FOR OFFICIAL USE ONLY.

Attention is called to the penalties attaching to any infraction of the Official Secrets Act.

O.U. 5243.

INSTRUCTIONS

FOR

TACTICAL AND STRATEGICAL EXERCISES.

Carried out on Tables or Boards.

January 1921.

[*Superseding Instructions for Tactical and Strategical Exercises as carried out at the R.N. War College, Portsmouth* (*No.* 42, *January*, 1914).]

ADMIRALTY,
NAVAL STAFF,
TACTICAL SECTION.

CONTENTS.

TACTICAL INVESTIGATIONS AND EXERCISES CARRIED OUT ON TABLES OR BOARDS.

1. Tactical Table or Board—Uses of.—The tactical table or board is used for :—

(*a*) Tactical investigations.
(*b*) Tactical exercises.

2. Object of Tactical investigations.—(i) To formulate common tactical doctrines based on sound principles, which should represent a consensus of informed opinion and be generally accepted as sound.

(ii) To investigate the application of the principles of Command and Tactics to concrete problems in the organisation and tactics of a fleet and in the co-operation of all arms.

3. Conduct of a Tactical investigation.—In order to arrive at unbiassed conclusions the competitive element must be eliminated, and the plans, relative situations and moves of the opposing fleets should be freely discussed by all taking part in an investigation ; both fleets being formed, moved, and, if necessary, moved back and removed, as considered to be most likely in practice in accordance with the object of the particular investigation.

The conclusions arrived at should be briefly summarised in writing and the advantages and disadvantages of various plans, formations, moves, etc., under the most probable situations that may occur, should be given. Officers should thoroughly discuss the investigation before testing on the Tactical Table.

It is important that the object of each investigation should be clearly stated as well as the principles on which each has been based.

It is considered that from three to five officers form usually the best number for any one investigation, but where, for example, varying visibilities have to be taken into consideration, and time does not permit of the same officers considering all cases of the problem, additional sections should be formed.

4. Object of Tactical exercises.—(i) To practise and test the results obtained in tactical investigations in the most practical manner possible on the tactical table as a preliminary to tests at sea.

(ii) To afford opportunity for practising decentralisation of Command, and the full initiative of subordinate Commanders in accordance with common doctrine and a particular plan of battle.

(iii) To afford opportunity for exercising the practical application of tactical principles and doctrines in (i) the conduct of a fleet during the approach, (ii) the tactical co-operation of all units and all arms in action.

(iv) To practise the sending and receiving of enemy reports.

(49)3059 Wt 25721 D 154 500 1/21

(v) To exercise Staff officers in the observation of enemy movements and in keeping the strategical and tactical plots.

(vi) To exercise officers commanding fleets and units in acting on the information shown in the plots.

5. Conduct of a Tactical exercise.—It is considered that no hard and fast method of assessing damages should be drawn up or adhered to, but that the value of an exercise lies chiefly in drawing attention to, and, where possible, in summing up, the main points of the various tactical situations presented during an exercise at the time they occur, with consequent opportunities for short discussions.

It is of little value to allow an exercise to continue or reach a conclusion if this is not done. Otherwise the situations are forgotten, and if obvious mistakes made by one or more officers taking part are allowed to pass, the results obtained may be entirely falsified.

A mistake that would obviously not occur in actual practice, but made owing to lack of time for preparation and dissemination of the C. in C.'s tactical ideas, or to the unreal conditions of the tactical table, should be at once pointed out and the move put back and re moved. This, however, does not apply to mistakes which may obviously occur in actual practice due to practical difficulties in co-operation on account of visibility, etc.

6. Guide to the discussion and summing up of situations presented during the exercise and of the general conduct of the exercises. GENERAL CONSIDERATIONS.—The following general considerations, all of which have a most important influence in action, are given as a guide to appreciating the situations presented and the general conduct of the tactical exercise both by the umpires and the officers taking part. They should be fully considered before any decision is given.

I.
- (*a*) System of command.
- (*b*) Initiative of subordinate commanders.
- (*c*) Degree of co operation of the various units and arms.

II.
- (*d*) Moral effect.
- (*e*) Surprise ; rapidity and energy of the attack.
- (*f*) Gaining and keeping the initiative.
- (*g*) Value of a vigorous offensive.

III.
- (*h*) Concentration of superior force on a part of the enemy ; possibility of countering it, with method and time taken.
- (*i*) Distribution of fire.
- (*j*) Effect of state of sea, direction and force of wind, position of sun, varying visibility on different bearings due to natural or artificial causes.
- (*k*) Establishment of early and rapid hitting with guns and torpedoes.
- (*l*) Possibility, and method, of repelling torpedo attacks.

TECHNICAL CONSIDERATIONS. The following technical considerations, details of which are given in the Appendices, should be taken into consideration when discussing and summing up the various situations presented during the exercise :—

(i) Extreme hitting ranges of various types of guns for (*a*) Indirect fire ; (*b*) Direct fire ; and probable percentage of hits. (Appendix I.)

(ii) Ranges at which effective fire can be obtained from various types of guns and probable percentage of hits. (Appendix I.)

(iii) Value of varying degrees of concentration of gunfire at various ranges, and probable percentage of hits. (Appendix I.)

(iv) Whether A, B, C, or D arcs are bearing. (Appendix VIII.)

(v) Torpedo fire. (Appendix II.) :—

(*a*) Range and speed of torpedoes.
(*b*) Rate of fire.
(*c*) Numbers of torpedoes fired.
(*d*) Ranges at which torpedoes can be fired depending on relative bearing and course and speed of target ships.
(*e*) Method and value of concentration of torpedo fire.
(*f*) Danger to own ships from own torpedo fire.
(*g*) Relative track of torpedoes to course of enemy.
(*h*) Order of enemy fleet, squadrons, or divisions.

7. Duties of Officers. Officers will be selected for each fleet, Red and Blue, to carry out the following duties :—Commander-in-Chief with Chief of Staff and Staff officers, Officers in command of Units with Chief Staff Officer and Staff Officers, movers. In some cases it may be permissible that the officer commanding a unit should also act as mover.

As a general rule, Special ideas, Red and Blue, will be issued to the respective Commanders-in-Chief, who will, after consulting the officers on their side as necessary, prepare and hand in to the umpire a summary of their proposed plan of tactics. This should deal, amongst other things, with the following main points as far as applicable :—

Object of the Commander-in-Chief.
Main principles on which plan of battle is based.
System of command.
General battle instructions for (1) Approach.
(2) Action.
(3) After Action.
Cruising order and disposition.
General dispositions for the Approach.
Guide to general dispositions during action.

Considerations given in paragraph 5.
Possible enemy tactics.
Character and probable tactics of opposing Commander-in-Chief.

After the exercise has commenced no further communication will be allowed between units, except by signals passed through the umpires.

8. Method of carrying out the exercises.—Officers directing the movements of the respective fleets and units will be so seated at side tables that their view of the enemy represents approximately what would be seen from the bridge of their own ships. It is a feature of the exercise that they never have anything approaching to a bird's-eye view of the opposing fleet. Binoculars are provided to see the ships more clearly, also charts, squared paper and instruments to enable the staffs to plot the movements and relative positions of the fleets and units as required. The umpires will at all times keep the Commander-in Chief and other senior officers informed of events which they would know in practice concerning their own or enemy fleets.

The bearing and approximate range of any enemy's ship in sight may be given to any officer concerned when he asks for it. The degree of accuracy of the range given must depend on the distance and conditions at the time.

Reference Position.—It is essential that each fleet works on a reference position, as in actual practice. On the ship on which the reference position is based making the signal indicating her reference position, the umpires will decide which ships fail to obtain it through being out of touch by means of visual links, and, unknown to the officers concerned, will decide errors to be allotted to their supposed dead reckoning positions when making reports throughout the exercise.

The umpires may also, unknown to the officers concerned, impose on the reference position signalled a general error in actual position, as well as individual errors in different ships varying throughout the exercise by reason of the length of time since losing touch after the reference position was obtained, variations of courses and speeds, and difficulties in keeping an accurate D.R.

Reporting Positions.—Before the exercise commences the umpires will decide on, and promulgate to all concerned, certain fixed geographical reporting positions for each side; these being similar to the *ZZ* positions used during exercises at sea.

It will be convenient for the purpose of the exercise that one of these positions shall be a central one, common to both sides, and marked on the table or board.

Individual ships wishing to make reports should, whenever possible, obtain their positions with reference to one of these reporting positions from their own plots, but if they have been moved by the movers in accordance with general instructions

they may obtain their positions from the umpires who will make the necessary allowances for errors in reference or D.R. positions.

PLOTTING.—It is essential that officers commanding fleets and units as well as all ships acting as look-outs or scouts should keep strategical and tactical plots throughout the exercise. Staff officers must be detailed to the principal units for this purpose.

MOVING.—The ships are moved by the movers in accordance with orders received from time to time from the officers commanding units. The movers will be neutral, though in some cases it may be unavoidable for the officer commanding a unit also to move it. Unless otherwise directed by signal, movers will move the ships in accordance with the "Instructions" previously issued by the Commander-in-Chief or senior officer of the Unit.

LENGTH OF MOVES.—The length of moves will be at the umpire's discretion. Long moves may be made with the concurrence of both Commanders-in-Chief till in sight of the enemy. After this the moves can be six, three, or two minutes, according to circumstances.

For the quick reckoning of distances run during a move it is convenient to note that a six-minute move is one-tenth of the speed; the distance run for a three or two-minute move can then be quickly obtained by dividing the distance run in six minutes by two or three respectively.

USE OF SCREENS, &C.—The opposing sides, and so far as possible friendly units out of sight of each other, will be screened from one another until they actually sight. After this, as a general rule, the fleets or units are screened from one another whilst a movement is taking place. In certain circumstances, however, the move may be made with the screens removed, as it is recognised that it is otherwise difficult to carry the picture as well as the exact bearing of the enemy in mind. The moves must then take place simultaneously, when each officer has definitely decided what he is going to do.

The position of fleets or units which are outside the visibility of the battle area should be kept plotted with other units on squared paper by the officers concerned. Umpires and movers should, as far as possible, keep the positions of these units indicated by marks on the table until they get into visibility.

SIGNALS.—In order to save time all signals will be made in plain language. They must be written on a slip, marked with War Game time of origin and passed to the movers through the umpires. A *minimum* of one to two minutes according to circumstances must elapse between the times a manœuvring signal is ordered to be made and carried into execution. When in single line ahead the leader of a unit may, however, alter course in succession at any time by leading round, or alter speed without waiting to get a signal through.

SPEED.—The full speeds allowed for various classes of ships are given in Appendix VIII., but are only correct for the date of issue of this publication. If the speed of columns exceed the limits given below, the ships in column must be assumed to be unable to keep exact station, and their distance apart should be increased.

No. of Ships in column.	Maximum speed for column in station.
5 to 8 - -	2 knots less than available full speed of slowest ship other than the leader.
2 to 4 - -	1 knot less than available full speed of slowest ship other than the leader.

If the slowest ship is leading, so long as she is undamaged she may proceed at one knot less than her original full speed provided the remaining ships of her squadron are able to comply with the "column" rule given above.

EFFECT OF SEA ON SPEED.—With a sea of four or upwards before the beam, the speed of ships, especially small craft, must be reduced accordingly.

INCREASE AND DECREASE OF SPEED.—In the tactical exercises speed of ships will be altered at the following rates :—

To increase :—

From below 8 knots - - -	2½ knots per minute.
,, 8–12 knots - - -	1 knot ,, ,,
,, 12 knots up to within 3 of full speed* - - -	1 ,, ,, ,,
,, within 3 knots of full speed to full speed -	1 knot in 8 minutes.

To decrease :—

From above 12 knots* - -	1 knot per minute.
,, 12 to 8 knots - - -	1 ,, ,, ,,

SEAGOING SPEED.—Speeds within 1 knot of full speed can be maintained for four hours without penalty, after which the chances at the end of every six hours that an individual ship will fail to maintain that speed are to be :—

1 in 8 for a reduction of 20 per cent. of full speed.

A speed 2 knots less than full speed can be maintained in fine weather for 24 hours without penalty, after which the chances at the end of every six hours that an individual ship will fail to maintain that speed are to be :—

1 in 16 for a reduction amounting to not more than 10 per cent. of full speed.

---

* 12–18 knots.

Ships are liable to have their speed reduced by the chief umpire as he thinks fit, the above chances being given as a guide for the case of a fleet.

9. Apparatus used.—The movements of ships are represented by means of small model ships on tactical tables or boards which are graduated in 1 in. squares normally representing cables, but this scale can be varied if required. The scales most generally used are 10 in. = 1 mile, or 10 in. = 2 miles.

The models, which represent ships about 500 ft. long, may be mounted on circular cards of 2½ in. diameter, so that when a division of ships on these cards is placed on the table with the cards in contact, the ships are 2½ cables apart.

The cards supplied are marked in azimuth every 15 degrees. Appendix VIII. gives the angular magnitudes and bearings of the arcs of fire for each class of ship. "A" arc includes all guns which can bear on one broadside; "B" arc, those which bear on one bow or quarter; and "C" and "D" arcs ahead or astern. "D" is used only in special cases when the "ahead" and "astern" fires are unequal; in such cases "C" is always heavier than "D."

Before using the cards for a tactical exercise it is preferable that the limits of these arcs should be marked at the edge of cards in pencil; the name or class of each ship taking part, her speed and main details of gun and torpedo armament should also be marked either on the cards or on a blackboard.

Smaller models are supplied for use as destroyers, submarines, etc., but in many cases it will be found useful to cut out flat cardboard shapes to represent the area covered by a flotilla or half flotilla in cruising or fighting formation.

For moving and altering course, protractors are provided. The straight portion of these protractors gives the distance moved in three minutes at the speed in knots corresponding to each number. For example: a ship steaming 14 knots will, in three minutes, move a distance on the Tactical table equal to the distance 0 to 14 on the straight edge of the protractor. The remainder of the protractor shows the track of a ship under helm and distance travelled in three minutes at the respective speeds. Alterations of course for every 10° from 0° to 180° are shown.

Protractors for tactical diameters of 800 yards and 1,200 yards are provided for both the full and half scales of the Tactical board, *i.e.*, 1 in.—200 yards.

1 in.—400 yards.

Measuring scales are also provided.

Some simple form of wooden or cardboard torpedo director is of use when considering the possibility of firing torpedoes and as a guide to their actual tracks.

CRUISER PROBLEMS.

Cruiser problems include look-out, scouting, supporting, and screening, patrols, search, &c.

Scouting and screening exercises and various methods of patrol may be studied in the form either of "Tactical Exercises" or "Tactical Investigations." The rules and instructions given in the preceding pages are applicable to these exercises.

When cruiser exercises are carried out on the tactical table, it will usually be sufficient to plot the position of the battle fleets should they be in the area.

Cruiser problems involving search or patrols over large areas can be carried out by two different methods :—

(i) When the object is to afford practice in preparing plans of search or patrol, issuing orders to the cruiser squadrons making suitable reports from the cruisers and considering their action on sighting the enemy, they may be worked out in the form of small strategical exercises. The rules and instructions given in the following pages for "Strategical Exercises" are then applicable.

(ii) If it is wished only to afford practice in planning a search, or patrol dispositions, each officer or pair of officers may be given the problem to work out separately. Each officer (or pair) will work in a separate room, and will plan on tracing paper the tracks and successive positions through which his ships would pass for the whole period under consideration, supposing the enemy were not sighted. The Chief Umpire will lay down several alternative tracks for the evading ship or squadron on the chart, and each tracing will be laid over these, to see in which cases the plan adopted would prove successful.

STRATEGICAL EXERCISES.

The object of the strategical exercise is to practise the naval movements of two belligerent nations consequent on a situation known or partly known. Incidentally it gives practice in writing orders and appreciations, and opportunities for studying British and foreign ships and naval resources.

Officers carrying out an exercise are supplied with the following information :—

(i) A "General Idea" (printed on white paper), giving the general situation up to the time at which the game begins, and any information which would be commonly known. This "Idea" is supplied to both sides.

(ii) A "Special Idea" (printed on coloured paper) giving the positions of the particular belligerent's own fleets, and such information as would be known to him but not to his opponents; also such information concerning his enemy's ships as he would be likely to obtain through spies, newspapers, &c. This cannot always be depended upon as reliable.

To the officers taking part are apportioned duties such as "Admiralty," "Commander-in Chief," etc. of various fleets, "Officers Commanding Cruiser Squadrons," "Staff," and the like.

Preparation of Appreciations and Plans and Orders for Strategical Exercises.

Appreciations by Flag Officers.—Before the commencement of the exercise, the Officers detailed for the higher commands, assisted by the Officers appointed as their Chiefs of Staff, will study the situation as set forth in the General and Special Ideas, and will prepare an Appreciation of the whole situation. This should be completed in duplicate, one copy being handed into the chief umpire at such time as may be ordered. This will usually be at noon on the day preceding the commencement of the exercise.

In addition to the Chiefs of Staffs, the Senior Officers may, before the exercise begins, consult any of the other Officers who are told off for their respective sides on matters on which they may have special knowledge. After the exercise commences, officers not in the same ship may meet and consult only if their ships are lying at anchor in the same harbour.

Appreciations by other Officers. On the first day of the exercise, the General and Special Ideas will be issued to all Officers, who will each prepare an Appreciation of the whole situation as it presents itself to his own side, handing it in to the Chief Umpire at such time as may be ordered. Staff Officers will

not prepare separate Appreciations, but will assist the Officers to whom they are attached.

ORDERS AND INSTRUCTIONS BY ADMIRALTIES OR SUPERIOR COMMANDS.—On the first day of the exercise, the Admiralties or other Officers in supreme command will commence the preparation of the War Plans for their own side, and at the same time they, or the Commanders in Chief, will commence the preparation of such Operation Orders or Instructions to their subordinate commanders as may be necessary to direct the latter in making the requisite opening movements or dispositions to give effect to the plan.

These should be prepared in duplicate, one copy being handed in to the Chief Umpire.

(A sufficient number of copies of War Plan and Operation Orders will be reproduced by the Secretariat to supply one to each Officer whom they concern.)

OPERATION ORDERS BY SUBORDINATE COMMANDERS.—On receiving copies of the War Plan and of the Commander-in-Chief's Operation Orders, each Officer in Command of a Unit will proceed to prepare Operation Orders for the forces under his command.

First Move.—When all Officers have handed in their Operation Orders, the first move will be ordered by the Chief Umpire.

STANDING ORDERS BY COMMANDER-IN-CHIEF AND OFFICERS IN COMMAND OF UNITS.—The Commander-in-Chief and each Officer in Command of a unit will, as opportunity arises during the course of the exercise, prepare the following War "Standing Orders" for his Fleet or Unit, and any other Standing Orders which may be specially called for. The preparation of these Standing Orders is not to be allowed to interfere with the progress of the exercise.

(a) *Cruising Order under various conditions* (when applicable).—In the case of the Commander-in-Chief this should include brief instructions to be followed by other units when cruising with his Flag. Officers of such Units should, therefore, find out the Commander-in-Chief's views before writing out their own instructions for cruising with the Flag.

(b) *Fighting Instructions.*—To include the method of fighting his unit under various conditions. In the case of the Commander-in-Chief this should include his proposed scheme of battle tactics for all units of the fleet likely to be present at a fleet action.

Officers in Command of Units who may be present at a fleet action should, therefore find out the Commander-in-Chief's views on the matter before writing out instructions for their units in fleet actions.

(c) *Reliefs, Replenishment, Repairs, etc.*—Orders on these matters should be prepared when applicable, if not already dealt with in the Operation Orders.

Notes on preparation of Appreciations, Orders and Instructions.

APPRECIATIONS should be of a general nature and not overburdened with details; they should be clear and concise, and complete enough to show the reasons for the adoption of the selected object, the courses of action proposed to obtain this object, and the plan recommended to give effect to these courses.

They should be sufficiently complete to enable any other officer to write the necessary orders in accordance with the writer's intentions.

No definite rules can be laid down for writing Appreciations, but the following points will usually require consideration, and the sequence in which they are placed is suggested as one that will present results of a train of thought in a logical manner.

(a) *Forces engaged* :—

Our strength.
Enemy'sstrength
Movements of friendly forces.
Latest known movements of enemy's forces.

These should be presented so as to give the situation, both as regards relative strengths and positions, in a broad and easily grasped form. Details may well be put into tabular Form as an Appendix, so that the correctness of this summarised statement may be verified by the reader. It is useful to include in the tables the bases of the forces referred to.

(b) *What we want to do.*—Our object. This must be selected with due consideration to the political situation.

(c) *Obstacles in the way.*—Enemy's possible and probable courses of action *which may affect the attainment of our object*, and how we may overcome them.

(d) *How to do what we want.* Our possible courses of action, which will achieve our object. Our proposed course, with reasons.

(e) *Our Plan.*—Our general plan and dispositions of our fleet to carry out this course.

The detailed dispositions of the vessels comprising the several Squadrons should, as a rule, be left to their own Commanders.

WAR PLAN.—This should comprise a brief explanation of the disposition and functions of the recipient's force.

It should include information of the disposition and functions of other forces whose action may be connected with his own, or who are operating in the same area.

It is not usually desirable to include other information than that which immediately concerns the recipient, as it not only introduces irrelevant matter, but also widens the chances of leakage where secrecy is of importance.

OPERATION ORDERS.—The object of an Operation Order is to bring about a course of action in accordance with the intentions of the issuing Officer, suited to the situation and with full co-operation between all forces concerned.

It should contain just what the recipient requires to know to carry out the operation, and nothing more.

It should tell him nothing which he can and should arrange for himself.

It should avoid details except where these are absolutely necessary.

Information regarding the enemy, or movements of one's own ships, should be strictly limited to what the recipient, or recipients, of the order require to know in carrying out the task assigned to them.

In orders for an operation concerning more than one unit, it will often be desirable to issue them as General Operation Orders to each unit concerned. If the issuing authority wishes to give more detailed orders to individual Officers, he should do so in the form of separate Operation Orders, which should not be included in the General Operation Orders.

In the case of detached forces not under the immediate control of the Commander-in-Chief, *Instructions* for guidance may be more appropriate than actual Orders, in which case fuller information as to the intention of the Commander-in-Chief and other confidential matter should be included, so as to ensure the recipient working in accordance with the spirit of the Commander-in Chief's intentions.

INSTRUCTIONS AND ORDERS may be combined, but are usually best kept separate, and their nature should be clearly indicated.

SUGGESTED SEQUENCE OF OPERATION ORDERS.—Operation Orders should usually contain the following subjects, but, as in the case of Appreciations, it is undesirable and impossible to fix any definite rules for writing them :—

Heading, Number of Order, Number of Copy, Name of Officer issuing Order, all Subordinates whom it affects. **Date,** List of charts and publications referred to in the body of the Order.

(*a*) The general situation given briefly, including information about the enemy, and about such other portions of their own fleet as may affect the recipients of the Order.

(*b*) Brief summary of the intention of the Officer issuing the Order.

(*c*) The necessary instructions for those to whom the Order is issued, the chief essential being stated clearly in the first paragraphs, and more minute details in the later ones. Appendices should be used, if necessary, for very detailed information, and these should be referred to in the body of the Order.

Signature, date of issue, individuals to whom sent and number of copy issued to each.

N.B.—The Operation Orders of Officers in command of units should include Orders for Sailing, etc., and also, on a separate sheet, the organisation of their unit.

STANDING ORDERS are permanent or semi-permanent orders in connection with warlike operations. Their object is to save frequent repetitions on each occasion of drafting Operation Orders.

They should be confined to essentials and added to or cancelled as circumstances require.

General Rules.

CHARTS.—The movements of ships are to be shown on the charts in the same way as would be the case on actual service, and only such movements are allowed as would be reasonably possible under the given conditions of wind and weather.

All ships, squadrons, and vessels at sea are to be clearly marked in their places on the charts, showing what vessels are represented. This applies not only to the ships which each officer is working, but to all other ships on the same side whose positions and movements are accurately or approximately known by him. All bearings and courses used are true unless stated otherwise.

RETURN OF POSITIONS.—A return of the positions of all squadrons or detached ships is to be sent in on tracing paper when called for by the Chief Umpire. The course and speed of the ship or fleet, and, in the case of the latter, the formation also, must be shown on a sheet of paper attached to the tracing.

Date and time are to be entered on the tracings sent in to the umpires, at every alteration of course, and every two hours. The tracing should also be marked with the name of the Squadron and the number of the Room.

The positions are plotted on the Umpire Charts, and Officers will be informed by an umpire if they have sighted anything, when they must state what they propose to do. They must decide at once on their movements, as the ships will be moved on minute by minute by the umpires at the speed and on the course last ordered, until fresh dispositions are made, counting from the time that each side knows that the other is in sight.

VISIBILITY AND WEATHER.—The distance at which ships sight each other will be given by the Chief Umpire, together with the state of the weather at intervals during the exercise. The weather conditions given are taken from the meteorological reports of the same day in some previous year, and are, therefore, the real weather that may be expected in that part of the world at that time of the year.

PATROLLING AT NIGHT.—When vessels are patrolling at night or in thick weather without means of verifying their position, they will be liable to have their estimated positions adjusted by the Chief Umpire, without being informed of the fact until afterwards.

SHIPS OR SQUADRONS DETACHED.—When ships or squadrons are detached, the Officers Commanding must not on any account consult with any officers who are not in company with them as to what they should do. They will be given charts in separate rooms, which they must not leave, after which they can only communicate with ships and stations out of sight by means of wireless or by sending a despatch vessel. All such messages and signals must pass through the Umpire's room to be stamped and registered before they can be received and acted upon. The time which signals take to be transmitted depends on the weather, the distance apart, and possible interference.

ORDERS AND SIGNALS.—All orders issued must be written out in proper form as though they were issued by an Admiral or other Officer in Command to the ships under his orders. All signals are to be sent in code unless specially ordered otherwise, and must be in accordance with the Signal Books.

All orders and signals should contain the following information :—

(i) Room from which issued.
(ii) Ship or fleet of origin.
(iii) Ship or fleet addressed.
(iv) Order or signal.
(v) War game date and time.
(vi) Signature of sender.

The following procedure should be adopted :—

(*a*) When signals are sent in plain language :

At least three copies of each signal are to be made.

One copy is to be kept for reference.

Two or more copies are to be sent in, one being marked "Chief Umpire," and the others with the name, or names, of the intended recipients—one copy for each recipient.

(*b*) When signals are sent in code :

One copy of the code message is to be kept for reference, and one or more copies sent to the Umpire's Room, marked with the name, or names, of the intended recipients. One copy of the signification is to be sent to the Umpire's Room, marked "Chief Umpire."

Code messages and their signification should on no account be written on the same paper.

NUMBERING OF SIGNALS.—All signals should terminate with the "time of origin." This time should be quoted when subsequent reference is made to the signal.

SECRECY.—The safe custody of orders, signals, charts, &c., must be attended to as in war. Such documents if not put away after working hours, and any incautious conversation carried on in public, may be made use of by the opposing side. This use, however, must be reported to, and authorised by, the Chief Umpire.

SPEED.—*See* Rules for Speed on page 8.

SPEED IN BAD WEATHER.—According to the wind and sea, and their directions relative to the ships, care must be taken by the respective Officers working them that the speed of ships, especially light cruisers and smaller vessels, is not allowed to exceed what is possible in actual practice, and also that if necessary they take refuge in port.

FUEL CONSUMPTION.—The record of fuel consumption is to be kept for each ship or squadron in the book supplied for the purpose, by the Officer in Command or by one of his staff.

WHEN THE ENEMY IS SIGHTED.—When ships or squadrons come into contact with each other they may be placed by the Umpires on the tactical tables, when the subsequent movements will be carried out as in the Tactical Exercise.

Minor tactical situations will not, however, be worked out on the tactical tables, but will be decided by the Chief Umpire.

Officers in Command of squadrons or detached vessels are to keep a short diary of events.

The Commander-in-Chief on each side, with other Officers to assist him, will be required to produce afterwards a short history of the operations for record.

APPENDIX I.

GUNFIRE.

1. Direct Fire.

Two gunfire tables "A." and "B." have been prepared.

Table "A" gives the rate of hitting made for the number of guns selected.

Table "B." shows how the gun power of a ship being hit is reduced, and eventually her speed also, until she is sunk.

2. Indirect Fire (where fittings are provided).

Insufficient data are at present available to admit of definite figures being given for results when indirect fire is employed; but it appears probable that not more than 25 per cent. of the rate of hitting given in Table "A." would be obtained, if aircraft are available, otherwise nil.

3. Concentration of Fire.

(*a*) PAIRS.—The fire of a pair is to be considered to be twice as effective as that of a single ship.

(*b*) THREES OR FOURS.—This cannot well be compared with the fire of a single ship as the dispersion of the various salvos may help to produce hits (on an enemy snaking her course to avoid being hit).

As a very rough approximation it is to be considered that :—

Threes are equivalent to		**2·5**	**single ships.**
Fours	,,	,,	3 ,,

TABLE "A."

GUNFIRE.

1. Class of Ship.	2. *Max. Range.*	3. *Long Range.* No. of mins. for 1 hit on similar class of ship.	4. *Effective Range.* No. of mins. for 1 hit on similar class of ship.	5. *Close Range.* No. of mins. for 1 hit on similar class of ship.	6. Standard No. of Guns bearing to produce the hits shown.	7. Remarks.
Capital Ships.						
16-in. - - -	36,000	17,000 to Max. / 2·0	17,000 to 13,000 / 1·0	Below 13,000 / 0·5	8	
15-in. I. - -	23,700	16,000 to Max. / 2·0	16,000 12,000 / 1·0	Below 12,000 / 0·5	8	Only ⅓rd the rate of hitting shown in cols. 3–5 is made if firing at a Light Cruiser, and ⅛th if firing at a Destroyer Leader or Destroyer.
13·5 V. - -	23,500	15,000 to Max. / 2·0	15,000–11,000 / 1·0	Below 11,000 / 0·5	10	
12-in. XI. - -	20,400	14,000 to Max. / 2·0	14,000 10,000 / 1·0	Below 10,000 / 0·5	10	

TABLE "A"—*continued.*

GUNFIRE—*continued.*

1. Class of Ship.	2. *Max. Range.*	3. *Long Range.* No. of mins. for 1 hit on similar class of ship.	4. *Effective Range.* No. of mins. for 1 hit on similar class of ship.	5. *Close Range.* No. of mins. for 1 hit on similar class of ship.	6. Standard No. of Guns bearing to produce the hits shown.	7. Remarks.
Light Cruisers.						
7·5-in. VI. - -	20,900	12,000 to Max. / 4·0	12,000–9,000 / 1·0	Below 9,000 / 0·4	6	Only $\frac{1}{4}$th the rate of hitting shown in cols. 3–5 is made if firing at a Destroyer Leader or Destroyer.
6-in. XII. - -	18,800	11,000 to Max. / 4·0	11,000–8,000 / 1·0	Below 8,000 / 0·4	5	
Flotilla Leaders and Destroyers.						
4·7-in. I. - -	16,100	10,000 to Max. / 6·0	10,000–7,000 / 2·0	Below 7,000 / 0·75	5	Twice the rate of hitting shown in cols. 3–5 is made if firing at a Light Cruiser.
4-in. V. - -	13,700	9,000 to Max. / 6·0	9,000–6,000 / 2·0	Below 6,000 / 0·75	4	

Secondary Armaments.		Against Light Cruisers and Below.				
6-in. XII. - -	13,100	11,000 to Max.	11,000–8,000	Below 8,000	6	Only $\frac{1}{4}$th the rate of hitting shown in cols. 3–5 is made if firing at a Destroyer Leader or Destroyer.
		4·0	1·0	0·4		
6-in. VII. - -	12,200	11,000 to Max.	11,000–8,000	Below 8,000	6	
		4·0	1·0	0·4		
5·5-in. - - -	17,900	11,000 to Max.	11,000–8,000	Below 8,000	6	
		5·0	1·0	0·4		
4-in. IX. - -	13,400	10,000 to Max.	10,000–6,000	Below 6,000	10	
		2·5	0·5	0·25		
4-in. VII. - -	11,000	9,000 to Max.	9,000–6,000	Below 6,000	6	
		5·0	1·5	0·5		

Note 1.—Maximum Range given is for Normal M.V.

Note 2. Accuracy of range allowed on opening fire.

(*a*) If *No* R.F. ranges are obtained before straddling, range can be estimated within 1,000 yards for each 10,000 yards range.

(*b*) If R.F. ranges *are* obtained before opening fire, average error is 1,000 yards in 20,000 yards.

	Range.	Time to hit.
(*a*)	20,000	3 mins.
	15,000	$2\frac{1}{2}$,,
	10,000	2 ,,
(*b*)	20,000	2 mins.
	15,000	$1\frac{1}{2}$,,
	10,000	1 ,,

If enemy is zigzagging, these times are to be increased by 50 per cent.

The timing for hits by scale as above must, therefore, commence after the period given by (*a*) or (*b*).

Note 3.—Interpolation to be used with above Table as necessary.

The Table is constructed for good Gunnery conditions, and must be reduced by a percentage decided by the Senior Officer on the spot if these conditions do not obtain.

TABLE "B."

GUNFIRE.

Class of Ship.	Smallest gun whose projectile can reduce offensive power of ship.	Number of hits to "knock out" 1 gun * of Main Armament.	Remarks.
Battleship.			
(*a*) Mounting 16-in. guns	12-in.	(*a*) 3½, 15-in.	
(*b*) ,, 15-in. ,,		(*b*) 3, 15-in.	
(*c*) ,, 14-in. and 13·5-in. guns		(*c*) 2, 15-in.	
(*d*) ,, 12-in. guns		(*d*) 1, 15-in.	
Battle Cruiser.			
(*a*) Mounting 16 in. guns	12-in.	(*a*) 2·75, 15-in.	
(*b*) ,, 15-in. ,,		(*b*) 2·5, 15-in.	
(*c*) ,, 13·5 in. ,,		(*c*) 1·75, 15-in.	
(*d*) ,, 12-in. ,,		(*d*) 0·75, 15-in.	
			Number of hits from turret guns to knock out a Light Cruiser.
Light Cruiser.			
(*a*) **Large** with 7·5-in. guns.	4-in.	(*a*) 9, 6-in. -	(*a*)—4.
(*b*) Medium with 6-in. guns.		(*b*) 8, 6-in. -	(*b*)—3.
(*c*) Small with 4-in. guns.		(*c*) 4, 6-in. -	(*c*)—2.
			Number of hits from turret guns to knock out.
(*a*) **Flotilla Leaders** -	4-in.	(*a*) 1, 6-in. -	(*a*)—1.
(*b*) **Destroyers** - -		(*b*) 1, 6-in. -	(*b*)—1.

* *Note* 1.—1, 15-in. hit = 1·5, 13·5-in. hits = 2, 12-in. hits.
1, 7·5-in. hit = 3, 6-in. hits = 6, 4·7-in. hits = 9, 4-in. hits.

Note 2.—When more than ¼ the main armament guns are knocked out the speed to be reduced by 10 per cent.

Note 3. When all the main armament guns are knocked out, the ship to be considered to have been sunk.

Note 4.—When the armour protection is of an exceptional nature, the Chief Umpire should exercise his discretion as to the application of the rules given for "knocking out."

C.—RULES FOR EFFECT OF GUNFIRE ON AEROPLANES.

Table I.

H.A. Fire.

Height of Plane / Angle of Sight: Gun.	Number of Rounds to be fired before Aircraft can be considered out of action.														
	15,000–10,000.			10,000–5,000.			5,000–3,000.			3,000–1,000.			Below 1,000.		
	80° / 60°	60° / 40°	40° / 20°	80° / 60°	60° / 40°	40° / 20°	80° / 60°	60° / 40°	40° / 20°	80° / 60°	60° / 40°	40° / 20°	80° / 60°	60° / 40°	40° / 20°
4-in.	800	1,000	1,200	300	400	500	150	200	250	80	100	120	30	30	30
3-in.	1,000	1,200	1,400	400	600	800	200	250	300	100	120	140	40	40	40
2-pdr.	—	—	—	—	—	—	800	600	400	250	200	150	100	80	60
·303	—	—	—	—	—	—	—	—	—	—	—	—	1,000	800	600

TABLE II.—L.A. FIRE.

Planes to be considered out of Action :—

(*a*) One salvo of turret guns firing shrapnel, if plane is within 1,200 yards and below 1,000 feet.

(*b*) Under fire from secondary armament creating "splash" barrage at range of less than 2,000 yards for one minute.

(*c*) Under fire of 2-pdr. or ·303 as above.

D.—RULES FOR EFFECT OF GUNFIRE ON AIRSHIPS.

(*a*) For airships being attacked by H.A. fire from 3-in. and 4-in. guns, rules same as for C. Table I., only *half* quantities of ammunition to be taken in computing results.

(*b*) Any airship cruising within the following ranges to be considered out of action :—

Capital Ships	5,000 yards.
Light Cruisers	4,000 ,,
Other Craft mounting H.A. Guns	2,000 ,,

E.—RULES FOR EFFECTS OF BOMBS DROPPED FROM AIRCRAFT.

TABLE I. CAPITAL SHIPS, CRUISERS*, AND AIRCRAFT CARRIERS.

(*a*) Percentage of hits allowed when bombing from certain heights.

Height.	Percentage of hits.
Feet.	
100	100
500	60
1,000	35
2,000	20
3,000	15
4,000	10
5,000	7
6,000	5
7,000	3
8,000	2
9,000	Nil.

(*b*) Effect of hits :—

Weight of Bomb.	Numbers of hits required to put 1th of personnel not under cover out of action.	Number of hits to put one gun of Secondary Armament out of action. (*See* Note (*i*)).
Lb.		
20	6	4
100	4	3
220	2	2
500	1	1

Note (*i*) :—

This casualty only to be imposed in capital ships where the secondary armament guns are in an exposed position on the upper deck (*e.g.*, "Hood").

* "Courageous" and "Glorious."

Table II.—Light Cruisers.

(*a*) Percentage of hits allowed when bombing from certain heights.

Height.	Percentage of hits.
Feet.	
100	100
500	40
1,000	25
2,000	15
3,000	10
4,000	5
5,000	2
6,000	Nil.

(*b*) Effect of hits :—

Weight of Bomb.	Number of hits required to put $\frac{1}{3}$th of personnel not under cover out of action.	Number of hits required to put one gun of Main Armament out of action.
Lb.		
20	6	4
100	4	3
220	2	2
500	1	1

Table III.—Flotilla Leaders, Destroyers and Submarines.

(*a*) Percentage of hits allowed when bombing from certain heights.

Height.	Percentage of hits.
Feet.	
100	100
200	50
500	35
1,000	20
2,000	10
3,000	5
4,000	Nil.

(*b*) Effect of hits :—

Weight of Bomb.	Number of hits required to put ship out of action.
Lb.	
20	5
100	3
220	2
500	1

TABLE IV.—TRAWLERS, PATROL CRAFT ("P" BOATS), C.M.B.'S.

(*a*) Percentage of hits allowed when bombing from certain heights.

Height.	Percentage of hits.
50 ft.	100
100	75
200	50
500	25
1,000	10
2,000	5
3,000	Nil.

(*b*) Effect of hits.

Weight of Bomb.	Number of hits required to put ship out of action.
Lb.	
20 to 500	1

F.—RULES FOR EFFECT OF MACHINE-GUN FIRE FROM AIRCRAFT.

(*a*) IN CAPITAL SHIPS, CRUISERS, LIGHT CRUISERS, AIRCRAFT CARRIERS, TORPEDO CRAFT, AND PATROL VESSELS.

One-eighth of personnel in exposed positions to be considered out of action if plane passes over ship at a height less than 200 ft. and in such a way as to bring machine guns into play.

(*b*) C.M.B.'s.

To be considered out of action, if under fire from aircraft at range not exceeding 1,000 yards for one minute.

APPENDIX II.

TORPEDO FIRING.

Range and Speed of Torpedoes.—Torpedoes are allowed the speeds and ranges given below :—

		*Approximate Distance Run per Minute.	Reference Letter for Torpedo or "Setting."
18-inch :—			
35 knots	for 3,000 yards	1,100 yards per minute.	(*a*)
29 ,,	,, 7,000 ,,	950 ,, ,, ,,	(*b*)
35 ,,	,, 2,500 ,,	1,100 ,, ,, ,,	(*c*)
29 ,,	,, 4,000 ,,	950 ,, ,, ,,	(*d*)
21-inch :—			
35 ,,	,, 8,000 ,,	1,100 ,, ,, ,,	(*e*)
29 ,,	,, 12,000 ,,	950 ,, ,, ,,	(*f*)
25 ,,	,, 15,000 ,,	850 ,, ,, ,,	(*g*)

Allocation of Torpedoes.—The above torpedoes are allotted to British ships and torpedo craft as given below. Foreign ships will be credited with torpedoes similar to existing British types.†

Class of Ship.	Torpedo or "Setting."
18-inch Tube Battleships and Battle Cruisers	(*a*) and (*b*).
All other surface craft except C.M.Bs.	(*e*), (*f*) and (*g*).
C.M.Bs. and Airplanes	(*c*) and (*d*).
"J" and "K" Class Submarines	(*a*) and (*b*).
All other Submarines	(*e*), (*f*) and (*g*).

Number of Torpedoes allowed to Ships.†—Ships may be allowed to carry 6 torpedoes per submerged tube. Light Cruisers, 6 per A.W. broadside. Destroyers, 6 per ship. Submarines, 2 per tube.

Rate of Fire.—Torpedoes may be fired from submerged tubes at the rate of 1 per tube every 2 minutes. A.W. tubes one broadside in 20 seconds.

Method of Firing.—Torpedoes will be fired as opportunity offers, unless orders to the contrary are given.

The Mover will make an arrow or dot on the course of the ship firing at the point where the torpedo was discharged, noting the time.

Long Range Firing.—In the case of the Long Range adjustment, when sufficient time has elapsed for the torpedo to reach the enemy, a line is drawn from the arrow or dot in the direction in which the torpedo ran. If the path of the torpedo passes through the enemy's line, the shot is allowed, and chances of hitting given as shown in table below.

---

* Approximate position of running torpedoes at the end of each minute can be found by means of range-mensuring scale.

† *See also* Appendix VIII.

TABLE OF CHANCES FOR "LONG RANGE FIRING" AT ENEMY'S LINE, ALLOWING FOR ERRORS OF TORPEDOES.

Chance of Hitting.

Track Angle.	45°	90°
Enemy's ships 5 cables apart -	1/10 to 1/20‡	1/5 to 1/10.‡
" " 3 " " -	1/6 to 1/12‡	1/3 to 1/6.‡

Short Range Firing.—In the case of the short range adjustment, when sufficient time has elapsed for the torpedo to reach the enemy, the shot may be claimed. A line is drawn from the arrow or dot to the position of the ship fired at.

If torpedo was fired to run within 10° of the line the shot is allowed and chances of hitting given from table below.

TABLE OF CHANCES FOR TORPEDOES SET FOR SHORT RANGE, 35 KNOTS. AT INDIVIDUAL SHIPS.

Range. Length of Run.	Angle between track of Torpedo and Course of Enemy.		
	Up to 30°.	45°.	90°.
8,000 to 5,000 - - - - -	Nil	1/12	1/9
5,000 to 3,000 - - - - -	Nil	1/8	1/6
3,000 to 2,000 - - - - -	Nil	1/5	1/4
2,000 to 1,000 - - - - -	Nil	1/4	1/3
1,000 to 500 - - - -	Nil	2/5	1/2

Note.—Half above chances are allowed at night.

Assessment of Damage.—Should a torpedo strike a ship of not less than 5,000 tons she can proceed at two-thirds her original speed for 6 hours and afterwards at half original speed.

If a ship of over 5,000 tons is hit by two torpedoes she is reduced to 6 knots. The same applies to a ship of 5,000 tons or less which is hit by one torpedo.

‡ At discretion of Chief Umpire, depending on the position in enemy's line torpedo passed through and the number of ships in the line.

APPENDIX III.

WIRELESS TELEGRAPHY AND TELEGRAPH CABLES.

Wireless Telegraphy.—For details, *see* Appendix B to "British W T Instructions." Also "Telegraph Chart of the World" (3 sheets).

Time Signals take to get through. The umpires will decide when a message gets through, and will send it to the Officer concerned, marked with the time of supposed receipt. If the signals are of a lengthy nature, extra time for transmission will be imposed, at the discretion of the Umpire.

Telegraph Cables.—In order that a cable may be considered as cut, a telegraph ship must have been on the spot and able to remain there for :—

4 hours if under 50 fathoms.
6 hours if between 50 and 100 fathoms.
10 hours if between 100 and 300 fathoms.
18 hours if over 300 fathoms.

For ordinary ships fitted with grapnels add 50 per cent. to the time provided the depth is less than 200 fathoms; over that depth only a properly fitted telegraph ship can cut the cable.

APPENDIX IV.

DESTROYERS.*

SPEED ALLOWED FOR DESTROYERS.

FLOTILLA LEADERS.

"Scott" Class	can steam	32	knots for	25	hours.
"Parker" Class	"	29½	"	25	"

DESTROYERS.

"V" and "W" Class	"	31½	"	27	"
"R" and "S" Class	"	32	"	22	"
Yarrow T.B.Ds	"	34	"	17	"
"M" Class	"	30	"	20	"

After which destroyers require to lay up for 24 hours in each case. Also, with a Flotilla of 20 vessels, probably 4 would always be laid up for 4–5 day boiler-cleaning periods.

"Scott" Class	maximum sea speed—			33½	knots.
"Parker" Class	"		"	31½	"
"V" and "W" Class	"		"	33½	"
"R" and "S" Class	"		"	34	"
Yarrow T.B.Ds.	"		"	36	"
"M" Class	"		"	32	"

SPEED IN ROUGH WEATHER.

The speeds given above must be reduced considerably in these circumstances.

Reports from the Grand Fleet in 1918 placed the various classes in the following order of seaworthiness in heavy weather :—

"S" Class.
"V" "
"R" "
"V" . (Leaders).
"M" "

"S" Class kept up 20–24 knots with a sea of force 4 on the bow, and "R" Class made 20 knots dead to windward, without sustaining damage.

INCREASING SPEED.

Speed may be increased at the following rates :—

10–16 knots	3	knots per minute.
16–20 "	2	" "
20–24 "	1	" "
24–28 "	½	" "
28 upwards	¼	" "

PUTTING OUT OF ACTION.

As in Tables "A." and "B."

If destroyers come under the fire of heavy guns inside 18,000 yards one destroyer will be considered to be put out of action every four minutes by each ship firing, if that ship is herself unfired at.

* For other details, see Appendix VIII. and Admiralty publications.

APPENDIX V.

SUBMARINES.

ARMAMENT.

Class.	Guns.	Torpedo Tubes.	Torpedoes Carried.
"K"	1—4 in. and 1—3 in. H.A. (or 2—4 in).	8—18 in.	16
"M"	1—12 in. and 1—3 in. H.A.	4—18 in. ("M. 3," 4—21 in.).	8
"J"	1—4 in.	6—18 in.	12
"L. 50"	2—4 in.	6—21 in.	12
"L"	1—4 in.	"L's 1—8" 4—18 in. Later "L's" 4—21 in., 2—18 in.	8 8—21 in. 4—18 in.
"H"		4—21 in.	6
"R"		6—21 in.	8

All classes carry one or two Lewis guns.

ABOVE-WATER SPEEDS, &c.

Type.	Fuel Stowage in Tons, Normal.	Maximum.	Full Speed, Knots.	Patrol Endurance at Max. Stowage. Speed.	Miles.	Passage Endurance at Max. Stowage. Speed.	Miles.
"H. 21"	$\frac{14}{19}$		$11\frac{1}{2}$	$11\frac{1}{2}$	1,520	$11\frac{1}{2}$	1,780
				9	2,310	9	3,420
"R"	$\frac{17}{23}$		9	9	1,660	9	2,200
				8	1,665	8	2,500
"L. 1" Non-mine-layer.	$\frac{58}{78}$		17	17	2,542	17	2,760
				13	3,722	13	4,361
				10	3,890	10	4,865
"L. 1." Mine-layer.	$\frac{28}{37}$		15	15	2,270	15	2,460
				12	3,470	12	4,076
				10	3,930	10	4,920
"L. 50"	$\frac{78}{100}$		15	15	2,950	15	3,190
				12	4,630	12	5,290
				10	5,220	10	6,100
"J"	$\frac{54}{150}$		$18\frac{1}{2}$	$18\frac{1}{2}$	3,740	$18\frac{1}{2}$	3,950
				12	7,680	12	9,220
"M. 1"	$\frac{79}{126}$		$14\frac{1}{2}$	Not used		$14\frac{1}{2}$	2,380
						10	1,320
"M. 2 and 3."	$\frac{79}{119}$		$14\frac{1}{2}$	Not used		$14\frac{1}{2}$	3,340
						10	6,150
"K"	$\frac{150}{400}$		23	Not used		23	1,840
						10	4,000

UNDER-WATER SPEEDS, &c.

Class.	Full Speed	Endurance in hours at speeds of—													
		14	13	12	11	10	9	8	7	6	5	4	3	2½	Knots.
"H"	9						1·0	1·7	2·2	4	6·5	15		40	
"R"	14	1·3	1·7	2·2	3	4·2	5·5	8·5	16	23	35	45			
"L"	10						2	3	5	6·5	10	17	25		
"J"	9							2	3·5	7	12	23	33	48	
"K"	9						0·9	1·0	1·7	2·7	4·2	7·5	15·7		
"M"	9							2	3·5	7·5	14	23	33	48	

Towing.—"H" and "R" class submarines may be towed in smooth water.

Fuel. Fuel can be obtained from any source, either ship or shore, where oil fuel is used.

Diving.—A submarine under way using her main engines on the surface will take 1½ minutes to dive, with the exception of "K" class submarines which take 5 minutes to dive.

If a submarine is "trimmed down" she will dive in 30 seconds.

At night a submarine is usually on the surface and charging.

"K" class submarines should be considered as surface craft if surprised on the surface.

Visibility.—The distance that a submarine can sight a ship, or a ship the submarine, will be settled by the umpire, who will decide each case upon its merits.

Method of Moving and Assessing Results of Attack.—The track or position of submarines will be sent in by the officer in charge of the submarines when called for.

When the course of an enemy is such that she will be sighted by a submarine the chief umpire will decide whether a successful attack is possible, taking into consideration the under-water speed of the submarine and the course and speed of the ship.

If a successful attack is possible, the Chief Umpire will decide by drawing lots whether the ship sees the submarine or not, whilst the latter is delivering her attack.*

If the ship does not see the submarine, lots will be drawn to decide whether the torpedoes hit, the same chances being given as for a ship's short-range torpedo. (*See* Appendix II.)

If the ship sees the submarine, the Officer in Command of the ship is informed of the position of the submarine. If he alters course, the action of any other submarines in the vicinity will be considered by the Chief Umpire in the same way.

Breaking Down.—The chances of a submarine breaking down and being unable to dive, or being unable to remain under water, will be left to the discretion of the umpire, who will decide each case upon its merits.

Rules for placing Submarines out of Action.—*Gunfire.*—A submarine in surface trim will be placed out of action if within 2,000 yards of any vessel for one minute; or within 4,000 yards of a ship, or 3,000 yards of torpedo craft, for two minutes.

Depth Charge Attack.—A submarine actually sighted by a properly constituted hunting flotilla at a less distance than 2,000 yards has an even chance of escape.

At greater sighting distances:—

Sighting distance.	Chance of escape.
4,000 yards.	3 out of 4.
6,000 yards.	7 out of 8.

A submarine sighted by escorting or patrol vessels, carrying depth charges, at a less distance than 2,000 yards has five chances out of six to escape.

---

*The chances given of a ship seeing a submarine or her periscope before the torpedoes are fired will depend on weather conditions, and other conditions prevailing at the time.

APPENDIX VI.

MINING AND MINE-SWEEPING.

LAYING MINES.*

INFORMATION REQUIRED.—Tracings of all minefields are to be handed in to the chief umpire when called for.

These tracings are to show the positions of the lines of mines and should be taken off the largest scale chart available.

The following information is also required whenever minefields are laid:—Distance apart of mines, depth below L.W.O.S., number and type of mines, type of sinkers used, whether fitted with sinking plugs or delayed release, and the periods set for, by whom laid, time taken in laying, estimated date and time of completion.

RECORD OF NUMBER OF MINES.—A record of the total number of mines laid is to be kept.

* For further information, see Vol. I., Part II., Mining Manual, 1920.

TABLE OF TYPES OF MINES, THEIR APPLICATION, MAIN FEATURES AND TACTICAL PARTICULARS.

Type of Mine and Sinker.	H. II. Mine, Mk. II., Mk. VIII., VIII*., VIII**.	H. II. Mine, Mk. II., Mk. XII., XII*.	H. IIA. Mine, Mk. VIII., VIII*., VIII**.	S. IV*. Mine on Sinker.	S. V. Mine on Sinker.	S. VA. Mine on Sinker.	L. Mine on Sinker.
Charge in lbs. (Nominal).	Amatol 320.	Amatol 320.	Amatol 320.	Amatol 210.	Amatol 250.	Amatol 210.	Amatol 500.
Mooring wire	60 fms. 1¼" Mk. VIII. 175 fms. ·94" Mk. VIII*. 215 fms. 1" Mk. VIII**.	60 fms. 1¼"	60 fms. 1¼" Mk. VIII. 175 fms. ·94" Mk. VIII*. 215 fms. 1" Mk. VIII**.	30 fms. 1¼"	50 fms. 1¼"	50 fms. 1¼"	40 fms. paravane cable, 11/16"
Special devices	Sinking plug.	Sinking plug. Delayed release.	Sinking plug	Sinking plug.	Sinking plug.		Can take an "A" attachment.
Active	At all times when moored.	At all times when moored.	*At all times when moored.	At all times when moored.	At all times when moored.	*At all times when moored.	Only when current supplied externally.
Distance mines can be laid apart	150 ft.	150 ft.	150 ft.	120 ft.	150 ft.	150 ft.	150 ft.

* The "A" attachment loses sensitiveness if moored below 10 fms. and fails altogether at 30 fms.; also it is normally safe if moored at a less depth below surface than 25 feet. The contact firing gear remains effective in all these cases.

TABLE OF TYPES OF MINES, THEIR APPLICATION, MAIN FEATURES AND TACTICAL PARTICULARS—*continued.*

Type of Mine and Sinker.	H. II. Mine, Mk. II., Mk. VIII., VIII*., VIII**.	H. II. Mine, Mk. II., Mk. XII., XII*.	H. IIA. Mine, Mk. VIII., VIII*., VIII**.	S. IV*. Mine on Sinker.	S. V. Mine on Sinker.	S. VA. Mine on Sinker.	L. Mine on Sinker.
Charge in lbs. (Nominal).	Amatol 320.	Amatol 320.	Amatol 320.	Amatol 210.	Amatol 250.	Amatol 210.	Amatol 500.
Means of obtaining depth.	Plummet.	XII. fixed moorings. XII*. hydrostatic.	Plummet.	Hydrostatic.	Hydrostatic.	Hydrostatic.	Fixed moorings.
Operation for which designed.	Automatic laying from A.W. minelayers.	Deep laying and automatic laying with hydrostat from A.W. minelayers.	Automatic laying from A.W. minelayers.	Automatic laying from "E" class submarines, and C.M.B.'s.	Automatic laying from "L" class submarines, and 70-ft. C.M.B.'s.	Automatic laying from "L" class submarines, and 70-ft. C.M.B.'s.	Controlled mining (L. system from special "L" minelayers.
Maximum depth mine shell will stand.	70 fms.	70 fms.	*70 fms	40 fms	70 fms.	*70 fms.	75 fms.
Minimum depth in which mine can be laid; the mine being 8 ft. below surface at low water.	5 fms.	3 fms.	5 fms.	3 fms.†	3 fms.†	3 fms.†	

* The "A" attachment loses sensitiveness if moored below 10 fms. and fails altogether at 30 fms.; also it is normally safe if moored at a less depth below surface than 25 feet. The contact firing gear remains effective in all these cases.

† Submarines cannot lay in such shallow water.

POINTS TO BE OBSERVED.—The following points should be observed :—

(i) A minefield must start at a safe distance from those previously laid in the vicinity.*

(ii) Minelayers must return to harbour to embark another outfit of mines.

(iii) Speed of minelaying. The actual minimum working interval (in time) between successive mines laid from the same rail is 12 seconds.

For A.W. minelayers other than C.M.B.'s a speed of 15 knots should not generally be exceeded on account of the stern wave introducing errors in depth taking; for the same reason the state of the sea must be taken into account, errors of depth equal to half the height of a wave may be expected. A table of time intervals for various speeds is given in Torpedo Manual, Vol. I., Part II.

Submarines are limited to a speed of 5 knots whilst laying, to ensure the mines clearing the hull on release.

C.M.B.'s usually lay in groups and stop engines before laying.

(iv) Mines are inoperative till one hour after laying.

(v) The minefield efficiency of all contact mining systems is affected :—

(i) Nearly always by *rise* and *fall* of tide, and
(ii) frequently by the strength of current.

In order to assess Minefield Efficiency it is necessary first to prepare a Minefield Efficiency Diagram,* and it is always advisable that this should be done for all minefields unless the laying conditions are similar.

(vi) Minelayers cannot lay mines under the following weather conditions :—

A wind of force 7 or more from any direction, or a sea of force 5 or more on the quarter. These figures should be reduced by 25 per cent. when destroyer minelayers are employed.

(vii) When passing through a line of mines the chances of a ship striking a mine will be decided by the chief umpire.

(viii) Number of mines carried :—

(*a*) Large A.W. minelayers according to class of vessel.

(*b*) Destroyer minelayers, 40–86 H. II. mines, according to class of vessel.

(*c*) (1) "E" class submarines, 20 S. IV. mines.
(2) "L" class submarines, 16 S. V. mines.

(*d*) Monitor minelayers, 48 H. II. mines, and "L" mines if specially fitted.

(*e*) Trawler minelayers, 16–24 H. II. mines, and "L" mines if specially fitted.

(*f*) 40-ft. C.M.B.'s, 1 S. IV. mine.
55-ft. C.M.B.'s, 2 S. IV. mines.
70-ft. C.M.B.'s, 4 S. V. mines.

(ix) Mines should be considered active at all times when moored.

The rated times for sinking plugs are—

8-hour.
60-hour.
10-day.
38-day.

---

* For further information, *see* Volume I., Part II., Mining Manual, 1920.

The rated times for delayed release device are—

7-day.
14-day.
21-day.
28-day.

MINE SWEEPING.

Fleets must depend upon paravanes as a protection from mines laid in the open sea.

There are no such ships as fleet minesweepers in the true sense, *i.e.*, vessels capable of accompanying the fleet to sea and sweeping ahead. Destroyers using the H.S.M.S. come nearest to this definition, but the sweep is not reliable.

The functions of fleet sweepers are :—

(i) to search and keep clear the channels giving exit and entrance to the fleet bases;
(ii) to define and/or clear enemy minefields;
(iii) to skim your own deep minefields.

Sweeping of exit and entrance channels takes place daily or periodically or immediately before use.

The sweeping of the channel to be used must be taken into consideration when fixing the time of sailing of the fleet.

Minefields found outside the fleet channels must be defined by the fleet sweepers and their limits reported, for Commander-in-Chief to decide whether it should be cleared at once or later, or left down as a defensive minefield.

Where it is necessary to route ships over your own deep minefields it will be necessary to skim these areas to remove enemy shallow mines laid subsequently.

Fleet sweeping, therefore, takes place independently of the fleet, except in particular operations as :—

(i) Where the speed of the fleet can be safely reduced to admit of them keeping station astern of the sweepers.
(ii) Bombarding operations by monitors of slow speed.
(iii) Some minelaying operations.
(iv) In special cases in shallow water ahead of a convoy.

It may be assumed that no mines can be laid in water of greater depth than 200 fathoms.

It may be assumed that nine twin-screw minesweepers of the "Aberdare" class are attached—

(i) to each fleet;
(ii) to each fleet base;
and 12 trawlers (i) to each fleet base;
(ii) to each auxiliary base.

Two thirds of the total strength are always ready for sea.

TWIN-SCREW MINESWEEPERS.

Maximum sweeping speed, 9 knots.
Maximum station keeping speed running free, 14 knots.
Maximum draught, 8 ft.
Breadth of sweep of one pair, 2¼ cables.
One pair can sweep 2·25 square miles per hour.

TRAWLERS.

Maximum sweeping speed, 6 knots.
Maximum station keeping speed running free, 9 knots.
Maximum draught, 15 ft.
Breadth of sweep of one pair, 2 cables.
One pair can sweep 1·2 square miles per hour.

SEARCHING SWEEPS.

A percentage of the water only is swept. Fifty per cent. is considered a sufficiently high percentage to ensure discovery of a minefield laid in a channel.

The chances of the discovery of scattered or isolated mines vary directly as the percentage of water swept.

CLEARING SWEEPS.

(*A*) By T.S.M.S.:—

(i) By three pairs in D formation in water of less depth than 20 fathoms. Area cleared, 4 square miles per hour.

(ii) In water of more than 20 fathoms sweeping in F formation, i.e., line abreast. Area cleared per hour is $1 \cdot 5 \times (x - 2)$ square miles where x = number of minesweepers employed.

(*B*) By trawlers:—

(i) By three pairs in D formation in water of less depth than 20 fathoms area cleared = 2 square miles per hour.

(ii) In water of more than 20 fathoms sweeping in F formation, i.e., line abreast. Area cleared per hour is $\cdot 9 \times (x - 2)$ square miles per hour where x = number of trawlers employed.

DELAY RELEASE.

This can be countered by trawlers using the bottom sweep at a speed of 4 knots.

CASUALTIES.

One T.S.M.S. or two trawlers for every 50 mines swept up.

These casualties need not be incurred if sweeping can be confined to safe hours when—

(*a*) The rise of the level of sea above L.W.O.S. is greater than the draught of the sweepers.

(*b*) The dip of the mine caused by the tidal stream is greater than the draught of the sweepers.

(*c*) A combination of (*a*) and (*b*).

WEATHER.

Searching sweeps up to state of the sea, 6.
Clearing sweeps up to state of the sea, 4.

For further details and information, *see* "Handbook of Minesweeping."

APPENDIX VII.

AIRCRAFT.

Aircraft may be used under the following conditions :—

INFORMATION REQUIRED.—A tracing, showing their tracks and successive positions as described in the Rules for the Strategical Exercise, is to be sent in with the following modifications :—

The course steered and the drift due to the wind allowed for are to be shown in red and the course made good in black.

The speed of aircraft and the speed of wind are to be noted against the course steered and the line showing the drift.

Positions where wind was verified are to be shown in the case of airships.

On receipt by the Chief Umpire, the actual position reached by the aircraft, allowing for all errors, will be marked on the Umpire's chart, and this position, as far as it could be known to the aircraft, will be marked on the tracing when the latter is returned in readiness for the next move.

BREAKDOWNS.—Every 24 hours the Chief Umpire will draw lots for the chance of aircraft breaking down. The chances given will depend on weather, class of aircraft, and other conditions prevailing at the time.

AIRSHIPS.

SPEED.—Speed through still air 45 knots maximum for 48 hours, at the end of which period they must be at a base and will be unable to proceed for eight hours and until they have replenished with fuel and gas. When there is wind the speed of an airship on any course is the resultant of the speed of the wind and speed of airship.

BASES.—She may operate from three descriptions of base :—

(a) Permanent base. Safe under all conditions.

(b) Temporary base. Requires at least 1 fathom of water and clear swinging room, and takes 18 hours to prepare with the resources of a dockyard, large seaport, or battle division. Safe up to a wind not exceeding 8.

(c) Moored to mast of battleship or battle cruiser at anchor. Safe in a wind not exceeding force 6.

ERRORS IN POSITION. An airship can ascertain the direction and speed of wind by stopping for a quarter of an hour in every four. If this is not done, she will be liable to an error of two points and 15 per cent. of speed in her estimation of the wind when out of sight of land. She will also be liable to a further error of 10 miles in every four hours' travel when out of sight of land.

WIRELESS TELEGRAPHY.—Range for wireless telegraphy, 500 miles.

AEROPLANES AND SEAPLANES.

SPEED.—Details of speed in still air are given in the attached table; if there is wind, the speed of an aeroplane on any course is the resultant of the speed of the wind and the speed of the aeroplane.

At the end of the period of endurance given, an aeroplane must be back on land, or on a properly equipped carrier, *e.g.*, "Eagle" or "Argus," and cannot proceed again for half an hour.

ERRORS IN POSITION.—An aeroplane is liable to an error in position of 5 miles in every 2 hours' travel when in sight of land, or of 10 miles in every 2 hours' travel when out of sight of land.

WIRELESS TELEGRAPHY.—Range (if fitted), 150 miles.

EXISTING TYPES OF AEROPLANES AND SEAPLANES.

Type.	No. of Seats.	Max. Speed (knots))	Endurance at cruising speed (hours).	Armament.	Remarks.
AEROPLANES.					
"Panther"	2	95	4½	2 machine guns.	Reconnaissance, and observation of fire. Can fly off and land on a carrier, or fly off fore turret.
"Night Hawk."	1	122	2½	2 machine guns.	Fighter, and attacking exposed personnel. No signalling gear, can fly off and land on a carrier, and fly off turret or light cruiser platform.
"Cuckoo"	1	87	3½	1 18" torpedo	Torpedo carrier. No signalling gear, can fly off and land on a carrier.
BOAT SEAPLANES.					
F. II. A.	5	83	7½	(on submarine patrol). 2 Machine Guns, about 1,000 lbs. weight of bombs.	Reconnaissance and bombing.
F. V.	5	89	8½		

Type.	No. of Seats.	Max. Speed (knots).	Endurance at cruising speed (hours).	Armament.	Remarks.
FLOAT SEA-PLANES.					
"Short" -	2	73	4	—	Reconnaissance, bombing, and observation of fire. Can only rise in very sheltered water. Poor climbers and very vulnerable to attack by fighters.
"Fairey" -	2	96	5½	1 Machine Gun, about 300 lbs. weight of bombs.	

AIRCRAFT CARRIERS.

Name.	Guns.	Torpedo Tubes.	Speed.	Date of Completion.
"Argus" - -	2 4" 4 4" H.A.	—	20–21	1918
"Eagle" - -	12 6" 4 4" H.A.	18 A.W. 21"	24	1920
"Hermes" - -	10 5·5" 4 4" H.A.	—	26	Building.

APPENDIX VIII.

DETAILS OF SHIPS COMPLETED NOT EARLIER THAN 1910.

N.B.—*Also details of latest Flotilla Leaders and Destroyers.* (*Minelayers and Auxiliary Vessels are not included.*)
The bearings of foreign torpedo tubes and guns, when given, are only approximate.
Tubes are 18-*inch* (*approximate*) *unless otherwise stated.*

GREAT BRITAIN.

Ship.	Date of completion.	Full speed.	Guns.	Arc of fire from 0° "Ahead" to 180° "Astern."	Submerged tubes and their bearings. (Above-Water tubes marked A.W.)	No. of torpedoes carried.
BATTLESHIPS.						
5 Royal Sovereign (Royal Oak, Ramillies, Revenge, Resolution).	1916–17	22	8 15″ I. 14 6″ XII.	C. 30, A. 150 C. - -	4 Beam 21″ - -	20
5 Queen Elizabeth (Malaya, Warspite, Barham, Valiant).	1915–16	25	8 15″ I. 12 6″ XII.	C. 25, B. 30, A. 150 C. -	2 10° B. } 21″ 2 10° A. } -	20
4 Iron Duke (Emperor of India, Benbow, Marlborough).	1914	21	10 13·5″ V. 12 6″ VII.	C. 40, A. 140, B. 150 C. -	2 10° B. } 21″ 2 10° A. } -	20
1 Erin - - - - - -	1914	21	10 13·5″ 16 6″	C. 30, A. 140, B. 150 C. -	2 5° B. } 21″ 2 5° A. } -	16
3 King George V. (Ajax, Centurion).	1912–13	21	10 13·5″ V.	C. 40, A. 140, B. 150 C. -	2 10° B. 21″ -	14

Ship.	Date of completion.	Full speed.	Guns.	Arc of fire from 0° "Ahead" to 180° "Astern."	Submerged tubes and their bearings. (Above-Water tubes marked A.W.)	No. of torpedoes carried.
BATTLESHIPS—*cont.*						
4 Orion (Conqueror, Monarch, Thunderer).	1912	21	10 13·5″ V.	C. 40, A. 140, B. 150 C.	2 Beam 21″	14
2 Colossus (Hercules)	1911	21	10 12″ XI.	D. 40 Stb. B. 50, A. 110, B. Pt. B. 70, A. 130, B. 140 C.	2 Beam 21″	14
1 Neptune	1911	21	10 12″ XI.	" "	2 Beam	12
2 St. Vincent (Collingwood)	1909–10	21	10 12″ XI.	C. 40, A. 140, B. 165 D.	2 15″B.	9
BATTLE CRUISERS.						
1 Hood	1920	31	8 15″ I. 12 5·5″ I.	C. 30, A. 150 C.	2 Beam, 4 A.W. } 21″	20
2 Renown (Repulse)	1916	31·5	6 15″ I.	C. 30, A. 150 D.	2 Beam 21″	10
1 Tiger	1914	28	8 13·5″ V. 12 6″ VII.	C. 30, A. 150 C.	2 10″ B., 2 10″ A. } 21″	20
2 Lion (Princess Royal)	1912	27	8 13·5″ V.	C. 40, A. 140, B 150 C.	2 Beam 21″	14
1 New Zealand	1912	25	8 12″ XI.	C. 30 Stb. B. 50, A. 110 B. Pt. B. 60, A. 130 B. 140 C.	2 Beam	12

Cruisers						
2 Courageous (Glorious)	1917	31	4 15″ I.	C. 30, A. 150 C.	2 Beam, 12 A.W. 21″	22
1 Furious	1917	31	10 5·5″ I.	—	2 Beam, 16 A.W. 21″	25
Light Cruisers.						
4 Hawkins (Raleigh, Effingham, Frobisher).	1919 and later.	30	7 7·5″ VI.	C. 30, B. 48, A. 135, B. 150C.	2 Beam, 4 A.W. 21″	12
1 Vindictive	1918	30	4 7·5″ VI.	—	2 Beam, 4 A.W. 21″	15
2 Emerald (Enterprise)	Building	33	7 6″ XII.	—	12 A.W. 21″	—
8 Dragon (Delhi, Dunedin, Danae Dauntless, Durban, Despatch, Diomede).	1918 and later.	29	6 6″ XII.	C. 20, B. 35, A. 145, B. 155C.	12 A. W. 21″	13
5 Carlisle (Cairo, Calcutta, Colombo, Capetown).	1918 and later.	29	5 6″ XII.	C. 20, B. 35, A. 145, B. 160C.	8 A.W. 21″	8
5 Ceres (Cardiff, Coventry, Curlew, Curacoa).	1917–18	29	6 6″ XII.	—	8 A.W. 21″	8 or 9
3 Caledon (Calypso, Caradoc)	1917	29	5 6″ XII.	C. 20, B. 50, A. 130, B. 145 C.	8 A.W. 21″	8
2 Centaur (Concord)	1916	28·5	5 6″ XII.	—	2 Beam 21″	7
6 Cambrian (Canterbury, Constance, Castor, Champion, Calliope).	1915–16	28·5	4 6″ XII.	—	2 Beam 21″	7
6 Caroline (Cleopatra, Carysfort, Cordelia, Comus, Conquest).	1914–15	28·5	4 6″ XII.	—	4 A.W. 21″	4
7 Aurora (Royalist, Inconstant, Phaeton, Galatea, Undaunted, Penelope)	1914–15	28·5	2 or 3 6″ XII.	—	8 A.W. 21″	9
2 Birmingham (Lowestoft)	1912–14	25·5	9 6″ XII.	—	2 Beam 21″	7
3 Chatham (Dublin, Southampton).	1912–13	25·5	8 6″ XI.	—	2 Beam 21″	7
3 Dartmouth (Weymouth, Yarmouth).	1911–12	25	8 6″ XI.	—	2 Beam 21″	7

Ship.	Date of completion.	Full speed.	Guns.	Arc of fire from 0° "Ahead" to 180° "Astern."	Submerged tubes and their bearings. (Above-Water tubes marked A.W.)	No. of torpedoes carried.
FLOTILLA LEADERS and DESTROYERS.						
"Scott" Class	1918-19	36·5	5 4·7" I.	—	6 A.W. 21"	6
"Parker" Class	1916	34	4 4" IV.	—	4 A.W. 21"	4
"V" Class leaders	1917	34	4 4" V.	—	6 A.W. 21"	6
Mod. "W" Class	1919	34	4 4·7" I.	—	6 A.W. 21"	6
"W" Class	1917-18	34	4 4" V.	—	6 A.W. 21"	6
"V" Class	1917-18	34	4 4" V.	—	4–6 A.W. 21"	4–6
"S" Class	1918-19	36	3 4" IV.	—	4 A.W. 21"	4
"R" Class	1916-17	36	3 4" IV.	—	4 A.W. 21"	4
"M" Class	1914-16	34	3 4" IV.	—	4 A.W. 21"	4

AUSTRALIA.

BATTLE CRUISERS.						
1 Australia	1913	25	8 12" XI.	C. 40 St. B. 50, A. 110 B. Pt. B. 60, A. 130 B. 140 C.	2 Beam	18
LIGHT CRUISERS.						
1 Adelaide	Building	25·5	9 6" XII.	—	2 Beam 21"	8
3 Brisbane (Sydney, Melbourne)	1913	25·5	8 6" XI.	—	2 Beam 21"	8

Battleships.						
3 Bretagne (Provence, Lorraine)	1915–16	20	10 13·4″ 22 5·5″	C.30, B.45, A.135, B. 150 C.	4 Beam - -	12
4 Jean Bart (France, Paris, Courbet).	1913–14	20	12 12″ 22 5·5″	C.40, B.45, A.135, B.140 C.	4 Beam - -	12
4 Condorcet (Vergniaud, Diderot, Voltaire).	1911	19	4 12″ 12 9·4″	C.15, B.45, A.135, B.160 C.	2 Beam - -	4
Cruisers.						
2 Edgar Quinet (Waldeck Rousseau).	1911	23	14 7·6″	C.10, B.60, A.120, B.170. C.	2 Beam - -	—
Light Cruisers.						
1 Strasbourg - - - -	1914	27·5	7 5·9″	—	2 A.W. 19·7″ -	—
1 Metz - - - - -	1916	28·5	8 5·9″	—	2 Beam, 2 A.W. } 19·7″ -	—
1 Mulhouse - - - -	1912	27	7 5·9″	—	2 Beam, 2 A.W. } 19·7″ -	—
1 Colmar - - - -	1910	25	6 5·9″	—	2 A.W. - -	—
1 Thionville - - - -	1914	27	8 3·9″	—	8 A.W. - -	—
Destroyers.						
Ex. German - - - -	1917–18	34	3 4·1″	—	6 A.W. - -	—
"Kaba" Class - - -	1917	29	1 4·7″, 4 12 pdr.	—	4 A.W. - -	8
"Tempête" Class - - -	1914	32	4 3·9″	—	4 A.W. - -	—
"Commandant Bory" Class -	1913–15	31	2 3·9″, 4 9 pdr.	—	4 A.W. - -	6

Ship.	Date of completion.	Full speed.	Guns.	Arc of fire from 0° "Ahead" to 180° "Astern."	Submerged tubes and their bearings. (Above-Water tubes marked A.W.).	No. of torpedoes carried.
BATTLESHIPS.						
2 Andrea Doria (Duilio)	1915 16	22	13 12", 16 6"	C. 25, B. 40, A. 140, B. 155 C.	2 40° B, 1 Stern	—
2 Guilio Cesare (Conte di Cavour)	1914 15	22	13 12", 18 4·7"	C. 25, B. 30, A. 150, B. 155 C.	2 40° B., 1 Stern	—
1 Dante Alighieri	1912	22	12 12", 20 4·7"	C. 25, B. 45, A. 150, B. 155 C.	2 Beam (?), 1 Stern	—
CRUISERS.						
3 San Marco (San Giorgio, Pisa)	1909–10	23	4 10", 8 7·5"	C. 20, B. 35, A. 145, B. 160 C. (Pisa 65 A. 130).	2 Beam (?), 1 Stern	—
LIGHT CRUISERS.						
2 Basilicata (Campania)	1916–17	16	6 6"	—	2 A.W.	—
3 Nino Bixio (Quarto, Marsala)	1912 14	27	6 4·7"	—	2 A.W.	6 (?)
1 Libia	1913	22	2 6", 8 4·7"	—	2 A.W.	—
1 Ancona	1914	27·5	7 5·9"	—	2 A.W. 19·7"	—
2 Brindisi (Venetia)	1914	27	8 3·9"	—	6 A.W.	—
1 Bari	1914	27·5	8 5·9"	—	2 A.W. 19·7"	—
1 Taranto	1912	27	7 5·9"	—	2 Beam, 2 A.W. } 19·7"	—
FLOTILLA LEADERS and DESTROYERS.						
"Aquila" Class	1916–19	35	5 4·7", 4 14 pdr.	—	4 A.W.	—
"Mirabello" Class	1915 16	35	8 4"	—	4 A.W.	—
"Sirtori" Class	1916–18	33	6 or 4 4"	—	4 A.W.	—
"Abba" Class	1915 16	30	5 4"	—	4 A.W.	—

Battleships.						
2 Kaga (Tosa)	Building	23	8(? 10) 16″, 20 5·5″	——	8(?)	—
2 Nagato (Mutsu)	Building	23	8 16″, 22 5·5″	——	8(?)	—
2 Hyuga (Ise)	1917–18	23	12 14″, 20 5·5″	C. 30, A. 140, B. 150 C.	6 21″	12
2 Yamashiro (Fuso)	1915–17	22·5	12 14″, 18 6″	C. 30, B. 45, A. 150, B. 155 C.	6 21″	12
1 Settsu	1912	20·5	12 12″, 10 6″ 8 4·7″	C. 20, B. 35, A. 145, B. 160 C.	4 Beam, 1 Stern	—
1 Aki	1910	20	4 12″, 12 10″, 8 6″	C. 30, B. 42, A. 138, B. 150 C.	4 Beam, 1 Stern	16
1 Satsuma	1910	18	4 12″, 12 10″, 12 4·7″	C. 30, B. 42, A. 138, B. 160 C.	4 Beam, 1 Stern	16
Battle Cruisers.						
4 Akagi (Amagi, Takao Atago)	Projected	—	—	——	—	—
4 Kongo (Hiyei, Haruna, Kirishima)	1913–15	27	8 14″, 16 6″	C. 20, B. 25, A. 150 C.	8 Beam 21″	24
2 Kurama (Ibuki)	1909–10	22	4 12″, 8 8″, 14 4·7″	C. 30, B. 40, A. 140, B. 150 C.	2 Beam, 1 Stern	9
Light Cruisers.						
4	Projected	—	—	——	—	—
3 Kitakami (Kiso, Oh-I)	Building	—	—	——	—	—
2 Kuma (Tama)	Building	33	7 5·5″	——	8(?) A.W. 21″	—
2 Tatsuta (Tenryu)	1919	31	4 5·5″	——	6 A.W. 21″	—
3 Yahagi (Hirado, Chikuma)	1912	26	8 6″	C. 30, B. 45, A. 135, B. 150 C.	3 A.W.	—

Japan—*continued.*

Ship.	Date of completion.	Full speed.	Guns.	Arc of fire from 0° "Ahead" to 180° "Astern."	Submerged tubes and their bearings. (Above-Water tubes marked A.W.)	No. of torpedoes carried.
DESTROYERS—1ST CLASS.						
"Hakaze" Class - - -	Building	34	4 4·7″	——	6 A.W. 21″ -	12(?)
"Kawakaze" Class - - -	1918–19	34	3 4·7″	——	6 A.W. 21″ -	12(?)
"Amatsukaze" Class - -	1917	34	4 4·7″	——	6 A.W. - -	12(?)
"Umikaze" Class - - -	1910–11	31·5	2 4·7″, 5 12 pdr.	——	4 A.W. - -	8(?)
2ND CLASS.						
"Momi" Class - - -	1919–20	31·5	3 4·7″	——	4 A.W. 21″ -	8(?)
"Momo" Class - - -	1917–18	31·5	3 4·7″	——	6 A.W. - -	12(?)

UNITED STATES.

BATTLESHIPS.						
6 South Dakota (Indiana, Iowa, Montana, Massachusetts, North Carolina).	Building	23	12 16″, 16 6″	——	2 21″ - - -	—
4 Colorado (Maryland, Washington, West Virginia).	Building	21	8 16″, 14 5″	——	2 21″ - - -	16(?)
2 Tennessee (California) - -	Building	21	12 14″, 14 5″	——	2 21″ - - -	—
3 New Mexico (Idaho, Mississippi).	1917–19	21	12 14″, 14 5″	C. 30, B. 35, A. 145 C.	4 21″ - - -	8(112)

2 Pennsylvania (Arizona) -	1916	21	12 14", 14 5"	C. 30, B. 35, A. 145, B. 150 C.	2 21" - - -	8(?12)
2 Nevada (Oklahoma) - -	1916	20·5	10 14", 12 5"	C. 25, B. 30, A. 135, B. 150 C.	2 21" - - -	8
2 New York (Texas) - -	1914	21	10 14", 16 5"	C. 15, B. 30, A. 140, B. 165 C.	4 Beam 21" -	12
2 Arkansas (Wyoming) - -	1912	20·6	12 12", 16 5"	C. 15, B. 40, A. 135, B. 170 C.	2 21" - - -	8
2 Utah (Florida) - - -	1911	20·75	10 12", 16 5"	C. 15, B. 30, A. 135, B. 150 C.	2 21" - - -	—
2 Delaware (North Dakota) -	1910	21	10 12", 14 5"	C. 15, B 30, A. 135, B. 150 C.	2 15° B. 21" -	8
Battle Cruisers.						
6 Lexington (Constellation, Saratoga, Ranger, Constitution, United States).	Building	33.25	8 16", 16 6"	—	4 / 4 A.W. } 21" -	—
Light Cruisers.						
10 - - - - - - -	Building	35	8 6"	—	4 A.W 21". -	—
Destroyers.						
Nos. 296 347 - - - -	Building	35	4 4"	—	12 A.W. 21" -	12
Nos. 231–235 - - - -	Building	35	4 5"	—	12 A.W. 21" -	12
Nos. 186 230, Nos. 236–295 -	1919–1920	35	4 4"	—	12 A.W. 21" -	12
Nos. 75–185 - - - -	1918–1919	35	4 4"	—	12 A.W. 21" -	12