DECISION | SKILL

COLREGs Collision Avoidance Trainer

A quick guide — how to use it on your phone or tablet

What you need. A phone (held upright) or a tablet, and about 15 minutes. Sound is optional — the whistle signals sound a horn if your volume is on.

What this is

You drive a simulated vessel, with physics-based handling, towards another ship. You decide what to do, do it, then replay exactly what happened — including how close you passed compared with the passing distances **you** chose before you started.

How an exercise works

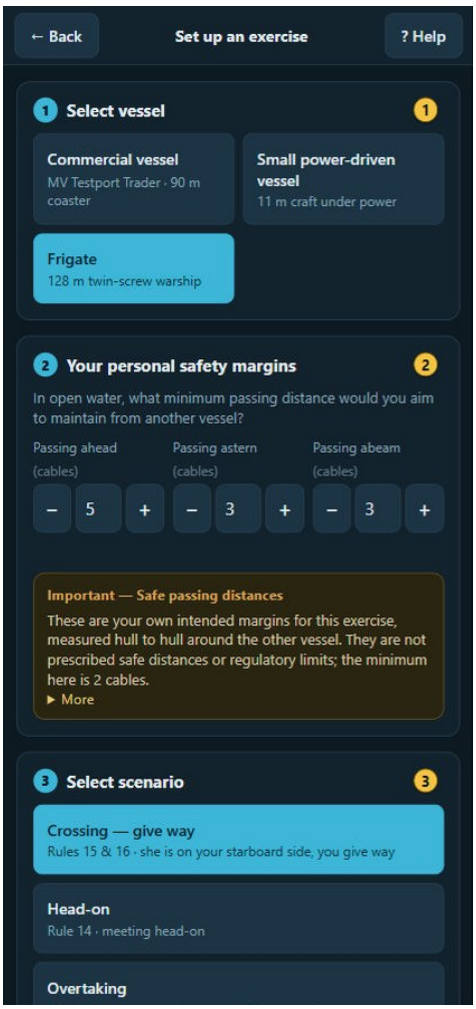
1. **Choose your vessel** — a small power-driven vessel (11 m), a commercial vessel (90 m) or a frigate (128 m). The frigate has two engines; here one lever drives both together.
2. **Set your passing distances** — how close you would be happy to pass: ahead, astern and abeam. They are locked once you start.
3. **Choose a scenario** — head-on, crossing or overtaking, where the exercise tells you the situation, or a Single or Three Vessel Encounter, where you work it out for yourself.
4. **Read the briefing** — the task and the conditions first; the key rules for the situation are folded away underneath (quoted in full from the International Regulations), with Begin below them. The browser's or phone's Back button steps back inside the trainer: it closes a window, asks before ending an exercise, and only leaves from the home screen.
5. **Drive** — use the engine, helm, autopilot, speed and whistle. Acquire the target on the radar to see its closest point of approach.
6. **Replay** — see what happened, the key events, and how your passing distance compared with your own margins.

This is a training aid. It does not replace professional judgement, training or the Collision Regulations. The distances you set are your own intended margins, not prescribed safe distances or regulatory limits.

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Set up

Steps 1–3

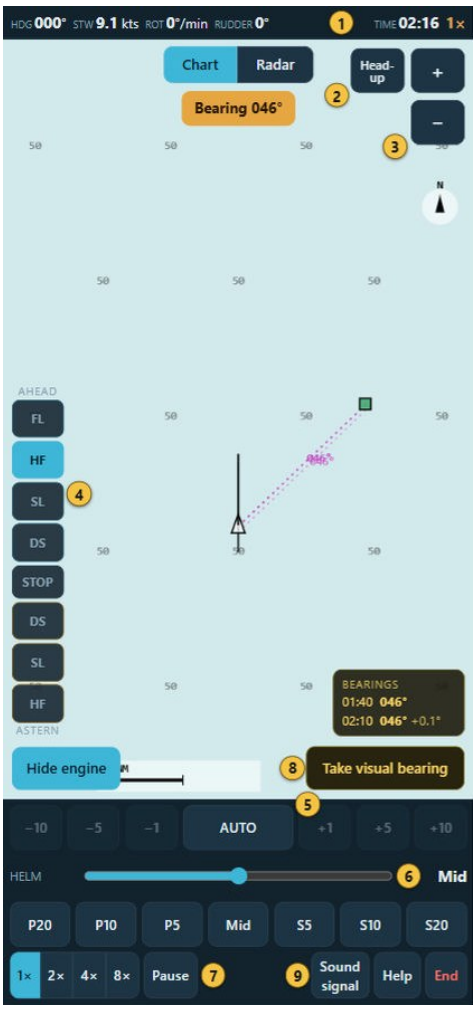


1. **Select vessel** — the Commercial vessel, the Small power-driven vessel or the Frigate; each has its own speed and handling. The frigate has two engines, driven together by the one engine lever.
2. **Your personal safety margins** — type, or use + and −, how far ahead, astern and abeam you would aim to keep from another vessel, in cables (1 cable = 0.1 nautical mile), in steps of half a cable (anything else you type is rounded to the nearest half). Minimum 2, maximum 20. Read the amber note: there is no single correct distance.
3. **Select scenario** — Head-on (Rule 14), Crossing — you give way (Rules 15 and 16), Overtaking (Rule 13), or the Single Vessel Encounter or Three Vessel Encounter, in which you are not told the situation (see **Encounters**). Other scenarios are shown greyed out, marked In development.
4. **Start** — you see a rule card first. Your margins are then locked for that exercise.

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Driving

The driving screen



1. **Top bar** — heading, speed through the water, rate of turn, rudder angle, time and simulation speed.
2. **Chart / Radar** — the chart, a training overview showing the true positions of the vessels (more than a navigator would actually see), and the radar picture. On a wide screen such as a laptop or tablet in landscape both are shown side by side; on a phone, switch between them with the Chart and Radar buttons.
3. **Zoom, orientation, range** — + and − zoom the chart, or change the radar range when you are on the radar; you can also pinch with two fingers, double-tap, or use the mouse wheel. The Head-up / North-up button beside the + flips the picture, and the range and the mode are written top left of the radar. **Help**, bottom right next to End, opens this guide at any time and pauses the exercise while you read.
4. **Engine lever** — touch or drag: ahead steps at the top, stop in the middle, astern at the bottom. Engines take time to respond. On a phone or small tablet the controls sit behind the **Hide engine** / **Show engine** button, bottom left: press it to hide them and see more of the radar, and press it again to bring them back. The steps are two letters: DS dead slow, SL slow, HF half, FL full (on the small power-driven vessel LO low, MD mid, HI high, FL full). Hold your finger or mouse on a step to see its full name.
5. **Autopilot** — press AUTO to hold your present heading. With AUTO on, −10 … +10 change the course you want, in degrees. Moving the helm yourself switches it off.
6. **Helm** — drag the slider, or tap P20 / P10 / P5 (port), Mid, S5 / S10 / S20 (starboard).
7. **Speed and Pause** — 1×, 2×, 4× and 8× run the simulation faster; nothing is skipped. Pause stops everything.
8. **Take visual bearing** — on the chart, taps record the true bearing of the other vessel and draw a magenta bearing line. Take one, wait, and take another: the list shows the change each time. If the bearing is not changing and the range is closing, there is risk of collision (Rule 7). Keep taking them, including after you act, to check the effect.
9. **Sound signal and End** — Sound signal opens the whistle signals. End stops the exercise early — it is recorded as abandoned, not as a success — and goes straight to the replay.

Keyboard

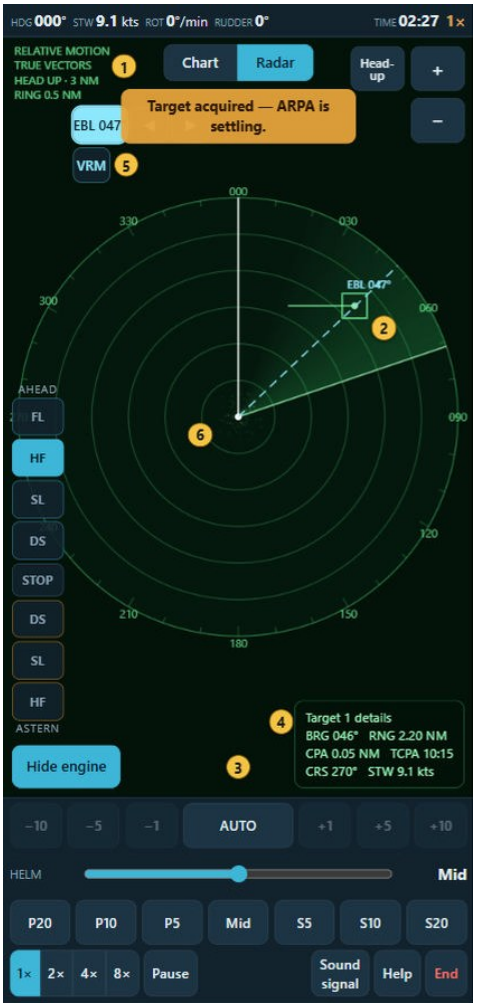
Everything can be done from a keyboard. **P** pause or resume; **A** / **D** (or the left and right arrows) helm 5° to port or starboard; **C** midships; **1–4** simulation speed 1×, 2×, 4×, 8×. Press **Tab** to reach the engine lever, then the **up** and **down** arrows move it a step at a time. **V** selects the next vessel, **T** acquires the selected vessel on the radar and **B** takes a visual bearing of it. **Escape** closes Help, Pause and other windows.

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Radar

The radar

The radar always says what it is showing: **relative motion, true vectors**. You can choose head-up or north-up.



1. **Mode label — Relative motion**: your ship stays at the centre and the other vessel's echo moves across the screen according to how you move relative to each other. An echo on a steady bearing with the range getting less is on a collision course.
2. **Echo and true vector** — after you acquire the target, a box appears round the echo and a line shows where she is really going (her true course and speed, six minutes ahead).
3. **Acquire target** — press to lock on. The system needs about 30 seconds to settle before it gives figures. The button disappears once she is acquired. With several vessels there is no button: tap each echo on the radar to acquire it, then tap an acquired echo to show its read-out.
4. **Read-out** — BRG and RNG: bearing and range. CPA: closest point of approach — how close you will pass if neither of you changes. TCPA: time until then. CRS and STW: her course and speed through the water (in kts).
5. **Range rings, EBL and VRM** — the rings are at round distances (the interval is written top left, for example “RING 0.5 NM”). **EBL** switches on an electronic bearing line and **VRM** a variable range marker: to move one, touch it (the line or the ring) and drag; a tap on a vessel always picks the vessel. The small arrows nudge the one that is highlighted. With both on, press a button to highlight that one; press it again to switch it off.
6. **Sweep and clutter** — the line sweeping round is the radar beam: an echo brightens as it passes and fades until the next sweep. The speckle round your ship, out to about 500 m, is sea clutter; it is small and never hides another vessel. If your device is set to reduce motion, the radar is drawn without the sweep and the echoes stay steady.

The read-out gives facts. It never tells you what to do — that is your decision.

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Encounters

Single Vessel Encounter

One other vessel, and you are not told what the situation is. Each time you start, the trainer picks a head-on, a crossing or an overtaking situation, and one of three variations of it (the other vessel starts at a different bearing, range and speed). It will not give you the same encounter twice running. Work out what you are looking at, decide what the Rules require of you, and act. The replay names the situation.

Three Vessel Encounter

Three other vessels at once, numbered **1, 2 and 3** on the chart and the radar. There are several different set-ups and the trainer picks one at random, never the same one twice running. You are not told which vessel does what, or which rule applies to which: you have to work that out, and what you do about one vessel affects how you meet the others. A vessel that is not in your way can still matter, so keep watching all three until every one is past and clear.

1. **Numbers** — each vessel carries its number on the chart and on the radar echo, and in the bearing list and the replay.
2. **Acquire** — tap an echo on the radar to acquire that vessel. ARPA takes about 30 seconds to settle on each. Tap an acquired echo to show its details (bearing, range, CPA, TCPA, course and speed) bottom right.
3. **Visual bearings** — press **Take visual bearing**, then tap the vessel on the chart. The list shows one short row per vessel: V1, V2, V3, with the time, the bearing and the change since that vessel's last bearing. Bearings of different vessels do not mix.
4. **When it ends** — when every vessel is past and clear, or at a collision. Ending early is recorded as abandoned and is not scored.

Playing them again

Retry same encounter in the replay repeats exactly the same encounter. **Choose a new exercise** and starting again from set-up give a different one.

Both are scored for the situation they turn out to be: see **Scores**. In My attempts a Single Vessel Encounter is listed under its own name, with the situation it turned out to be, and every attempt shows the margins you set.

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Signals and speed

Whistle signals (Rule 34)

Tap Sound signal, then choose a signal. It sounds the horn and is recorded, with the time and your situation, for the replay. It does not change how your vessel moves.

One short blast	I am altering my course to starboard
Two short blasts	I am altering my course to port
Three short blasts	I am operating astern propulsion
Five short, rapid blasts	I am in doubt about your intentions, or whether sufficient action is being taken

Simulation speed

1× is real time. 2×, 4× and 8× make the exercise pass faster so you do not wait through the approach. The physics is the same at every speed, but slow back to 1× when the other vessel gets close. The pause box can return you to 1× automatically as a close-quarters situation develops.

The other vessels

In **Head-on** the other vessel obeys Rule 14: she turns 25° to starboard at a set moment. In **Crossing — you give way** and **Overtaking** she is the vessel that keeps her course and speed. Her actions are the same every time. In the **Single** and **Three Vessel Encounters** the vessels follow the same rules for the situation you meet; some of them may alter course themselves, so keep watching until each is past and clear.

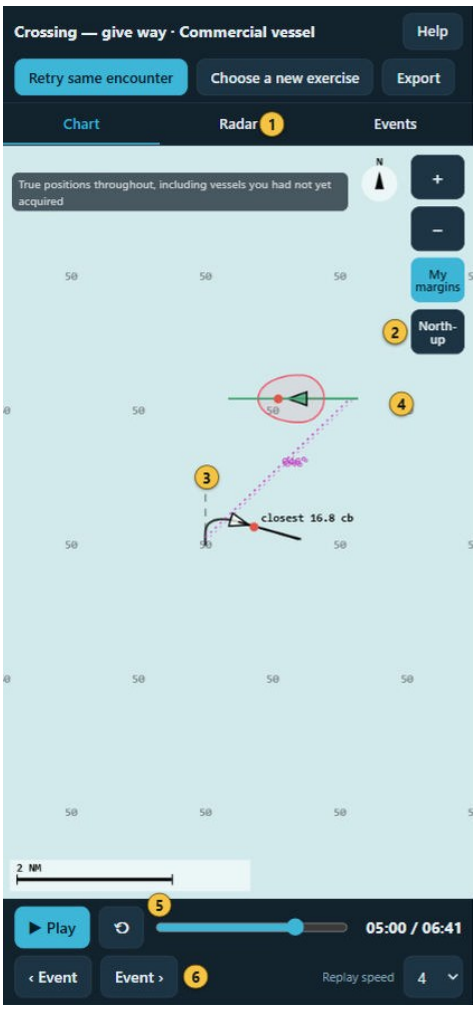
When does it finish?

At the **closest point of approach**: as soon as the range between you starts to open again (or the time to closest approach is down to about ten seconds), the encounter is settled and the exercise ends. A collision ends it straight away. Ending early is recorded as abandoned.

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Replay

The replay

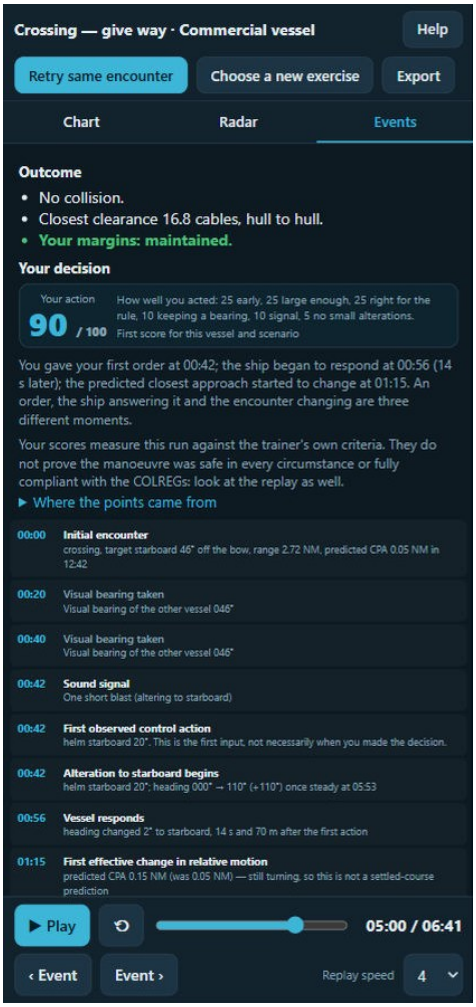


1. **Chart / Radar / Events** — three views of the same run. The replay shows the true positions of every vessel from the start, including any you had not yet acquired on the radar, so it shows more than you could see at the time.
2. **Zoom, margins, north up** — 'My margins' shows the red outline of the passing distances you chose, around the other vessel.
3. **Dashed lines** — an idealised picture of what would have happened if both vessels had held course and speed. For comparison only.
4. **Closest approach** — the red dots and label mark where the two hulls came closest, measured hull to hull.
5. **Play, Restart and scrub** — play the run, press Restart to go back to the beginning and play it again, or drag the bar to any moment.
6. **Event buttons** — jump to the previous or next key moment. 'Retry same encounter' replays the identical exercise; 'Choose a new exercise' returns to set-up; 'Export' saves the full data record (a simulated VDR log as CSV, and the run package as JSON).

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Replay: events

Events



The key moments in order: your first action, when the vessel responded, when the predicted closest approach first changed, any sound signals, entering or leaving your own margin, closest approach, and finally past and clear. Red means you were inside your own margin.

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Scores

Your results

The results read in three parts: the **outcome** first (whether there was a collision, your closest clearance, whether you kept your margins, and any unsafe pass), then **your decision** (your action score out of 100, and how long it took from your first order to the ship answering it and to the encounter changing), then the **detail** under *Where the points came from*.

When does the exercise end? Once the closest approach is behind you and the range is opening (in an overtaking, once she is more than 22.5° abaft your beam). It stops there for training; at sea your duty continues until the other vessel is finally past and clear.

What the scores are. They measure this run against the trainer's own criteria. They do not prove the manoeuvre was safe in every circumstance or fully compliant with the COLREGs: look at the replay as well.

Your margins — did you keep to the passing distances you chose? There is no number: your margins were either **maintained** (you never came inside them, hull to hull) or **breached**. If they were breached, the results say how close you came, in which direction, and for how long you were inside them.

Unsafe pass. Separately from your own margins, there is a fixed safety line: closer than **2 cables** passing ahead of the other vessel, **1.5 cables** abeam of her or **1 cable** astern of her, hull to hull. Coming inside it caps your action score at **25**, whatever margins you chose, so setting smaller margins does not help.

Your action — the decision itself, whatever the outcome.

- **25 points, early action**: scored by how far off the other vessel was when you first acted. Beyond 2 NM is full marks; between 2 and 1.5 NM loses 2; between 1.5 and 1 NM loses a further 3; inside 1 NM loses a further 2 for every 100 m closer. The small power-driven vessel is much slower, so for her these ranges are 25% shorter (1.5 NM, 1.1 NM and 0.75 NM). Nothing if you had not acted. If the exercise starts closer than 2 NM, acting straight away is never penalised. **Overtaking** starts close and closes slowly, so it is scored by time instead: full marks if you first act within the first quarter of the time to closest approach, nothing from three quarters.
- **25 points, substantial action**: a heading change of 20° or more, or cutting your speed through the water by half or more before closest approach (readily apparent on radar and by eye). A smaller speed reduction on its own earns up to 10. Meeting head-on, slowing down earns nothing: it does not resolve the situation (Rule 14 asks you to alter to starboard).
- **25 points, right action for the rule**: head-on, alter to starboard; crossing as give-way vessel, do not cross ahead of her; overtaking, keep clear until finally past and clear, which here means until she is more than 22.5° abaft your beam with the range opening (if you drop back or turn away instead and do not overtake her, this line scores nothing: the exercise ends once she is more than 1 NM off; in the Three Vessel Encounter, keeping out of her way is enough).
- **10 points, sound signal**: the Rule 34 signal that matches your alteration, around the time you made it, or three short blasts with an astern order.
- **10 points, keeping a bearing** (Rules 5, 7 and 8): 7 points for taking a visual bearing of the other vessel at any time up to closest approach. Full marks for two bearings taken between 15 seconds and 2 minutes apart, because two bearings show whether the bearing is changing (two or more before you act and one after also earns full marks).
- **5 points, no small alterations**: three or more separate alterations under 15° earns nothing (Rule 8). Changes made within 30 seconds of each other count as one, measured in your own time (taps a few seconds apart at 8× speed count as one), so three quick +10° autopilot steps are one 30° turn. A change back towards your original course is not counted.

Three Vessel Encounter. Your margins are maintained only if you kept outside them for all three vessels, and an unsafe pass of any of the three caps your action score. Your action is the average over the vessels the Rules rate you on, each judged as the situation it is (head-on, crossing as give-way vessel, overtaking, or standing on). Each line is averaged too: for example, bearings of only one of three vessels can give a few points rather than none or all. Bearings count for the vessel you took them of. A vessel that keeps station on you (astern, or ahead on your own course and speed) and is never in your way is not rated for action, but still counts for your margins and the unsafe-pass line. The score notes name each vessel and what was asked of you for it.

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Tap *Where the points came from* to see every part with your points and a note. A collision scores 0. An exercise you end yourself is not scored.

Personal best. Your best action score for each vessel and scenario, and how often you kept your margins, are kept on this device and shown under My attempts. Because you choose your own margins, compare yourself with yourself, not with other people.

Provisional scoring: the weights are open to review. The cut-offs used here (a 20° alteration, the early-action ranges, the speed reduction of half, the bearing intervals) are training rules to support the training environment; they are not required under the COLREGs. Your passing distances are measured hull to hull; the CPA on the radar is measured between the reference points of the two vessels, so it reads a little larger.

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Tips

Tips

Act early, and make it obvious. Rule 8 asks for action that is positive, in good time and large enough to be readily apparent. Several small alterations are easy to miss.

Take bearings and watch them. If the other vessel's bearing is not changing and the range is closing, there is a risk of collision (Rule 7). A changing bearing does not guarantee safety, though: risk can still exist, especially at close range or with a large vessel (Rule 7(d)(ii)). Use Take visual bearing on the chart, more than once, and again after you act.

Keep checking. Your duty continues until the other vessel is finally past and clear.

Use the autopilot to hold a heading. Engage AUTO, then step the course in 5 or 10° steps, so you can concentrate on watching the other vessel.

Choose margins honestly. The replay measures you against *your* margins. Very small ones make it easy and tell you less.

Try the three vessels. The small power-driven vessel turns and slows quickly; the commercial vessel and the frigate take much longer.

Development build: professional maritime review of the rules interpretation and scoring is outstanding.

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Terms

Terms and abbreviations

HDG	Heading: the direction the bow is pointing, in degrees true.
STW	Speed through the water, in knots (kts). There is no tidal stream here, so it is also the speed over the ground.
ROT	Rate of turn, in degrees per minute.
CPA	Closest point of approach: the closest the two vessels will come if neither alters. On the radar it is measured between the reference points of the two vessels.
TCPA	Time to the closest point of approach, in minutes and seconds.
ARPA	Automatic radar plotting aid: tracks an acquired target and works out her course, speed, CPA and TCPA (after about 30 seconds of settling).
EBL	Electronic bearing line: a line from your own ship to measure a bearing on the radar.
VRM	Variable range marker: a ring to measure a range on the radar.
Cable	One tenth of a nautical mile (about 185 m).
NM	Nautical mile (1852 m).
Clearance	The distance between the two hulls at their closest points. Your margins and the unsafe-pass line are measured this way.
Head-up / North-up	The picture turned so your heading is up, or so north is up.
Simulated VDR log	The full data record of the run, exported as a spreadsheet file (CSV). It is a simulation record, not a real ship's voyage data recorder.

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