

E. SINKING OF MERCHANT VESSELS

(b) The fact that the actual force of the explosion increases with the increase of depth need not be considered in the case of merchant vessels, since they are not provided with under-water protection like war vessels are.

(b) Whenever there is some sea (over 3-4):

Depth setting = 3 m. [ 9.8 ft.]  
or 4 m. [13.1 ft.]

depending on the size of the ship, a lever pistol,\* if desired, being used to render a hit more certain.

Look out for your deflection.

See A. X. 1.

As a general rule, a steamer draws more water than a sailing vessel of apparently the same size.

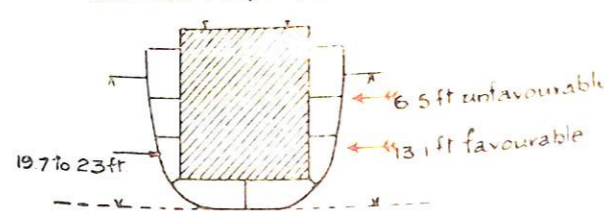
(c) Against large tank steamers, depth setting = 4 m. [13.1 ft.].

The advantages offered by a shallow shot (see a) must give way to the necessity for ensuring reliable depth-keeping; the thing to look out for in this case is not to get a miss underneath.

In this case your object is to penetrate the heavy tank plating.

The possibility of doing so will depend upon the nearness of the side of the tank to the hull and the absolute amount of the explosive effect, and also upon the distance of the point of impact from the middle of the tank. It is important that the hit should not be near the middle in order that the pressure may not be distributed equally over the whole side of the tank but may come with maximum force on the lower part. (See sketch.)

Closed and completely filled



The sides of the tank, which are of considerable strength, are built up independently inside the ship and are connected with the hull by stiffening plates.

\* For particulars of the use of the 'lever pistol', see p. 36. 15.

E. SINKING OF MERCHANT VESSELS

On some occasions 'G' torpedoes, which have hit high up, have not burst open the side of the tank.

Too much differentiation in depth setting leads to mistakes and consequently misses.

It has constantly happened that in their eagerness to hit a stationary vessel at an exact spot to a yard, Captains of submarines have occupied their minds with alteration of course a degree at a time, and consequently have not observed that they were approaching too close. At a range of 150 m. [164 yds.] you will get a miss underneath.

U. 63, Torpedo Experiments Committee.

(d) When adjusting for depth, note what is said in Appendix C. I. 5.

8. When attacking stationary vessels, force yourself not to approach within less than 400 m. [437 yds.].

In such cases a simple method of estimating distance is to observe what proportion of the space between the two side wires of the 30° periscope field (with magnification 1½) the target occupies when broad-side on.

Rule of thumb:

Distance = twice the width of field thus enclosed.

9. When firing at stationary steamers do not endeavour to hit exactly amid-ships, but about 20-30 m. [66-98 ft.] abaft this.

See A. V. 5 f. 8.

The largest spaces in the ship are situated hereabouts. The change of trim produced by a hit here will bring about the bursting of bulkheads, and thus cause the ship to sink more quickly than a vessel hit right amid-ships and merely heeling over.

U. 28, U. 61.

When abandoning ship, many Masters of steamers will keep their engines moving slowly in order to keep the ship head to wind.

10. In the case of steamers believed to be stationary, steer an accurate course whilst attacking and carefully observe the change of bearing, calculating your deflection accordingly.

Do not fire a torpedo on the assumption that the ship is stationary without making sure of the fact.

Many a miss has been made with torpedoes fired at vessels apparently stopped and blowing off steam.

Compare the case of attack on a vessel lying at anchor.

See C. VI. 1 and 2.

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## E. SINKING OF MERCHANT VESSELS

11. Keep a constant look-out in case the steamer should suddenly go ahead.

For this purpose watch her stern! Should she do so, turn up\* at high speed and, without using deflection, fire at her stern.

Do not in any case take a point of aim further aft.

*Note.*—In the cases referred to in 10 and 11, the rule given in 9 naturally does not apply.

12. An exception to the rule given under A. II. 1 is offered by the case of merchant ships which one can attack from a good short range (250 m. [273 yds.]), even in a flat calm, without their avoiding the torpedo.

13. With steamers steering a zigzag course, by taking bearings and ranges of the enemy at the moment when he alters course, it is possible to determine the period and direction of his zigzag fairly accurately.

First base your attack on the average course and, when you get closer, steer 'unseen' for your position of attack before his final alteration of course.

14. When attacking steamers, seek an opportunity for a stern shot at 200 m. [219 yds.].

### Conditions requisite:

A calm sea (not more than 3-4) and not much swell.

15. At night do not attempt to fire on the surface in a seaway.

\* i. e. towards a similar course. Tr.

For the wash of the propellers. If you waited to read off your deflection and then adjusted for it, the chance of a safe shot would be missed.

The acute track angle will of itself lead to a hit further aft.

*Note.*—In the cases referred to in 10 and 11, the rule given in 9 naturally does not apply.

An incredibly bad look-out is kept in such cases.

It will take years of practice for the crews of merchant vessels to acquire a good eye for a periscope and the track of a torpedo.

Submarine Flotilla, Pola

It has been ascertained that most merchant vessels, and even men of war, make definite alterations of course at equally definite intervals (10-15 minutes), which your watch will give you.

By joining up one or two of the vessel's tacks, a submarine Captain has been able to say  $\frac{1}{2}$  minute beforehand when and in which direction the next alteration of course would be made.

U. 32

Utilize the advantages offered by this safe and easy shot.

If the speed of the steamer is low the submarine remains for too long ahead of her enemy and, being obliged to increase speed in order to keep her depth in a seaway, she may easily get too far away from the enemy or be sighted prematurely.

U. 60

Just before firing the boat may unexpectedly be thrown off her course, and, if forced to dive hurried

## E. SINKING OF MERCHANT VESSELS

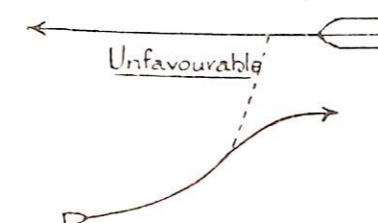
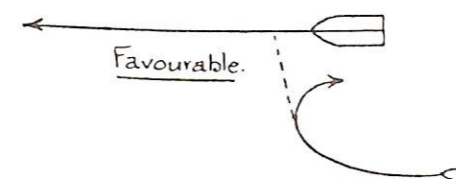
16. A night attack with torpedoes offers very good prospects of success.

17. For this purpose use a simple director which you can make for yourself.

Do not attempt a night attack without an instrument of this sort.

Rules of thumb.

18. If there is any choice, when attacking merchant vessels on the surface at night a large fast submarine should always endeavour to steer an overtaking course and not an opposite course.



19. When firing on the surface at night (and this applies also to firing submerged) turn away towards the stern of the enemy.

20. For a night attack, at short range, using a bronze torpedo, make an exception and choose the lee position. See A. I. 1 b.

21. TRAPS TO LOOK OUT FOR IN NIGHT ATTACKS.

(a) When taking navigational lights as your point of aim, endeavour to make out their position in the vessel.

ly, she may not be able to get below the surface quickly enough (air bubble) and may be exposed to gunfire.

U. 48.

See B. I. 1.

See B. II. 8.

See B. II. 9 and 10.

Attacking from astern means safety and peace of mind, also a favourable track angle.

When attacking from ahead the submarine may easily be exposed to danger of ramming, the track angle is unfavourable and the conditions for turning away, i. e. towards the enemy's stern, when firing or immediately afterwards, are likewise unfavourable.

Submarines cannot be spun round with the helm like destroyers.

Here again we have a fundamental difference between submarine and destroyer attack.

II Submarine Flotilla.

Otherwise you run the risk of ramming or being rammed.

Bronze torpedoes run better in calm water. At night the attack remains unseen.

U. 30.

A trawler with lights extinguished suddenly displayed side lights and a steaming light at the jackstaff, to simulate the appearance of a large steamer.

U. C. 7.

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## E. SINKING OF MERCHANT VESSELS

(b) Patrol vessels have frequently displayed fishing lights or, in addition to a white masthead light, have shown a red or green stern light.

(c) At night, steamers have shown their side lights reversed, and sometimes have displayed particularly bright side lights raised on spars.

(d) Buoys have been observed with navigational lights on them.

(e) Other traps which do not immediately bear on the attack.

22. Do not employ net cutters against steamers.

### 23. ATTACK ON CONVOYS.

(a) Average speed = 11 knots.

(b) In the case of an attack on a convoy in which the ships are 1,000 m. [1,094 yards] apart, as a general rule, it will not be possible to sink more than one ship unless several submarines attack simultaneously.

The employment of submarines in pairs or groups against convoys is therefore advantageous.

(c) There is a possibility of bagging two ships:

(α) Head for the middle of the interval between two ships on a course converging at an angle of 50° with that of the convoy.

At about 700 m. [766 yards] fire at the leading ship with a track angle of 50°.

Then fire an angled shot (90° or 270°) at the next astern.

In order to mislead an observer as to their occupation or as to their course.

U. C. 65

In order to screen patrol vessels proceeding astern of them with lights extinguished.

Flanders Submarine Flotilla

Intended to decoy submarines into a net or on to a line of mines.

See Appendix A. II. 20.

The head of the torpedo may jam in the hole blown by the net cutter without the whiskers getting a grip anywhere.

Torpedo Inspection

The maximum speed of the slowest ship.

On hearing the explosion the other ships will turn away according to signal or to a prearranged plan and they will not resume their previous formation until they are beyond the submarine's attacking radius.

The amount to be allowed off for the acute track angle is small (see A. VIII. 1); with speed of enemy 11 knots, speed of torpedo 32 knots, it is nil.

The shot is certain not to be seen.

On the definite assumption that she will not turn away until she hears the explosion, and then will turn in

## E. SINKING OF MERCHANT VESSELS

the direction favourable to the angled shot.

It is a safe shot, free from anxiety.

In the case of an unpractised convoy there is an indescribable degree of irregularity in station-keeping at the place of assembly, so that even smaller distances apart and positions threatening mutual ramming frequently occur.

(β) Where two ships are proceeding in closer order, say 200-300 m. [219-328 yds.] apart, if possible fire two direct bow shots at 300 m.

Fire the first at an acute track angle, and fire the second under helm.

## APPENDIX A

### HINTS FOR THE CONDUCT OF WAR AGAINST COMMERCE OUTSIDE THE BARRED ZONE, &c.

U. C. 71. Flanders Submarine Flotilla.

#### I. General.

1. While observing all necessary caution, let as **short** a time as possible elapse between the sighting of a vessel and her destruction!

2. The necessity for watchfulness cannot be too strictly enjoined on look-outs.

3. Be ready for instant diving. Have as few men as possible on deck.

4. Always keep under way!

5. Always arrange your course so that the submarine's clear view of the whole horizon can be blocked by the steamer for a short time only.

#### II. Procedure when Holding Up Neutral Vessels.

Assuming that you are ahead of the enemy and that there is good visibility.

1. Pass the vessel submerged and unseen, at a distance of 200 m. [219 yds.], till you are about on her beam.

Have a torpedo tube constantly ready! (Angled stern shot, with small parallax).

2. Observe the steamer **narrowly** from this position, with periscope exposed to view.

The longer the delay, the greater the likelihood of new difficulties arising or of enemy measures intervening.

It is only natural that the men should be interested in the visible part of the proceedings (firing on the steamer), and self-control is needed, for instance, to keep a good look-out to port while the enemy is in process of being destroyed to starboard.

All, who are not needed at the guns or as look-outs, should be at diving stations!

Constant danger from enemy submarines!

In order to detect the approach of enemy forces in good time.

So that any attempt to ram would then fail.

A certain hit, if a trap or the possibility of counter-measures should be detected.

If the steamer is a trap, she will probably disclose her character on sighting the periscope.

If she is harmless, it will hasten her surrender.

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## APPENDIX A

A sharp look-out should be kept for the following:

(a) Suspicious erections on deck.  
Concealed flaps in the ship's side.

Suspicious scuttles.

(b) The nature of the wireless installation.

(c) The behaviour of the crew on sighting the periscope, from which it is possible to draw conclusions.

(d) How are the neutral markings displayed?

How are the name of the ship and her port of registry painted on?

3. Even if no suspicious signs are observed, the submarine should remain submerged after having passed the steamer.

4. The submarine should blow her tanks when at a distance of 5,000-7,000 m. [5,468-7,655 yds.] right astern of the steamer and should then proceed with gunfire and signal in accordance with the Prize Regulations.

Do not get inside this distance.

5. The submarine should keep the steamer's masts **constantly** in line.

6. If preparations to send a boat alongside are not made with sufficient

Dinghy aft, W.C.'s.  
Hinges, marks of rust where the ship's side is broken.

In places where scuttles are not usually fitted.

A dummy aerial has been seen which was not connected to anything.

Do they think of their safety first or of resistance?

It has frequently been observed that on a periscope being sighted the ensign staff has been removed. (Sure sign of a gun mounted aft.)

Neutral vessels have the markings painted in a durable manner on the hull, because they need not remove them on entering any port; the same applies to the name of the ship and her port of registry.

Vessels are suspect if the markings are on the bridge, bulwarks, cargo doors, &c., where they can easily be painted over or entirely removed when at sea. A vessel whose name has been painted over is **always** suspect.

The vessel is still not free from suspicion.

In order to prevent the enemy from replying to her fire (only a stern gun could be used, and only after removal of the ensign staff).

In this war the appearance of a submarine holding up a steamer is

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APPENDIX A

dispatch and energy a few hits should be made to speed things up.

7. After examining the ship's papers, send the boat back with orders to the crew to abandon ship and pull over to the submarine. One or two men should be retained on board the submarine.

8. As soon as the ship's boats start pulling towards the submarine put a few shots (with internal fuse) into the steamer.

9. Increase the number of hostages to 6 (Captain, Engineer). Keep the ship's boats together at a distance of 200 m. [219 yds.] from the submarine and watch them **closely!**

10. Keep a good hydrophone watch and a sharp look-out for periscopes. (For the latter purpose divide horizon into 45° sectors.)

11. Send a demolition party, armed with loaded pistols, to the steamer in one of her own boats. Arrange with them a **distinctive recall** (sound and visual signals).

12. The submarine should approach the steamer as soon as the demolition party have begun their work.

13. Reply to every movement of the vessel (apparent turning broadside on) by a counter-movement. Should this be **unnaturally** repeated, open an effective fire.

14. Destruction of the vessel by explosive charges or burning.

15. If, after determining her course, it is **not** possible to observe the vessel through the periscope whilst submerged, steer for a position as nearly as possible right astern of her, and let your first warning shot

known to every ship, and the excuse that the signal is not understood **cannot** be entertained.

As hostages, particularly in case the ship should be armed or enemy submarines should be in the vicinity.

To clear up the situation and make sure that no guns' crews have been left concealed on board.

After several hits in the interior of the ship they would reply to your fire.

As a precaution against hostile acts (throwing of bombs), for which you must always be prepared.

Danger of enemy submarines.

In case of a sudden change in the situation.

But not sooner, for her own security, and not later, in order not to lose too much time.

A steamer, when stopped, lies broadside on to the sea.

See Appendix B. II and III.

The submarine will then be exposed to the fire of a stern gun, but any attempt by the steamer to close the submarine will demand more time and be readily detected.

APPENDIX A

be fired from a distance of 5,000 m. [5,468 yds.] or more.

16. If other vessels approach while a ship is being sunk, compel them in good time to stop at a wide distance.

If they do not stop, assume that their intentions are hostile and recall the demolition party.

Destroy the steamer with a torpedo.

As far as possible use up 45-cm. [17.7-in.] torpedoes for stationary steamers.

17. While taking the demolition party on board again, the submarine should conceal herself behind the sinking steamer from the view of the vessels sighted in the distance.

18. Special precautions and preparedness are needed in misty weather!

Visibility of 5,000 m. [5,468 yds.] is required.

In a case of this sort it is advisable quickly to fire one effective round and then to alter your position.

In misty weather the submarine will be detected by other vessels only with difficulty and after some delay.

19. Two submarines, thoroughly accustomed to working together, may be employed to advantage.

20. Look out for submarine traps! Steamers under false flags.

Steamers with markings which have intentionally been made to resemble particular markings prescribed as a protection, for instance the Red Cross.

See 11.

Bow and stern tubes must be kept in readiness.

'G' torpedoes are too good for this work, the older types fully meet the requirements.

In order to be secure whilst re-embarking the demolition party and handing over the hostages, and to be able to dive undisturbed.

The attention of vessels which are in the vicinity but **not** in sight will be attracted by the gunfire, and they may appear suddenly, steaming at high speed.

Therefore **immediate** counter-measures, such as firing or diving, will achieve the desired result.

(a) The more distant submarine compels the crew to abandon ship by gunfire, while the nearer boat, by showing her periscope, threatens to reply to any hostile acts.

(b) If other ships appear in sight, the rôles can be exchanged according to relative positions, and thus more can be accomplished in a given time.

See E 21.

APPENDIX A

Armed smacks among harmless fishing fleets.

Submarines among fishing fleets.

Submarines near apparently damaged seaplanes.

Ship's boats, which leave the steamer in an innocent manner, but are really provided with depth-charges.

Steamers, which stop when ordered to, lower their boats with every sign of panic, and on the approach of the submarine, open fire from concealed guns.

Vessels which carry lights with the characteristics of light buoys and which are armed.

Armed lighters in tow.

Steamers and other craft with poisoned provisions to give to submarines' crews on the high seas.

Armed sailing vessels (from the smack to the full-rigged ship). Heaving to at the warning shot, they dexterously throw the sails over the gun and open fire as soon as the submarine approaches on the surface.

III. Procedure when Pursued with Hydrophones.

1. A rough sea is the best natural protection.

Hitherto pursuit with hydrophones has been troublesome to submarines only in quite calm weather.

2. The reduction to a minimum of the sounds caused by your own boat is an effective protection.

(a) Connect the vertical rudder and hydroplanes for hand working.

Steering engines produce a typical sound, easily picked up by hydrophones.

(b) Stop your ballast and trimming pumps.

Use compressed air in lieu.

Pumping or trimming with compressed air is almost inaudible.

(c) Let your main motors run at the lowest possible number of revolutions, stopping frequently. Keep the boat trimmed on the periscope.

To do this, trimming and steering must have been brought to the highest degree of perfection.

3. Proceed at a depth of 45 m. [148 ft.]

As deep as possible in view of depth-charges; on the other hand, the boat must have a margin of depth in case of a sudden involuntary dive.

4. It is better to keep near the coast than out in the open sea in cases where the depth is greater than 70 m. [230 ft.]

So that it may be possible to lie on the bottom in the event of the boat being unable to keep her depth.

5. Lying on the bottom is a good way of evading enemy hydrophone

(a) There will then be no sounds at all caused by your own boat.

APPENDIX A

pursuit, provided that the hull is absolutely tight.

No leakage of air and, above all, no oil bubbles.

(b) This will furnish the best opportunity for making full use of your own hydrophones.

(c) The pursuer, who can only use his hydrophones when his engines are stopped, will drift away from a submarine lying on the bottom.

While hydrophone vessels are steaming at high speed they can hear nothing themselves.

6. Make the most of the time when your pursuer is going ahead, in order to increase your distance from him.

The submarine must, however, stop frequently to listen, even at the risk of not increasing her distance from the enemy so rapidly.

It is difficult for the submarine to distinguish when hydrophone vessels, which are apparently proceeding at full speed, have really stopped to listen and are merely carrying their way.

It is better to be content with small advantages, otherwise you may easily lose the start which you have previously gained.

This has no object when proceeding at such low speed.

It merely hinders the submarine from increasing her distance from her pursuers.

7. It is not advisable for the submarine to zigzag.

Submarines accustomed to work in pairs can deceive hydrophone pursuit by pre-arranged noises and thus shake it off sufficiently until favourable weather conditions make it possible to come to the surface and escape.

8. Here also, working in pairs is advantageous.

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## APPENDIX B

### HINTS ON GUNNERY IN SUBMARINES, &c.

(Inserted here merely on account of their close connexion with operations for the destruction of commerce, *see* E 1.)

#### I. Gunnery.

##### 1. GENERAL.

The measured or estimated range is corrected by spotting. The general principle is: with range decreasing, sights up a little, down a lot; with range increasing, the reverse. Gradually increase the correction if the desired effect is not obtained. Get the splashes on your side of the target.

At all ranges **shorts** are easier to make out than **overs**. Therefore work on a system of obtaining short shots.

It is difficult to determine hits, and only clearly visible destruction of portions of the target justify you in assuming a hit for the purpose of spotting corrections.

Shots to one side of the target must **never** be used for making spotting corrections, as there is always an element of doubt about them.

The point of aim should be the **centre of the water line**, qualified by the order: 'Right' or 'left'.

##### 2. DEFLECTION.

Is dependent on the drift (correction given in range tables), the calculated correction for own speed and speed of enemy, the wind, and the displacement of the point of impact corresponding to the point of aim.

For your own speed always correct towards the stern, i. e. on the starboard side correct to the right, on the port side correct to the left.

For speed of enemy always correct towards her bow.

**Wind:** For each unit of wind strength apply a correction of  $\frac{1}{16}$  of a degree at ranges over 3,000 m. [3,280 yds.], and of  $\frac{3}{16}$  of a degree at ranges under 3,000 m., in the direction of the wind.

At long ranges use small corrections, but at short ranges apply large ones, i. e. not less than  $\frac{1}{16}$  of a degree (at 1,000 m. [1,094 yds.]  $\frac{1}{16}$  of a degree shifts the point of impact 1.1 m. [3.6 ft.]).

##### 3. FIRE CONTROL.

No success will be obtained without **controlled firing**.

**Bracket 'Strichschiessen'**\* (only advantageous when **closing rapidly**. At the lower or upper limit of the bracket use 'Strichschiessen').

\**Strichschiessen*, lit. strip firing=Method of getting the range by obtaining a **short** when the range is decreasing or an **over** when the range is increasing, and then keeping the same range on the sights until a shot falls over or short, as the case may be. (*See* C. B. 1182, German Navy, Part IV, Sec. 4, p. 24).—Tr.

## APPENDIX B

Example:

(a) Range decreasing.		(b) Range increasing.	
(i)	(ii)	(i)	(ii)
3,600 m. -	3,600 m. +	3,600 m. -	4,000 m. +
4,000 m. +	3,200 m. -	4,000 m. +	3,600 m. -
3,600 m. -	3,200 m. -	4,000 m. +	4,000 m. +
3,600 m. -	3,200 m. +	4,000 m. -	4,000 m. -

**Abbreviated bracket 'Strichschiessen'.**

The target is brought inside the 400 m. bracket and then, commencing from the lowest bracket figure, the range is increased 100 m. at each shot.\*

Example:

(i)	(ii)
4,000 m. +	4,000 m. -
3,600 m. -	4,400 m. +
3,700 m. -	4,000 m. -
3,800 m. +	4,100 m. +

Doubtful shots should be repeated without altering the range.

The simplest method of '**Wirkungsschiessen**' † is gradually to bring the splashes on the - side by lowering the sights somewhat more than the actual rate of change of range\*, then from this range use 'Strichschiessen' until the splashes become +.

If you do not get a short after 3 overs, double your correction.

Example: Rate of change of range = 75 m. between successive shots; apply 100 m. on the sights.

(i)	(ii)	(iii)
4,000 +	4,000 +	4,000 +
3,600 -	3,600 -	3,600 -
3,700 +	3,700 +	3,800 +
3,600 +	3,600 +	3,600 -
3,500 -	3,600 +	3,600 +
3,500 +	3,500 +	3,500 +
3,400 +	3,300 -	3,400 +
3,300 +	3,300 +	3,200 +
3,100 -	3,200 +	2,800 -
	3,100 +	2,800 +
		2,700 +
	2,900 -	2,600 +
		2,400 -
	2,900 +	2,400 +

Note: Also work with corrections of 50 or 150 m.

When getting the range **always** wait for the splashes. When in '**Wirkungsschiessen**', fire as rapidly as possible consistently with proper

\* This assumes range **decreasing**.—Tr.  
 † Rapid fire, i. e. fire designed to produce maximum effect.—Tr.

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## APPENDIX B.

observation, sight-setting, and gun-laying; after sufficient practice it is not necessary to wait for the splashes.

If, in the course of 'Wirkungsschiessen', fire has been checked involuntarily owing to the sea, make a proportionate increase in your sight correction.

In the case of range increasing, reverse the above procedure.

### 4. CHOICE OF AMMUNITION.

#### (a) Nose-fused shell.

Against cargo steamers.

When finding the range.

The shell, on entering, will make large holes in the hull.

Splashes are larger and therefore easier to observe.

#### (b) Internal-fused shell.

Against troop transports and munition steamers.

The explosion takes place in the interior of the ship after penetration of the hull.

The resulting gas and fire will do execution against living targets and munitions.

## II. Blowing Up of Steamers, &c.

1. Never use explosive charges singly for large ships.

2. If the ship has a list, arrange the explosive charges in groups on the side rising out of the water, lowering them down to at least 1 m. [3.3 ft.] below the surface.

Three charges lashed together are sufficient.

Do not place the charges in the interior of the ship.

The only work necessary there is to open the sea-cocks, if there is time.

4. When using groups of charges, employ one fuse only.

The effect is too insignificant!

The charges will then lie close against the ship's side, thus ensuring the maximum effect.

Damage to the hull above water would be insignificant and also useless.

Detonation without appreciable effect.

If a second fuse should detonate simultaneously with the first, the combined effect of the detonations, thus taking place side by side and partially neutralizing each other, would be appreciably diminished.

The largest spaces in the ship. The ship will turn turtle.

U. C. 71.

5. Place groups of charges abreast cargo holds and engine-room.

Smash in the hatches to allow the air to escape.

## APPENDIX B

If it is not possible to place more than one group of charges in position, owing to enemy patrols appearing, it should be placed either forward or aft in the ship.

The change of trim causes the bulkheads to burst and the ship to sink quickly.

One group of charges amidships will not suffice to cause the vessel to capsize.

## III. Destruction by Fire.

Sailing vessels and cargoes of timber or other inflammable material should, if possible, first be sprinkled over with oil and then set alight by gunfire.



## APPENDIX C

### HINTS FOR THE HANDLING OF TORPEDOES AND TORPEDO TUBES

#### I. The Torpedo.

1. When trimming the boat, pay attention to the condition of the air vessels of the torpedoes! It makes a difference whether the air vessels are empty or filled!

2. The greatest care must be observed when embarking torpedoes, also when stowing spare torpedoes.

3. As soon as a torpedo is withdrawn from the tube, the propeller clamp must always be put on, and the safety pin (*Vorstecker*) and the safety bolt (*Sicherheitsbolzen*) of the pistol inserted.

The safety pin and the propeller clamp must be connected by means of a lanyard.

#### WEIGHT OF AIR CHARGE:

**G 7 torpedo** (160 kg. pressure [2,276 lbs. per sq. in.]) = 121 kg. [267 lbs.].

**G 6 and K torpedo** (160 kg. pressure [2,276 lbs. per sq. in.]) = 101 kg. [223 lbs.].

**C/06 torpedo** (160 kg. pressure [2,276 lbs. per sq. in.]) = 76 kg. [168 lbs.].

**C/03 torpedo** (150 kg. pressure [2,133 lbs. per sq. in.]) = 54 kg. [119 lbs.].

**A/08 torpedo** (150 kg. pressure [2,133 lbs. per sq. in.]) = 52 kg. [115 lbs.].

**G/99 torpedo** (150 kg. pressure [2,133 lbs. per sq. in.]) = 46 kg. [101 lbs.].

**C 45/91 S-torpedo** (100 kg. pressure [1,422 lbs. per sq. in.]) = 33 kg. [73 lbs.].

**C 45/91 Br.-torpedo** (100 kg. pressure [1,422 lbs. per sq. in.]) = 24 kg. [53 lbs.].

In order to prevent the spare torpedoes taking charge if the boat loses her trim, and to prevent accidents.

For the safety of the boat and crew.

To ensure that, when the torpedo is being loaded into the tube, the clamp is **always** removed, as otherwise the torpedo will sink!

## APPENDIX C

4. The Torpedo Officer must carefully examine every torpedo **himself**.

5. Special attention must be paid to the depth-setting of the torpedo.

6. The position of the adjusting screw of the reducer must **always** be checked with the **spanner**. Testing with the finger or by means of peering in affords no certainty. The adjusting screw must be screwed either **hard up** or **hard down**.

7. All doors in the shell of the torpedo must be screwed down very tightly.

8. Before diving to a depth of more than 15 m. [49 ft.], the bow and stern caps must be closed.

9. When the tube has been flooded and the torpedo not fired, the torpedo must **always** be withdrawn at the first opportunity and the shell examined to see that there is no water in it.

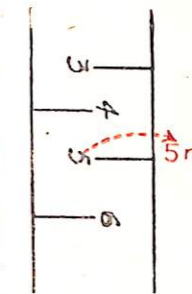
10. The prescribed air pressure must always be maintained in the air vessels of the torpedoes. After the air vessel has been charged, the air cools and contracts. For firing in action the maximum permissible charge should be used in the air vessels, whilst for practice firing they must be charged to a pressure corresponding to the required range.

11. When charging the air vessels the standpipe must frequently be drained.

12. The balance-chamber drain

This alone precludes the possibility of mistakes on the part of the crew.

The men are inclined to set the depth 1 m. [3.3 ft.] in error. Exact depth-setting is particularly essential in the case of torpedoes set to run shallow. The figure indicating the depth is abreast of the corresponding line of the scale, and **not above or below it**.



It frequently happens that the adjusting screw is screwed one or two turns short of 'hard up' or 'hard down.' Variations in the tension produce variations in the speed of the torpedo and may cause a miss.

Otherwise there is risk of the shell not being watertight.

Torpedo will run in a circle.

Otherwise, owing to the high water-pressure, the torpedo may spring a leak and fail to run properly.

Otherwise the torpedo may run in a circle and endanger the boat from which it was fired.

(a) When firing in action the air charge determines the range of the torpedo.

(b) In practice firing an excessive air charge endangers the buoyancy of the torpedo at the end of its run.

(c) Too low an air charge causes a loss of speed and reduces the chances of hitting the target.

Otherwise the water (used for lubricating the air pump) will enter the air vessel and cause rust.

The excessive pressure would be

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screw must not be removed whilst there is an excess of air pressure in the boat.

13. When inserting the pistol the striker must be examined with special care.

14. During practice firing examine the carbide light container for leakage of gas (dip the container into water!). Safety screws of the container only to be removed shortly before loading. Used and opened containers must always be stowed outside the boat and never in the interior.

15. During long-distance cruises the torpedoes must be handled in accordance with the torpedo handbook for submarines.

16. Torpedoes must no longer remain untouched during an entire cruise, as formerly occurred, but are to be thoroughly overhauled at frequent intervals (at least every other day).

17. Net-cutters should not be used against light cruisers.

II. The Tube.

1. Before opening the bow or stern cap the cock in the pressure equilibrium connexion, marked 'Tube—Outboard', must be opened.

2. When opening the bow or stern cap observe the position of the pointer of the operating gear and the interlocking lever of the firing bar. The pointer must be exactly at

transmitted to the air in the balance chamber and thence, on firing, to the innersurface of the hydrostatic valve, increasing the pressure normally produced by the hydrostatic spring.

The torpedo would then run deep proportionately to the excess of pressure (76 mm. [2.99 in.] of mercury = 1 m. [3.28 ft.] of water).

If the striker fails, the whole torpedo fails in its object.

The gases generated by containers prematurely started in the tube are injurious to the health of the crew.

Attention to the instructions eliminates carelessness.

This cannot be sufficiently emphasized.

The satisfactory results achieved by submarines are due to the torpedoes running well.

III Submarine Flotilla.

The war-head may become wedged in the hole blown by the net-cutter without the whiskers getting a grip.

Torpedo Inspection.

(a) Otherwise the operating gear is subjected to too great a strain.

(b) During practice firing there is the danger of starting the carbide light container.

Otherwise the firing gear will fail.

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'A' and the lever must be just clear of the firing bar.

3. In the case of the deck tubes in 'U.C.' boats, it must be ascertained beyond doubt that the intermediate valve, in the pipe lead between tube and torpedo tank, is closed, before opening the bow or stern cap.

4. The firing spring on the firing bar must be cocked to the correct length for firing. The prescribed length of the spring when cocked is engraved on a brass plate soldered to the spring.

5. The firing bar must always be kept free from paint.

It may only be greased with torpedo lubricating oil.

6. Wandering leads must not be stowed on the tube.

7. The bolt of the electrical release must be lifted up before every shot, and cleaned and gently inserted, the point being examined.

8. The contact casing of the electrical release must always be kept free from water and oil.

9. The strength of the current of the firing battery must be tested at frequent intervals with the ammeter supplied. The containers must be frequently ventilated.

10. The large firing valve, the non-return valve, and the cut-off valve of the swirl reducer must frequently be moved (by hand).

11. The correct securing stop or tripper for the particular type of torpedo in use must be inserted in the tube.

12. Before loading, the angling gear on the torpedo must be set to zero.

Otherwise the torpedo tank, which in this class of submarines serves also as a trimming tank, will become filled.

An insufficiently cocked spring is too weak to actuate the bar.  
Result: a missfire.

Grease, &c., congeals, clogs the firing gear and causes stiffness in working.

They may catch in the firing gear and cause missfires.

The explosion chamber, in which the gases of the powder cartridge produce their effect, is of small size; hence this chamber must always remain free from dirt and powder residue. The point must be intact.

Otherwise the release will fail to act.

Otherwise the release will fail to act.

U. C. 26.

Otherwise they set up and fail to act when firing.

For instance, if a G 6 torpedo were loaded into a tube fitted with a G 7 securing stop, the engine would be started inside the tube.

Angling can be effected only when the torpedo is in the tube. The gear on the torpedo and that on the tube

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13. It is very important that the securing stop and tripper should be treated with care during loading. Damaged securing stops and trippers must be exchanged.

14. When loading, never launch the torpedo right up against the securing stop. Combine the last stage of launching in the torpedo with the closing of the rear door. A torpedo ready for service should in every case be launched back again and the securing stop examined.

15. When loading, raise the tripper by means of the testing rod.

16. Whilst loading, hold the testing rod of the tripper in its upper position; never set it or lash it there.

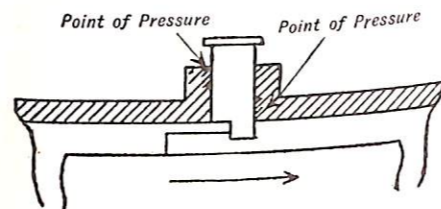
17. When the tube is loaded, do not release the firing lever.

18. At the same time as 'Tube ready' is reported to the Captain, the following further reports should be made: (1) that the tripper is right down (the testing rod being again pressed in to ensure this), (2) that the

must therefore be in corresponding initial positions.

The securing stop provides the limit for launching the torpedo into the tube. If the securing stop is damaged, the adjusting gear on the tube, e. g. the spindles of the depth-setting and angling gear, will not be immediately opposite the corresponding fittings on the torpedo itself.

If a torpedo ready for service bears against the securing stop, the latter is liable to bind in its casing.



The firing spring is then not strong enough to actuate the firing rod and lift the securing stop on firing.

Result: a missfire.

If the tripper slides along the air vessel during the loading, it will be damaged and its connecting rod (the gyro starting rod) will be bent. The firing spring will not actuate this rod on firing if it is bent.

Result: a missfire.

Otherwise you may easily forget to release the rod afterwards. The engines of the torpedo will then fail to start on firing and the torpedo will immediately sink on leaving the tube.

The tripper would be operated by the gyro starting-rod. The engines of the torpedo would start in the tube.

This ensures the tube's crew again having their attention drawn to the important points.

With the constant changes in personnel in the Submarine School this rule has proved to be of great value.

indicator of the swirl reducer is at 'Ready for Firing,' and (3) that the firing reservoir is correctly filled.

19. When getting the tube ready for firing, the firing reservoir and connexions must be drained and vented.

20. When the tube is loaded, always keep its draining connexions open.

21. After firing, compare the air pressure remaining in the firing reservoir with what is laid down in the Range Tables.

22. After every shot always inspect and dry out the tube and examine the securing stop, tripper, and angling bolt, and slightly grease the tube.

23. When opportunity offers fire a water-shot.

24. Frequently practice adjusting the depth gear and reducer, then launch back the torpedo and ascertain whether the adjustments have been made correctly.

25. Never fire if the boat is trimmed more than 5° from the horizontal.

26. Do not flood the deck tubes (in 'C' and 'E' boats)\* when it is freezing. As a guide to the degree of cold in which this rule applies, it may be assumed that as long as the bow or stern cap can be opened the torpedo may be fired.

27. When firing mines from the torpedo tubes disconnect the swirl reducer (by turning the hand wheel

\* i. e. U. C. boats and U. 71-80 class (all minelayers).—Tr.

If the intermediate capacity has not been vented, the indicator of the swirl reducer will not show 'Ready for Firing' when the tube is otherwise ready. Water in the connexions is always a cause of trouble.

(a) Tube and torpedo remain dry.

(b) There is no possibility of an excessive pressure being set up in the tube should the air vessel of the torpedo not be pressure-tight.

This will show whether the swirl reducer is working correctly and the splash was properly reduced on firing.

This is necessary to ensure that the torpedo will go easily into the tube and that the bolts in question will work properly.

This is always the simplest test of the correct working of the firing gear.

This makes for security and reliability.

The torpedo would not take up its depth in the usual way and would probably either go to the bottom or break surface.

Otherwise the torpedo may be damaged by the formation of ice.

U. C. 27, Submarine Inspection, Torpedo Inspection.

Very important!

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on the control valve hard over in the direction of the arrow marked 'Mine Shot') and set the tripper in the raised position.

*Guiding Principle:* Thorough attention to detail and the most painstaking precision.

It is preferable to examine and test ten times too much than once too little.

Endeavour to arouse in the tube's crew the same ambition as the torpedo itself possesses! Implant in the minds of the technical ratings the consciousness that success can only be obtained if each one of them always has all his wits about him.

For a successful hit with a Torpedo, part of the credit is invariably due to the technical personnel!

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