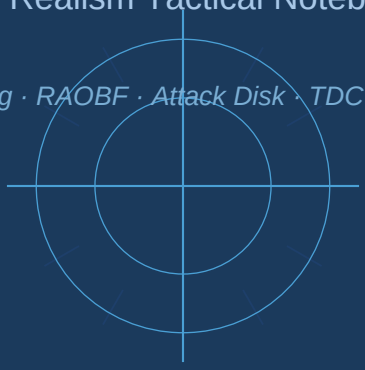
UBOAT

Full Realism Tactical Notebook



Contact Tracking · RAOBF · Attack Disk · TDC · Torpedo Firing

Hydrophone · Intercept Geometry · Speed Estimation · AoB Solutions

SECTION TOC

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SECTION 1

Smoke / Contact Sighting Procedure

STEP-BY-STEP ON FIRST SIGHTING

1. Do NOT close immediately. Smoke on horizon = possible destroyer screen. Stay at safe distance (8–12 km) and observe first.

2. Note time, your heading, and your position on the nav map.

3. Classify the smoke: single thin plume = merchant; multiple broad plumes = convoy; black/oily = warship at speed.

4. Surface carefully (or stay at periscope depth) and take a bearing reading. Wait **3–5 minutes**, take a second bearing.

5. Plot both bearings from your position on the nav map as lines. The target is somewhere along each line.

6. Estimate range using RAOBF (see Section 2) or visual mast height judgement.

7. Plot two position fixes (one per bearing + range estimate). Draw a line between them — this is the **target track**.

8. Read off course and calculate speed (distance between fixes ÷ time elapsed, converted to knots).

9. Decide: attack now or shadow? If escorts are present or position is unfavourable, shadow at safe distance and wait for night.

TIP — MULTIPLE BEARINGS
The more timed bearing pairs you take, the more accurate your track. Three pairs over 10 minutes gives a very reliable course/speed solution. Never rush the plot — a wrong course estimate means a missed shot.

WARNING — SMOKE DIRECTION TRAP
Smoke drifts with wind, not target course. Always take compass bearings to the SHIP HULL (or bow wake), not to the smoke cloud itself.

SHADOWING A CONVOY

Stay 8–12 km behind, on the surface at night, submerged by day. Keep the convoy on a steady bearing. If bearing drifts left, you are falling behind — increase speed. If it drifts right, you are overtaking — reduce speed or dive. Aim to get ahead of the convoy during the night so you can submerge and let them run onto you at dawn.

SECTION 2

RAOBF — Stadimeter & Range Finder

WHAT THE RAOBF IS

The RAOBF (Range And Optical Bearing Finder) is your periscope stadimeter tool. It lets you calculate distance to a target by measuring the angular height of a known mast/funnel height against a calibrated scale. In UBOAT, you use it by aligning the split-image reticle with the waterline and masthead.

HOW TO USE IT — STEP BY STEP

1. Raise periscope. Set magnification to 1.5x for ranging (6x for fine bearing work).

2. Identify the target type and look up its **mast height** in your ship recognition book (or use the in-game reference). Typical values: small merchant ~20 m, large tanker ~30 m, destroyer ~25 m.

3. In the RAOBF wheel, set the **mast height** on the inner ring.

4. Measure the target's angular height through the periscope by aligning the two halves of the split image (waterline to masthead).

5. Read the **range in metres** off the RAOBF scale where it aligns with your measured angle.

6. Feed this range into the TDC or note it for your nav plot.

COMMON MAST HEIGHTS REFERENCE

Ship Type	Mast Height	Notes
Small tramp steamer	~18–20 m	Most common early-war target
Medium cargo ship	~22–25 m	C2/C3 class
Large tanker	~28–32 m	High value, slow
Liberty ship	~26 m	Common mid-war
Destroyer / escort	~22–26 m	Fast — take range quickly
Battleship / cruiser	~35–45 m	Do NOT engage without orders

KEY FORMULA

Range (m) = Mast Height (m) x 1000 / Observed Angle (milliradians). The RAOBF does this for you — but knowing the formula helps you estimate if the tool is unavailable.

ACCURACY TIPS

- Always use 1.5x magnification for ranging — 6x narrows the field and makes waterline alignment harder.
- Take 2–3 readings and average them. Roll/pitch causes errors of ±10%.
- If target is stern-on or bow-on, mast appears shorter — add 15–20% to your reading.
- At ranges beyond 2,000 m accuracy degrades significantly. Prioritise closing to 1,500 m or under before shooting.

SECTION 3

Attack Disk — Side A (Speed & Course Solver)

PURPOSE OF SIDE A

Side A of the Attack Disk (Angriffsscheibe) is used to determine the **target's true speed** from a timed observation, and to lay out the geometric relationship between your boat and the target. Use it before you commit to an attack run, once you have a course estimate.

INPUTS YOU NEED BEFORE USING SIDE A

- **Target bearing** (from compass or periscope)
- **Your course** (from navigation display)
- **Observed target speed** — estimated from bow wake, smoke, or timed bearing shift
- **Target course** — estimated from your track plot

STEP-BY-STEP — SIDE A

1. Set your own course on the outer ring of Side A.

2. Set the target bearing on the middle ring.

3. Set the estimated target course — align so that the relative geometry is correct.

4. The disk now shows you the **relative track angle** — how the target is moving relative to you.

5. Use the speed scale to read off the **target's speed component** that is useful for the torpedo solution.

6. This feeds directly into Side B (the firing solution side).

SPEED ESTIMATION WITHOUT THE DISK

STOPWATCH METHOD

Time how long it takes the target's bow to travel one full ship-length past your crosshair. Speed (knots) = Ship Length (m) / Time (seconds) x 1.944. A 140 m cargo ship crossing in 18 seconds = 140/18 x 1.944 = 15.1 knots.

- Typical merchant speeds: 6–10 knots fully loaded, 10–14 knots in ballast.
- Convoy speed is set by the **slowest ship** — usually 6–9 knots.
- Destroyers and escorts: 18–28 knots when hunting, 12–16 knots when screening.
- If in doubt, use 8 knots for a loaded merchant — you will rarely be far wrong.

BOW WAKE READING (VISUAL ESTIMATE)

Bow Wake Appearance	Estimated Speed
No visible wake, flat water around bow	0–4 knots
Small ripple, slight foam at bow	4–7 knots
Distinct white foam, low bow wave	7–10 knots
Pronounced white bow wave, spray	10–14 knots
Heavy spray, large bow wave	14+ knots

SECTION 4

Attack Disk — Side B (Firing Solution)

PURPOSE OF SIDE B

Side B computes the **required gyro angle** for your torpedo — i.e., how much the torpedo needs to turn after launch to intercept the target. The ideal is **0° gyro angle** (straight shot), achieved by a perfect 90° AoB setup. Side B is also used to calculate the correct lead angle when you cannot achieve a perfect beam shot.

INPUTS FOR SIDE B

- **Target speed** (from Side A or stopwatch method)
- **Torpedo speed** (your selected setting: fast/medium/slow)
- **Angle on Bow (AoB)** — how many degrees off the target's bow you are sitting (see Section 5)
- **Range to target** (from RAOBF)

STEP-BY-STEP — SIDE B

1. Set torpedo speed on the outer ring (fast = ~44 kts, medium = ~30 kts, slow = ~20 kts in-game).

2. Align target speed on the inner ring against the torpedo speed marker.

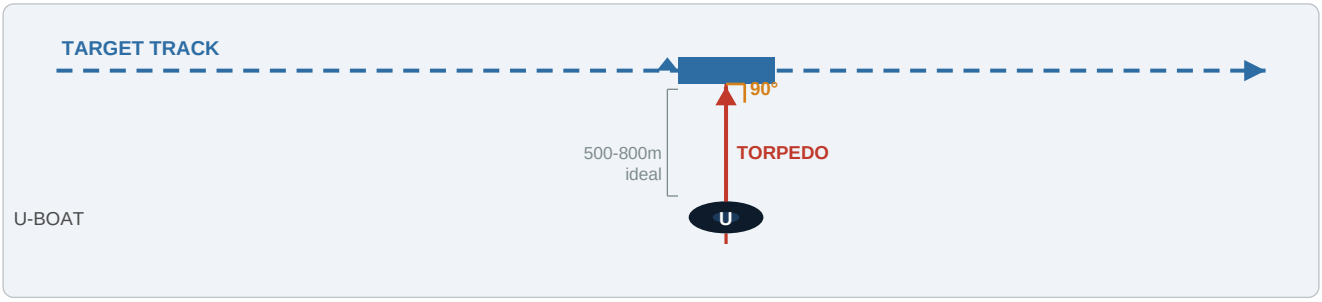
3. Set AoB — rotate to the measured Angle on Bow. The disk now shows the geometry of the intercept triangle.

4. Read the deflection angle (lead angle) — this is how far ahead of the bow you must aim.

5. Apply deflection to your periscope bearing to get the correct firing bearing, OR enter values into the TDC and let it compute gyro angle automatically.

6. At 90° AoB with correct inputs, deflection equals zero and the TDC outputs 0° gyro — fire straight.

THE FIRING TRIANGLE



*The torpedo must travel to where the target **will be**, not where it is. The Attack Disk solves this triangle using target speed, torpedo speed, and AoB to give you the correct lead.*

DEFLECTION ANGLE QUICK REFERENCE

AoB	Target 8 kts	Target 12 kts	Target 16 kts
45°	~5°	~8°	~10°
60°	~6°	~9°	~12°
70°	~6.5°	~10°	~13°
90° (ideal)	0° (straight)	0° (straight)	0° (straight)
110°	~6.5°	~10°	~13°

Values shown for medium-speed torpedo. Adjust proportionally for fast/slow settings.

SECTION 5

Angle on Bow (AoB) — Identification & Estimation

WHAT AOB MEANS

Angle on Bow (AoB) is the angle measured at the **target** between its bow and the line back to your U-boat. It tells you how the target is oriented relative to you. **0° AoB = target heading directly at you. 90° AoB = target is beam-on (crossing). 180° AoB = target heading directly away.**

AoB	What You See	Silhouette Shape	Action
0°–15°	Bow-on, heading at you	Narrow, symmetrical bow	Dive or evade — bad shot angle
15°–30°	Slightly angled toward	Narrow, one side of hull visible	Track and wait — improving
30°–60°	Quartering toward	Funnel(s) and bridge visible	Plot intercept, prepare attack
60°–80°	Approaching beam	Full profile, bridge forward	Move to intercept position
80°–100°	Beam-on (IDEAL)	Full broadside, max target length	FIRE — optimal shot angle
100°–120°	Quartering away	Full profile, bridge aft of midships	Good, fire if set up
150°–180°	Stern-on, moving away	Narrow stern, propeller wash	Chase or use stern tubes

HOW TO ESTIMATE AOB VISUALLY

- **Bridge position:** On most freighters, the bridge is aft of midships. If the bridge appears forward of the funnel, target is heading toward you (AoB < 90°). Bridge abaft the funnel = heading away (AoB > 90°).
- **Mast rake:** Forward-raked mast = bow toward you. Raked away = stern toward you.
- **Funnel smoke direction:** Smoke trails behind the ship — if smoke goes left, ship is moving right.
- **Propeller wash:** White froth at the stern is visible at < 2,000 m — confirms stern aspect.
- **Full hull visible:** If you can see the entire waterline from bow to stern, AoB is near 90°. The more foreshortened, the more bow-on or stern-on.

AOB ESTIMATION BY VISIBLE LENGTH RATIO

RULE OF THUMB

Look at the visible hull length versus the known ship length. If you can see 100% of the hull length = 90° AoB. If you can see only 70% = approximately 45° AoB. If you can see 50% = approximately 30° AoB. Err toward overestimating AoB — a slightly off AoB causes much less error than wrong target speed.

CORRECTING AOB DURING THE ATTACK

Continuously update AoB in the TDC as you close. At 500–800 m range, small AoB errors (±5°) have negligible effect on the solution. At long range (1,500+ m) even 10° of AoB error can cause a miss. Use the final TDC AoB input to fine-tune just before firing.

SECTION 6

Hydrophone — Bearing, Classification & Tracking

HYDROPHONE FUNDAMENTALS IN UBOAT

The hydrophone (GHG array) lets you detect surface ships and submarines by sound while submerged, or on the surface at low speeds. In UBOAT on full realism it is your primary sensor when you cannot use the periscope — and often gives you contact BEFORE visual. The operator sweeps manually; you must be patient and methodical.

OPERATING PROCEDURE

1. Stop or reduce to minimum speed (ideally all stop). Your own propeller noise masks contacts at speeds above 3–4 knots.

2. Assign a crew member to the hydrophone station with good skill rating. Higher skill = better bearing accuracy and range.

3. Sweep in a full 360° — do not jump straight to the expected bearing. Unknown contacts may be behind you.

4. Listen for distinct signatures (see table below) to classify the contact.

5. Note the bearing when a contact is found. Call out the bearing and mark it on the nav map.

6. Wait 2–5 minutes, then take a second bearing. Bearing drift tells you which way the contact is moving.

7. Cross-bearing with a second stop: If you can reposition slightly, a second set of bearings from a new position gives you an estimated range by triangulation.

HYDROPHONE SIGNATURE CLASSIFICATION

What You Hear	Classification	Notes
Low, slow thump-thump rhythm	Large merchant / tanker	Slow reciprocating engine, 60–100 rpm
Fast, higher-pitched churn	Fast merchant / passenger liner	Turbine or fast diesel
Very fast, sharp propeller beat	Destroyer / escort	High-speed screws — DANGER
Multiple overlapping rhythms	Convoy	Several ships — bearings cluster
Faint, distant hum	Distant contact > 10 km	Take bearing; monitor for closing
Pinging sound / echo	ASDIC active sonar	You are being hunted — go silent
Rapid close-in churn + growing	Escort charging	Dive deep, hard turn NOW

TRACKING A TARGET BY HYDROPHONE ALONE

- **Bearing rate:** If bearing drifts steadily in one direction, the target is not on a collision course with you. If bearing stays constant while getting louder, it IS heading toward you.
- **Closing vs. passing:** A constant bearing + increasing volume = closing on you. Drifting bearing + increasing volume = passing. Drifting bearing + decreasing volume = opening (target moving away).
- **Night surface attack setup:** Track by hydrophone from periscope depth, then surface ahead of the convoy using the bearing track you have plotted.
- **Maximum hydrophone range in UBOAT:** Large ships detectable at ~12–15 km, convoys at ~20 km, destroyers at ~8 km (their higher frequency is shorter range in the model).

CRITICAL — SILENT RUNNING

When ASDIC pinging is detected: set Silent Running, reduce speed to 1–2 knots, go to 150–200 m depth, shut down all non-essential systems. Do NOT make course changes > 5° per minute. Wait for the escort to pass before moving.

SECTION 7

Intercept Geometry — Plotting the Attack Run

THE INTERCEPT PROBLEM

Your goal is to reach a firing position **ahead of the target**, on its beam (90° AoB), at the right range, before it passes. You do this by plotting where the target will be in X minutes and calculating whether you can get there in time.

STEP-BY-STEP INTERCEPT PLOT

1. Draw the target track as a straight line on the nav map, extending it forward based on its course.

2. Choose a firing point on that line — roughly 600–800 m from your intended position, ideally where the track passes beam-on to you.

3. Estimate time for target to reach firing point: Time (min) = Distance from target to firing point (m) / (Target speed (kts) x 30.9). For 10 km at 8 knots: 10,000 / (8 x 30.9) = 40.4 min.

4. Estimate time for you to reach intercept position: Distance from your position to intercept point / your speed.

5. If your time < target's time: You can make it — proceed at calculated speed.

6. If your time > target's time: Increase speed, choose a closer firing point, or cut across the track at an angle.

7. Surface at night to maximise speed for the intercept run. Submerge 20–30 minutes before expected contact.

THE 90° POSITION — GETTING BEAM-ON

The **ideal firing bearing** is when the target is exactly abeam — at 90° to your bow. To set this up:

- Position yourself so the target track runs at 90° across your heading.
- If you are ahead of the target, hold your position and let it come to you — the simplest approach.
- If you are behind, intercept at an angle — approach on a course ~30° off the target track, then turn parallel to the track when in position.
- On full realism, the **"leading the target"** technique is most reliable: get 3–5 km ahead of the target, position yourself 600–800 m off its projected track, go to periscope depth, and wait.

SPEED/TIME CONVERSION QUICK REFERENCE

Speed (knots)	Metres per minute	Km in 30 min	Km in 60 min
4 kts	123 m/min	3.7 km	7.4 km
6 kts	185 m/min	5.6 km	11.1 km
8 kts	247 m/min	7.4 km	14.8 km
10 kts	309 m/min	9.3 km	18.5 km
12 kts	370 m/min	11.1 km	22.2 km
14 kts	432 m/min	13.0 km	25.9 km

FORMULA — TIME TO INTERCEPT POINT

T (minutes) = Distance (metres) / (Speed (knots) x 30.9). Example: 5,000 m at 12 knots = 5000 / (12 x 30.9) = 13.5 minutes.

SECTION 8

TDC Setup & Firing Solution Checklist

TDC INPUTS — WHAT EACH ONE DOES

TDC Input	What to Enter	Where It Comes From
Target bearing	Current compass bearing to target	Periscope / UZO reading
Target course	Target's true heading (0–360°)	Nav map track plot
Target speed	Speed in knots	Stopwatch method or Attack Disk A
Range	Distance in metres	RAOBF stadimeter
AoB	Angle on Bow in degrees (0–180°)	Visual estimate + Attack Disk B
Torpedo speed	Fast / Medium / Slow setting	Your pre-attack choice
Torpedo depth	Draft of target minus 0.5–1 m	Ship recognition guide
Spread angle	Fan spread for salvo (0–5°)	Your choice based on target size

PRE-FIRE CHECKLIST

■ **Target bearing entered and tracking**	Update continuously up to firing
■ **Target course confirmed (2+ bearing plot)**	Wrong course = definite miss
■ **Target speed set (stopwatch verified)**	Most common source of misses
■ **Range measured (RAOBF within 60 sec)**	Re-measure if setup took > 5 min
■ **AoB set and reasonable (cross-check silhouette)**	Aim for 80–100° for best results
■ **Torpedo depth set (target draft - 1 m)**	Too shallow = pass above keel
■ **Torpedo armed and ready**	Check tube flooded and outer door open
■ **Gyro angle shown by TDC (prefer < 20°)**	Higher gyro angles degrade accuracy
■ **Escorts located and tracked**	Know where they are before firing
■ **Escape route planned**	Decide dive / course before you pull the trigger

GYRO ANGLE RULE

Never fire with a gyro angle above 30°. At 30° the torpedo has to make a significant turn, which degrades precision. Above 60° it may miss entirely. Reposition rather than fire with a bad gyro angle.

SECTION 9

Torpedo Settings & Selection

TORPEDO SPEED SELECTION

Speed	Max Range	Best Range	Use When
Fast (44 kts)	5,000 m	< 600 m	Close escorts, short setup
Medium (30 kts)	7,500 m	600–1,200 m	Standard convoy attacks
Slow (20 kts)	12,500 m	> 1,200 m	Long-range/silent approach

Medium speed is the best default choice — it balances range, running time, and accuracy. Use fast only for close emergency shots when an escort is close. Use slow only for very long range set-and-forget shots on a large convoy.

TORPEDO DEPTH SETTING

- Set torpedo depth to **target draft minus 1.0 m**. This ensures detonation below the waterline where hull plates are thinnest.
- Typical merchant drafts: small = 4–5 m, medium = 6–7 m, large tanker = 8–10 m.
- For magnetic detonation (if available): set depth equal to or 1 m deeper than keel — it detonates under the keel for maximum hull break.
- Minimum arming distance: ~250–300 m. Do NOT fire at targets closer than 300 m — torpedo may not arm in time.

SHOT PATTERNS — SINGLE VS SALVO

- **Single shot:** Use when AoB is near-perfect (85–95°), TDC solution is confident, range < 800 m. Most economical.
- **Fan of 2:** Use for AoB 70–85° or > 95°, or when target speed estimate is uncertain. Set 1–2° spread. Covers ±~30 m at 800 m range.
- **Fan of 3:** Use for uncertain solution (speed or course less confident), larger targets (tankers, large freighters). Set 2–3° spread.
- **Fan of 4:** Convoy attacks — fire down a column. Space 3–4° to cover multiple ships.

TORPEDO TYPE SELECTION (IF MODELLED IN YOUR CAMPAIGN)

Type	Speed	Range	Best Use
G7a (air)	Fast/Med/Slow	5.5–14 km	Standard — leaves bubble track
G7e (electric)	Medium only	5 km max	No wake — use at night or for escorts
LUT (pattern)	Medium	12 km	Convoy lanes — runs a zigzag pattern
FAT (pattern)	Medium	10 km	Fire into a convoy column and let it seek

BUBBLE TRACK WARNING

G7a (compressed air) torpedoes leave a visible white wake. If you fire in daylight at an alert escort or zigzagging merchant, they may see the track and evade or counter-attack. Use G7e (electric) for daylight attacks on warships.

SECTION 10

Convoy Attacks & Evasion

CONVOY ATTACK SEQUENCE

1. Identify convoy structure: How many columns? How many escorts? Where are the escorts (ahead, flanks, rear, zigzagging)?

2. Shadow from astern until you find a gap in the escort screen — typically a wider spacing on one flank at night.

3. Select your primary target before penetrating the screen: largest tonnage (tankers first), then ammunition ships, then general cargo.

4. Penetrate the escort screen submerged and slowly (< 2 kts) — preferably between escorts during their outward leg.

5. Position within the convoy lanes if possible — surrounded by ships, harder for escorts to use ASDIC without risk to own ships.

6. Fire and immediately prepare next solution on a second target before diving.

7. After firing, go deep (150+ m), set silent running, hard turn 90° away from the nearest escort, slow to 1 knot.

8. Reload and reassess — if escorts are hunting, wait at depth until contact is lost before surfacing.

EVASION AFTER ATTACK

- **First 60 seconds:** Maximum depth, maximum speed (brief burst to open range), then immediately reduce to silent running.
- **Course:** Turn 90° to your original attack heading. Escorts will run down your torpedo track back to where you were.
- **Depth layers:** Try to reach a thermal layer (typically 80–150 m in North Atlantic) — this deflects ASDIC.
- **Decoys:** If available, release Bold (bubble decoy) when you hear the escort charging — it creates a false echo.
- **Do NOT go too deep too fast** — rapid depth changes stress the hull and create noise.
- **Patience:** If the convoy moves on, escorts often follow within 30–60 minutes. Wait silently.

CREW MANAGEMENT TIPS (UBOAT SPECIFIC)

- **Fatigue:** Keep crew off stations during transit — rotate actively. A fatigued crew misses contacts and makes targeting errors.
- **Officer placement:** Best navigator on the watch officer slot for fastest course plotting. Best engineer on diesels for fuel efficiency.
- **Morale:** Sinking ships boosts morale. Being depth-charged hurts it. Use medals and promotions after successful patrols.
- **Repair during depth charge attacks:** Assign max crew to damage control. Prioritise: pressure hull > diving planes > engines > periscope.

FINAL TIP — PATIENCE IS THE WEAPON

Real U-boat commanders would shadow a target for 12–24 hours to find the perfect attack position. In UBOAT on full realism, resist the urge to rush in. A well-set-up 90° beam shot at 600 m with a confident TDC solution will reliably sink ships. An impatient snap shot at 1,500 m with a guessed AoB will miss and alert every escort within 20 km.

SECTION 11

Quick Reference Cards

SPEED ESTIMATION — STOPWATCH FORMULA

Speed (kts) = Ship Length (m) / Crossing Time (sec) x 1.944

TIME TO INTERCEPT

T (min) = Distance (m) / (Speed (kts) x 30.9)

RAOBF RANGE FORMULA

Range (m) = Mast Height (m) x 1000 / Angle (milliradians)

AOB QUICK IDENTIFICATION

Visible aspect	Approx AoB
Full broadside, both ends visible, no foreshortening	85–95°
Funnel nearly over bow or stern — slightly foreshortened	60–80° or 100–120°
Bridge and masts prominent, hull foreshortened 50%	40–60°
Mainly bow or stern — very narrow profile	0–20° or 160–180°

PERISCOPE DEPTH RULES OF THUMB

- Periscope depth = 12–14 m. Keep scope exposure < 10 seconds in daylight near escorts.
- Raise scope, sweep 360° first, then focus on target bearing. Never stare at one bearing — you miss flanking destroyers.
- In heavy seas: raise scope height to avoid wave tops smashing optics.

DEPTH CHARGE SURVIVAL DEPTHS

Situation	Recommended Depth
Normal submerged patrol	30–50 m
ASDIC detected — evasion	120–150 m
Heavy depth charge attack	180–220 m (if hull allows)
Near thermal layer (North Atlantic)	80–100 m (aim to sit just below it)
Emergency crash dive from surface	Pass through 60 m at maximum rate

FIRING SOLUTION CONFIDENCE GUIDE

TDC Data Quality	Gyro Angle	Range	Expected Result
All inputs confirmed, AoB 85–95°	< 5°	< 700 m	High confidence hit
Good data, AoB 70–110°	5–15°	700–1,200 m	Likely hit — fire 2
Estimated speed/AoB	15–30°	1,000–1,500 m	Uncertain — fire fan of 3
Poor data, rushed setup	> 30°	> 1,500 m	Low confidence — reposition

REMEMBER

Surface at night. Submerge before dawn. Shadow patiently. Set up the perfect shot. One torpedo in the right place is worth ten fired in hope.

FIELD LOG

Target Contact Records · Bearing Plots · Torpedo Log · Patrol Notes

SECTION LOG

Field Log — How To Use These Pages

The following pages are designed to be filled in by hand during or after each engagement. Each page type serves a different purpose:

Target Contact Record (×4) — One per engagement. Captures everything from first sighting through firing solution to result. Fill top-to-bottom as the attack develops.

Bearing Plot Worksheet (×2) — Use the polar grid to manually plot bearing lines from your position. Each ring = 2.5 km. Mark each timed bearing as a line, then connect intercept points to establish track and course. The bearing log table on the right keeps your raw data.

Torpedo Launch Log (×1) — Chronological record of every torpedo fired this patrol. Includes tube, type, settings, target, and result. Use the summary strip at the bottom to track running totals.

Mission Notes (×2) — Ruled pages for tactical observations, convoy compositions, escort behaviour patterns, and anything that does not fit the structured forms.

Patrol Debrief Summary (×1) — Fill in at end of patrol. Summarises contacts, results, lessons learned, and commander's assessment. Useful for improving future patrol planning.

HOW TO USE THE BEARING PLOT

Mark your U-boat at centre. Each time you take a hydrophone or periscope bearing, draw a line from centre outward at that compass angle. Estimate range and mark a dot on the line. After two or more timed observations, connect the dots — the line between them is the target track. The angle of that line gives you the target course; the distance between dots divided by elapsed time gives speed.

TIP — FILL THE CONTACT RECORD IN STAGES

Sections 1–2 (sighting & track) are filled during the approach. Section 3 (speed) when you have a crossing observation. Sections 4–5 (TDC & result) at and after the firing point. Do not wait until the engagement is over to start filling it in — you will forget the details.

TARGET CONTACT RECORD

DATE / TIME: _____

SIGHTING & IDENTIFICATION

Time of first contact	Bearing (initial)	Estimated range (km)	Your depth/state

Contact type (merchant / warship / convoy)	Ship class / name	Mast height used (m)	No. of funnels

Escort count	Escort positions (sketch or notes)	Sea state / visibility

TRACK PLOT (bearing pairs — minimum 2)

Obs #	Time	Bearing	Range (m)	U-boat pos (relative)	Notes
1					
2					
3					
4					
5					

SPEED ESTIMATION

Ship length (m) — from recognition	Crossing time (sec)	Calculated speed (kts)	Bow wake estimate (kts)

SPEED USED IN TDC: ____ kts COURSE USED: _____° AoB ESTIMATE: _____°

TDC FIRING SOLUTION

Target bearing (final)	Range at firing (m)	Gyro angle (TDC output)	Torpedo speed setting

Torpedo depth set (m)	Number of torpedoes fired	Spread angle (°)	Time of firing

RESULT & POST-ATTACK NOTES

Hits (count)	Misses	Observed result (sank / damaged / unknown)	Tonnage (GRT)

Escort reaction (nil / search / charge)	Depth charges received	Damage to U-boat

Post-attack course/depth	Time of evade complete	Torpedoes remaining after attack

COMMANDER'S NOTES / LESSONS LEARNED

TARGET CONTACT RECORD

DATE / TIME: _____

SIGHTING & IDENTIFICATION

Time of first contact | Bearing (initial) | Estimated range (km) | Your depth/state

Contact type (merchant / warship / convoy) | Ship class / name | Mast height used (m) | No. of funnels

Escort count | Escort positions (sketch or notes) | Sea state / visibility

TRACK PLOT (bearing pairs — minimum 2)

Obs #	Time	Bearing	Range (m)	U-boat pos (relative)	Notes
1					
2					
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SPEED ESTIMATION

Ship length (m) — from recognition | Crossing time (sec) | Calculated speed (kts) | Bow wake estimate (kts)

SPEED USED IN TDC: ____ kts COURSE USED: _____° AoB ESTIMATE: _____°

TDC FIRING SOLUTION

Target bearing (final) | Range at firing (m) | Gyro angle (TDC output) | Torpedo speed setting

Torpedo depth set (m) | Number of torpedoes fired | Spread angle (°) | Time of firing

RESULT & POST-ATTACK NOTES

Hits (count) | Misses | Observed result (sank / damaged / unknown) | Tonnage (GRT)

Escort reaction (nil / search / charge) | Depth charges received | Damage to U-boat

Post-attack course/depth | Time of evade complete | Torpedoes remaining after attack

COMMANDER'S NOTES / LESSONS LEARNED

TARGET CONTACT RECORD

DATE / TIME: _____

SIGHTING & IDENTIFICATION

Time of first contact | Bearing (initial) | Estimated range (km) | Your depth/state

Contact type (merchant / warship / convoy) | Ship class / name | Mast height used (m) | No. of funnels

Escort count | Escort positions (sketch or notes) | Sea state / visibility

TRACK PLOT (bearing pairs — minimum 2)

Obs #	Time	Bearing	Range (m)	U-boat pos (relative)	Notes
1					
2					
3					
4					
5					

SPEED ESTIMATION

Ship length (m) — from recognition | Crossing time (sec) | Calculated speed (kts) | Bow wake estimate (kts)

SPEED USED IN TDC: ____ kts COURSE USED: _____° AoB ESTIMATE: _____°

TDC FIRING SOLUTION

Target bearing (final) | Range at firing (m) | Gyro angle (TDC output) | Torpedo speed setting

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COMMANDER'S NOTES / LESSONS LEARNED

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Obs #	Time	Bearing	Range (m)	U-boat pos (relative)	Notes
1					
2					
3					
4					
5					

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Ship length (m) — from recognition	Crossing time (sec)	Calculated speed (kts)	Bow wake estimate (kts)

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Target bearing (final)	Range at firing (m)	Gyro angle (TDC output)	Torpedo speed setting

Torpedo depth set (m)	Number of torpedoes fired	Spread angle (°)	Time of firing

RESULT & POST-ATTACK NOTES

Hits (count)	Misses	Observed result (sank / damaged / unknown)	Tonnage (GRT)

Escort reaction (nil / search / charge)	Depth charges received	Damage to U-boat

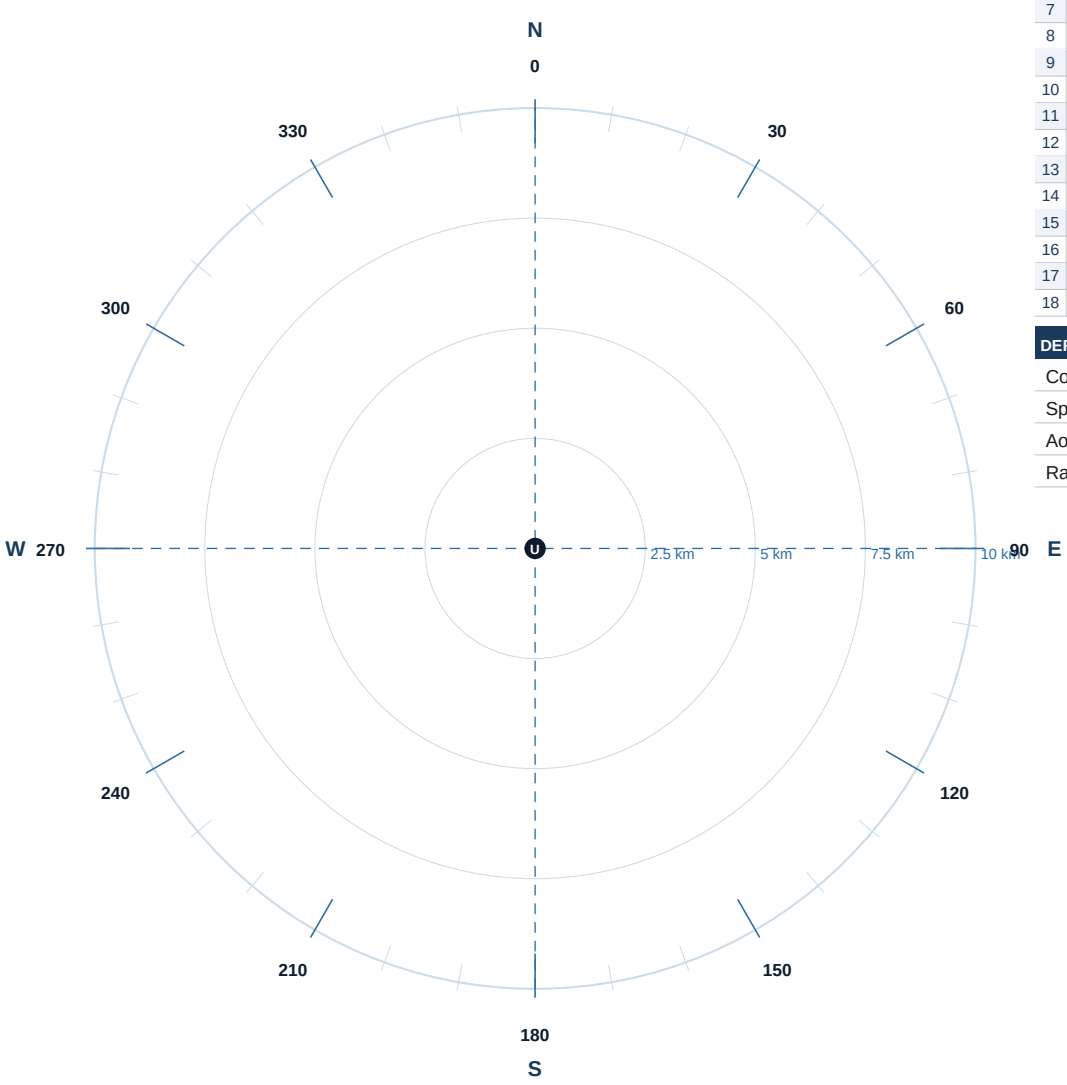
Post-attack course/depth	Time of evade complete	Torpedoes remaining after attack

COMMANDER'S NOTES / LESSONS LEARNED

BEARING PLOT & TRACK WORKSHEET

PATROL: _____ DATE: _____

U-boat course	U-boat speed (kts)	Time (start of plot)	Position (grid ref)



BEARING LOG

#	Time	Brg	Rng
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

DERIVED SOLUTION

Course: ____°

Speed: ____kts

AoB: ____°

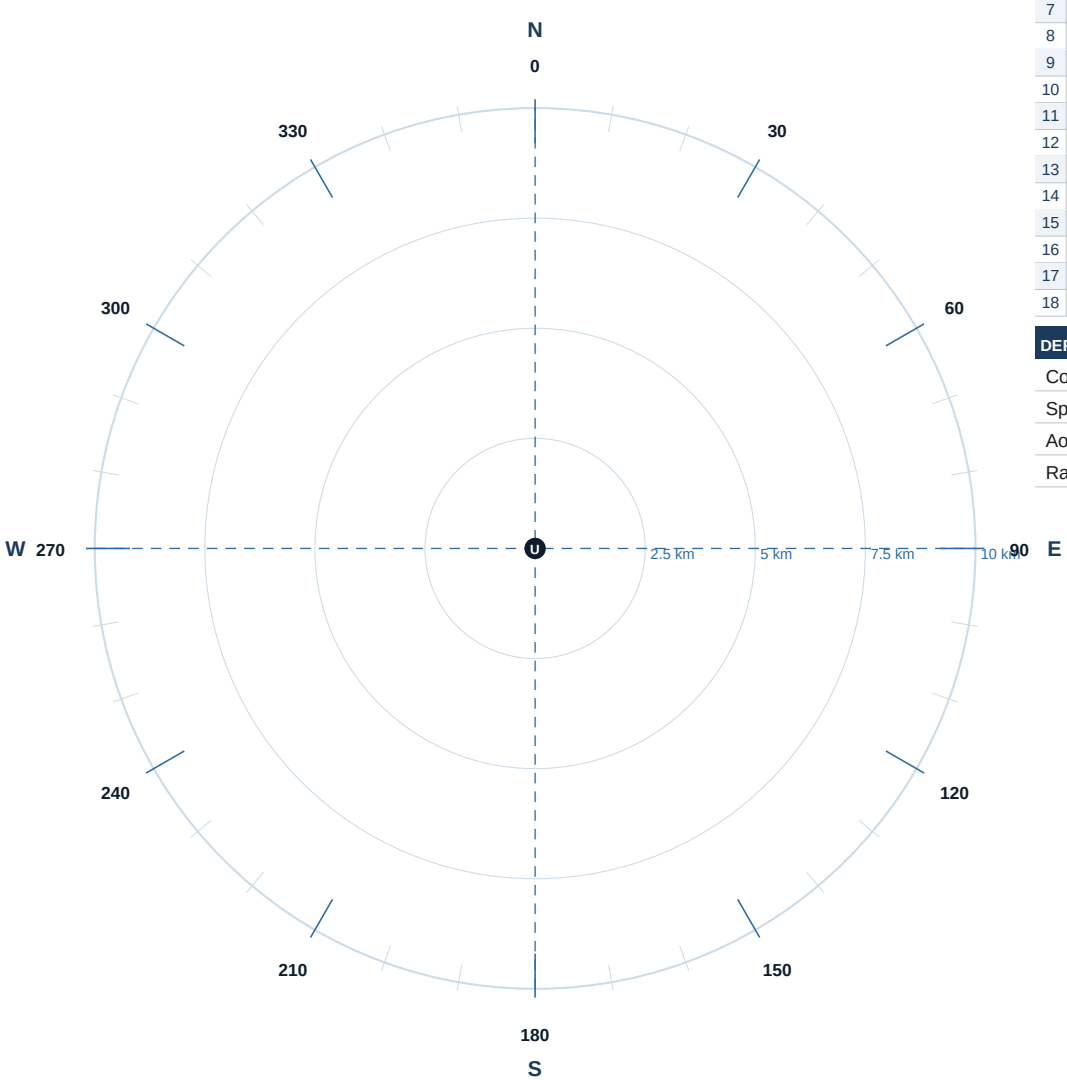
Range: ____m

TRACK SKETCH / NOTES

BEARING PLOT & TRACK WORKSHEET

PATROL: _____ DATE: _____

U-boat course	U-boat speed (kts)	Time (start of plot)	Position (grid ref)



BEARING LOG

#	Time	Brg	Rng
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

DERIVED SOLUTION

Course: ____°

Speed: ____kts

AoB: ____°

Range: ____m

TRACK SKETCH / NOTES

TORPEDO LAUNCH LOG

PATROL: _____

TORPEDO LAUNCHES — FIRST HALF OF PATROL

#	Time	Tube	Type	Depth (m)	Speed	Range (m)	Gyro (°)	AoB (°)	Target
1									
2									
3									
4									
5									
6									

TORPEDO LAUNCHES — SECOND HALF OF PATROL

#	Time	Tube	Type	Depth (m)	Speed	Range (m)	Gyro (°)	AoB (°)	Target
1									
2									
3									
4									
5									
6									

PATROL TORPEDO SUMMARY

Total fired	Hits	Misses / duds	Total GRT sunk	Torpedoes remaining

PATROL NOTES / CREW OBSERVATIONS

MISSION NOTES — PAGE 1

PATROL: _____ DATE: _____

MISSION NOTES — PAGE 2

PATROL: _____ DATE: _____

PATROL DEBRIEF SUMMARY

PATROL #: _____

PATROL OVERVIEW

Patrol area / grid	Departure date	Return date
U-boat type	Crew skill level (avg)	Weather conditions (general)
Torpedoes loaded at start	Fuel at start (%)	Special orders / mission type

CONTACTS SIGHTED

Type	Count	Engaged?	Result
Single merchant			
Convoy			
Warship / escort			
Submarine			
Aircraft			

PATROL RESULTS

Merchants sunk	Warships sunk	Total GRT sunk	Torpedoes fired	Hit rate (%)

Damage to U-boat (summary)	Crew casualties	Crew promotions

Notable events / encounters

LESSONS LEARNED / COMMANDER'S ASSESSMENT