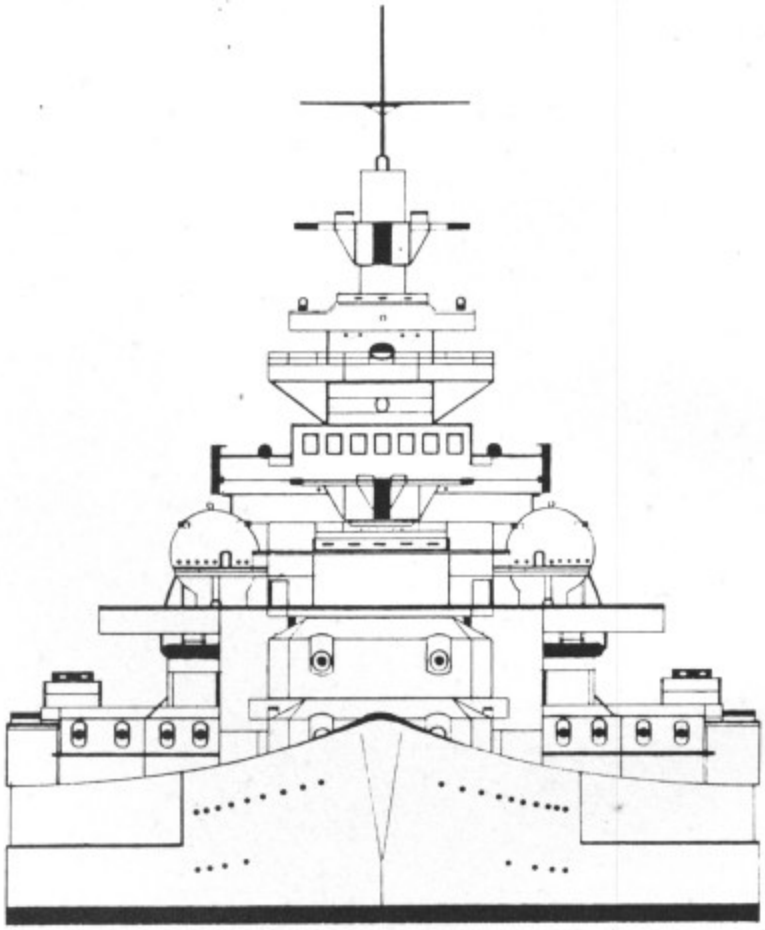
SEEKRIEG

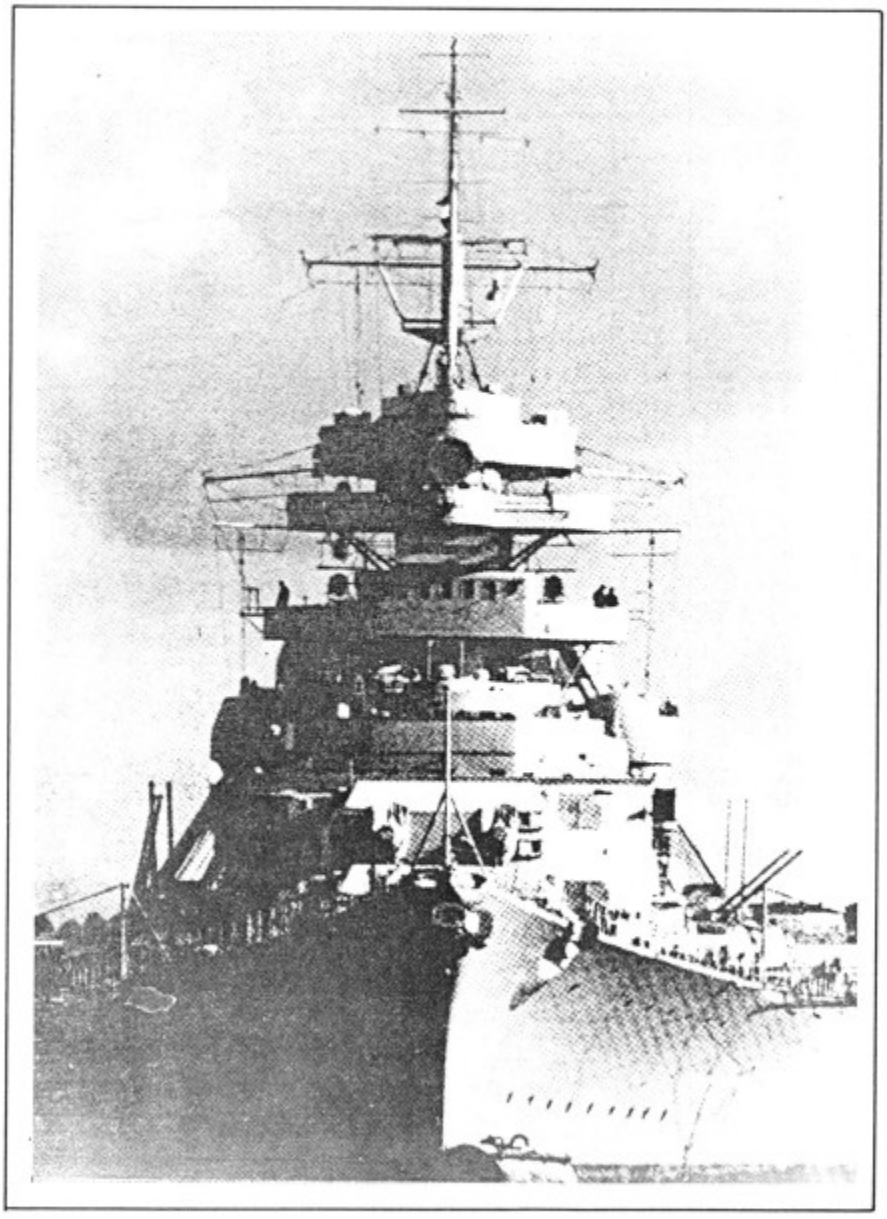
FOURTH EDITION



RULEBOOK

Richard R. Sartore & *Jack L. Joyner*

SEEKRIEG



BY

R. SARTORE J. JOYNER

SEEKRIEG

FOURTH EDITION

CONCEPT AND DESIGN

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TEXT AND GRAPHICS

RICHARD R. SARTORE

PRINTED IN THE UNITED STATES OF AMERICA

SECOND PRINTING 1984

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

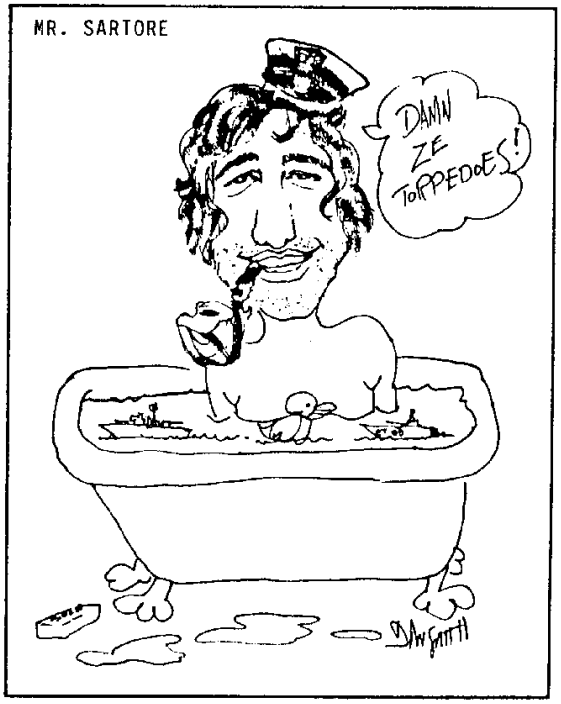
INTRODUCTION

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.



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).

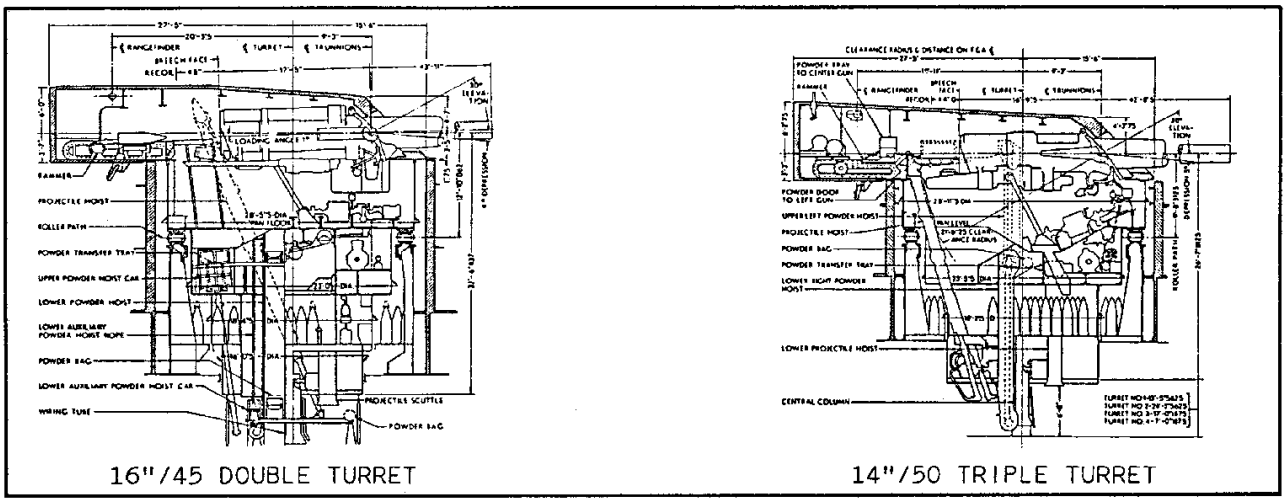
We sincerely hope you enjoy this edition of SEEKRIEG 4 as much as we enjoyed designing it. The best of luck and a fair wind to you always...

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.

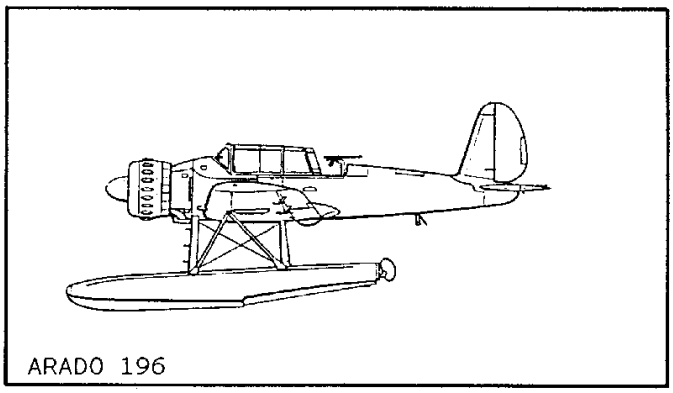
There is a slight difference between the Northern and Southern Hemispheres so the times listed on CHARTS K1 and K2 must be adjusted by the times listed on CHART K4.

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 per hour 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 byrolling 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 = $\frac{1}{4}$" (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.

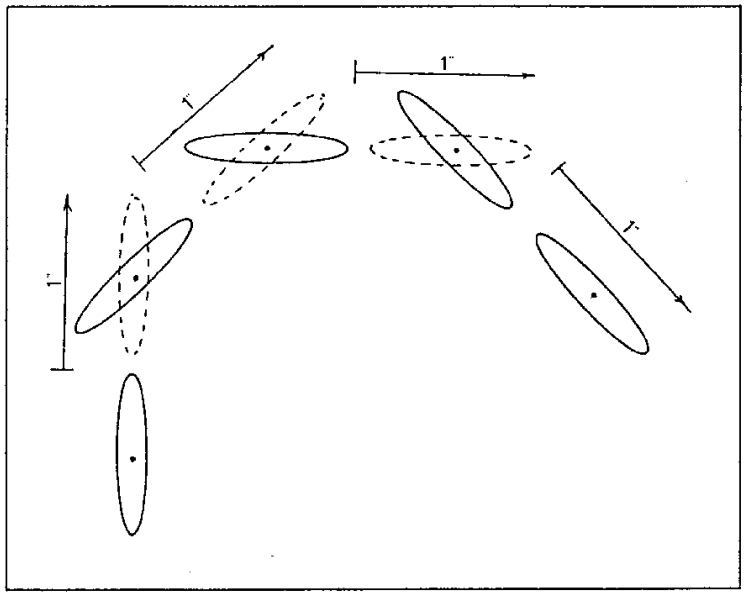
CHART A1 shows the maximum distance (in inches) that a ship can move during a single BATTLE PHASE turn at any given speed. Ships may decelerate under power at a rate of 0.40 x REMAINING SPEED AT END OF TURN, so that a ship moving 30 knots may slow down to 12 knots the next turn and then 4 knots the turn 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 $\frac{1}{2}$ 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 ¼ movement and that no turn is made after its last ¼ movement. Movement is split into equal parts and no forward speed is deducted from ships making turns of any degree.



Collisions, both intentional and accidental 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.

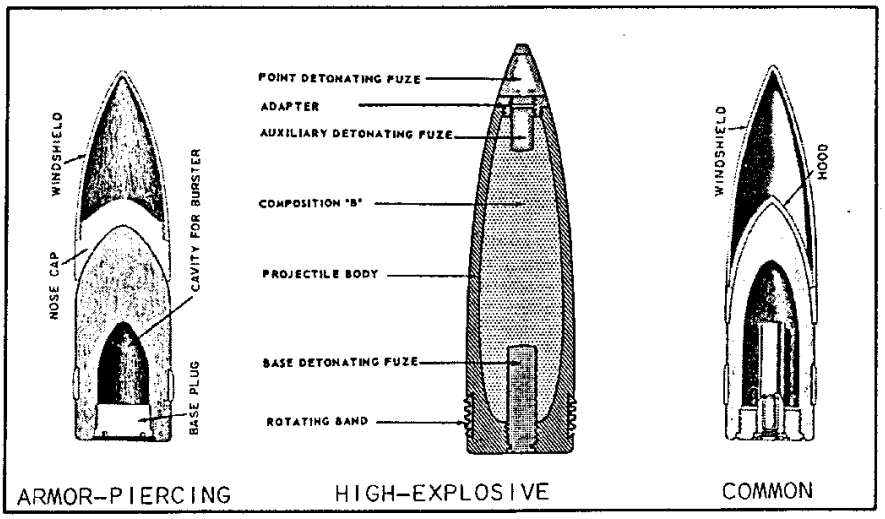
Any ship that intersects the line of sight within the lower 10% of the FS gun range will prevent the FS from firing at its target (regardless of size). Likewise, any ship within the lower 3% of the FS gun range cannot be fired upon due to the fact that the guns cannot depress enough to be brought to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

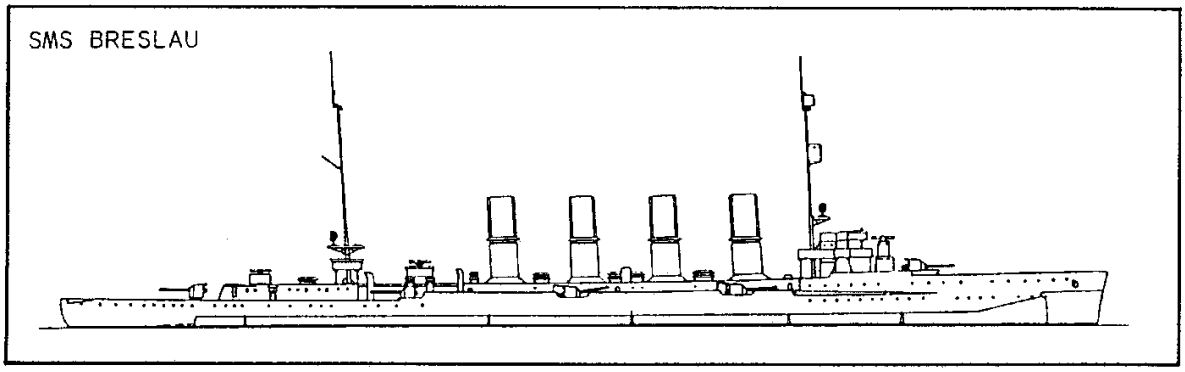
13. SMOKE SCREENS -- Any ship at least 50% covered by either funnel smoke or chemical smoke is considered hidden by a smoke screen. This does not apply to ships laying the screen.

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).

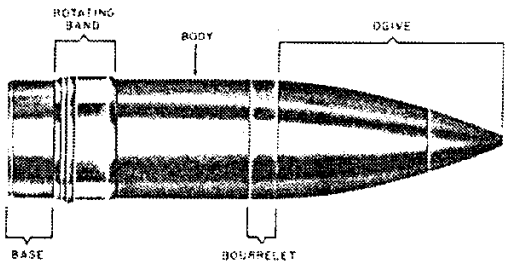
To determine the amount of armor a particular shell will penetrate, use the Penetration Class listed for the gun in the SHIP DATA SHEETS (item E) and match this with the Penetration Class listed in the far left column of CHART R1. Along the top of this chart is a breakdown of the ranges (in yards). Thus, 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 ½ 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" (½ 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 87½°. However, that same shell could penetrate only 0.67" of armor at 5,000 yards when striking at an angle of 2½°. 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 cap-

abilities (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%.