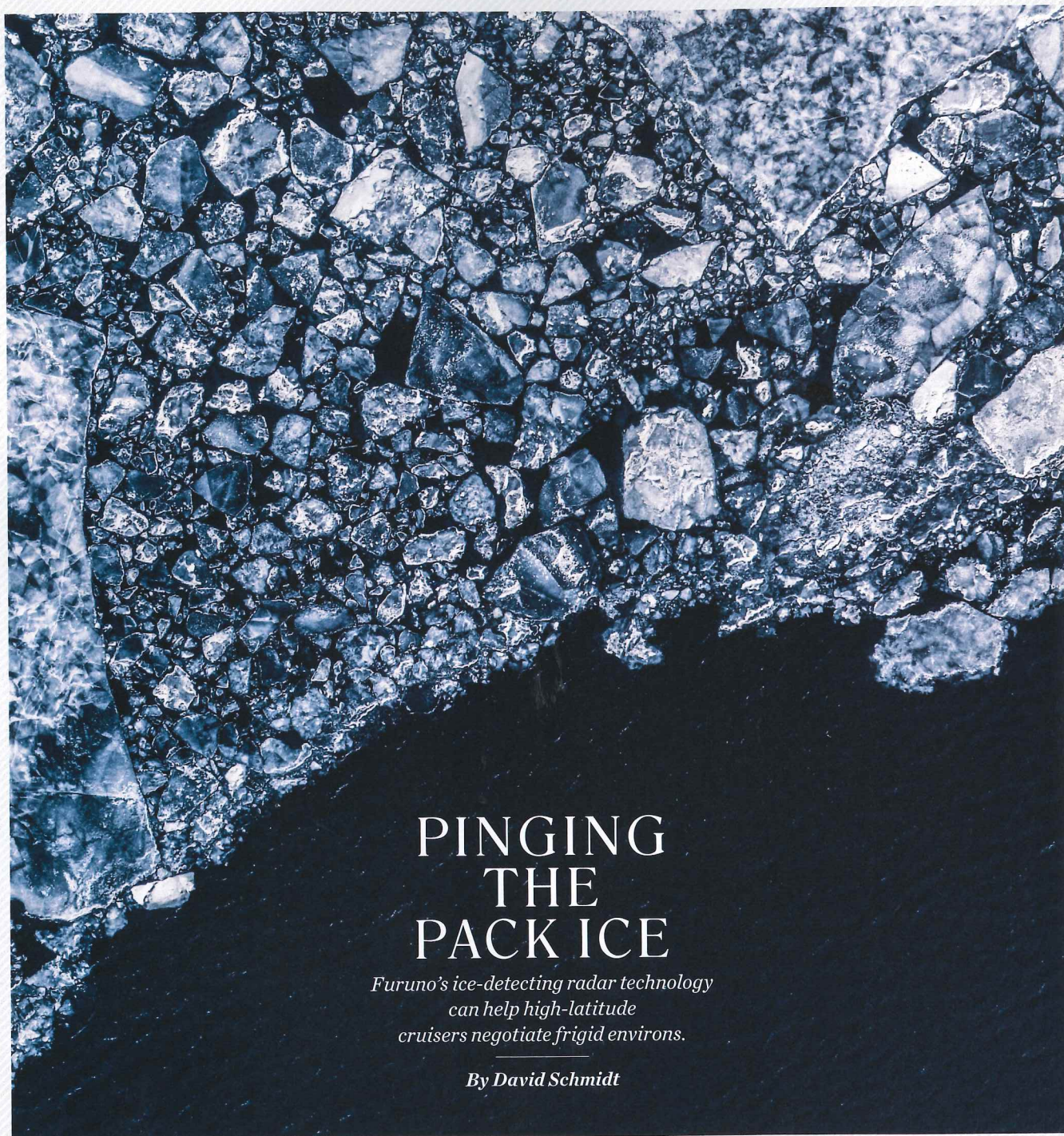

I

INSIGHTS

TECHNICAL EXPERTISE FROM THOSE IN THE KNOW



PINGING THE PACK ICE

*Furuno's ice-detecting radar technology
can help high-latitude
cruisers negotiate frigid environs.*

By David Schmidt

Furuno's FICE-100 can find paths in places that used to require ice-breaking hulls.

DURING HIS CREW'S FIRST NORTHWEST PASSAGE ATTEMPT in 1994, a massive closing ice pack threatened Roger Swanson's plans. He tied up behind a grounded ice floe to protect himself and all souls aboard, but for three or four days, things were looking pretty grim. Then the wind shifted, and they escaped through 5 miles of passable, but somewhat concentrated, ice. ¶ Swanson returned twice more aboard *Cloud Nine*, his 1975 Bowman 57 cutter-rigged ketch, and — in 2007 — became the first person to skipper an American-flagged boat east to west through the Northwest Passage. He completed that bold journey using basic electronics, relying on hard-earned skills acquired over 217,928 nautical miles, including three circumnavigations, three Cape Horn roundings, and multiple Arctic and Antarctic "cruises." ¶ Maritime history is rife with accounts of explorers

like Swanson braving high-latitude elements using equal parts skill, experience, persistence and patience. Fortunately, modern mariners have electronic tools that — while no substitute for seamanship and sturdy vessel construction — provide increased situational awareness and bolster good decision-making. ¶ One such technology is Furuno's FICE-100 Ice Detecting Radar, designed to help captains find the best route through pack ice, mitigating risk and potentially saving time, fuel and even lives. ¶ Unlike navigation radars, which detect vessels, objects and landmasses to help prevent collisions, the FICE-100 is a secondary processor, a kind of downstream black box. It takes the raw feed from a Furuno X-band radar's automatic radar plotting aid (ARPA) processor to create detailed composite, or, in Furuno's parlance, "fusion," images of the surrounding pack ice. ¶ FICE-100 modules (\$40,000) can be networked to any compatible Furuno X-band radar (\$11,000 to \$40,000) via Ethernet and then connected to a dedicated or shared display. ¶ Matt Wood, Furuno USA's national sales manager, says that in cruising grounds such as Scandinavia, wintertime navigation is usually only possible with ice-breaking

EYEING ICEBERGS

While Furuno's FICE-100 can't leverage its networked radar's ARPA capabilities to acquire and track icebergs, the radar can be networked with compatible FLIR thermal-imaging cameras to provide target video tracking. This slew-to-cue functionality allows a radar to tell a camera where to point its lens in order to track one or more targets. "The FICE-100 and an X-band radar can drive the cameras," says Furuno's Matt Wood, adding, "We have done a lot of separate development with FLIR."

vessels. "Open trails can be navigated without an icebreaker, but they're not readily apparent to a navigation radar or the naked eye," he says. "You need a radar with advanced signal processing to find the breaks." ¶ By employing advanced algorithms and concentrating on the returning echoes from the lower portion of the radar's transmitted vertical beam, the FICE-100 lowers the signal's noise floor to capture fine details in the returns (imagine an ultra-powerful, downward-looking "bird mode" feature). ¶ "Ice radar wants to magnify clutter," Wood says. "Navigation radars use a few

sweeps to paint a picture, but the FICE-100 uses a composite of sweeps, tiling or layering one on top of the other, to [determine] what's solid ice and what's open water." ¶ Users select the number of sweeps — from one to 100 — that the FICE-100 uses to create its composite imagery, and older sweeps fall off the composite image as newer sweeps are gathered. Given that Furuno X-band radars operate at 24 rpm, a FICE-100 takes four minutes and 16 seconds to create a 100-sweep composite radar image. That amount of time is also the longest shelf life of any individual sweep, and the unit updates its imagery every 2.5 seconds. ¶ While the FICE-100 was designed for commercial vessels, it also works for go-everywhere yacht owners. The FICE-100 can share its imagery with a Furuno TZtouch2 multifunction display or a black-box processor. Furuno's X-band radars can also be networked to the same MFDs and black boxes, allowing users to dedicate screens on a glass bridge for navigation and ice-radar views. ¶ Unlike navigation radars that can provide ranges approaching the triple-digit mark, the FICE-100 delivers a range of 3 to 6 nautical miles. ¶ "For the purposes of navigation, the FICE-100 is focused on finding an open pathway through the ice," Wood says, adding that most vessels in such conditions operate at speeds of 0.5 to 5 knots, making the job one of threading needles, not dodging bullets. "We're not looking for ice at 96 nautical miles." ¶ Likewise, since tracking other vessels isn't the FICE-100's mission, it can't leverage the main radar's ARPA functionality to track individual icebergs. However, users can designate those objects as targets on their main navigational radar or track them via a networked camera system (see "Eyeing Icebergs," above). ¶ "A savvy navigator is looking

Furuno's FICE-100 Ice Detecting Radar modules can be networked with any Furuno X-band radar.

back and forth between navigation and ice-radar screens," Wood says, "and when he sees [an iceberg], he'll track it with the nav radar." ¶ A FICE-100 operates independently of — and without compromising or influencing — the main navigation radar's processor, allowing navigators to find old tracks through the ice, saving time and fuel. ¶ Looking to the future, Furuno is working on its next-generation ice-radar technology, which, Wood says, will deliver ice-ranging and ice-thickness information. The company is also developing radar/sonar technology that looks for ice above and below the waterline and determines the thickness of submerged ice. ¶ "The challenge is imaging it all in real time, as it takes a huge amount of video processor [capability]," Wood says. "It's going to require something like James



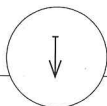
GHOSTLY IMAGERY

Furuno's FICE-100 lowers the radar signal's noise floor in order to capture fine details in the returns.

Cameron's *Avatar* project, there will be so much data." ¶ In terms of costs, a FICE-100-enabled radar installation fetches between \$51,000 and \$80,000, which, Wood says, is cost-competitive

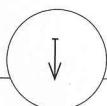
with other ice-routing technologies such as thermal-imaging cameras. Current FICE-100-equipped vessels include the U.S. Coast Guard's *Healy* and *Polar Star* icebreakers, as well as commercial ships that operate in the high latitudes during the dark months. ¶ "It's one thing to be around bergy bits, but realistically, you need a well-fortified yacht to travel in pack ice," Wood says. "As polar navigation opens up interest and requirements for the technology, it's exciting to be providing a solution that works." ¶ So, if you have high-latitude dreams like Roger Swanson's but don't have a lifetime to undertake the three multimonth expedition-style attempts that he required aboard *Cloud Nine* to reach Alaska, Furuno's FICE-100 paired with an X-band radar could be the difference between success and a long, cold winter. ▾

INSIGHTS > NEW ELECTRONICS > By David Schmidt



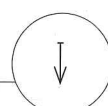
SOLID-STATE SPEED

Airmar's UDST800 Ultrasonic Smart Sensor (\$1,030) provides yacht helmsmen of all stripes with distance, speed and temperature information in a single, solid-state, and might we say elegant, housing. The UDST800 shows precise readings and has a reporting rate as fast as 10 hertz, making it a match for vessels of most sizes, speeds and types (including sailing yachts). It automatically configures itself for different water depths, water-clarity levels and vessel velocities. *Airmar Technology Corp., airmar.com*



QUANTUM LEAP

Raymarine's Quantum 2 (\$1,949) radar has a solid-state power amplifier, chirp technology, and algorithms that deliver Doppler processing. Quantum 2 radars are designed to make boats safer by working with Raymarine's Axiom multifunction displays to paint potentially dangerous targets red on-screen while rendering nonthreatening traffic green. The radar has Raymarine's Safety Sector, which evaluates all stationary targets within 655 feet of the vessel. *Raymarine, raymarine.com*



MAGIC (STEERING) WAND

Furuno's NavPilot 300 (\$1,550) has a 4.1-inch LCD and a remote Gesture Controller. Users press a button, point the Gesture Controller in the desired direction and then release the button, and the NavPilot 300 changes the boat's course. The NavPilot 300's self-learning software allows it to master a vessel's handling characteristics, and it can execute driving patterns (such as zigzag or orbit), making it equally handy for sport fishing or man-overboard retrieval. *Furuno USA, furunousa.com*