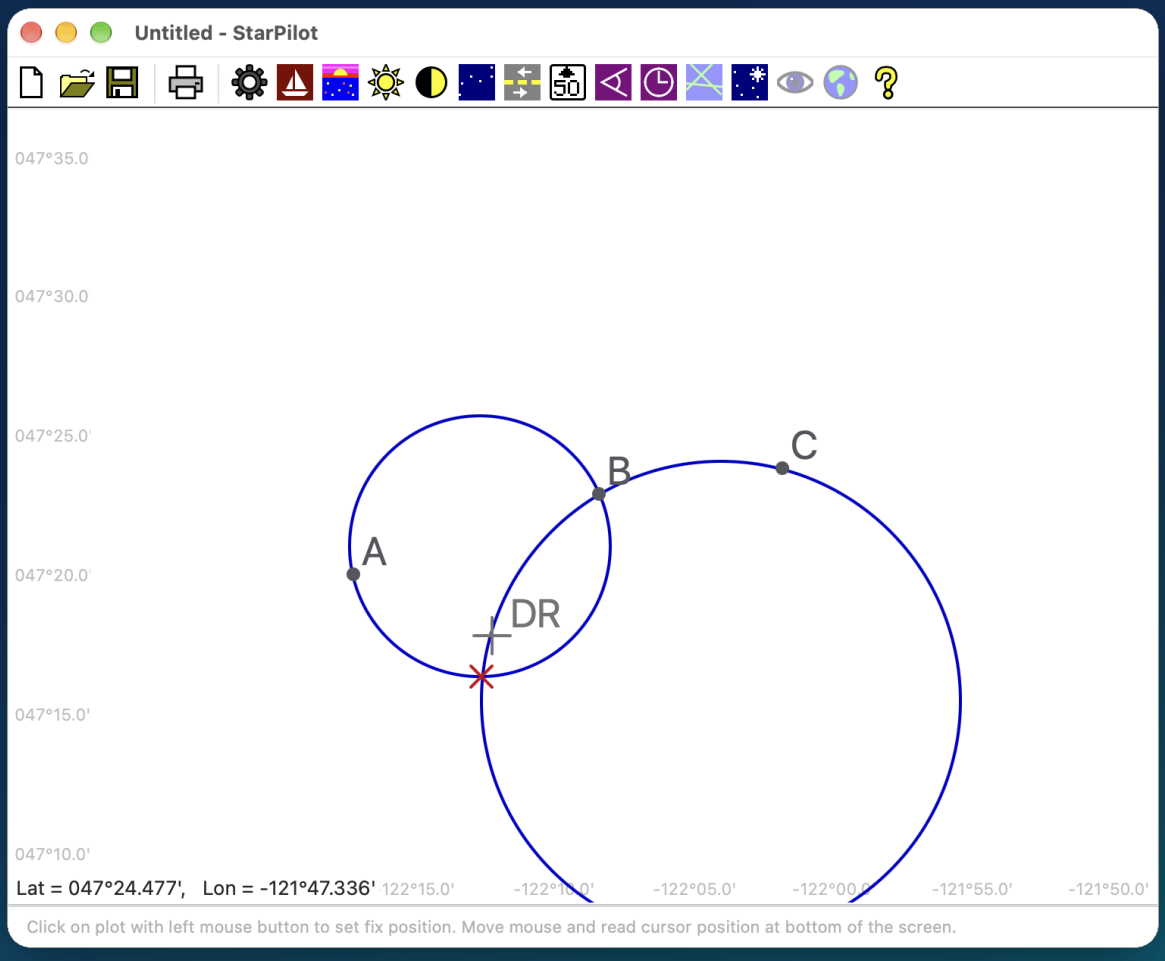
STARPATH · STARPILOT 4.2

The navigator's calculator for inland and coastal navigation

Bearing fixes, running fixes, distance off, currents and tides, route and passage planning, dead reckoning, compass work, speed-time-distance, add-subtract-average angles and times — all the everyday computations of navigation, solved in seconds.



StarPilot
for computers, phones, tablets and TI calculators

Starpath School of Navigation
www.starpath.com

NOT JUST FOR CELESTIAL NAVIGATORS

Everything between the dock and the landfall

StarPilot is well known as a state-of-the-art celestial navigation app, but it does very much more. Behind its **DR-and-Piloting** menu is a complete toolkit for the chart navigation most of us do every day: within sight of land, among tides and currents, using a steering compass, knotmeter and log, bearing compass, and perhaps a sextant. Each StarPilot piloting tool answers a practical question, shows its inputs beside the answer, for accurate, fast solutions to often crucial questions. Its DR routines make transcribing a long series of logbook entries into an accurate DR position a quick and easy process.

1 Where am I?

- Running fix from bearings at two times
- Distance off by two bow bearings
- Distance off by vertical sextant angle
- Three-body fix from horizontal sextant angles
- Geographical range of a light or landmark

2 What is the water doing?

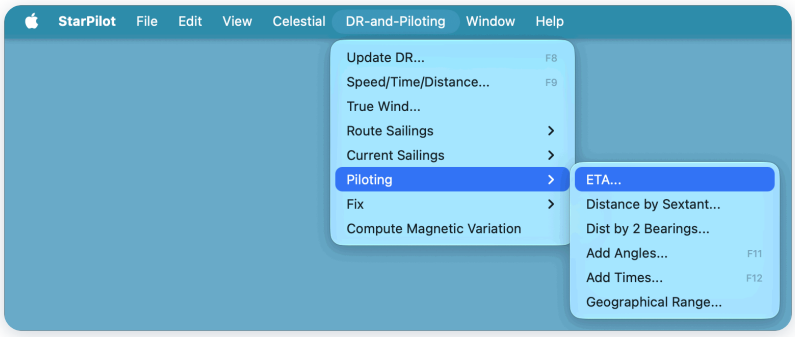
- Course and speed made good through a current
- Course and speed to steer to make good a track
- Set and drift found from GPS and log
- Tidal current and tide height at any time

3 How do I get there, and when?

- Rhumb line and great circle routes
- Composite and traverse sailings
- ETA in the destination's time zone
- Speed, time and distance; true wind

4 Where will I be?

- Update DR by log and course or speed and time
- Magnetic variation for any place and date
- Compass check from the Sun's shadow
- Add and average times and angles



The DR-and-Piloting menu: every tool in this brochure, two clicks away.

Built the way navigators work

Enter positions, courses and times the way you write them in the log book. Bearings are shown True, or Magnetic once you set your variation. StarPilot remembers your DR, destination and settings, so each tool starts from where you are.

Answers are computed, not looked up, and many tools can store their result straight back into your DR.

A fix from what you can see

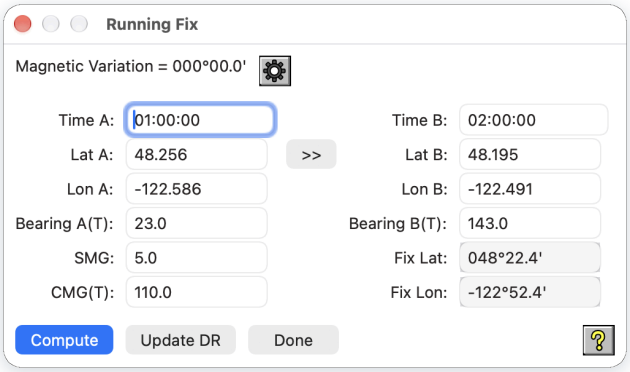
A compass bearing, a known landmark and a log are still the backbone of coastal navigation, and the best check on any electronic position. StarPilot turns them into a position.

Running fix

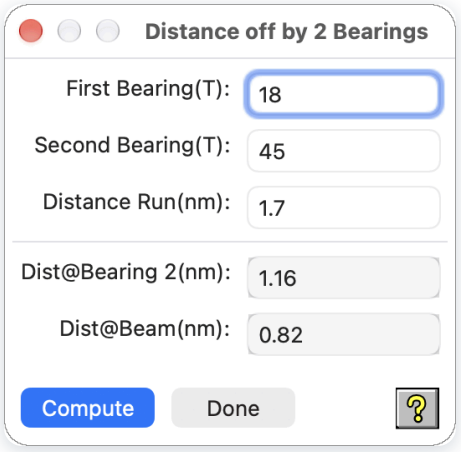
"I took a bearing an hour ago and another one now. Where am I?"

Enter each landmark's position, its bearing and the time, plus your course and speed between the two sights. StarPilot advances the first line of position to the time of the second and gives the fix. Use one landmark twice or two different landmarks. With speed zero it also solves an ordinary two-bearing fix. **Update DR** stores the answer as your new DR.

> **Strait of Juan de Fuca** making 5 kt on 110°T, Marker G3 bears 023°T at 0100; an hour later Minor Island bears 143°T. Fix at 0200: **48°22.4'N, 122°52.4'W**.



The magnetic variation is shown on the dialog, with a shortcut to change it.



Distance off by two bearings

"How far off is that headland, and how close will I pass it?"

Note the angle on the bow to a landmark, run a measured distance on a steady course, and note the angle again. StarPilot gives your distance off now and the distance at which you will pass it abeam. It needs no chart and no position for the landmark, so it works on any point you can see.

> 18° on the bow, then 45° after running 1.7 nm: **1.16 nm off now**, passing **0.82 nm off** abeam.

It tells you when the geometry is weak

Bearings that cross at a shallow angle make a fix sensitive to small errors. StarPilot still gives the answer, with a note beneath it when the lines cross at under 20° (running fix) or 15° (two bearings). It refuses bearings that cannot cross at all, and bearings that do not fit an object you are passing, rather than printing a misleading number.

The sextant as a piloting tool

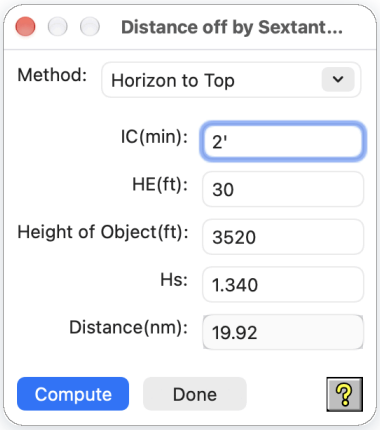
You do not need celestial navigation to put a sextant to work. Against a landmark it gives distances and fixes far more precise than a hand-bearing compass; even a simple plastic sextant will do.

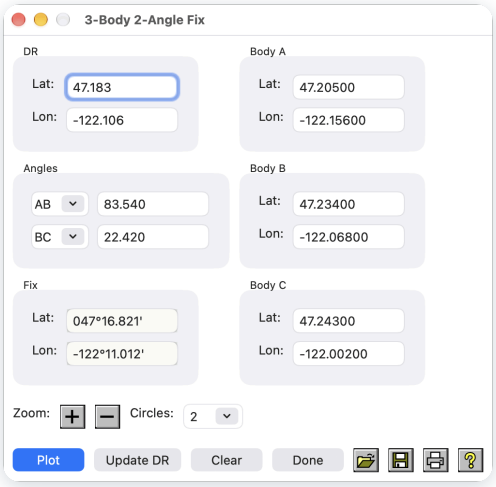
Distance off by vertical sextant angle

"How far am I from that lighthouse, that hill, that peak?"

Measure the angle from the waterline or the horizon to the top of an object of known height. StarPilot handles three cases: the base hidden below the horizon (landfall at tens of miles), the base in view and closer than the horizon, and base-to-top for close-in piloting.

> Peak 3,520 ft high, base hidden, sextant angle 1°34′, eye height 30 ft: **19.9 nm off**.
> Hill 460 ft high, base to top 2°30′: **1.7 nm off**.





Three charted marks, two sextant angles, then Plot.

Three-body fix: survey-grade position

"Is the anchor dragging? Exactly where are we?"

Hold the sextant sideways and measure the horizontal angles between three landmarks. Each angle puts you on a circle; StarPilot computes the circles, plots them and marks the fix where they cross. That replaces the station pointer, and it is far more accurate than plotting three compass bearings.

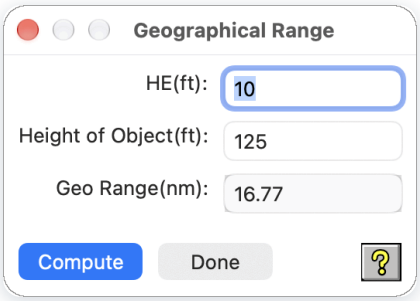
Your DR picks the right crossing. Choose the marks with care: if they and your boat all lie on one circle (a "swinger"), no fix is possible. Marks in a line, or with the middle one nearest you, avoid it.

Geographical range

"When will that light come over the horizon?"

Give your height of eye and the height of the light or land. StarPilot uses Bowditch's refraction-inclusive horizon distance to predict where it first appears.

> Light 125 ft high, eye height 10 ft: **16.77 nm**.



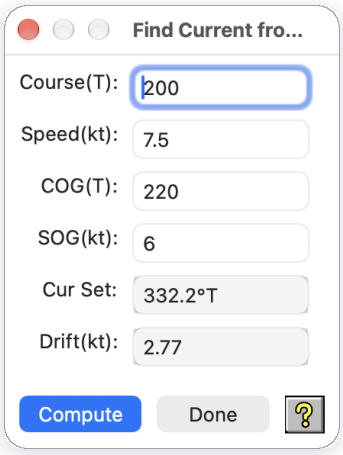
Currents and tides, solved

Current vectors are the most common navigation arithmetic in coastal waters and the easiest to get wrong. StarPilot solves the four standard problems and interpolates tide tables for the time you need.

You know…	StarPilot finds…	Use it to…
Course steered, boat speed, current set and drift	Course and speed made good (CMG, SMG)	see where the current is really taking you
The track and speed you must make good, and the current	Course to steer and boat speed needed	arrive on time after a passage through current
The track to make good, your boat speed, the current	Course to steer and speed made good	hold a track across a tidal stream
GPS course and speed over ground, plus compass and log	The set and drift of the current	measure the current you are actually in

Find the current from your GPS

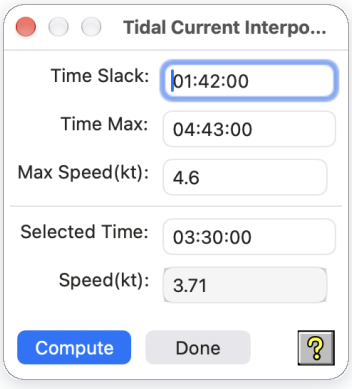
Steering 200°T at 7.5 kt by the log, the GPS shows 220°T at 6.0 kt over the ground. The difference is the current: **2.77 kt setting toward 332°T**. Average your readings over a few minutes rather than using an instantaneous value.

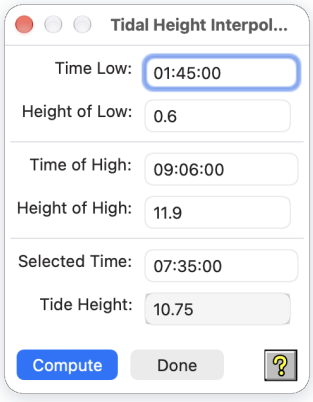


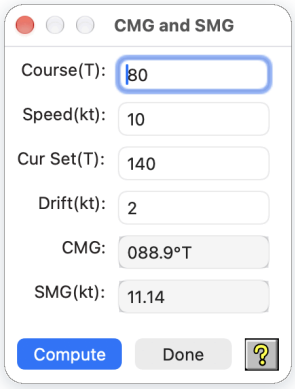
Tidal current and tide height

From the times of slack water and maximum flood or ebb in the tables, StarPilot gives the current's speed at any time between them. From the times and heights of low and high water, it gives the height of tide at any time, in feet or metres. Both can be repeated for several times from one set of entries.

> Slack 0142, maximum 4.6 kt at 0443: at 0330 the stream runs **3.71 kt**.
> Low 0.6 ft at 0145, high 11.9 ft at 0906: at 0735 the tide is **10.75 ft**.





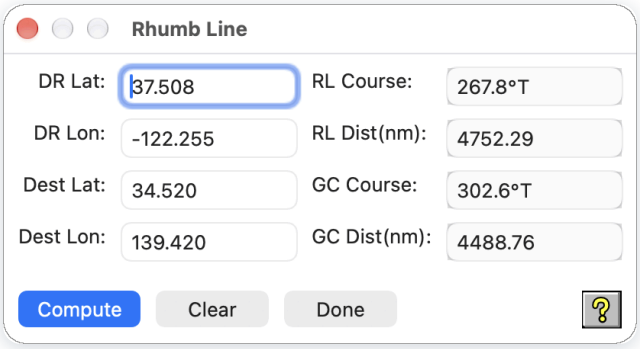


Routes and passage planning

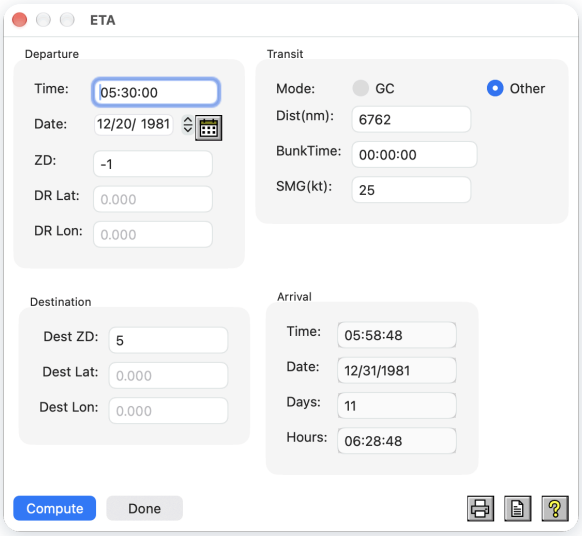
From the next headland to the next ocean, StarPilot works out the course, the distance and the arrival time. It starts from the DR and destination you have stored.

Rhumb line and great circle

The rhumb line is the single course that is a straight line on your chart. The great circle is the shortest route, broken into rhumb-line legs with waypoints at the longitude interval you choose. **Composite sailing** follows the great circle but holds a limiting latitude, to stay clear of ice or weather. **Traverse sailing** turns a day of tacks into one course and distance made good.



> San Francisco to Yokohama: rhumb line **267.8°T, 4,752 nm**; the great circle starts at **302.6°T** and saves **263.5 nm**.



ETA across time zones

Give a departure time and zone, a distance (or let StarPilot compute the great-circle distance), your speed made good and any planned stop. It returns arrival time and date in the destination's zone, and the time en route.

> A US Coast Guard exam problem: Cape Town at 0530 (ZD −1), 20 Dec, 6,762 nm at 25 kt to New York (ZD +5). Arrive **0559 on 31 Dec**.

Speed, time, distance

Enter two and get the third. 112.8 nm at 14.5 kt takes **7 h 46 m 46 s**; a measured mile in 8 m 32 s is **7.03 kt**.

True wind

Apparent wind to true, for sail trim, routing and the log. 16 kt apparent at 30° on the bow while making 6.5 kt is a true wind of **10.9 kt at 47.4°** on the bow.

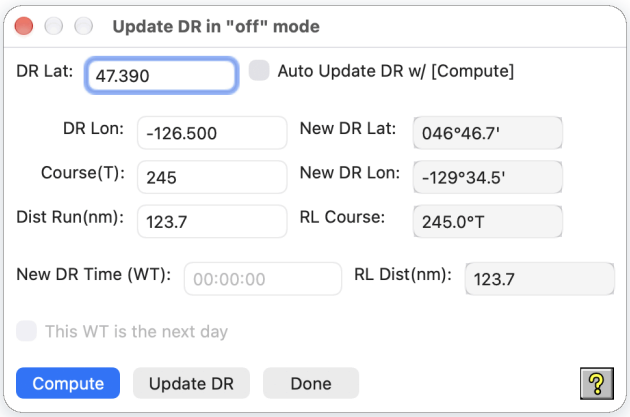
Dead reckoning, variation and the compass

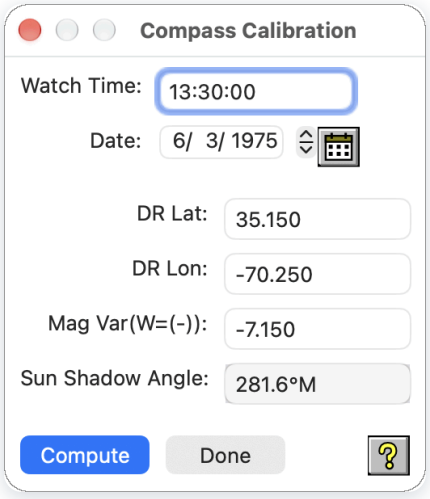
Good DR is what makes every other fix believable. StarPilot keeps it with you, and it handles the two corrections every compass course depends on.

Update DR, the way you keep the log

Work your DR three ways. **Off**: give a course and distance run. **Log**: give the next log reading. **Speed and time**: give the next time you care about. StarPilot remembers the last position, course, speed, log and clock, so you can type your log book in line by line, change course and speed as you go, and read off the final position.

Each result can replace the stored DR, and the running fix, the three-body fix and other tools can update it directly.





Check your compass with the Sun's shadow

"Is my compass right on this heading?"

The one "celestial" tool every coastal sailor can use, at the dock or offshore. Give the time and your position, and StarPilot predicts where the Sun's shadow should fall across the compass card. The difference from what you see is your deviation on that heading. Repeat around the compass to build a deviation card.

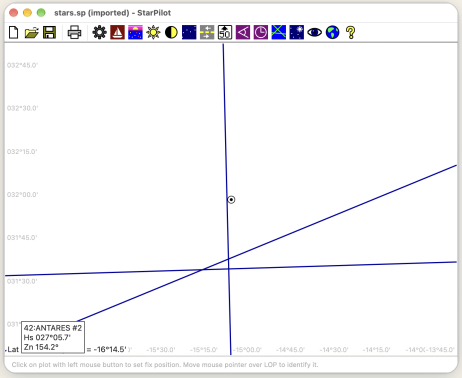
Magnetic variation, built in

StarPilot carries **IGRF-14**, the international reference model of the Earth's magnetic field. It gives the variation and its annual change for any position from 1900 to 2030, with no chart lookup and no internet connection. Set it once and StarPilot shows and accepts bearings in Magnetic.

AND WHEN YOU LOOK UP

A complete celestial navigator, too

The same program is Starpath's full celestial navigation system, ready when you are: sight reduction for the Sun, Moon, planets and stars, celestial fixes plotted on screen, a sight planner and a sight analyzer, with its own almanac built in. Learn piloting with StarPilot today; it will still be the right tool the day you pick up a sextant for the stars.



A three-star fix plotted on screen. Point at a line to see which sight it came from.

Why navigators trust it

StarPilot comes from Starpath, a navigation school, and its engine is the program Starpath shipped for years. Many of the worked examples in its help are tested against the program itself, so the book and the screen agree.

Every answer shows its inputs beside it, so you can check the work, and many tools print a record for the log.

Runs on your computers and devices

COMPUTERS

macOS

A native Mac application.

Windows

Unzip and run; no installer and no registry changes.

Linux

A single AppImage; nothing to install.

PHONES, TABLETS, AND CALCULATORS

iOS

iPhone and iPad.

Android

Phones and tablets.

TI-89 Titanium

On the graphing calculator.

TI-Nspire CX

On the graphing calculator.

WEB BROWSERS

Web

StarPilot in your browser, for study and practice.

Try a free demo

StarPilot Web, free for three days, at www.starpilotllc.com/web

The desktop editions need no internet connection once registered: the almanac, the magnetic model and every tool in this brochure live on your computer.

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