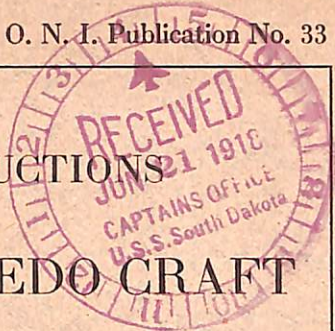


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GENERAL INSTRUCTIONS
FOR
SLOOPS AND TORPEDO CRAFT
EMPLOYED ON
ANTISUBMARINE DUTIES



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NAVY DEPARTMENT
OFFICE OF NAVAL INTELLIGENCE
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NAVY DEPARTMENT,
OFFICE OF NAVAL INTELLIGENCE,
Washington, May 24, 1918.

This book is a reprint of a British Admiralty confidential publication. It is intended for the use of commissioned officers of the United States Navy and is not to be shown or allowed to come into the possession of any other persons.

ROGER WELLES,
Captain, U. S. Navy, Director of Naval Intelligence.

NAVAL STAFF
ANTISUBMARINE DIVISION
DECEMBER, 1917

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GENERAL INSTRUCTIONS FOR SLOOPS AND TORPEDO CRAFT EMPLOYED ON ANTISUBMARINE DUTIES.

PRELIMINARY REMARKS.

The principal uses of sloops and torpedo craft employed on antisubmarine work are—

- (1) Sinking of enemy submarines.
- (2) Protection of trade.

Trade is best protected by sinking submarines, but since submarines are very difficult to find, it has been found necessary to adopt certain other methods for the protection of trade.

These methods are either—

- (1) Patrolling certain areas through which the trade has been ordered to pass.
- (2) Escorting convoys, the convoys being formed of snips that have a speed below about 15 knots.

GENERAL.

1. There are certain general rules which apply to destroyers at sea, whether patrolling or escorting, which require to be always remembered and obeyed. A destroyer under way is always watched by a submarine, with the intention of sinking the destroyer with a torpedo should opportunity offer.

The watching submarine may be ahead, astern, or on either bow, beam, or quarter.

Her periscope may be 3 feet above the water, or 6 inches, or only showing for about 10 seconds in every minute.

Be always ready to open fire with one gun in any direction. This does not mean that all guns are to be kept manned; two guns, each of which can fire through 180° (the two arcs being opposite), are quite sufficient.

2. Submarines are usually on the surface at night and by day when not kept down by air or surface patrols.

In narrow waters, where air patrols are frequent, or when the visibility is low, submarines may remain submerged except for the periscope during daylight hours. In this condition their range of vision is very limited, and consequently so is the area in which they can attack shipping. Submarines are not, however, likely to remain submerged unless forced to do so.

They have also been seen on the surface in a fog. When traveling on the surface by day, their speed is usually about 10 knots unless chasing a ship, when they may travel about 15 knots.

When unmolested, the submarine's favorite method of attacking shipping is to steam round on the surface to a position ahead, keeping only the masts and top of the funnel in sight. After steaming a short distance on the same course in order to determine, if possible, the mean course, the submarine dives and allows the ship to overtake her, turning in to attack when the ship starts a new leg of her zigzag.

3. In dark or foggy weather it is probable that an enemy submarine is made aware of the presence of a steamer long before the steamer is near her by use of her hydrophones. Submarines are able to distinguish clearly between turbines and reciprocating engines.

4. When going to the assistance of a ship being shelled by a submarine, have a gun ready to fire at long range, and a lookout aloft to report directly the submarine is sighted. The submarine will dive as soon as the gun is fired (if the shot falls within about 500 yards of her), and the steamer may thus be saved from being sunk or set on fire.

5. When chasing a submarine trying to escape on the surface, fire an occasional long-range shot, on the chance of holing her so that she can not dive until she has repaired the damage and thus the destroyer may overtake and sink her.

6. When chasing a submarine on the surface, if the submarine dives steer at once at high speed for the place where she went under, follow the track of oil that comes to the surface, and drop a depth charge on her when overtaken, which will be ahead of where the oil track stops. It has been found by experiment that oil of specific gravity .886 takes about 85 seconds to rise from a depth of 100 feet. In this interval a submarine at 6 knots would travel 283 yards. Always be moving over 10 knots before the depth charge is dropped.

A submarine in these circumstances will always dive deep—at least to 140 feet—and will probably use full helm as soon as she is under and full speed for a short distance. When making her escape after firing a torpedo at a ship or convoy, a submarine will probably turn away from the direction in which the ship fired at was heading unless there is good reason for her to do otherwise, such as the position of escorts or other ships.

7. It is known that a submarine can determine the bearing of ships or patrol craft by means of her hydrophones, but this becomes very difficult, if not impossible, if several craft are in the vicinity.

8. Keep a good lookout at night for a submarine on the surface; her conning tower may look like a boat, a wrecked chart house, etc.; if sighted, she will probably be at short range and there will be no opportunity for more than about two or three shots. Remember also

that what you see may be a motor launch, or a camouflaged destroyer, or other friend.

Always keep an eye on the horizon by day; you may see unusual smoke, or flashes of gunfire, or shell bursting; you may also hear the sound of guns or bombs when there is nothing actually in sight.

9. Remember that, if the visibility is good, a submarine steaming on the surface at cruising speed may be watching your mast from a distance of 9½ to 10 miles, when you can see nothing of her from your bridge. (Height of eye, 25 feet.) Therefore, when weather permits, always have a lookout aloft with good glasses.

10. A submarine is always likely to be disguised, either with big sails, a funnel emitting smoke, or by some other means.

Whether deliberately disguised or not, submarines may often be mistaken for small fishing craft. Very often the only proof that an object sighted is a submarine is that it unaccountably disappears.

For this reason, if an object that has been definitely sighted can not be picked up again and there is nothing in the prevailing weather conditions to account for its disappearance, there is a strong presumption that it is a submarine.

11. If the duty on which you are employed permits, the best chance of sighting and attacking a submarine whose presence you suspect is obtained by running out of sight of the position and steaming round to a different bearing from it, taking full advantage of the prevailing conditions of light. Then run down to the position again at high speed.

Remember that if the submarine wishes to remain on the surface she will come up as soon as you have gone, so you must go far enough away to prevent her watching your masts over the horizon, and be careful that you are not given away by your smoke.

12. Seeing the necessity of very smart lookouts, it is advisable not to allow men to remain on the lookout for more than about one hour at a time.

Everything that you see at sea may be of importance; it may be a dummy periscope with a mine attached, in the hope that you will ram it; it may be a boat with a bomb attached which will explode when you get hold of the boat; it may be a boat with three or four men in it of whom one or two may be alive.

As far as possible examine everything you can see, unless you are on very important duty which precludes it.

13. A submarine attacking with gunfire, and frequently also with torpedo fire, attacks from the direction of the sun. If approaching to the assistance of a ship that is being shelled and there is time and space, approach in the sun's rays, and you stand a better chance of getting the submarine.

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14. When nearing a torpedoed or shelled and sinking ship or a raft or boats with the intention of rescuing the survivors, circle around her at high speed in a spiral up to about 1,500 to 2,000 yards from the ship so as to scare the submarine before going to rescue survivors. The submarine may be watching and maneuvering to fire another torpedo to complete her work. She is not likely to do this outside 1,500 yards unless the ship is obviously stopped or is a very large one. Look for an oil track from the submarine, and, if possible, drop a depth charge over her.

When two destroyers are rescuing survivors, one should circle around while the other goes to the rescue.

15. When a ship or a destroyer has been torpedoed but not sunk, and there is a chance of her being salvaged, all the people on board who are not required should be taken off, so as to reduce the loss of life should she suddenly capsize or sink. If there is any panic in the ship it is advisable to send an officer on board to assist in quieting the people and to make sure that the ship can not proceed under her own steam. There have been cases where the man-of-war has had to send a party to stoke and work the engines owing to the crew refusing to go back. When in tow, a party should be left on board to look after the hawsers, steering, etc., but they should be seen to have lifebelts, a boat if possible, and some food on deck. They may have to be taken off during the night.

When shipwrecked crews are picked up they should only be brought direct into harbor if the captain has a special reason for so doing. Otherwise they should be kept on board until the ship returns normally.

16. Destroyers should not take a heavy ship in tow; they are not built for it. No ship should be taken in tow unless there is another armed ship present to escort the tow.

Very's lights are usually better than searchlights to illuminate boats or rafts being picked up at night.

They leave no trace, and the rescuer should change his position relative to the boats constantly.

Always steam over 13 knots (when weather permits) and zigzag irregularly, except on dark nights and in fog, snow, and similar weather. You are always just going to have a torpedo fired at you.

On very dark nights when in vicinity of shipping, dimmed bow lights should be shown at intervals (for about 1 minute every 15). The masthead steaming light should not be shown.

17. As far as possible keep a note of the position of all destroyers, sloops, and convoys that are known to be at sea. All knowledge of that kind may come in useful at any time.

Keep your ship's position coded in the wireless office, made out every two hours if speed of advance is below 8 knots, and each hour

if speed is greater, so that in case of a disaster a signal can be made without the delay caused by working out the reckoning, etc. (*Vide* W/T Code, 1917. C. B. 0321A, p. 60.)

Make notes of anything new that occurs on every voyage; it may come in useful.

18. Remember that all wireless codes may be considered as compromised and able to be deciphered by the enemy. *In any case signals may be picked up by enemy D. F. stations, from which your position can be plotted and the information passed to enemy submarines. Wireless should, therefore, be used as little as possible, and positions should always be given with reference to a squared chart, a known rendezvous, or other position of that kind.*

Ships at sea should always have steam ready at not over 15 minutes for the highest speed the weather will permit.

Ships should always be complete with oil before leaving harbor.

PATROLLING.

19. When sent to patrol an area, remember that the ship is on patrol from the time she leaves the harbor till she returns.

While on patrol (except on dark nights) zigzag irregularly; do not always go from end to end of your area; steam in varying directions so as not to allow any inference to be drawn as to where you will be in an hour's time. This makes navigation very difficult, and as careful a reckoning as possible should be kept. Compasses also should be corrected fairly often.

20. Remember that your best chance of destroying a submarine at night is when she is between you and the moon. For the same reason the direction away from the moon is always the most dangerous to yourself. With a dark background a submarine may be within 500 yards of you and on the surface without your being able to see her. The foregoing applies generally to morning and evening twilight, and reports of attacks upon merchant shipping show that the hour of morning twilight is the most dangerous hour of the 24.

21. When a ship is sighted, escort her unless you have reason to do otherwise; if more than one ship, escort what appears to be the most valuable, taking as a general principle that specially valuable ships, oilers, ships carrying munitions, should not be left alone.

22. When escorting a very slow ship, i. e., of about 5 knots in still water, through the patrol area, the best procedure is to circle around her while the slow ship steers a steady course.

If the ship can steam 6 to 9 knots, a single escort should zigzag on one quarter or the other about 2 to 1 points abaft the beam, crossing from one quarter to the other every few miles. If the ship is of moderate speed, i. e., about 12 to 14 knots, escort should zigzag about on the beam.

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For faster speeds escort should be rather before the beam, the angle before the beam increasing with the speed.

Information from a reliable source makes it apparent that enemy submarines prefer to fire their torpedoes so that they will reach the ship aimed at from a direction abaft the beam rather than from before it. For an 8-knot ship this means that an enemy submarine will fire her torpedo for preference from a *position abeam* or a *point abaft* it rather than from *2 to 3 points* before the beam.

If the escort is too much before the beam the submarine has plenty of time to fire from the most favored position, and at the same time is much safer from depth charge attack, since the escort has to turn right around to get at her.

23. When two destroyers are escorting a ship of moderate speed one should zigzag on each side—positions as in section 22.

If the ship is very slow they should change sides frequently, one crossing ahead and the other astern of the convoy.

By day a submarine will attack, if she has any choice, from the direction of the sun (if on a convenient bearing) and down wind, but if the ship is zigzagging well and the submarine has not been able to make out the mean course she will have very little choice as to which side she will attack from.

By night a submarine will probably attack on the surface unless it is very bright moonlight, and will always try to attack from a direction away from the moon (*vide* section 20).

These points should be considered when deciding the position for the escort, especially if only one is available.

24. On dark nights it is considered that the best position for a single escort when escorting a slow ship is close astern of the escorted ship or zigzagging from quarter to quarter.

A submarine attacking at night can proceed at good speed on the surface using her motors, and will prefer to approach from abaft the beam, where she is in no danger of being rammed if the ship alters course.

Information from a reliable source makes it apparent that submarines after firing a torpedo turn toward the enemy's stern unless there is some obvious reason for acting otherwise. If a submarine sights a destroyer close astern of the ship when about to attack it may very probably deter her altogether. If she does not sight the destroyer, the latter has a very good chance of successfully attacking the submarine.

25. Unless looking out for a specially valuable ship about which warning has already been issued, a ship should leave her patrol to reply to a S. O. S. within about 50 miles of her area, especially if the S. O. S. comes from a ship of importance.

But remember that the area for which you are responsible is vacant while you are away.

Keep near a torpedoed ship in your area that has not sunk, and between her and the sun, and watch for the submarine to come back to sink or board her. But do not take her in tow: wait until another ship comes to do so and then escort her.

CONVOY

26. When destroyers proceed in search of a convoy they should always go in scouting formation so as to sweep the sea for submarines.

When approaching a convoy in scouting formation, vessels should be particularly careful to preserve their relative (magnetic) bearings and distances from each other so as to make reasonably certain that they will all find the convoy after contact has been reported. This is very necessary when the visibility is low and observations for latitude and longitude are not possible. The *first* destroyer to make contact will immediately make it general. She should give the magnetic bearing and estimated distance of convoy from her at the time contact was made, and should be careful to give the correct time group in this signal. Each destroyer receiving the general signal will acknowledge to the sending ship, which will repeat the signal to those vessels that do not acknowledge. As soon as a destroyer receives the contact signal she will proceed to her escorting station without further orders. When the visibility is low each destroyer on making contact will make it general. Vessels failing to find the convoy will maintain W/T silence. They should proceed as best they can on the estimated course and speed of convoy and be ready to join as soon as conditions improve. After a reasonable time the senior escorting vessel present with the convoy will inform absent destroyers of the magnetic course and speed of the convoy and its position with reference to her own position in formation at a time previous to contact. This makes unnecessary the use of latitude and longitude, which would be uncertain in thick weather, and affords a recognized point of reference.

27. Should a destroyer sight a submarine on the surface she will immediately proceed at full speed and engage her, and report to the senior destroyer officer: and will remain in the vicinity of the submarine until there is no reasonable chance of her reaching the convoy or until recalled. No other destroyer will leave station unless ordered.

A torpedo is quite likely to be fired at a convoy from the quarter, so keep as good a lookout abaft the beam as before it.

28. When a submarine is sighted close-to, the destroyer sighting her will attack at once. Vessels should keep clear of the attacking destroyer, and refrain from firing across her bow when she nears

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her position to drop her depth charges. One long blast of the whistle will be a warning that she has dropped a depth charge.

29. If a periscope has been sighted, the first destroyer to reach the spot should drop her depth charges ahead of the position the submarine is judged to have reached. If the track of a torpedo can be seen, she should drop her depth charges near the beginning of the track. Other destroyers as they reach the position should add to the barrage in what appears to be the most favorable direction (*vide* section 6).

30. If the periscope of a submarine is sighted when she is in a position to attack a ship or convoy, and within a reasonable distance of a patrol craft, it is suggested that a depth charge should be dropped *at once*. A submarine under such conditions can only afford to show her periscope for very short periods, and may not have observed the destroyer. In any case an explosion near her is very apt to rattle her and put her off her shot, or even make her keep her periscope down until her opportunity has passed.

If this plan is adopted some prearranged signal should be used to indicate to other escorts that the depth charge was not dropped on the supposed position of a submarine.

31. Strangers approaching the convoy will be warned by nearest destroyers to keep clear of the formation. If of a suspicious character, report circumstances to senior officer. Merchantmen proceeding in the same general course of the convoy should join convoy if the examining destroyer is satisfied that their character is friendly. The name, speed, and destination of such ships should be reported to the senior officer of the convoy.

32. The use of W/T is to be reduced to a minimum. (*See also* section 18.) Senior officer controls traffic, but each destroyer answers if called direct. Messages for commander in chief should also be addressed to senior officer of escort to keep him informed of the situation. Vessels answer in alphabetical order of their call signs. Keep W/T operators informed of the situation, and of all orders affecting them. Ships of the convoy will be referred to by the numbers given in the extract from the Admiralty Letter.

Repeat all flag signals made by senior vessels to convoy. Cooperate as far as possible in forwarding any information to destination. Avoid unnecessary repetition of semaphore signals by acknowledging each word by raising semaphore flag. The sending vessel will repeat each word till this is done.

33. Escorts must not be weakened below necessary strength by hunting submarines at a distance. If an S. O. S. is heard, and a destroyer can be spared, she should be sent by the senior officer of the escort to the rescue if not too far; she must not leave except by his order and the approval of the senior officer present

should be obtained. A fair distance may be considered as three hours' steaming in the weather holding at the moment.

The main principle is that the escort's chief duty is the preservation of the convoy, and nothing can excuse this being risked in order to attack a submarine which is reported elsewhere.

34. When one ship of a convoy drops astern, an attempt should be made to get her to rejoin, but if unable to do so, the convoy must continue with its escort, leaving the ship to look after herself unless her cargo is unusually valuable. Where two ships drop astern, the senior officer of the escort must consider whether to drop one or more destroyers to help them, or to leave them to look after themselves; but in all cases the safety of the convoy as a whole is the first consideration and the senior officer present must first be consulted.

The speed of a convoy may be reduced in order to enable one or two ships to keep up, but not below a certain speed; for instance, an 8-knot convoy may be reduced to 7 knots, but not below.

When sloops are mixed with destroyers as an escort, the sloops, being slower, should be stationed on the quarters of the convoy, the destroyers being ahead, on the bow and abeam.

35. When a convoy approaches its destination at night but is unable to enter harbor, it should be turned round and escorted to sea, making the harbor by daylight.

It is most important that the convoy should remain under way, as when escorted it is far safer under those conditions than when in an open anchorage.

Searchlights should never be used when on escort duty, except in case of a very serious accident, and even then their use is very dangerous by night, as they will attract submarines from a very considerable distance.

36. The diagram at the end of the book gives a quick and simple method of determining the *best* browning positions for any formation. These positions are quite independent of the range, speed of target, or speed of torpedo, and are decided only by the size of the ships in the convoy and their formation. (N. B.—By "position" is meant the position of the submarine when she fires her torpedoes.)

From these it will be seen that with the formations at present in general use for Atlantic convoys the best browning position is about 9° before the beam, and there is a second good position 9° abaft the beam. The first position is better than the second because the track of the torpedo is more nearly at right angles to the target, and therefore the chances of hitting are greater.

It is evident that if the submarine is free to choose her position for attack she will prefer a position in which her torpedoes, if they miss the ship aimed at, will still have a good browning chance.

German submarines at present appear to be firing short-range shots whenever possible, and consequently torpedoes are probably generally set for high speed. The range at high speed (setting) of enemy torpedoes now in use varies from 2,000 yards at 38 knots to 3,700 at 35 knots.

37. Submarines at present appear to be attacking from between the columns or between the wing column and the escort whenever possible. The closer the formation the more difficult does this become, but the distance to which columns can be closed is limited by practical considerations of the maneuvering power of the ships in convoy.

38. When a convoy is broken up by weather, torpedo attack, or other causes, it will be found best to round up the scattered units into two, three, or four separate convoys. This requires more destroyers to guard each ship properly, but is less dangerous than keeping the greater number of ships waiting while the remainder are brought up to join them.

Before sailing, the senior officer of a destroyer escort is always to organize the destroyers and sloops under his orders with a view to attacking a raider, should one be met, when no ocean escort is present. In this case the torpedo is the destroyer's most valuable weapon, and for this reason and in view of this possibility destroyers should always carry at least 75 per cent of their torpedoes on board. The safety of the convoy is best assured by a successful attack on the raider, and this can only be done by a previously organized plan, so that each ship knows what is expected of her and is organized for a combined torpedo attack on the raider. If convoy is dispersed by senior officer present, a signal is to be made to commander in chief "Raider, lat. —, long. —," in order that a cruiser may come at once to assist. When an ocean escort is in company, her commanding officer will decide on the action to be taken in attacking the raider.

39. If a report that is considered reliable is received of a submarine within striking distance of the path of the convoy, a large alteration of course should be made and the vicinity avoided. If the report is only that a submarine has been sighted and it is not clear that she is being hunted, an escort vessel should be detailed to scout in that direction to prevent the submarine maneuvering for position on the surface.

The convoy should not be dispersed if it is considered possible to avoid the submarine, as the ships when dispersed require more than twice the number of destroyers to protect them than they do when together.

40. It is most important when proceeding in formation in thick weather before going on the scouting line for destroyers to keep in

touch. Screened speed lights will be used if necessary, and vessels will call the next astern by flashing lamp from time to time or mast-head lamp when contact can not otherwise be maintained. It is extremely improbable that submarines will find it easy to keep the escort in sight when the destroyers themselves can not do so.

41. The rear destroyers are charged with the duty of keeping stragglers closed up. If for any reason they are unable to keep closed up, report the facts to the escort commander. All destroyers should be assigned certain columns or specified vessels to which they should be ready to pass any orders or instructions from the ocean escort that may be necessary. This should be specified in the commander's escort order, if practicable; but in any case the destroyers should cooperate as far as possible in the control of the convoy.

42. A most difficult situation arises when a big ship in a convoy is torpedoed, especially when carrying a large number of men. The principle always remains that the undamaged ships have the prior claim and must be protected to their destination. At the same time a sinking ship with a large number of men on board can not be deserted. Therefore one (or more *if they can safely* be spared) destroyer should remain by the sinking ship and send out W/T calls for help (the sinking ship's W/T being presumed out of action). The destroyer must not allow herself to be swamped by taking too many survivors on board (every captain should know how many men his ship can safely carry in moderate weather) and would do better by steaming around the scene to keep off submarines while sending out S. O. S. The rest of the escort must stick to the convoy and take it to its destination.

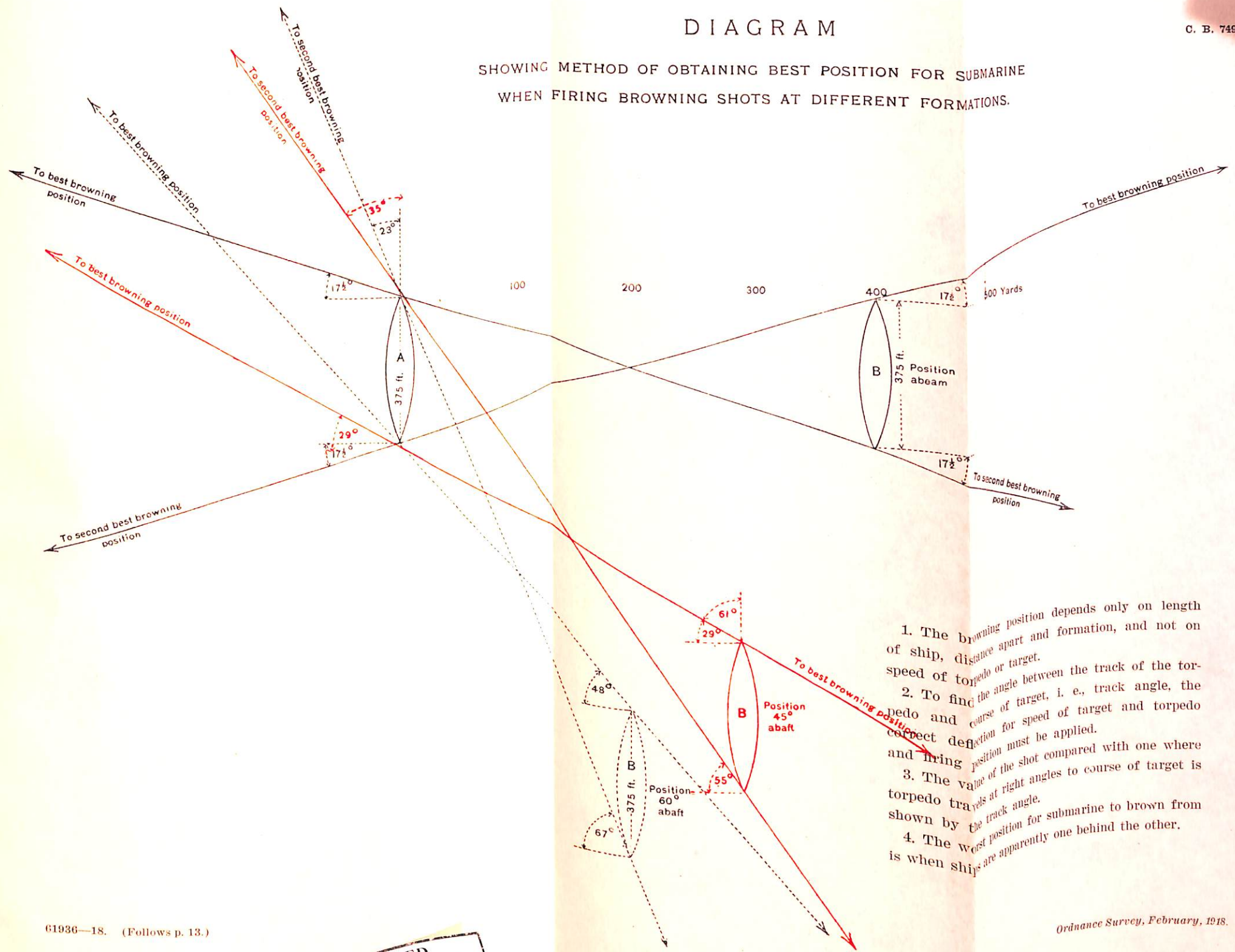
43. If the weather encountered is such that the speed of the escort must be reduced below that which the convoy is capable of maintaining (e. g., troop transports and fast convoys), the senior officer present is to exercise his discretion as to whether the destroyer escort should be ordered to return to harbor.

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DIAGRAM

SHOWING METHOD OF OBTAINING BEST POSITION FOR SUBMARINE
WHEN FIRING BROWNING SHOTS AT DIFFERENT FORMATIONS.



1. The Browning position depends only on length of ship, distance apart and formation, and not on speed of torpedo or target.
2. To find the angle between the track of the torpedo and course of target, i. e., track angle, the correct deflection for speed of target and torpedo and firing position must be applied.
3. The value of the shot compared with one where torpedo travels at right angles to course of target is shown by the track angle.
4. The worst position for submarine to Brown from is when ships are apparently one behind the other.

61936-18. (Follows p. 13.)

Ordnance Survey, February, 1918.

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