). For game purposes, all CAP must operate in sections of four aircraft each and are assumed to be operating in the general area of the ship or ships it has been assigned to protect.

Each strike group is termed a "raid" and the probability that a raid will be detected depends upon several factors, the most important of which are the approach altitude of the raid, the presence of CAP above the target, and the presence of air search radar on ships of the target group. There are six general conditions as listed on CHART M1, one of which (and only one) will apply to the particular target. One of the percentile dice is rolled and compared with this chart. Thus, on a roll of 5, a ship (or ships) with air search radar and a CAP (number 6) will detect a raid when the raid is 10 game turns from reaching the ship. If, however, there was air search radar aboard the ship but no CAP above it, on the same roll the raid would only be detected 5 game turn away if the raid approached at Sea Level, and 9 game turns away if the raid was approaching at any level above Sea Level.

Only if the raid is detected can CAP groups be vectored to intercept. The major factor affecting the probability of intercept in this case is the quality of the air search radar aboard the target ships. CHART L3 shows the probability of successful CAP group vectoring as a function of the air search radar by the use of CHARTS Y. Thus, if the raid was detected by ships with 1940-42 air search radar, the base probability of CAP groups intercepting is 75% (.75). If there are 6 groups of CAP (24 aircraft total), and the dice roll was 43, then up to five of those groups may be considered to successfully have intercepted the raid on the first turn of detection. The CAP commander may not wish to vector all 5 groups to this one raid and may decide to hold some groups in reserve. If, however, on a later turn the CAP commander wishes to vector additional CAP groups, then he must roll as explained above, using the total number of CAP groups remaining as the left column number on CHARTS Y. Thus, if the commander in the situation above had decided to vector only 2 groups on the first turn, then his remaining number of CAP groups would be 4 (yes, he does have to roll again for those 3 he chose not to vector the first turn).

DOUGLAS SBD (Dauntless)

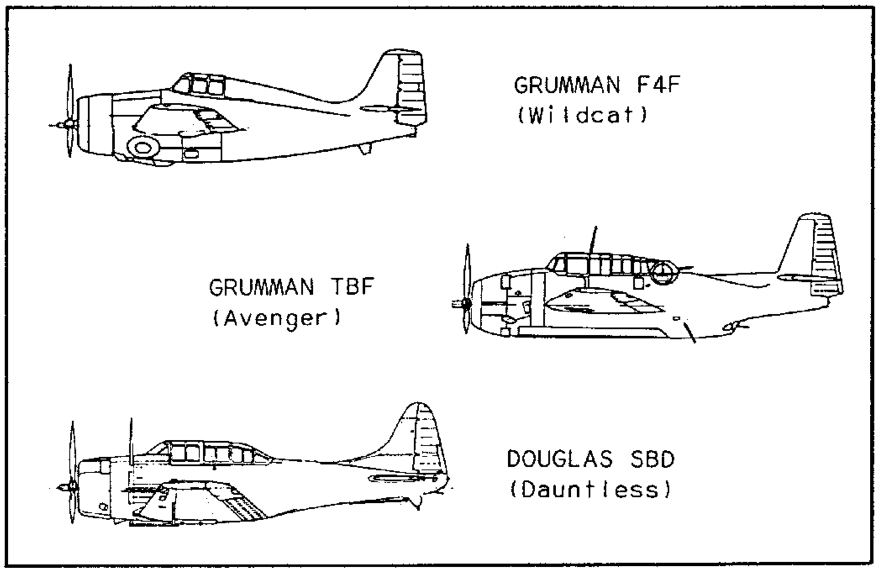


Successfully vectored CAP groups may attempt to engage the raid on the first turn of detection. It is not necessary to deduct flight time from the CAP aircraft for vectoring since, if successfully vectored, the group is considered to have arrived on the game turn of the CAP vector roll.

Remember that each strike group is considered a raid and must be rolled for seperately on CHART M1.

AIR TO AIR COMBAT

Each aircraft has been assigned an Attack Value and a Defense Value (see AIRCRAFT A/D FORMULA) based upon its performance and specifications. However, before any combat may take place, an "initiative roll" must be made based on the number of fighter aircraft present in each of the opposing groups. This roll will determine which aircraft commander has the advantage and it will be his decision as to how the attacking and defending aircraft will be allocated for air to air combat. Each commander rolls the percentile dice and adds the total of the two dice (i.e. 46 being counted as 10 and 70 being counted as 17) to the number of fighter aircraft in his group. The commander with the higher total has the initiative and may decide to use his fighters to engage the enemy fighters (regardless of the number of fighters in the opposing forces, if a commander has won the initiative roll, he may keep all of the enemy fighters from his attack aircraft by allocating a number of fighters equal to at least 50% of the number of enemy fighters) or, if a CAP group, the enemy attack aircraft. Thus, if a CAP of 8 fighters intercepts a raid of 6 fighters escorting 12 attack aircraft, and the raid commander has the initiative, he may allocate only 4 of his fighters to attack the CAP fighters and the CAP commander may not attack the attack aircraft during this turn of air combat. As a general rule, any commander with the initiative may attack with a given number of fighters, an enemy group of fighters equal to twice his strength, thus preventing the enemy fighters from any other combat during that turn. If the raid commander in the above situation had only 2 fighters and still won the initiative roll (talk about lucky!), then only 4 of the enemy fighters would be prevented from attacking the attack aircraft during that turn.



The initiative roll is still made, even when one of the opposing forces has no fighter aircraft.

Initiative rolls are made at the beginning of each turn of air combat and take into account the number of fighter aircraft remaining at that time.

After the initiative roll and allocation of aircraft, actual combat may begin. This is accomplished by dividing the attack value of one of the type of aircraft that are attacking by the defense value of one of the defending aircraft. This will result in a percentage to be used on CHARTS Y. Thus, if 12 A6M-2 Zekes are attacking 8 F4F-3 Wildcats the percent probability for the Zekes is 42% (22/52 = .423). Since all air combat during a game turn is considered simultaneous, then the attack for the Wildcats must also be considered, the actual probability for which is 23% (10/44 = .227). Since the difference of two or three percent makes little difference on CHARTS Y, the increments are by 5%, and the closest percent column should be used. Results with .025 or higher and .075 or higher should be rounded to the higher column. Thus, the Zekes would roll on the 40% column and the Wildcats on the 25% column. The number of aircraft (for use on the left column on CHARTS Y) must always be the NUMBER OF AIRCRAFT COMPRISING THE SMALLEST OF THE TWO OPPOSING FORCES. Thus, in the above situation the number used will be 8 for both sides when computing the number of aircraft shot down. On a roll of 62 on the dice for the Zekes, 3 Wildcats would be shot down in that game turn. Likewise, a roll of 08 for the Wildcats would mean that 4 Zekes had been shot down. It will be noted that even though the Zekes have a better probability in this case, through the use of CHARTS Y it is still possible for an "inferior" group to do better.

Combat resolution when fighters are attacking attack aircraft is done in the same manner. Fighters can never be considered to be engaging more than twice their number in attack aircraft during any one game turn. Thus, 12 fighters may attack up to 24 attack aircraft in one game turn. The number of aircraft is still considered the number of aircraft comprising the smaller of the two forces when using CHARTS Y. However, on the initial run (first turn of attack) for fighters against attack aircraft, the fighters may increase their percentage column on CHARTS Y by 10% (two columns) when figuring the number of attack aircraft shot down. Thus, a fighter group using the .35 column may use the .45 column when attacking attack aircraft for the first time.

Of course, when different types of aircraft are in the same group, their attacks must be calculated separately because of their different attack/defense values. Like fighters, attack aircraft are never considered to be engaging more than twice their number in opposing aircraft.

Air combat will continue until the game turn in which the attack aircraft reach the target. At that time they are considered to have broken free of any fighters and may attack their targets. Air combat may be terminated after ANY turn ONLY by aircraft with the faster maximum speed. All aircraft engaged in air combat use 3 turns of flight time for each game turn of combat. Thus our TBD-1s from Page 22 (remember them?), if engaged in air combat for two game turns would have only 85 turns of flight time remaining (91 minus 6 = 85). This is to simulate the higher fuel consumption due to high-speed maneuvering, etc. They will still be over the target on Game Turn 62, however.

Aircraft do not, of course, have an unlimited supply of ammunition. Fighters are considered to have sufficient ammunition with which to fight 6 game turns of air combat (12 minutes). Attack aircraft have sufficient ammunition with which to fight 10 game turns of air combat (20 minutes). Any aircraft that is out of ammunition may not return fire if engaged in an air combat situation.

ALTITUDES

It may be desireable to include the current operating altitude of the aircraft during each game turn. There are five basic altitude levels and these are as follows:

[S] 1. SEA LEVEL -- less than 2,000 feet
[L] 2. LOW LEVEL -- 2,000 feet to 10,000 feet
[M] 3. MEDIUM LEVEL -- 10,100 feet to 18,000 feet
[H] 4. HIGH LEVEL -- 18,100 feet to 27,000 feet
[V] 5. VERY HIGH LEVEL -- above 27,000 feet

All aircraft operating as a strike group (or raid) must be at the same LEVEL, however, they may be at different altitudes within that level. It will take some time for aircraft to change from one level to the next. All fighters may change up to 3 levels when in a dive and only one level when in a climb. These are per game turn, so that a fighter may dive from H to S in one turn and climb from M to H in one turn. All attack aircraft may dive up to 2 levels per turn and climb one level per 2 game turns. Of course, each type of aircraft has its own rate of climb and dive. If actually known, this may be used, however, for game purposes the above limitations can be used.

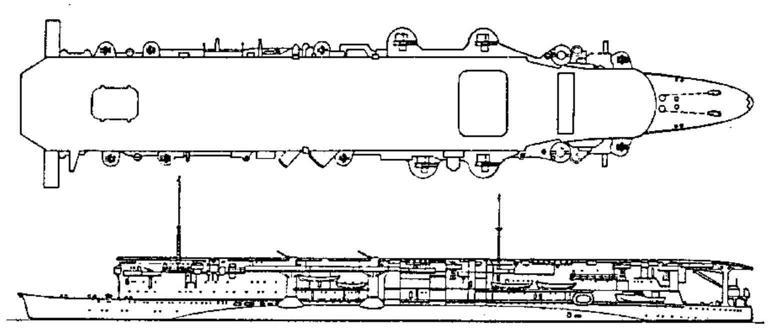
Thus, a CAP at H that is successfully vectored to the raid 5 game turns away from the target may not engage the raid until the raid is 4 game turns away if the raid is at S because it will take one game turn for the fighters to dive to that level. Any level changes less than the limitations above do not delay intercept and combat may take place immediately.

AA FIRE AND ATTACKS ON SHIPS

On the game turn during which the attack aircraft arrive at the target and resolve their attack on the ships, AA fire from the actual target and any screening AA fire from the ships around it must be resolved. Each battery of like guns aboard a ship has an AA Factor which is calculated by multiplying the number of guns in that battery by the factor for the type of gun as listed on CHARTS E. Thus, a U.S. ship with a battery of 8 5"/38 Mark 12 guns (without power ramming) has an AA Factor of 29 for that battery (8 x 3.6 = 28.8 which is rounded to 29). Of course, not all types of guns could fire effectively at the higher altitude levels so each is given a limitation in altitude levels. The 5"/38 Mark 12 could fire effectively at all 5 levels, but the U.S. 3"/50 Mark 10 could fire effectively only at the lower three levels. Thus, a ship armed with both of these weapons could only use the AA Factor for the 5"/38 guns when attacked by aircraft flying at level H or above. However, if attacked at level M or lower, the ship could use both of the AA Factors. All ships within 4,000 yards (foremast to foremast) of the actual target ship may elect to provide screening fire IN LIEU OF AA FIRE FOR THEMSELVES IF ATTACKED DURING THAT SAME TURN. Only AA Factors for guns capable of firing at level M or above may be used by the screening ships and the total resulting number is halved before adding it to the target ship's AA Factor. Thus, a ship armed with only 8 of the 5"/38 guns above would have an AA Factor of 15 to add to the target ships AA fire if it is screening for the target (29 x ½ = 14.5 which is rounded to 15). If desired, only the number of AA guns that can be brought to bear in the direction of the attacking aircraft can be considered, however this may prove much too time consuming.

Aircraft may attack in various ways, so the type of attack must also be considered when determining the total AA Factor. LEVEL BOMBING will expose the aircraft to AA fire from all guns capable of firing at that altitude level or above. TORPEDO BOMBING and SKIP BOMBING must be done at level S and so expose the aircraft to AA fire from all guns capable of firing at level S or above. DIVE BOMBING will expose the aircraft to AA fire from all guns capable of firing at level L or above (since most of the attack time is spent at that level while diving).

AA Factors may be adjusted according to the factors listed on CHART M3. Thus, our ship with the eight 5"/38 guns, if using VT fuse and radar and director fire control systems would have the original AA Factor of 29 increased to 60 (29 x 1.6 x 1.3 = 60.3 which is rounded to 60). This must be done for the target ship and all screening ships individually BEFORE adding the totals together.



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The total AA Factors for the target ship and all screening ships are then added together and divided by the total number of aircraft making the attack that during that turn. No more than 9 aircraft are permitted to attack a single ship during one game turn. The result is then divided by the Defense Value of one of that type of aircraft multiplied by 2. This calculation may be seen on CHART M2. The result of the completed calculation should match with the percentages along the top row of CHARTS Y or be rounded until it matches one of the percentages. A roll of the percentile dice is then made using the total number of aircraft (never more than 9) for the far left column on CHARTS Y. The result is the number of attacking aircraft shot down by AA fire before releasing their ordnance (actually, this is the number of aircraft shot down during the entire attack and if desired this may be split 60/40 to show the number shot down before releasing their ordnance and after releasing their ordnance).

Aircraft not downed by AA fire may release their ordnance according to the type of attack. LEVEL BOMBERS release their ordnance at their level of attack. TORPEDO and SKIP BOMBERS release their ordnance always at Level S. DIVE BOMBERS release their ordnance always at Level S (even though they only expose themselves to AA fire at Level L). Attack aircraft must always be (and remain) at their attack level from the time they have been detected up to the time (and including the time) of their attack.

Actual hits on ships are determined by the speed of the target ship and the level at which the aircraft released their ordnance. One of two different methods may be used. In METHOD 1 (shown on CHART M4), the target ship commander and the aircraft commander each draw a number of boxes on a piece of paper equal to the number indicated by CHART M4 (i.e. an attack at level L on a ship moving at 28 knots would mean that each draw a row of six boxes). The commander of the ship may then locate his ship by placing an X in any one of the boxes (or squares). At the same time, the commander of the aircraft may place any of his aircraft(that remain after AA fire) in any of the boxes by writing the number of aircraft dropping their ordnance in a particular box. The two sheets are then compared and any aircraft releasing their ordnance in the same box in which the ship was placed have scored hits. METHOD 2 (shown on CHART M5) is simply a percent probability system, the number from CHART M5 being matched with the appropriate number on CHARTS Y (top row) and the number of attacking aircraft (after AA fire) being listed along the far left column of CHARTS Y. Thus, in the above situation, the probability would be .15 (15%) and with 4 aircraft making the attack would mean that two of them scored hits if 02 thru 11 were rolled on the percentile dice. All of the ordnance carried by the aircraft is assumed to have hit the target if successful. It should be noted that the hit probabilities resulting from either CHART M4 or M5 take into account the fact that the target ship will be attempting to avoid bombs or torpedoes as much as possible.

The amount of armor penetration for a bomb and the amount of damage it will cause are both a function of the weight. CHART M7 lists the Damage Factors and the Penetration Class for bombs according to their weight. CHART M6 shows the range column to use on CHARTS R in determining the penetration of the bomb as a function of the height at which it was released. Hit Location should be determined using the Long Range column on CHART G1. Penetration and damage can be calculated using the same systems explained on Pages 11, 12, and 13, but using CHART M8 in place of CHART G2. Critical Damage is calculated in the same manner, as are shipboard fires, however, the probability for CD is greater as noted on CHART M8. Damage caused by torpedo hits are calculated in the same manner as explained on Pages 17 and 18.

Skip bombing, even though performed at the same altitude level as torpedo bombing, was more accurate. When used, a skip bomber will have twice the probability of scoring a hit as that of any level S attack. Thus, when using CHART M4 for skip bombers, the first row should read 1, 2, 2, 3, 3, and when using CHART M5 for skip bombers, the first row should read 1.00, .70, .50, .40, .30. Skip bombers should use the Short Range column for Hit Location on CHART G1.

KAMIKAZE ATTACKS

The standard Kamikaze tactic was to operate in groups of three aircraft. Any aircraft so designated must expose themselves to AA fire from all guns capable of firing at level S or above. If not downed by AA fire, then the aircraft uses the method described for skip bombers above to determine its probability of hitting the target ship (CHART M4 or M5 may be used). In addition to damage caused by the bombs carried by the Kamikaze aircraft, the aircraft itself will do Damage Points equal to a percentage of its Defense Value. CHART V4 shows the modifiers to the aircraft Defense Value according to a roll on the percentile dice. Thus, a Kamikaze aircraft with a Defense Value of 45 would cause 68 DP to a ship if 52 were rolled. Remember that this amount is only for the aircraft itself. Any bombs carried by the aircraft will also cause damage that is calculated in the usual manner using the penetration for LOW LEVEL on CHART M6. Any Kamikaze hit on a ship (with or without bombs) will cause automatic Critical Damage (use Short Range column on CHART G1 for hit location) and a shipboard fire, the severity of which is the total rolled on two dice.

AIRCRAFT RETURN AND RECOVERY

Any aircraft that survive air combat and AA fire may return to their base. Since most World War Two carriers were equipped with homing beacons, there is no need to determine navigational error on the return flight. However, CHART L1 should be used for aircraft returning to carriers that are not equipped with homing beacons. Carriers may recover aircraft at the rate of 3 per game turn during normal conditions and 2 per turn during Force 6 weather or worse. Land bases may recover aircraft at the rate of 8 per game turn regardless of conditions. Shipboard floatplanes may be recovered at the rate of 1 per 5 game turns (per catapult) and only during Force 5 conditions or better. Ships recovering aircraft in this manner must come to a complete stop before hauling the aircraft aboard.

It should be mentioned that for each turn in the air, an aircraft will use one turn of flight time while waiting to be recovered. Thus, any aircraft that run out of flight time before they can be recovered are assumed to have landed in the water and although the crew may be safe, the aircraft is a total loss.

ATTACKS AT NIGHT

Radar equipped aircraft operating at night will score hits equal to about 70% of those operating under normal daylight conditions. Likewise, radar-directed AA fire should be reduced by 70% (accuracy) and non radar directed AA fire reduced by 50%.

DAMAGE TO CARRIERS AND LAND BASES

Any carriers or land bases that have received damage risk the loss of launch and recovery operations. For game purposes, CHART U4 may be used, substituting the column at the right to read PROBABILITY OF LOSS OF LAUNCH/RECOVERY OPERATIONS. Thus, on a roll of 40 or less a carrier or air base with 20% damage would lose launch and recovery capability. This may be considered temporary damage and a roll on CHART N5 can be made to determine duration of loss.

AIRCRAFT A/D FORMULA

The Attack/Defense values for aircraft have been computed from a involved formula. To be perfectly accurate, one must take into account many more factors than are readily (if at all) available. In addition to to that, most of the sources consulted provided data that conflicted one another (especially where normal and maximum ranges are concerned) for the same model aircraft. This is understandable when one takes into account the variety of conditions that may be encountered by an aircraft in flight as well as whether the aircraft is factory fresh, or a seasoned veteran.

Thanks must here be expressed to Mr. Lou Zocchi for his invaluable assistance in both providing data and the maneuverability calculation. His cooperation made much of this possible.

The Defense Factor is perhaps the easiest calculation and this is as follows:

$$(\text{EMPTY WEIGHT OF AIRCRAFT})^{.46} = \text{Defense Factor}$$

The Attack Factor takes into account the firepower and maneuverability of the aircraft. There is a difference between the calculation for fighter aircraft and for bomber types. For fighters, a firepower rating was calculated by multiplying the number of forward firing guns by the factor listed below for each type of gun:

.303", 30 cal., 7.7 mm, 7.9 mm, 7.5 mm	1.25
50 cal., 12.7 mm, 13 mm, 15 mm	2.50
20 mm	8.50

This result is then divided by the result of a maneuverability calculation, which is a calculation resulting in the maximum speed at which an aircraft can make a 2G turn.

$$\sqrt{\frac{\dfrac{\text{WEIGHT (EMPTY)}}{\text{WING AREA (sq. ft.)}}}{1.56}} \times 19.66 \times 1.414 = \text{Maximum speed in MPH to complete a 2G turn}$$

$$\frac{\text{FIREPOWER FACTOR}}{\text{MAX SPEED FROM ABOVE} \times 0.01} = \text{Attack Factor}$$

For bombers, since their attack is considered to be defensive area fire, the firepower factor of ALL guns is added together and the result is square-rooted. This number is then the total Attack Factor for a bomber.

SUBMARINES AND ASW

Submarines are a unique type of naval weapon and must be considered apart from other warships. They also, however, deserve more detailed rules than can be presented in this rulebook. For this reason, only basic rules for conducting submarine operations will be given.

During search, submarines may be sighted by aircraft and other ships only when the sub is surfaced. During battle, submerged subs are not placed on the playing area until detected by sonar or asdic. Hidden movement may be accomplished by the use of a 360° protractor or compass rose (the larger the better) fastened to the playing area. Range and distance bearings may be taken from the center of the protractor at the end of each submarine's movement so that its position can be plotted by the commander of the sub. When recording positions of subs, the direction of movement and the current depth should be noted also.

In a controlled ascent or descent, a sub may change a maximum of 250 feet of depth per game turn. Depth changes are always in increments of 50 feet and subs may dive to a maximum of 600 feet without being affected by pressure extremes. However, each turn a sub remains at depths below 600 feet, it risks a 30% probability of being crushed by pressure. Thus, if the commander rolls 01 to 30 on the percentile dice when the sub is below 600 feet, then the sub is lost and removed from the playing area. Subs may turn up to 360° during any game turn.

Firing torpedoes from subs in done in the same manner as described for surface ships, however, since periscope depth is considered to be 50 feet, no torpedoes may be fired at depths below 50 feet.

Sonar or asdic contact will be made by any ship so equipped (most Destroyers and some Cruisers) if the ship passes within 5,000 yards of the position of the submarine during a game turn. No ship moving faster than 18 knots may receive sonar or asdic contact regardless of the range of the sub and all ships damaged may lose their sonar/asdic capabilities according to CHART U4. When a contact is made, the sub is placed on the playing area in the position when contact was made and will remain on the playing area until out of range of any effective sonar/asdic sweeps.

Depth Charge attacks (DC) may be made by any ship so equipped that passes within 500 yards of the position of the submarine (measured from the foremast to the conning tower). The ship may drop a maximum of 6 DC per game turn. Each DC may be set to explode at any depth (in 50' increments) or all at the same depth. If the current depth of the submarine matches that of any DC depth, then the sub has been hit. Only DC at the correct depth setting are considered hits.

Unlike other ships, submarines do not receive DP as a calculation of its damage, but rather receive only Critical Damage. Both DC, shell, and bomb hits are all scored in this manner, using CHART N3 to determine the extent of the damage. One dice roll on CHART N3 is made for each hit from a DC, shell, or bomb. Regardless of depth, no sub may make a torpedo attack while under fire.

Ahead Throwing Weapons (ATW) such as hedgehogs and squids can also be used if carried aboard the attacking ship. 6 depths may be chosen by the commander of the ship for each salvo fired (one per game turn), as explained for DC, except that the attacking ship need only be within 1,000 yards of the position of the sub in order to fire ATW.

NIGHT ACTIONS

Night battles may be fought using the same rules as for daylight actions with a few exceptions. The maximum visibility as listed on CHART C2 should be reduced by about 60%, assuming bright moonlight, and somewhat less for poorer light conditions. This visibility should be further reduced by atmospheric conditions as shown on CHART C1. Of course, the proper reductions listed on CHARTS H should also be employed according to the conditions. Ships using searchlights to assist in scanning for other ships increase their visibility by 20% under good visibility conditions and somewhat less during periods of low visibility.

Searchlights, when used to assist fire control, have a maximum range during good visibility conditions of 6,000 yards. Two searchlights may be combined on the same target to increase the range to a maximum of 10,000 yards. Loss of searchlights may be determined by using CHART U4.

Star shells may be fired by any gunmount or turret mounting guns of 3" to 6" caliber. This turret or gunmount must be on the engaged side and is assumed to be firing starshells during the entire turn (and, thus may not fire offensively). Each turret or gunmount so designated will illuminate an area 3,500 yards by 3,500 yards for the entire game turn and any ship in this area is considered in the pattern. However, at least 50% of the ship's length must be within this area in order to be considered illuminated. For game purposes, the maximum range at which a starshell may be fired is 75% of the normal maximum range for the type of gun. All starshell patterns should be designated before the movement of ships during a game turn and any ship that spends the majority of its movement allowance in the pattern, or ends its movement in the pattern is considered illuminated.

Ships equipped with radar are assumed to have IFF (Identify Friend or Foe) electronics so there is no danger of firing on a friendly ship. However, there is a possibility that when two friendly forces approaching from different bearings without IFF meet, they may fire upon one another. The referee should keep this in mind and no ship, until identified, should be placed on the playing area but rather represented by a marker (or covered with a piece of cotton).

BARRAGE FIRE OPTION

Any ship mounting guns capable of firing at a higher rate than allowed by CHART G3 may elect to commence Barrage Fire (BF). In the BF mode, a ship may fire up to twice the rate allowed by CHART G3 (if its maximum rate of fire as listed in the SHIP DATA SHEETS will allow it to do so). However, the final total resulting from the use of CHARTS H should be reduced by 40% (multiply the result by 0.6) before using CHART I1 to determine hits. If using the 01-10 column because the result from CHARTS H was less than 0, then use the 01-10 column and reduce the final number of hits scored by 40% instead.

The BF option should only be used during extreme circumstances and not be available as a general rule.

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It would be impossible to list every source consulted during the design and writing of SEEKRIEG 4, so only a list of those works which provided the majority of information are listed below. Much of the detailed information came from various issues of WARSHIP INTERNATIONAL published between 1966 and 1981 and sources consulted at the Naval History Division, Washington Navy Yard, Washington D.C. Several volumes of WARSHIP magazine published by Conway Maritime Press have also been consulted. Assistance provided by the U.S. Naval Institute, both in the publication of their excellent books and in providing reprints of articles from the PROCEEDINGS has been invaluable. Those readers requiring more information on a particular aspect of naval warfare are encouraged to write us for a more detailed bibliography of suggested reading.

Richard R. Sartore

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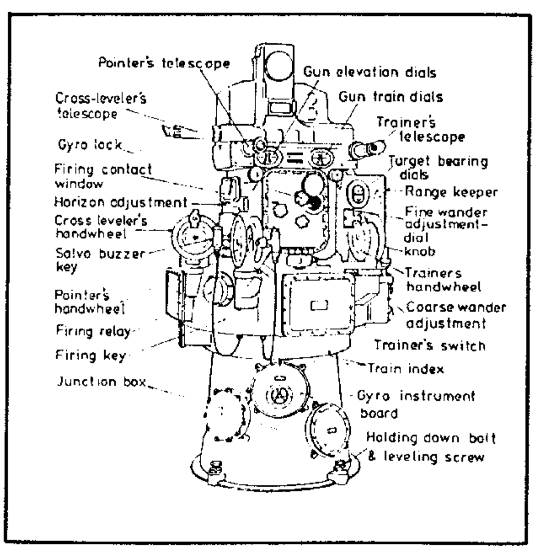
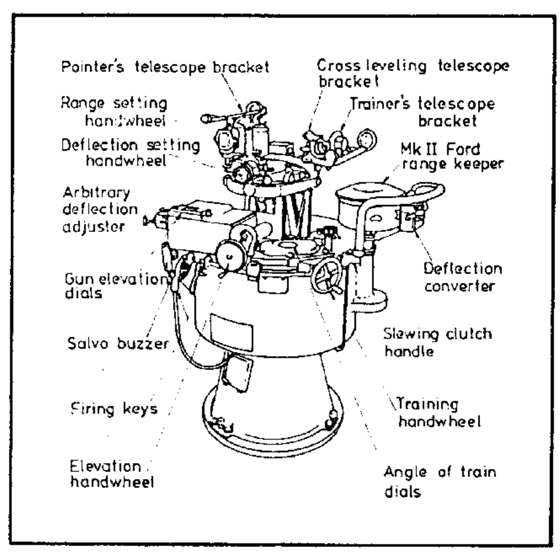
TURN SEQUENCE CHART

1. If not the result of a prior map search in which environmental factors had already been stated, the current visibility, sea state, wind speed and direction, and cloud ceiling should all be decided.
2. Decide which side moves ships first by either alternating each turn or rolling for initiative (high roll moves last).
3. Move ships according to their current speed [PAGES 6-7 / CHARTS A B3]
4. Plot gunfire and torpedo fire by all ships. This is done by noting the name of the target ship and the estimate of the range (if using Range Estimation Method) as well as which guns are firing at the target (or number of torpedoes fired). Also, note type of shell or torpedo used (AP, COM, HE etc. or Contact/Magnetic).
5. Check the line of sight and arcs of fire for all guns in a questionable aspect [PAGES 7-8 / CHARTS J1 J2].
6. Measure all ranges for ships that have fired.
7. Calculate probability of hits for each ship [PAGES 9-10 / CHARTS H1 or H2 or H3]
8. Check the rate of fire for each battery to determine number of shells on target [PAGE 8 / CHART G3].
9. Determine number of hits (if any) on target ship [PAGES 8-10 / CHART I1].
10. Determine location of each hit [PAGE 11 / CHART G1].
11. Determine penetration of shell according to the shell type and armor type (it may be helpful to adjust each ship's armor amount listed by the Armor Type Factors on CHART Q1 before the game begins). If required, check for pass-throughs [PAGES 11-12 / CHARTS R1 or R2 G2].
12. Calculate damage done by each hit in DP using the damage factors on CHARTS R [PAGES 12-13 / CHART G2].
13. Check for any Critical Damage from each hit AND Shipboard Fires during the same roll (doubles) [PAGES 13-14 / CHART G2 N].
14. Measure and note all information required for the Torpedo Calculation if any torpedoes have been fired during Step 4 of this turn [PAGES 17-18 / CHARTS S T]. If their speed allows them to reach the target this turn, then check for hits and calculate damage at this time.
15. Adjust any DP received by using Optional Damage Control [PAGE 20 / CHARTS V1 V2].
16. Check status of any shipboard fires caused during the PREVIOUS turn [PAGE 14 / CHART G4].
17. Adjust for any speed or guns lost from DP received this turn by using the Loss Factors [PAGE 13].
18. Check for loss of radar and check morale for each ship when applicable [PAGES 16 19 / CHARTS U2 U4].
19. Note any evasive maneuver or smoke screens for next turn [PAGES 15-16].
20. Begin sequence again at Step 2 above.

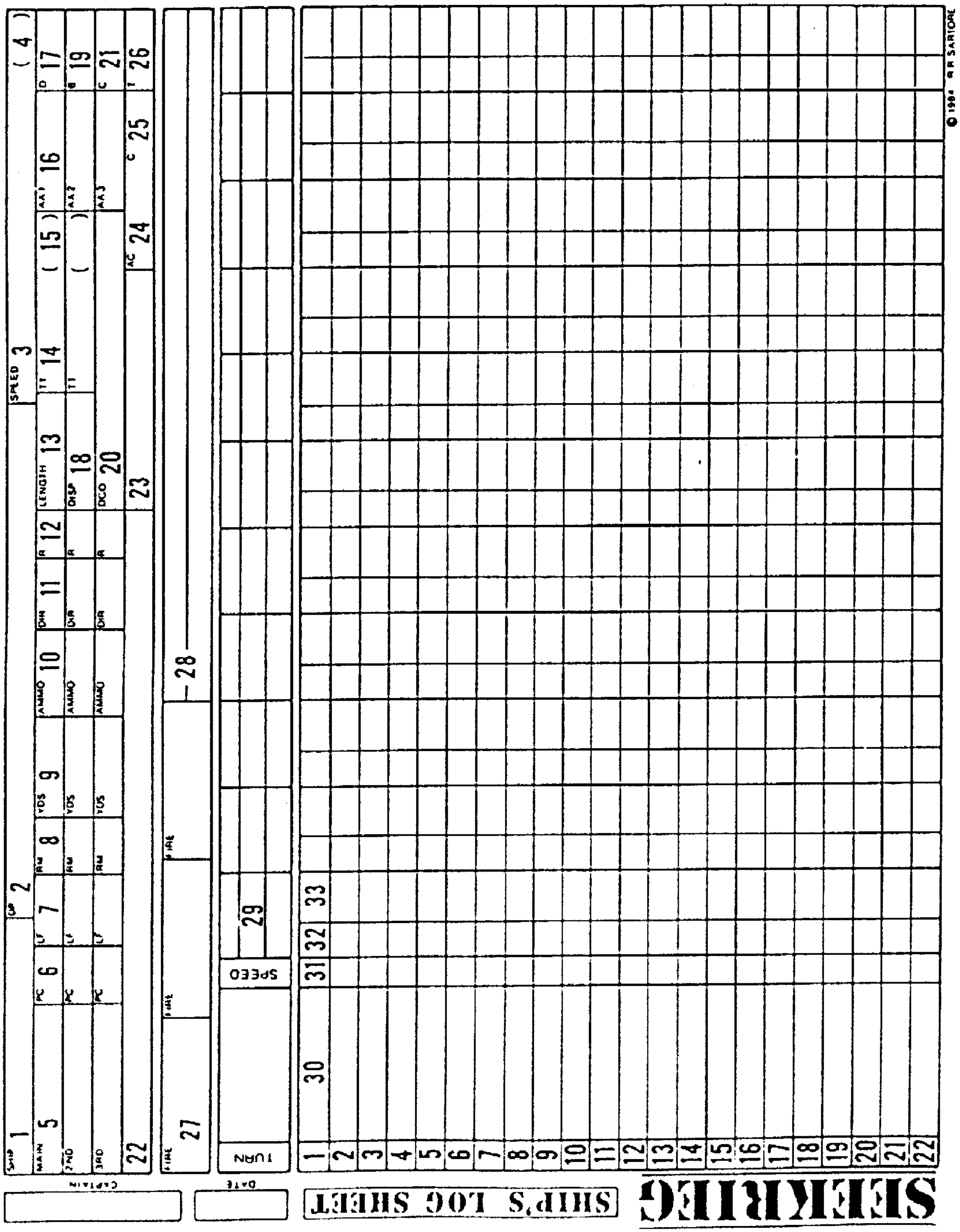
NOTE: Attacks by aircraft on ships and the resulting AA fire can be resolved immediately after Step 6 [PAGES 25-27].



MARK 18 DIRECTOR (US)



MARK 16 DIRECTOR (US)



SEEKRIEG

SHIP'S LOG SHEET

CAPTAIN

DATE

SHIP 1 | CP 2 | SPEED 3 | (4)

MAIN 5 | PC 6 | LF 7 | RM 8 | YDS 9 | AMMO 10 | DIR 11 | R 12 | LENGTH 13 | TT 14 | (15) | AA1 16 | D 17

2ND | PC | LF | RM | YDS | AMMO | DIR | R | DISP 18 | TT | ( ) | AA2 | B 19

3RD | PC | LF | RM | YDS | AMMO | DIR | R | DCO 20 | AA3 | C 21

22 | 23 | AC 24 | C 25 | T 26

TIME 27 | TIME | TIME | 28

TURN | SPEED 29

30 | 31 | 32 | 33

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

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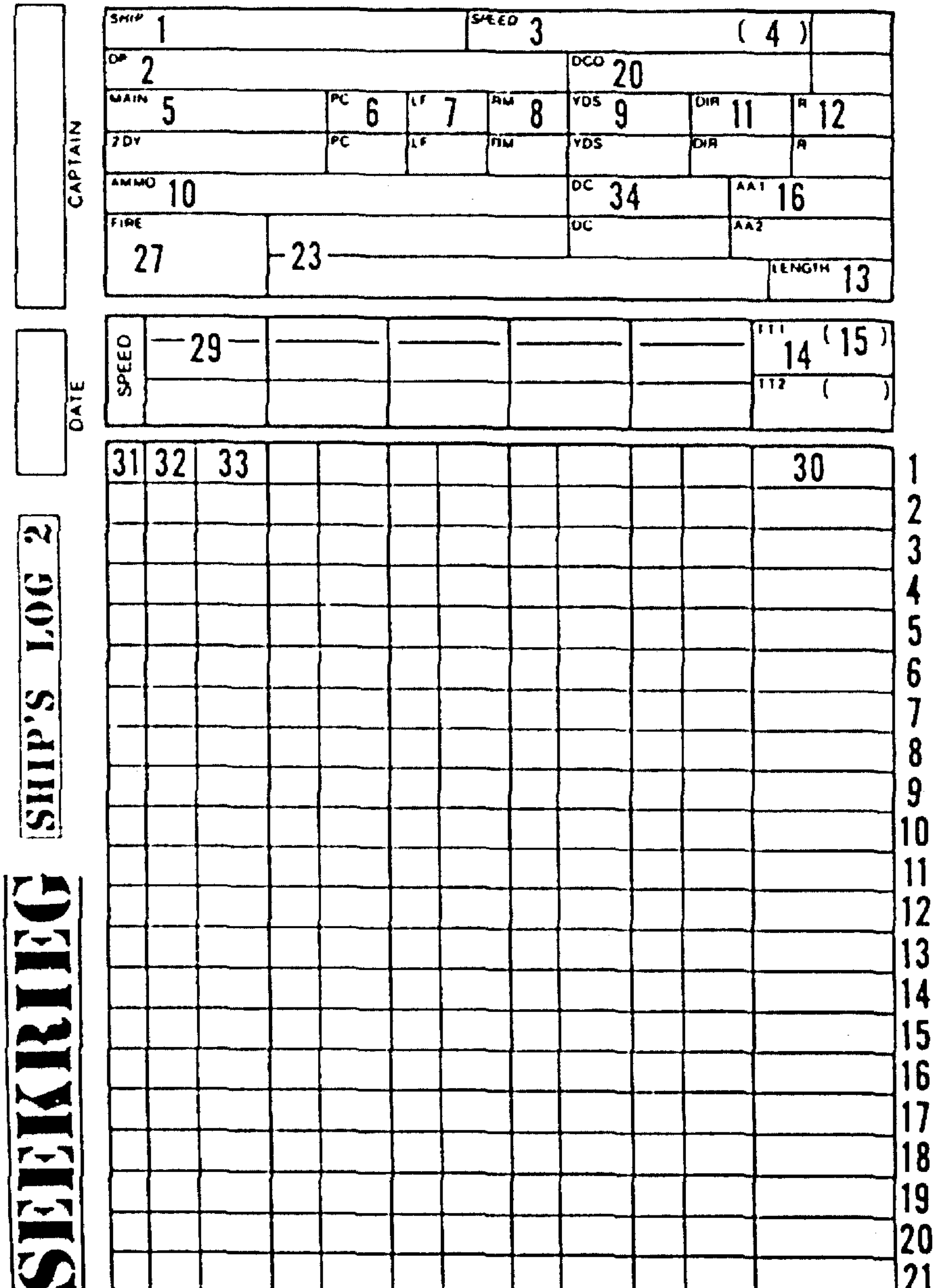
SEEKRIEG
SHIP'S LOG 2
CAPTAIN
DATE
SHIP 1
SPEED 3
(4)
OP 2
DCO 20
MAIN 5
PC 6
LF 7
RM 8
YDS 9
DIR 11
R 12
2DY
PC
LF
RM
YDS
DIR
R
AMMO 10
DC 34
AA1 16
FIRE
27
23
DC
AA2
LENGTH 13
SPEED
29
TT1 14 (15)
TT2 ( )
31
32
33
30
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

1. Name of ship.
2. DP of ship and space to keep track of DP taken.
3. Maximum speed of ship and space to keep track of losses to max. speed.
4. Loss Factor for speed.
5. Number, size and caliber of guns (i.e. 8x15.0"/42).
6. Penetration class of guns.
7. Loss factor for guns.
8. Rate of fire for guns.
9. Maximum range of guns.
10. Ammunition allowance (number of shells).
11. Type of gun director (number from CHARTS H).
12. Radar fire control (number from CHARTS H).
13. Length of ship in feet.
14. Number and size of torpedo tubes (i.e. 4x21.0").
15. Loss factor for torpedo tubes.
16. AA Factor for each battery of AA guns.
17. Deck armor in inches.
18. Displacement of ship in tons.
19. Belt armor in inches.
20. Damage control points available.
21. Con armor in inches.
22. Space for notes or to provide space for a fourth battery of guns.
23. Space for notes.
24. Number of aircraft available.
25. Number of catapults aboard.
26. Turret armor in inches.
27. Space for keeping track of shipboard fires.
28. Space for notes.
29. Columns for keeping track of each turret. First line should contain turret number (i.e. A, B, X, or Y OR 1, 2, 3, etc.) and second line the number of guns in the turret. Secondary and other batteries may be listed in the same manner if space permits or may be grouped each battery to a column (i.e. PORT 8x5.0").
30. Notes for each turn (i.e. launch torpedoes, lay smoke, evasive maneuver).
31. Current speed for each turn.
32. Designated target ship for that turret or battery for each turn.
33. Range estimate for that turret or battery for each turn (or type of shell being fired if not using range estimation method).
34. Depth charges available (for port & starboard sides).