AI in the cockpit ▸ Watermakers for power voyagers

Ocean Navigator

THE VOYAGER'S RESOURCE

May/June 2023
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OCEAN VOYAGING

INSIDE PASSAGE

GEAR FAILURE IN THE JOHNSTONE STRAIT

Key Communications

in an offshore rescue

SPECIAL SECTION

DIESEL ENGINES

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On the cover: Diego Poblet Warren White on the bow of the Pacific Seacraft Orion 27 cutter *Seaweed* in British Columbia's Toba Inlet. Josh Warren-White photo.

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Nat Warren-White (*Ocean Voyaging, "Inside Passage" page 24*) is an actor, director and executive coach/management consultant. His recently published book, In Slocum's Wake (see *ON* review, May/June 2022) chronicles his westabout circumnavigation, 2006 to 2011. Born and raised sailing the Maine Coast, he has returned to live in his hometown of South Freeport on the Harraseeket River. His 43-foot Montevideo cutter, *Bahati*, has appeared in numerous articles in *Ocean Navigator*. Warren-White is preparing to launch his 1977 Cape Dory 25, *Lilibet*, which will soon carry him and his wife, Betsy, and their dog, Beans, Downeast and northward.

Steve D'Antonio (*Diesel Engines, "Horsepower and Torque," page 37*) was for many years a full-service yard manager. He now works with boat builders and owners and others as the head of Steve D'Antonio Marine Consulting. He is an ABYC-certified Master Technician and sits on ABYC's Engine and Powertrain, Electrical, and Hull Piping Project Technical Committees. He's taught celestial and coastal navigation and yacht systems aboard the US Naval Academy's sail training vessels. And he's cruised in such remote locations as Antarctica, Iceland, Alaska, Greenland, Spitzbergen and the Faroe and Galapagos Islands.

David Berson (*Nav Problem, "Samuel 'Bully' Samuels," page 44*) is a Master Mariner holding a 200-ton Merchant Marine License since 1982. In his seventh decade, he is still pursuing the same dream of running away to sea, that he has harbored since a little boy in the Bronx Housing Projects. For the past 22 years he has owned and operated *Glory*, in Greenport, NY, the only solar-charged, electric-powered, sub Chapter T tour boat certificated by the USCG in the known world. He founded a 501c3 charity, *Glory* Going Green, in 2011 that provides scholarships to eligible students in Greenport. He looks his age but doesn't act it.

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Chartroom Chatter

Courtesy Luc Callebaut

Voyagers effort to aid Vanuatu

Above, Vanuatu residents have been affected by cylones and earthquakes. Right, relief supplies assembled for transport to the islands.

A GROUP OF VOYAGERS ORGANIZED BY LIVEABOARD Luc Callebaut — who, along with his wife Jackie was interviewed in *ON*'s 2022 *Ocean Voyager* annual issue — is pitching in to assist the South Pacific island nation of Vanuatu after it recently suffered two tropical cyclones — Cyclone Judy and Cyclone Kevin — and also a magnitude 6.5 and a magnitude 5.4 earthquake. The assistance effort is being aided by such groups as the Seven Seas Cruising Association; the Grand Large Yachting World Odyssey 500; Byond Disaster Relief NZ; Bay of Islands Marina, Port Opua, New Zealand; and Noonsite.com.

Callebaut wrote: "Sailors visiting Vanuatu soon are in a unique position to bring necessary supplies to the local communities they visit. The Grand Large Yachting World Odyssey 500, a round-the-world sailing rally, will visit seven islands of Vanuatu in May 2023. Our participants have already bought wheelchairs and crutches (that was all done before the latest tropical cyclone), but now that so many more

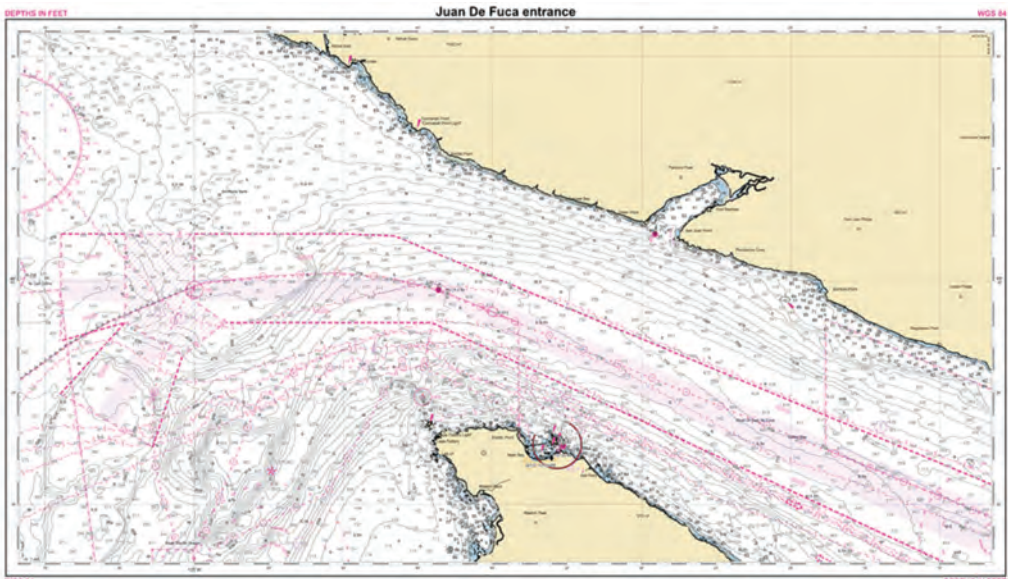
Courtesy Luc Callebaut

people are in need, we could bring more to Vanuatu.

"The fleet of 20 boats is already committed to bringing emergency relief items like water filtration kits, tool kits, shelter kits, water storage solutions, solar lights and more that will be donated via Byond Disaster Relief NZ. But we could do more with your help."

> "Sailors visiting Vanuatu soon are in a unique position to bring necessary supplies to the local communities they visit...."

For more information and to make a monetary donation go to the Vanuatu assistance website at www.givesendgo.com/G9WX5.



NOAA updates custom chart site

NOAA's Office of Coast Survey has been on a long program to digitize and customize the process of distributing nautical charts to users. The latest step in that process is an updated custom chart site with the release of NOAA Custom Chart version 2.0 (devgis.charttools.noaa.gov).

NOAA is calling this "a dynamic map application." It enables users to create their paper and PDF nautical charts that are derived from the official NOAA electronic chart the NOAA ENC. Users can create nautical charts with customized scale and extent, which can then be downloaded as PDF files. The data on the chart is much like traditional paper nautical charts, showing soundings, buoys, beacons and other aids to navigation, compass roses, etc.

According to NOAA the biggest change in the new version is the addition of the Personal Chart Catalog functionality, which allows users to save their charts to an exported Chart Catalog file. Users can then recreate a chart or multiple charts repeatedly as NOAA releases ENC updates by uploading the file in a new session of the NOAA Custom Chart in their web browser. The Chart Catalog file is small in size and can be emailed easily as an attachment, allowing users to share with print vendors or collaborate with others. NOAA is working on enhancing its Chart Updates website to allow users to upload the same Chart Catalog file and check for updates to their custom charts.

Custom chart PDFs created for letter or legal-size paper can be printed on a home printer. PDFs for large format charts may be sent to one of five companies working with NOAA (Frugal Navigator, Paradise Cay Publications, TrakMaps, The Blueprint Shop, East View Geospatial) for plotting or can also be printed through local commercial print shops.

Citizen science for voyagers

CRUISING SAILORS LEAVING HOME OFTEN WANT TO BE useful in places they visit along the way. This can take the form of applying skills from their lives on land, like teaching or carpentry, or distributing supplies to distant places. But another way to contribute to the greater good is through citizen science.

Citizen science happens when the public voluntarily helps conduct scientific research. Citizen scientists may collect data, analyze results, and even design experiments but the specific problem and the tools to address it are set up by professional scientists. Employing volunteers can broaden the geographic reach of a research project and make it possible to obtain a large pool of meaningful data that can be applied to real-world problems.

This raises the bar on activities like beach combing, fishing, or even gazing at the ocean on a passage and gives them a structured purpose. A good place to start could be with NOAA, which for decades has relied on citizen scientists to help fulfill its mission of studying the ocean. Visit the website (www.citizenscience.gov/catalog/#) and filter for NOAA in the search bar. If you prefer not to start with a government site there's SciStarter (scistarter.org/), an online citizen science hub supported by a number of private and public partners. You can search either site for interesting projects and find support and tools. For sailors with children on board there are projects that can be used in home schooling.

An obvious place to begin would be with the Marine Debris Monitoring and Assessment Project, or MDMAP, which engages NOAA partners and volunteers around the world to survey and record the amount and types of marine debris on shorelines. You just have to stand on the windward shore of an island in the Caribbean or South Pacific to understand the depth and breadth of this problem, where everything from flip-flops to plastic cigarette lighters floating in from miles away pollutes the beaches. NOAA's Shoreline Survey Guide provides an overview, and a Get Started Toolbox (marinedebris.noaa.gov/monitoring-toolbox) contains data sheets and protocol documents, tutorials and a registration portal where participants sign in to digitally upload their data. You can also view the results of previous data collection without having to sign in. Because the data is to be used by professional scientists, if protocols are not followed and the collection work is sloppy it will be rejected but it is well within the purview of interested sailors to do a good job and make a positive contribution to knowledge of the ocean environment.

Ann Hoffner

Transpac Race gearing up

MORE THAN 60 BOATS HAVE BEEN ENTERED IN the 2023 Transpac race from Cabrillo Beach, Cali. to Honolulu (*Ocean Navigator* is a Transpac Race co-sponsor). The pace quickens now for the competitors and the race committee as the first start on June 27 approaches. Before the start there will be a skipper's meeting and an aloha send-off party on June 24 on board the former US Navy battleship *USS Iowa*, which is docked in Los Angeles as a museum ship.

There will be three starts: Tuesday, July 27 for 17 boats (some boats slated for this start are provisional as they await their final rating), Thursday July 29 for 23 boats and Tuesday July 11 for the 26 largest and fastest boats.

For more on the Transpac preparations check the *Ocean Navigator* website.■

Notable New Titles

All Hands on Deck: A Modern-Day High Seas Adventure to the Far Side of the World

by Will Sofrin
Abrams Press—253 pages: $28

Will Sofrin, sailor and shipwright, was a man in a hurry. "The clock was ticking," he writes. He and the men and women he sailed with had cleared out of Newport on what would be a 36-day, 6,000-mile voyage to California because a production company was waiting to make a movie.

The year: 2002. Sofrin had signed as deckhand on *Rose,* a replica of an early 19th-century British frigate. The film would be called *Master and Commander: The Far Side of the World.* "We departed," the author notes, "with a crew of thirty on a ship of questionable seaworthiness, came close to sinking, and could have died, all while trying to deliver a movie prop."

The "adventure" Sofrin cites in his book's subtitle suggests only part of the tale he has to tell. For he breaks frequently into narrative with historical set-pieces on everything from yachts of the America's Cup and the building of the Panama Canal to the transformation of a onetime London ambulance driver, Richard Russ, into the maritime writer we know today as Patrick O'Brian.

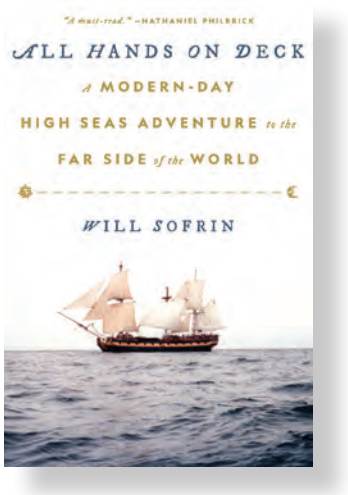
It should be noted that Sofrin's profile of the famed novelist of Napoleonic-era sea battles is central to his text. For the film adaptation based on the British author's work recasts the real-life *Rose* as stand-in for a fictional ship of the Royal Navy in the age of sail. Moreover, the essence of O'Brian's war epics is the test of courage. And as the vagaries of wind and wave would bring home to the crew of the *Rose,* that same test applies in the case of crisis at sea.

To this reader, the near-sinking of the auxiliary-powered square-rigger is the heart of Sofrin's engrossing book. Less than a week out of Newport he and his shipmates would prove their mettle. The *Rose* had become trapped in an Atlantic storm system of 30-foot seas and wind speeds peaking at 50 knots. In the forepeak, Sofrin reports, he could "see daylight" through openings in plank seams. Beyond the reach of land-based air rescue and with water pouring into the hull, the crew collected survival gear. "If the pumps went down," he writes, "we went down." But after a time the thrashing of the vessel began to ease, the pumps held, and they were clear of it.

For Sofrin there had been "no off-switch": no possibility of taking a break. Fighting to save the ship, he recalls, "forever changed my understanding of how to handle adversity.

"The only way out was through."

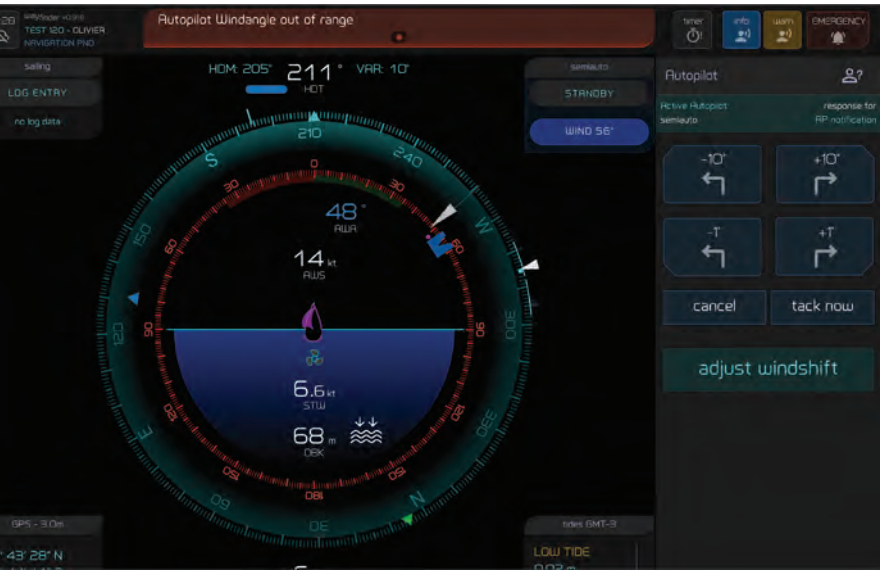
Alan Littell



Artificial intelligence comes to the cockpit

BY TIM QUEENEY

Integrated performance systems that display inputs like wind direction, heading, depth, position, etc., have been available for decades. Most recently the multifunction display has become the go-to device for combining all that sensor data in one place. Now an Oxford, Nova Scotia-based company named iNav4U has released a product called Wayfinder that not only integrates the display of sensor information but goes a step further and uses rules-based artificial intelligence (AI) to analyze the data and provide warnings and make recommendations to the vessel operators about how to proceed.



Courtesy iNav4U

Wayfinder screen. Note section in red at top alerting the vessel operator that a situation with the autopilot needs attention.

Wayfinder was developed by Olivier Hendrikx, an experienced Swiss voyager who has sailed more than 100,000 nautical miles, including in the North Sea, Mediterranean, Atlantic, Cape Horn and across the South and North Pacific.

The impetus for Hendrikx to develop Wayfinder was his realization that boats were becoming ever more complex with multiple pieces of electronics, all of which provided their own stream of plentiful data to a boat's operators. And in Hendrikx's eyes this was leading to information overload. At one point in his exploration of this idea he spoke with an aerospace engineer who observed that pilots faced the same issue and that aircraft and avionics designers are always working on ways to reduce data overload and improve situational awareness.

"We should have the same for boats," Hendrix said he thought at the time. "Something to diminish the workload." According to Hendrikx this is what his new product does. "With Wayfinder you can really focus on the overall situation on the boat and also enjoy nature."

Hendrikx had a longtime interest in software programming so as he sailed he began to automate many of the systems onboard his boat. His partner Brenda Robinson, who had experience with developing enterprise business software, saw the automation scheme that Hendrikx built and realized that he had a viable product. Together they launched iNav4U in 2015 to work on what would become Wayfinder.

So how does Wayfinder integrate all the input from a boat's sensors and other equipment? The company explains this to users by giving names to parts of its software, calling two of the modules the Analyzer and the Validator. These modules take the streams of data that arrive via NMEA 0183 and NMEA 2000 and then apply a set of hierarchical rules using what Hendrikx calls its rule engine.

"The Wayfinder unit takes data and applies rules to it," Hendrikx said. "The same way that any skipper makes decisions when sailing." Then, should certain data be outside set parameters, the unit will advise the operator to take action. "The basic idea is that you don't have to stare at the instruments," Hendrikx said. "It diminishes the workload on your brain."

The heart of Wayfinder is an aluminum black box that includes the brain chipset running on the Linux operating system. Also inside the box is built-in Wi-Fi and also various connectors for NMEA 0183, NMEA 2000, USB, Wi-Fi antennas and power. The unit can operate on either 12-volt or 24-volt DC.

While the brains of the Wayfinder system is its black box CPU, access by users is actually via web browser. Wayfinder puts all the data a user needs into the form of local network website with a distinctive 360 circular display of the data. Users can employ a browser on a smartphone, tablet, laptop or other browser-equipped Wi-Fi-capable device to interact with the system. Multiple users on board can access the Wayfinder screens anywhere on the boat. While Wayfinder does use the internet to download updates and send notifications via SMS, it doesn't need to be connected to the internet to function — the AI rule engine runs autonomously.

The system has a long list of capabilities in addition to its central navigation and hardware integration functions including a continuously recording log book; anchoring support that takes into account depth data, freeboard, the amount of rode paid out, anchor position and anchor alarm; collision avoidance via AIS; sail management; engine monitoring; weather and tide data; emergency support; document management; automatically-generated repair lists and more. According to Hendrikx, Wayfinder's weather capabilities are set to expand; and the software team will be adding a celestial navigation module for calculating sight reductions and determining an estimated position or fix.

Two intriguing examples of how Hendrikx has focused on the details is the way the system is set up to differentiate between salt water and fresh water in the bilge and its ability, should you lose GPS, to use AIS data from nearby vessels to triangulate your position.

Wayfinder has a price of $1,680 for the hardware and software, plus a $360 annual subscription for extended customer support. Currently, new Wayfinder buyers will receive six months customer support free.

As for Hendrikx and Robinson, once they get iNav4U running to their satisfaction, they plan to buy a boat and get back to voyaging again — no doubt assisted by some cockpit AI. ■

Translated 9

Courtesy Translated

Right, *Translated 9*, a Swan 65, was once named *ADC Accutrac* and owned by British ocean racer Clair Francis.

When you're preparing to sail in a race that hearkens back to an earlier age, a time when the equipment of the average ocean going yacht was much simpler, it makes sense to look for a boat that was a star of that era. When Marco Trombetti and Isabelle Andrieu, co-founders of the international translation company Translated, looked for a boat to sail in the fully-crewed Ocean Globe Race 2023, they chose a Swan 65 with a globe-girdling pedigree: *ADC Accutrac* was once owned and raced by British sailor Clair Francis. Aboard *ADC Accutrac*, Francis and crew finished fifth in the 1977 Whitbread Around the World Race after 126 days and 20 hours at sea.

The rules of the Ocean Globe Race put a premium on competitors in the 2023 race recreating "the spirit of the 1973 Whitbread Round the World Race" on the 50th anniversary of that event.

A Sparkman & Stephens design, *ADC Accutrac* was launched in 1974. After the 1977 Whitbread, Francis sold the boat and it went through a series of owners. When asked why he and Andrieu chose to sail in this boat, Trombetti responded in an email: "We opted for a Swan 65 for two reasons. First off, to take part in the Ocean Globe Race 2023, a celebration of 50 years since the first edition of the Whitbread Round the World Race, one of the requirements was to have a boat built before 1988. We analyzed which models had performed best in the early editions of this epic regatta and discovered that the Swan 65 was the most successful of them all. It was Ramón Carlín on board a Swan 65 — *Sayula II* — who won the first edition, while in the second edition, three Swan 65s — *King's Legend, Disque d'Or* and *ADC Accutrac* — placed second, fourth, and fifth respectively.

"The Sparkman & Stephens Swan 65 is an iconic boat crafted from Nautor Swan's ambitious and winning design. It is considered by many to be the queen of the seas – a perfect blend of performance and looks.

"Our Swan 65, *Translated 9*, is the one that came fifth in the second edition. Back then, it was captained by Clare Francis, the first female skipper to take part in the Whitbread. This adds a fundamental value to our company's boat: as a pioneer in artificial intelligence to support human creativity, Translated believes that human values — rather than technology — are the key to achieving ambitious goals. And it was precisely to promote these values, and our motto of 'We Believe in Humans,' that we decided to participate in the OGR 23,

Courtesy Translated

the most human race there is."

At one point in its history the boat was named *Force 9 of London* and had fallen into disrepair. Italian sailor Nicola Parolin got the boat back in shape and sailing again. Trombetti and Andrieu then purchased the Swan 65 and renamed it *Translated 9*.

The boat underwent an extensive refit by VMV Yacht Design at Marelift in Fano, Italy. Trombetti commented on the work: "Our refit was intended not only to bring the vessel in line with the rules of the Ocean Globe Race 2023, where no technology or modern materials are allowed on board, but also to restore the boat to its original design and to its former glory.

"The refit was led by Vittorio Malingri and assisted by many of the crew members who will compete in the Ocean Globe Race. It was crucial for the members of our crew to know and understand every single detail of *Translated 9* so that, if anything were to break down in the middle of the ocean, they would know exactly where to go to work.

Above, Translated company co-founder Marco Trombetti. Below, *Translated 9* at sea after an extensive refit that included the addition of a hard dodger.

Courtesy Translated

Courtesy Translated

Translated 9 crew on the foredeck. The crew has been selected from a pool of 1,400 applicants.

"The restoration involved all areas of the boat. We dismantled and restored it from top to bottom, and the refit covered some of the internal structures, all the onboard equipment including the tanks, and the engine room. We carried out structural testing of all the steel, including the rudder shaft and the propeller shaft, and we replaced all the pieces of the deck, setting up a new layout with the construction of a doghouse. Lastly, we replaced the masts."

As a tune-up for the Ocean Globe Race *Translated 9* sailed in the 3,600-mile Cape Town to Rio Race in January 2023. In addition to Marco Trombetti and Vittorio Malingri, the crew for the race was chosen from a pool of 1,400 applicants all new to ocean sailing.

When asked about the Rio race Trombetti wrote: "The boat performed really well in the Cape2Rio. Considering that we were already in trim for the Ocean Globe Race, so we didn't have modern technology on board, we managed to finish fourth. *Translated 9* rode the waves perfectly and made excellent use of the winds.

"With an international crew of young people under 24 who grew a great deal during this ocean journey, after an excellent start and a few periods of dead calm that slowed our progress, we managed to mount a comeback and finish just a few hours behind the first three boats, which had technology on board. For the last three days, when the wind was reaching speeds of 50 knots, *Translated 9* flew across the waves of the Atlantic Ocean. It was an important test. We became aware of our potential and identified the areas where we need to improve.

"We are convinced that the journey, and above all the growth that takes place during the journey, is the most valuable element of any adventure in sport and in life."

The next challenge for Trombetti, *Translated 9* and its young crew is the Ocean Globe Race, slated to begin in September 2023 from Europe (the starting and ending port have yet to be announced) and stop in Cape Town, Auckland, New Zealand and Punta del Este, Uruguay before returning for a finish in Europe. According to the company the selection process for crew to sail on *Translated 9* in the OGR 2023 is still open, and "anyone who wants to and believes they can take on a challenge as extreme as it is extraordinary" can apply at www.translated.com/9. ■

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Watermaker considerations

BY TIM QUEENEY

Courtesy Nordhavn

Adding a watermaker to a power voyager like the Nordhavn 41 involves answering some questions about needed output, voyaging location and more.

Watermakers have become such a common piece of gear on a power voyaging boat that it seems just about any unit will do. Some buyers take this idea to heart and will purchase their watermaker off the internet based solely on price. The reality, of course, is that there are factors in making sure the watermaker you choose is the right one for the type of voyaging you do. And those factors are not immediately apparent until you start to delve into the subject.

According to Larry Schildwachter of Emerald Harbor Marine in Seattle, which sells and installs watermakers on all kinds of boats, there are a number of things to look at. "We help folks get ready for long distance voyaging," Schildwachter said. "Many buyers look at watermaker capacity in gallons per day. But we like to start with gallons per hour." Schildwachter says the latter figure gives a better picture of how a watermaker will fit based on how they want to operate. Another factor is what amount and type of electrical power is available. For sailboats, for example, a DC watermaker usually makes more sense. Power voyagers more often have a diesel generator on board and that makes AC-powered units more attractive. Schildwachter says there are even regional preferences to take into account. "Many people in the Northwest don't like to run generators. Given that, they need a certain size watermaker because you need to run two hours in the morning and two in the evening."

Another factor is how much an owner wants to

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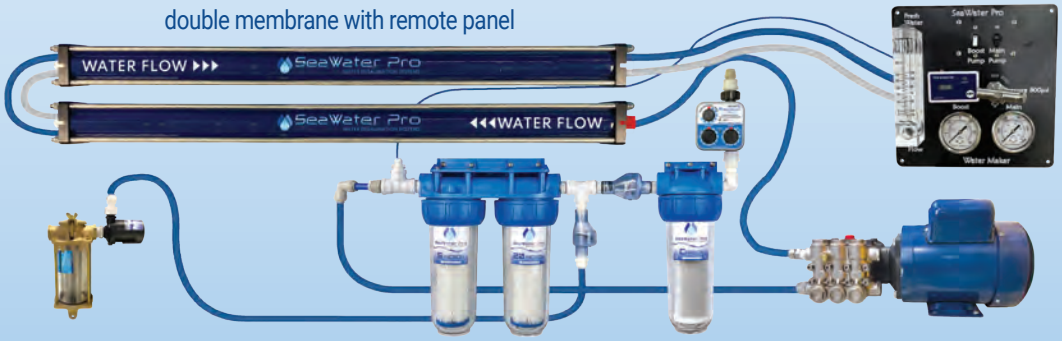

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Courtesy Emerald Harbor Marine

An installation of twin units from Blue Water Desalinization on a Nordhavn 68 by Emerald Harbor Marine.

get involved with operating and maintaining their unit. Years ago there wasn't much choice in this department, all watermakers were manual models with little or nothing in the way of automation. But current models have had most of their functions automated using improved sensor and processing technology. "If an owner is not hands on, we often steer them to more automated models. The automated features help make watermaker operation less difficult. For folks that are really talented, though, they can go any path they want."

Ask questions

Schildwachter stresses that buying just for the lowest price isn't always the best way to go. "Folks should be talking to their local dealers. For example, where will you be operating? If you size a watermaker for use in warm water, and then you go in cold water you'll get a difference in output."

Some owners really take this relying-on-dealer-knowledge to heart, Schildwachter said. "They come in and quiz us. They ask us what we like, what we've heard works well, what hasn't worked well. And if they're considering a unit for a Nordhavn, we ask them for the build numbers of their boat and we say here's the models that go well in those boats. And Nordhavn does a good job of making sure owners are steered in the right direction."

Berkeley Andrews, sales manager for Blue Water Desalinization, stresses the importance of having a quality unit. "When you go to many places in the world, you put so much on the line — your health and your family's health." Andrews said. "Water is not guaranteed to be safe in many of these places. So you want a unit you can trust."

Part of the trustworthiness of a good watermaker, according to Andrews, are the automatic maintenance features. "We make it easy and all automatic. Like a freshwater flush of the membrane every seven days."

Another advantage for power voyagers who are likely to have a genset on board and thus can opt to install AC-powered units is that AC pumps are generally simpler than low-power energy transfer device (ETD) DC pumps. "They [AC pumps] are less complex and can be rebuilt in the field in a couple of hours," Andrews said.

Cost of maintenance

One of the big considerations in any system is not just the cost of acquisition but the cost of maintenance. Mike Spanos founder of Seawater Pro watermakers notes that a good thing to look at is the cost and availability of spare parts. "Are the parts available on line, can you get them from Amazon?" Spanos said. "Can you use off-the-shelf parts? Can you go to the hardware

store to find elbows, hoses, those kind of parts to repair your system?" Not surprisingly, Spanos points out that his company's units are made of standard ISO parts. "When you have universal parts you can fix it."

What about installing a watermaker? Larger power voyagers often come with a watermaker standard whereas smaller boats require the watermaker to be installed after purchase. For example, the smallest vessel in the Nordhavn line, the 41, does not come with a standard watermaker. Is there a common location on board to install a watermaking unit? Drew Leishman, a project manager at Nordhavn weighed in on this question via email. "The most common location I have seen on the Nordhavn 41 is in the laz," Leishman wrote. And he stressed that the 41, for example, is already set up to accept such a unit into the fresh water system. "The 41 is pre-plumbed to accept water from a watermaker to the fresh water tank. There is also a dedicated seawater inlet installed as standard."

> "Water is not guaranteed to be safe in many of these places. So you want a unit you can trust."
>
> Berkeley Andrews,
> Sales Manager
> Blue Water Desalinization

What about arranging for a watermaker to be added to the boat as it is being built? Would that change the tankage required? "We do not offer a watermaker to be installed during the build stage," Leishman wrote. "Typically on the 41 a watermaker is installed after delivery of the boat. If we were to offer installs during the build it would have no bearing in the tank size. The 41 is more of a production boat in our model line and there is no room for any changes to the specified equipment and tankage."

So, the process of watermaker choice involves a number of factors that power voyagers need to weigh carefully. When you get a system that works for you, though, the benefits are increased voyaging range and greater crew comfort, so a few extra days of research and asking questions of dealers and manufacturers can be worth it. ■

A dual membrane, AC-powered system from SeaWater Pro with a rated output of 40 gallons per hour.

Courtesy SeaWater Pro

Courtesy Rick Rodriguez

The Peterson 44 *Raindancer*, seen here at anchor, was struck by a whale in the Pacific and rapidly sank.

Rescue communications

By Ann Hoffner

On March 13, on a South Pacific crossing midway between Galapagos and the Marquesas, s/v *Raindancer* with four people on board sank after an encounter with a whale. It was lunchtime and they had been in the cockpit eating pizza. In 15 minutes the boat, a Peterson 44, had slipped beneath the surface and the crew were surveying a sunny sea from the slim shelter of a liferaft and inflatable dinghy tied together.

Before abandoning ship the crew gathered supplies and the captain, Rick Rodriguez, activated an EPIRB and sent out a mayday on VHF.

Once in the liferaft they activated a GlobalStar SPOT tracker, started regular mayday signals via handheld VHF, and turned on an IridiumGO! and cell phone (creating a satellite service wifi hot-spot) to message Rick's brother on land, and a friend on s/v *Southern Cross* sailing 160 nm behind. After sending brief messages they turned the devices off. The liferaft carried several weeks' worth of vital provisions but their emergency signaling devices had precious little battery power. Two hours later on start-up there were messages. One, from Tommy Joyce on *Southern Cross*, said, "We got you bud."

What the *Raindancer* crew couldn't know was that from the time the EPIRB went off, and Rick's text messages were received, two streams of rescue communications were started and they flowed and intertwined throughout the nine hours it took for a rescue boat to find them.

Initial reports of the rescue were confused and shifting. In the new age of communications this shouldn't be a surprise; much was said on social media, especially on the Facebook page of Boatwatch, an organization that maintains a worldwide network of resources to aid the search for missing or overdue mariners and relay urgent messages. According to Eddie Tuttle, Boatwatch was alerted by Don Preuss, a cruiser in Panama, that mayday messages were showing up on social media and their own Facebook page became a central message platform. The use of social media allows information to be widely disseminated but also leads to a cacophony of voices, not all directly involved but all eager to participate. Initially it was reported that *Raindancer*'s EPIRB did not function, but that proved to be false, and the signal set off an official SAR chain of command that began in Peru and was rerouted through Rescue Coordination Center (RCC) Alameda in California, where the US Coast Guard fielded phone calls and coordinated via Automated Mutual-assistance Vessel Rescue (AMVER) to divert a commercial ship to the liferaft.

Rick's text messages set off another effort, one that ultimately led to the *Raindancer* crew's successful rescue.

An unusual aspect of this situation was the presence of a couple dozen boats in the 2023 World ARC, an international circumnavigation rally, coming up behind *Raindancer*. On receiving reports "by multiple means" of the sinking, Rally Control put out a Fleet Message to rally crews. The World ARC SSB Radio duty controller, Chris Parker on *Mistral of Portsmouth,* also relayed the distress message, and ten ARC boats close to *Raindancer*'s latest coordinates changed course along with two non-ARC boats, including s/v *Rolling Stones*, which turned out to be closest, only 35 nm away.

Tommy Joyce did not receive the original message from Rick because he doesn't check Iridium much, but he did get the message from Rick's brother which came through WhatsApp via Tommy's Starlink. (FB) "At that moment, I set up multiple chats, posts and other comms." Ninety percent of the tools Tommy used required fast internet access, which Starlink provided. He was able to communicate with both *Rolling Stones* and with the SAR assets. Ultimately *Rolling Stones* and a Panamanian-flagged tanker both arrived at the scene, but it was easier to board the sailboat and *Raindancer*'s crew was able to turn on a personal locator beacon (PLB) and shoot off a parachute flare to guide them in.

Both efforts depended on satellite communications, and were run more or less in parallel. A question raised on Boatwatch's Facebook page was whether/how in future the land-based SAR scenario could be altered to include recreational boats, which are not now included. AMVER is a world-wide voluntary ship reporting system operated by the United States Coast Guard that gives the SAR authorities information on and communications access to vessels near a reported disaster. Only merchant vessels more than 1,000 gross tons on a voyage of 24 hours or longer are eligible to enroll in AMVER, but SAR coordinator at RCC in Alameda Kris Robertson posted on Boatwatch FB that it was helpful to have had phone numbers for all sailing vessels that were involved in the rescue or relaying information. "Most of the time communications is the hardest part of any rescue coordination…Question for the group, is there a place where you all keep underway phone numbers for sailing vessels?"

Eddie and Glenn Tuttle and Boatwatch along with Tommy Joyce were instrumental again a few days later when a crew member on board a World ARC boat s/v *Cepa* had a serious stroke. *Cepa* was 6-7 days' sail out of the Marquesas without enough fuel to motor flat out. The captain was able to email rescue coordinators in Germany, World Arc Rally Control, and a medical support for German-flagged vessels. JRCC Papeete was contacted, RCC Alameda released SafetyNet and SafetyCast group emergency messages to ships over Iridium and Inmarsat, and the captain also sent a distress call to the chat group of the ARC fleet. Tommy Joyce again acted as a mobile command center. The ARC boats were able to scan the area around *Cepa*'s position using AIS and assist in locating nearby boats that could help. S/v *Pec* diverted from the rally to provide medicine and ultimately their captain went into the rescue effort as doctor. Even with this help, there was still the issue of time. A motor yacht, *Paladin*, located through AIS, did not respond to initial attempts to communicate. In a stroke of fortune for all involved, the email list used to forward the distress call to the rally fleet included a weather routing company that recognized the yacht as a previous customer and was able to contact the yacht's owner, who then contacted the captain, initiating

The use of social media allows information to be widely disseminated but also leads to a cacophony of voices, not all directly involved but all eager to participate.

a successful evacuation of the crew member complete with delivery of enough fuel to increase *Paladin*'s speed and allow them to divert to Nuku Hiva.

"Two back-to-back amazing rescues," said Eddie.

It's hard to imagine that all the activity in *Raindancer*'s rescue only lasted about 10 hours, yet photos of the four people sitting on s/v *Rolling Stones* showed up on Facebook the day after the sinking.

For all the hoopla, especially given the unusual circumstance of the rally being in the vicinity, it's important to remember that rescue options are usually scant, potential rescuers scattered far and wide, and those of us out on the ocean need to be take responsibility for our adventurous tendencies.

Peter Nielsen posted on the Boatwatch Facebook page that when he crewed on a cat in the Pacific in 2020 that was hit by a whale, the Coast Guard picked up the EPIRB signal, emailed the boat via IridiumGO! and initiated voice contact, leading to rescue nine hours later by a Chinese fishing boat.

Eddie says besides online they also posted an emergency message for the Maritime Mobile Service Network (MMSN.org) which is read by HAM radio operators on Ham Radio frequency 14.300, a world wide network of Ham Radio Operators communicating with vessels at sea. I spent 10 years in the Pacific on a Peterson 44, and often this radio net was the only live link my husband and I had to land.

It takes an ocean. ■

Contributing editor Ann Hoffner and husband Tom Bailey cruised on their Peterson 44, Oddly Enough. *She's now based in Sorrento, Maine.*

A tight spot to lose your bearings

By Damon Gannon

Editor's note: This experience of two cruisers shows the importance of having spares aboard if at all possible.

We left Titusville, Florida bound for Vero Beach via the Intracoastal Waterway (ICW). There wasn't a breath of wind, so we were motoring.

After about three hours into our expected six-hour trip, we noticed a subtle change in the sound of the engine. Janet was at the helm, so I got up to check. Before I even reached the bottom of the companionway ladder, there was a horrible shrieking and the sound of metal grinding, then the engine's overheat alarm sounded. Janet shut down the engine and used our momentum to move the boat to the edge of the ICW channel while I ran forward to drop the anchor. This section of the Indian River is quite shallow, so the channel was a very narrow strip dredged through the flats. Not much room to maneuver. This whole scene took just a minute.

Damon and Janet Gannon

Damon and Janet Gannon

When we came to rest, there was only about eight inches of water below our keel and a faint plume of smoke rising from the engine compartment.

With the boat safely out of the channel and the anchor down, we tried to figure out what was going on. The infrared thermometer showed that the temperature of the primary alternator was at more than 220 degrees and the top of the engine block was almost as hot. Little chunks of alternator belt were strewn around the engine compartment and there was an acrid smell of burnt rubber.

We removed the belts and spun the pulleys for both alternators and the freshwater pump by hand. All but the pulley on the primary alternator rotated freely. The primary alternator was completely seized. For good measure, we also checked the raw water pump impeller, which was fine (but we changed it anyway, since we had it all taken apart).

Diagnosis-after-the-fact: the bearings on the primary alternator burnt up (for reasons that are still unknown but it was 18 years old) and this caused the belt to stop turning. The metallic grinding sound was the alternator bearings seizing and the screeching sound was the drive pulley spinning against a stationary belt (and getting chewed up). That belt also drives the pump for the freshwater (coolant) side of the heat exchanger. A stuck belt meant no coolant circulation, leading to an overheated engine. We had a dead alternator and no spare with which to replace it and no way to repair it. We didn't really need the alternator to run the engine but without it we couldn't tension the belt to run the water pump. So the engine was inoperable.

At this point, we knew we were in for a long day. We made lunch with an eye on the wind, which at that point was light. There was still the possi-

Above, the Gannon's Pacific Seacraft 37 *Fulmar* at anchor in Florida. Below left, *Fulmar* under tow in the ICW.

bility that it could turn and push us into shallower water. Time for a plan.

We wanted to get to a dock, to make it easier to do the repair work. There were three marinas within five miles of us, all to our south. The afternoon breeze was supposed to be favorable for sailing in that direction. To help us get through the lulls and wind shadows near the bridges, we launched the dinghy and tied it alongside to act like a tug boat.

The plan was falling into place, but then we found out that none of those three marinas to our south had room for us. We now realized our best option was to go back to Titusville. Our dockage there was already paid up through the end of the week, the Titusville Marina has a DIY workshop that we could use, there is a good mechanic right next door to the marina, and there are parts suppliers within walking distance of the dock. The trouble was that Titusville was almost 20 miles north of us. Too far to rely on the dinghy for propulsion, we'd have to sail up the long, narrow ICW channel and negotiate a drawbridge that was undergoing construction (meaning that we'd have to dodge tug and barge traffic). We certainly could have sailed it. But it was going to involve a lot of tacking and because it was now about 3:30 in the afternoon, we wouldn't get to Titusville until well after dark. And then we'd need a tow into the marina anyhow because the marina staff weren't going to let us sail in or use our dinghy to push us into a slip. The marina is densely packed with very little room to maneuver. (We've since learned that "no tow-ins" is a common policy in Florida, which is probably why the first three marinas said they didn't have room for us.)

So one of us (the smart one) suggested we call TowBOAT US and get a tow all the way to Titusville. We have been paying BOAT US for

boat insurance and towing insurance for decades, and have never made a claim of any kind. In the interest of getting things sorted out as quickly as possible, we swallowed our pride and called the "Red Boat of Shame." We hoisted the dinghy back aboard and 45 minutes later, were under tow and hurtling north at a dizzying 6.5 knots.

The towboat captain was very professional and got us to Titusville with plenty of daylight to spare. It's not easy to maneuver a boat under tow into a slip. But he made it look easy. The marina staff were ready to take our lines and assist. Our friends Ann Beardsley and Elliot Walsh had drinks waiting for us. Plus they fed us a good, hot dinner. (Janet remarked: no fooling, I cried a little at that point. It was so kind.) And Elliott was a huge help on the following day, during the battle to remove the old alternator.

Not knowing how long it would take to get a new alternator or to rebuild the old unit, we ordered a new one from Beta Marine and also took the old one to "The Guy Over At Titusville NAPA." His name is Kelly and he used to own an automotive electrical shop. He now works at NAPA and does starter and alternator repair jobs on the side from his house. Everyone told us that having Kelly fix it would be the fastest, cheapest, and best solution. And they were right. Kelly completely refurbished the alternator that evening and had it ready for us by 8:00 AM the next day.

We re-installed the alternator, gave the engine a little extra TLC, crossed our fingers and turned the key. The mighty beast came right back to life without a hitch. ■

Damon and Janet Gannon have worked on the water from the Gulf of Mexico to the Bay of Fundy. They are currently enjoying a year's "pretirement," sailing their Pacific Seacraft 37, Fulmar, *up and down the Intracoastal Waterway.*

Inside Pasage

Tidal gates and a faulty engine increase the challenge of Pacific Northwest coastal voyage

STORY BY NAT WARREN-WHITE
PHOTOS BY JOSH WARREN-WHITE

Pax and *Seaweed* rafted up in Teakerne Arm, British Columbia.

Navigating the waters of the notorious Inside Passage, stretching between the San Juan Islands in northwest Washington State past Vancouver Island and on up to Alaska, is like finding your way through a tricky and dangerous labyrinth. Not for the weak of heart, you will encounter confusing tidal rapids that can run as strong as 12 to 16 knots replete with whirlpools that compete with those Odysseus faced in the Straits of Messina. The big difference is that the waters of the Inside Passage will also bless you with daily vistas of snow-capped mountain peaks on both the Vancouver Island and BC mainland sides. Combined with the myriad fjords, waterfalls and forest trails bedecked with salmon berries, grizzly bears and waters replete with wild salmon, urchins, crab and oysters, this stretch of water offers you and your crew some of the most awesome cruising territory on Earth.

During the winter of 2022, grimly facing another year of COVID, my son, Josh, his partner, Maria, and their seven-year-old son, Diego, announced that they were planning to sail their newly acquired 31-foot Australian-built Sapphire ocean-sailing sloop, *Pax*, up the Inside Passage with the hope of reaching Alaska. They had both negotiated sabbaticals that would allow them three months to accomplish their mission. For the first month or so they would be sailing with their friends, Luke, Amy, and their two-year-old daughter Ardea, on their similarly sized Pacific Seacraft Orion 27 cutter *Seaweed*.

The two crews decided they'd cast off on June 1. Maria and Diego would stay home for the first two weeks to wrap up the school year and job demands. I accepted Josh's invitation to hop aboard and help navigate along the early stretches of this infamous body of water.

The last time Josh and I had done any distance together was when he and Luke joined me for the first leg of our Indian Ocean crossing in 2010.

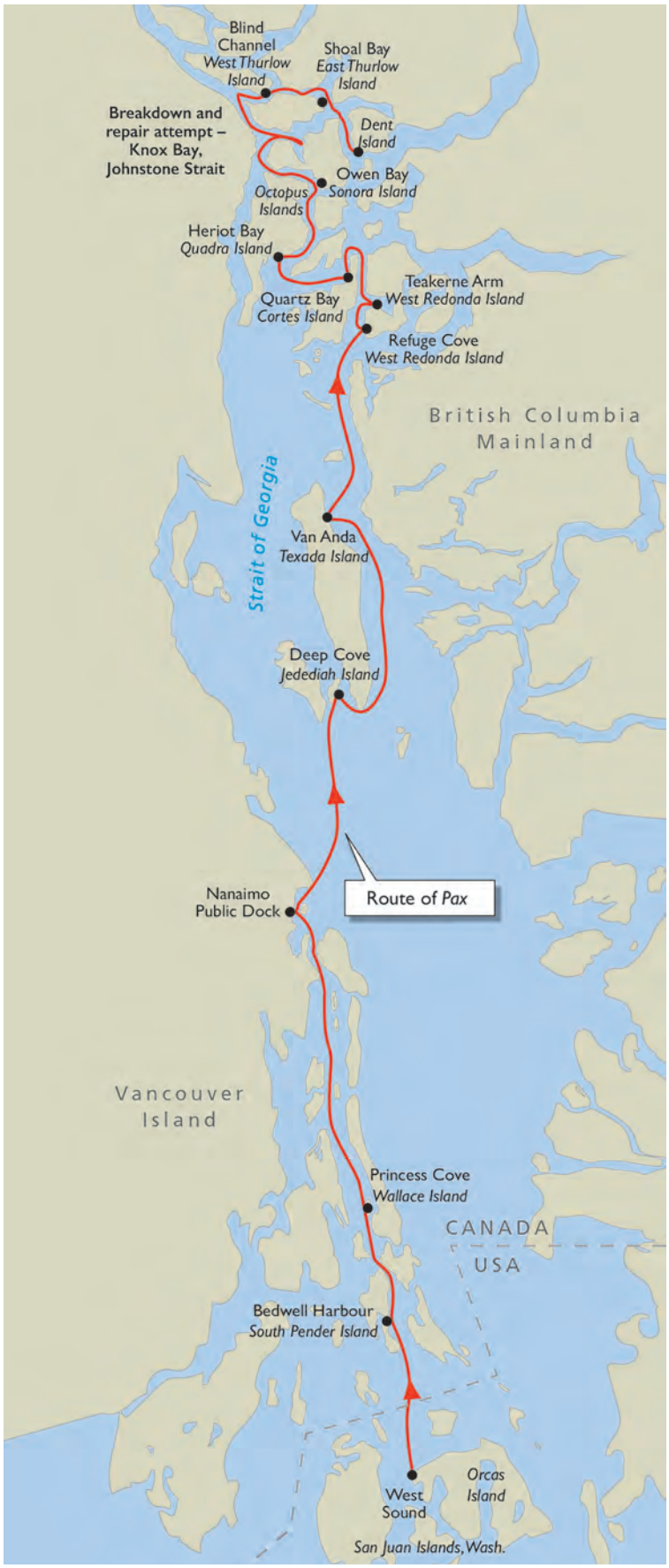
Pax stern tied in Pirates Cove, Gulf Islands.

Now Josh was skipper and I was signing on as first mate. I coached myself from day one to follow his lead and not interfere with decision-making unless invited to. Despite my resolve, I frequently caught myself wanting to spout opinions. But the more I practiced self-discipline the more I enjoyed not being the buck-stops-here guy. Josh, Luke and Amy had done their homework, carefully plotting their intended route north through the many tidal "gates" they knew they'd be facing. There was little left for me to do except settle down and enjoy the ride.

Engine differences

The one big difference between their two boats was their diesel engines. *Seaweed* was equipped with a rugged, tried-and-true 27-horsepower Yanmar 3gm30f, compared with *Pax*'s little 1976 make-n-break Yanmar 12-horsepower YSB12. Josh's old one-lunger — we called her Bessy — had challenged him from the beginning. He'd hoped to repower before heading north but ran out of time. He found a good diesel mechanic named Darrell Passmore at Fathom Marine in Anacortes. Darrell did everything he could to be sure the old girl was ready for the long haul but every time Josh went to start Bessy up, something didn't function the way it should have. He spent several long days bashing his knuckles and cursing blue smoke as he tried to replace the exhaust manifold. He finally accomplished the job but was still trying to align its serpentine twists and turns, with Luke's help, up to the moment we cast off.

On a chilly Wednesday morning in June, 2022, we waved goodbye to Maria and Diego and Luke's parents as they bid us smooth sailing. We motored most of the way to that imaginary red border line etched across our chart plotter and by mid-afternoon arrived at Poets Cove on Pender Island, our first landfall in British Columbia. The Canadian customs station there had opened for the season the day before. Good for us, since the



Left, *Pax* and *Seaweed*'s route north through the Georgia Strait. Below, *Seaweed*, at left and *Pax* at right, prepping for the passage.

next closest customs station was the much busier port of Sidney on Vancouver Island, a stop far west of our rhumb line. After several hours of nervously awaiting clearance, we celebrated permission to cruise Canadian waters for up to six months.

Early the next morning, we steamed out of Poets Cove and stopped for a night in the cozy anchorage at Princess Cove on Wallace Island, where we practiced our first stern-to anchoring. We shared this spot with only one other boat so early in the season.

Next, we headed toward our first "gate," or tidal rapid, which we knew had to be precisely timed in order to avoid battling strong counter currents. Dodd Narrows, the gate just south of the busy port of Nanaimo, can run ferociously with currents up to nine knots. It's a narrow passage making a nearly 90-degree turn between steep cliffs. Navigation is rec-

Left, Nat Warren-White at the helm of *Pax*. Right, *Pax* wing-and-wing crossing the Strait of Georgia.

ommended only at slack water. Josh and Luke closely studied the tide charts and determined the best time to make the run but, because it was difficult to push *Pax* faster than four or five knots, we found ourselves running late. Via VHF the two captains discussed the pros and cons of riding with the gushing flood tide. Finally, the decision was made to go.

Running the gate

Seaweed led the way and we could see she was doing okay despite being shoved hard from side to side as she shot ahead. The Narrows were full of floating timber broken loose from rafts hauled by tugs through these waters en route to local mills. Entering the narrowest part of the cut, Josh went forward to point out sunken logs as he nervously watched them twisting and turning in the chaotic current. I was on the helm doing the best I could to dodge all the threatening driftwood as it corkscrewed toward us. We narrowly missed colliding with several gnarled tree limbs and deadheads. Holding our collective breath and gritting our teeth, we sluiced our way through and, after nearly an hour of hair-raising slaloming, we finally squeaked through the tightest spot. We breathed a little easier as the gut widened and the errant timbers began drifting further astern. *Seaweed* was well ahead.

An hour later, after securing a rain-soaked berth in Nanaimo, we were startled to see a fully-loaded container ship rapidly rounding the same gut we'd so recently escaped. We were grateful we'd not tried to squeeze through the slot in the same moment as that behemoth.

Departing Nanaimo, we swung northward preparing to cross the Strait of Georgia. This would be our longest open-water passage of the summer. We aimed straight for Jedediah Island sitting mid strait, tucked between Lasqueti and Texada islands. It was not a long sail but we carefully heeded the wind predictions in order to avoid a rough passage. The winds in the strait can quickly jump to 25 or 30 knots causing rough conditions, especially when the tide is running counter to the winds, but we were lucky. The breeze settled nicely between 15 and 20 knots and the waves were on our quarter. We had a lovely reach all the

way up to Deep Bay on the northwest corner of Jedediah, a deep, secluded all-weather anchorage. Given how early we were in the season, we had no competition for the stern-tie chains strung along the rocky shoreline. We were still novices in the stern-to tie world but, with the new spooled line Josh had rigged on the aft rail, we quickly became facile running the dinghy ashore and stringing the warp through the ring at the end of the chain attached either to a tree or a ledge set just above the high tide line. A dozen or more boats can squeeze into this tiny cove using this arrangement. The trick is to set your anchor well as you back in to pick up the shoreside tether. If the cove is full and a strong squall comes through, you can end up with an anchor-dragging vessel-bashing tangle.

From Jedediah we made our way north to Texada and then West Redonda Island where we discovered Refuge Cove. If you're looking for good fresh dockside water, fuel, ice, ship's stores, hot showers and a comfortable berth for a couple of indulgent days, Refuge is your best bet. We did our laundry and chatted with the shopkeepers and dock attendants who were happy to welcome the first arrivals in what they hoped would be a busy summer after losing business during the pandemic. Refuge Cove is described as "whimsical yet functional." I'd call it "funky."

Not enough power

From Refuge we wound our way ever northward with stops at Teakerne Arm, where we explored the steep trails leading up and around the cascading waterfalls to the refreshing freshwater Cassel Lake, and then onward to delightful Quartz Bay on the northwest corner of Cortes Island. From Heriot Bay on Quadra Island, we aimed for the intoxicating Octopus Islands Marine Park. The only way in or out of this small piece of heaven is to negotiate one of three possible tidal gates: coming from the Strait of Georgia through Surge Narrows, from Discovery Passage, through the Upper and Lower Rapids of Okisollo Channels, and from the east through the Hole in the Wall. All three routes require careful timing. After an easy and uneventful passage through Surge Narrows, we successfully picked our path into Waiatt Bay via the rock-strewn southern passage but when it came time to leave the next day our timing was off by a half hour as we aimed through the Upper Rapids in Okisollo Channel. Even though we were just after slack tide, the current

Below left, Nat and Luke working on *Pax*'s engine. Below right, the broken end of the bolt, lodged in the engine block, after being drilled on for days

Capt. Luke up on *Seaweed*'s mast in Toba Inlet, BC.

had already shifted against us and was building rapidly. As hard as we pushed against the seven- to nine-knot rapids, we could not beat them. We were forced to retreat. *Seaweed* had enough power to make it through, but turned back and we dropped hooks together for second idyllic night basking in the Octopus archipelago. The next morning, we timed our exit perfectly.

From the Octopus Isles, we sneaked into inviting Owen Bay on the northwest corner of Sonora Island. We anchored in the cozy cove just inside the entrance and hiked along dirt logging roads from the small settlement on the opposite shore up to high cliffs overlooking the Hole in the Wall Passage where we sat and watched boats fighting the currents from the east side into the Octopus Isles.

From Owen Bay we aimed for our next pit stop, Blind Channel on West Thurlow Island. This outpost is a full-service marina owned and operated by the Richter family since landing there in the 1970s aboard their own cruising sailboat. We wanted to stay longer, but reluctantly departed after one night. Our plan was to continue plodding our way north to the Broughton Islands where we hoped to organize a sea plane flight to ferry Maria and Diego direct to our anchorage.

Engine trouble

As we exited Mayne Passage and took the right turn into Johnstone Strait, *Seaweed* was again leading the way. We timed our escape perfectly riding the tidal currents and were chugging full steam ahead when a sudden sickening sound erupted from below. Bessy uttered a loud rattle and bang. We immediately throttled back to a crawl and I jumped below. As soon as I lifted the midship engine cover poisonous exhaust fumes poured into the cabin. I could see a bolt rattling loose from the exhaust manifold. I tried to snatch it but it fell into the bilge and disappeared beneath the engine block. Covering my face to avoid asphyxiation, I returned to the cockpit and urged Josh to turn into Knox Bay. A few minutes later we dropped the hook in 20 feet of water. *Pax* swung with the tide and settled gently against her chain lying about 30 feet off the muddy beach. We called *Seaweed* and she turned back and soon pulled alongside.

With both engines shut down, we proceeded to search for the lost bolt. Luke, with his long arm, was eventually able to reach far enough into the bilge to fish out the escaped fastener. After careful analysis, we sadly realized we were facing more than just a bolt that had vibrated loose. It had sheared off and the stub end was stuck in the engine block. We managed to tighten down on the manifold creating one large hose clamp out of two. We knew this was a temporary fix, but we cranked old Bessy up, judged the exhaust fumes minimal and slowly crept back to Blind Channel where the dock crew we'd bid farewell to welcomed us again.

We immediately went to work trying to drill out the broken bolt from the block and luckily found a small extractor kit aboard one of the visiting power yachts. After hours of hard drilling, we eventually broke a heavy duty hardened-steel cobalt bit off flush with the hole in the broken bolt. The hole we hoped to attach the extractor to was now solid toughened steel that resisted everything we could throw at it. We borrowed a small blow torch from Stephen Dews, the owner of the newly-built Kiwi-bound schooner *Wolfhound*. While it was nice to meet Stephen, the renowned New Zealand marine artist, and his wife, Louise, the blow torch sadly made no difference.

> "...with the steady hand of a heart surgeon, managed to delicately attach a new bolt head to the broken butt end and then, ever so gently, backed the culprit out of the hole."

Help from a pro

Finally, with our own resources exhausted, we reached out to Passage Marine in Campbell River. The owner, Chris Chambers, offered to jump aboard a water taxi with his tool kit. Forty-eight hours later he was alongside unloading boxes of heavy-duty wrenches and drills plus a portable electric welding set. He tried for several hours to bore a hole in the sunken bolt end so he could attach a more powerful extractor but finally gave up and brought the welder on board. He covered *Pax*'s main salon with flame-proof blankets and, with the steady hand of a heart surgeon, managed to delicately attach a new bolt head to the broken butt end and then, ever so gently, backed the culprit out of the hole. We cheered his patient skill over a cold Molson and I asked him what he planned to do if he hadn't been able to extract the broken bit. "I guess I would've pulled the engine out of the boat and taken it back to my workbench in Campbell River!" As difficult as that sounds, the little Yanmar is so petite that he could well have succeeded with that last ditch approach. Fortunately, an engine-ectomy was not necessary and within an hour Chris had replaced all three fasteners and we had Bessy running again. Needless to say, we owed Chris and Passage Marine a huge literal and figurative debt.

Sadly, given the week we'd lost dealing with the manifold debacle, our plans to travel further north had to be adjusted. Maria and Diego were due to arrive in two days and there was no way we could make it to the Broughtons in time to fetch them. Josh rebooked their seaplane ride into the plush fishing resort at Dent Island just south of Blind Channel. After crossing through Dent Rapids we arrived at the dock and quickly got the sense that *Pax* and *Seaweed* were "poor cousins" surrounded by gigantic high-end powerboats but we were treated well and spent a lot of money for the privilege of visiting. Maria and Diego's float plane landed literally at our stern and the two new crew stumbled happily on board. Within a week I had found my way to Campbell River and caught a flight home to Maine. *Pax* and *Seaweed* and their salty crews enjoyed another six weeks exploring Desolation Sound and then found their way back home to Orcas Island.

Although *Pax* did not reach Alaska in 2022, she ably carried her crew on their first adventure into the labyrinth of the Great Pacific Northwest. Queen Charlotte Sound, Haida Gwaii and Alaska will be waiting for another day. ■

Nathaniel Warren-White is an actor, director and executive coach/management consultant. His book, In Slocum's Wake *chronicles his west-about circumnavigation, 2006-2011.*

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Trawlerfest presented by *Passagemaker* magazine is once again joining forces with the Anacortes Boat & Yacht Show for our Pacific Northwest stop to bring you an exciting destination and cruising event. Browse hundreds of new and used boats of all sizes from your favorite brands, dealers, brokers, and exhibitors in one place, as well as 25+ seminars from experts and rendezvous evening activities. For more information, visit us online: www. Trawlerfest.com or email us at trawlerfest@aimmedia.com

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ANACORTES BOAT & YACHT SHOW

The challenges of getting engine work done while voyaging

Diesel Overhaul in the Kai Islands

STORY AND PHOTOS BY DAVE MCCAMPBELL

Above, a crew of Indonesian mechanics works on one of the McCampbell's diesels. Right, the McCampbell's St. Francis 44 cat, *Soggy Paws*.

Voyagers need to know their diesel engines and there are plenty of ways to gain experience in working on them. My most recent experiences involved getting engines rebuilt while being in Indonesia. The experience was instructive of how to go about the process when in a foreign country.

My first foray into an engine rebuild was almost 50 years ago. I overhauled my 1961 40 horsepower Volkswagen bus gasoline engine using John Muir's classic book *How to Keep Your Volkswagen Alive: A Manual… for the Complete Idiot.* What an exercise in engine mechanics that was and the start of my amateur engine repair career. Because the engine was air cooled and had a habit of dropping valves, it was also worthwhile knowing how to remove and replace the engine on the road. So later, just to be safe, we carried a spare engine on a cross country move in our old VW bus!

Twenty five years later, after purchasing my first ocean-capable cruising boat, a 1980 CSY 44 Walkthrough with a dying Perkins 4154 marine diesel, I decided to try to overhaul the engine myself. This time it took six months working in my ga-

rage to tear it completely down, get outside work done, find the required new or used parts, clean and paint, and then try to remember how all the parts went back together. Luckily the Perkins Overhaul Manual was reasonably well done, I had a diesel savvy friend, and I had a camera and decent tools. But I realized early on that keeping track of all the nuts and bolts was going to be difficult without a good filing system. So I labeled Ziploc bags for each group of fasteners. Somehow, at the end, there were no significant leftovers. What a great learning experience that was!

Producing white smoke

Recently, after having spent seven years using the Philippines as a base for cruising in Southeast Asia, we left on our current boat, a St Francis 44 cruising catamaran, and continued our westward journey through southern Indonesia. After about five months while still in West Papua, eastern Indonesia, we realized something was wrong with our starboard Yanmar 3GM30F diesel engine. The injectors and injection pumps had been serviced in Davao before we left, but both engines were now hard to start. Engine experts on the excellent Yanmar Facebook Group said that was indicative of a leak in the fuel supply system. The starboard engine was uncharacteristically producing white smoke after startup, using more fuel than usual and making louder than normal knocking noises while running at slower speeds.

Since we were still on the remote west coast of New Guinea where we had been scuba diving, looking at WWII sites, and generally exploring the coastline, we decided to proceed to Tual in the Kai Islands. The Kais were a small island group 100 nautical miles southwest, where we had been several times previously getting monthly visa extensions.

Shortly after arrival, we met our local English-speaking "helper" friend Jhords and his buddy, John, who spoke passable English. John was a self-trained diesel mechanic. Among many other things, he was the go-to mechanic for the entire local diesel-powered fishing boat fleet, the large fish factory, and several schools. He also did all their electrical work, refrigeration and any other mechanical work they needed. In his spare time he bought, sold, rented and repaired motor scooters and bicycles, had a gravestone labeling business, rented large event equipment, and was raising his three kids without a wife to help. Previously he had taught a diesel mechanics course at the local Catholic trade school. And he had a small SUV car, a large cluttered but covered workshop, and a big table with lots of tools. Perfect!

Above, Tual mechanic John in his workshop Left, John's crew carrying the engine down the Coast Guard dock.

After a good bit of discussion regarding symptoms and what might be wrong, we decided to first do a test start/run and then an injector test. John finally arrived after several missed appointments and we went to work. It took about 10 seconds to finally get the starboard engine to start. John shook his head while watching

the white smoke billow out of the exhaust. Then he went to the engine to hear the knocking. Finally, he placed his finger on each of the high pressure lines between the injection pump and injectors to feel the injectors firing and shook his head again at one of them.

Injectors set up upside down to test for proper function.

Injector issues

After stopping the engine and some discussion, he took the three injectors out and reconnected them upside down so they would spray up instead of down into the cylinders. We held a towel above them and then engaged the starter. Diesel spray went up into the towel from each injector in turn. We could clearly see that one injector was squirting rather than spraying fuel, and they were all leaking. Also, an assortment of parts came flying out of the injector holes. After finally collecting all the parts, we decided to regroup, clean things up, do a proper cleaning and pop test for the injectors, and make one new heat shield and new copper covers in case we couldn't get the parts. There was no injection or machine shop in Tual. While John made the parts between other work, I spent some time cleaning injectors, ordering parts and watching Yanmar overhaul videos on the internet.

About a week later I received parts from Dieselindo, a well recommended diesel shop in Bali. Amazingly, the parts came to us air freight for about $5 US in only a couple of days. Now we had all the injector parts we needed plus some spares. Next step was to do a proper injector pop test with the ancient machine at the trade school diesel lab. Although the machine had a pressure gauge it wasn't reliable, but the part producing the spray pattern was. I had repaired the one injector's stuck plunger, which had produced the poor spray pattern, and taken them all apart for cleaning. I also was able to clean the various injector hole parts that had come flying out during the onboard injector test. All injectors, including my three spares, now produced a good spray pattern and the pressures all seemed similar.

Back on the boat a couple days later with injectors installed, there was no change to the slow start, smoke and knocking symptoms. So John advised the next step should be to remove the cylinder head and have a look. For this and subsequent work John's brother, Henkie, a trade school-trained diesel mechanic helped. But he did not speak any English. Now we were getting serious, and I could see this might lead to significant internal engine work. So I was glad to have two developing world mechanics, instead of just one, tearing our engine apart.

After removing the cylinder head, we found multiple problems: leaking valve seats, oil in one of the combustion chambers and what appeared to be a leaking cylinder head gasket, possibly from an earlier overheating episode. Based on that, the knocking and the engine's 5,000 hours we decided to remove the engine and do a complete overhaul at John's backyard shed.

Despite my request, John declined to give us a labor quote, saying that he could not estimate the work required until the job was finished and the engine was operating properly. So we kept rough track of his and Henkie's hours and established a typical Indonesian engine mechanic's labor rate from the internet. Regardless, we knew the labor cost would be far less than in the US.

Removing the engine

After I spent a day removing some of the auxiliary equipment and cables, wiring and hoses, and separating the engine from the sail drive, the day finally came to take the engine out of the boat. John and his brother were a couple hours late, as usual, but did remember to bring a strong piece of pipe. As planned, we tied the engine's lifting points to it. Then they lifted the 250-pound engine, mounts and all, off the beds and muscled it up the steps to the cockpit. We rigged the dinghy falls to very carefully move the engine off our boat and on to John's local fishing skiff. Once ashore, we were able to use the Tual Coast Guard's cement pier where, with a bit of help, they lifted the engine the six feet out of John's boat on to the pier and carried it to his car. Then we all went to John's shed with the engine where it lived for the next month during the overhaul. By late that afternoon most of the engine was in pieces spread around on John's already cluttered table. Some years ago I had purchased a Yanmar 3GM30 Special Tools kit from a friend, and it really came in handy disassembling and reassembling the engine.

Again we found multiple problems: a bent rod, damaged probably during a cylinder hydro lock event from the leaking cylinder head gasket, one piston rod that was shorter than a new rod by about 2 millimeters, leaking valve seats and seals, worn rings, leaking lip seals, worn shell bearings, and a cracked piston. After additional inspection we decided that since the engine was fully apart now we should replace all the normal wear parts including gaskets, O-rings, shell and roller bearings, piston rings, valve and other seals, most water and fuel hoses, injector covers and fuel and air filters.

No piston check

What we did not check, but probably should have, was the piston and valve stem diameters and a few other things for wear. When overhauling the other diesel at Dieselindo in Bali a month later we needed to replace all three pistons and six valves due to excessive measured wear. Here John just looked to ensure the valves were straight and not damaged and other parts not excessively worn. Then he lapped the valves to their seats so that they no longer leaked with fuel over them. Significant replacement parts included the one cracked piston, two piston rods and the head gasket.

I kept track of needed parts and placed several orders with Dieselindo in Bali. Most parts came quickly, but the piston took several weeks for delivery from Japan via Bali. Finally, we were ready to put the engine back together. Besides installing the new parts, more delays were caused by some additional things that John had to do during the overhaul including:

- Driving me back and forth from the pier to his shop pretty much on a daily basis because he did not trust the local "ojek for hire" motor scooter drivers.
- Covering most parts with oil and clear 'cling film' to prevent corrosion while waiting for new parts in the open shop.
- Figuring out which Special Tool was used where.
- Finding an accurate torque wrench and the proper torque reading for each part needing it.
- Finding lost engine parts and tools in John's shop.
- When necessary buying lunch and riding around with John when he was called away to emergency jobs all over town.
- Finding the tool locally and honing the cylinders so the new rings would seat properly.
- Checking the injection pump timing by watching as the pump pushed fuel into each injector pipe and then

Once removed from the engine the piston on the left was discovered to have a bent rod.

marking the crankshaft pulley.

• Completely cleaning and painting the engine.

John's shop did not have the capability to test run the engine in the shop. So once the engine was back together and painted, we pretty much did the reverse of the removal procedure. John and Henkie did the heavy lifting to get the engine back on the blocks on the boat. I did the finish connections and added oil and coolant. The two hour underway test run went well with no sustained smoke, a much quieter engine and a quick start.

The second engine unpainted and ready for testing at mechanic Hasta's shop.

Afterwards we had a typical developing world labor cost discussion. When I asked, he opened with "what do you think it's worth?" Since we knew roughly the hours they had spent (about 140 hours, over two months' time including transportation) and the daily Indonesian wage for a contract diesel mechanic, we offered $700 US. That worked out to about $5 an hour. Included in that was a strong recommendation for him from us on our website and elsewhere, which we have done several times since. We were both happy with that. I think he was also happy to get back to his other work.

A month later we arrived in Bali and decided to do the other engine since it had similar hours, and next year we would be crossing the Indian Ocean to the Mediterranean. We used a similar process to remove and reinstall the engine. This time, however, the engine went to a regular Yanmar diesel engine repair shop, Dieselindo, in Denpasar, Bali. By now we were good friends with the manager, Hasta, who had ordered all our parts for the other engine. He had trained mechanics who helped him carefully disassemble the engine, measure all the wear surfaces, send the cylinder head and injection pump to specialists and order needed parts. Then he advised us that the labor for the basic overhaul including removal and reinstallation would be $500 US.

Bench test

Only a week later I was present for the engine bench test at his shop. There had been no major issues other than wear which required replacement parts similar to the starboard engine. Again the injection pump timing test was right on with just the original shims, and there were no significant problems. I also had Hasta add mechanical oil pressure gauges at the engines and recheck all injectors for proper spray and pressure. The engine came back aboard spotlessly clean and freshly painted. This time I let Hasta and his mechanics do the entire installation while I was lazy and watched.

After I added oil and coolant they came back the next day for a successful test run. The run in period for these engines is 50 hours at reduced RPM and then an oil change. After that we were able to use a normal cruising RPM of 75 percent of maximum. Hasta and other professional diesel mechanics on the Yanmar Facebook Group also recommend a five-minute warmup and cool down and running the engine up to maximum RPM for about 10 seconds after every use to reduce soot buildup. This Facebook group is a great resource for us amateur mechanics. I used it a number of times when I had questions early on.

Luckily for us both overhauls went well even though done by very different mechanics and with very different facilities and skills. It always amazes me how developing world technicians can successfully repair complex machinery and devices with little formal training, basic tools and at minimal cost. A cruiser can certainly learn a lot from these folks, however, it is still advisable to study the repair in advance, find a parts source, be involved and ask questions. Also, it is worthwhile to source parts manuals, service manuals, and special tools from your engine manufacturer before you leave. An engine casualty at sea can be a scary thing. Thankfully we have two engines! ■

Dave McCampbell is a former US Navy officer who spent most of his time as a diving and salvage officer. He and his wife Sherry voyage on their St. Francis 44 Mark II cat Soggy Paws.

These sometimes misunderstood terms are key to understanding diesel engines

A newly-rebuilt diesel engine is hoisted into its waiting vessel. Diesel engines are renowned for their low rpm torque.

Horsepower and Torque

STORY AND PHOTOS BY STEVE D'ANTONIO

In my work within the marine industry the subjects of horsepower and torque invariably come up, and just as invariably their definitions are mangled. To characterize horsepower and torque as deeply misunderstood would be an understatement.

When distilled to its most basic, the difference between these two terms can be characterized thus: horsepower is a measurement of work over time, while torque is simply a measurement of force irrespective of time. Torque is an element of horsepower; however, it's distinctly different. A firm understanding may enable you to better evaluate engine options for new or used vessels, as well as evaluating performance and fuel economy for a vessel you own or are contemplating purchasing.

Horsepower history 101

Well over a dozen different types of horsepower measurement have been used since the term was first coined by James Watt, the developer of the "improved" steam engine, in 1782. He determined that ponies used to carry coal (or water) out of vertical mine could lift, via a rope and pulley, 22,000 foot-pounds per minute (more on what this means in a moment). The pony turned a mill wheel 144 times in one hour (2.4 times per minute). Watt also estimated that a pony could pull with a force of roughly 180 pounds. The wheel had a 12-foot radius, which meant the horse traveled 2.4 x 2π x 12 feet in one minute, which, using Watt's formula of force multiplied by time divided by distance equaled 32,572 foot-

Above, a new diesel undergoes dynamometer testing, which will record, among other parameters, its horsepower and torque capabilities. Right, a hydraulic pump, which is powered by this marine gear's power take off or PTO.

pounds of force per minute, which was rounded to 33,000 pounds of force per minute or one horsepower. The unit of measure for horsepower, which involves a calculation of force over time, remains prevalent to this day.

With the adoption of European Union standards for member countries, all horse power must be rendered in Watts (hp may be provided as well) for engines produced or sold in those countries. One horse power is equivalent to 746 Watts, or 0.746 kW. Therefore, a 100 hp(I) engine produces 74.6 kW.

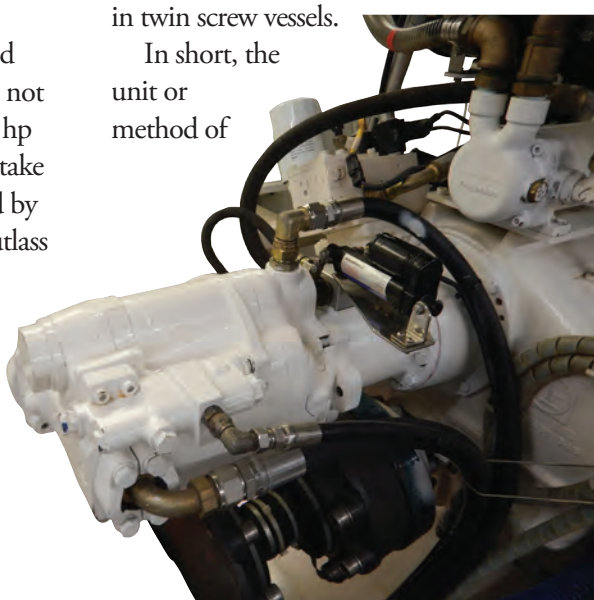
There's HP and then there's HP

That, however, is not the end of the horse power story. In addition to defining horse power, its form of measurement must also be defined, and there are several definitions, including drawbar horsepower (dbhp), used for measuring locomotive power plants, indicated horse power (ihp), a theoretical measurement of a perfectly efficient engine, brake horse power (bhp), commonly used in marine and other applications to measure an engine's power *without* any accessories such as marine gears, belts, water pumps, hydraulic power take off pumps etc, and shaft horsepower (shp), which is a measurement of the power available at the marine gear's output coupling. For the most part, the latter two are most commonly used for measurement of marine engine "power" although it's important to understand that in both cases "accessories" such as the aforementioned alternators and pumps are not included in most engines' hp ratings and none of them take into account drag induced by shafts, stuffing boxes or cutlass bearings.

Although it varies, the friction losses imparted by the transmission are typically between 3 percent and 10 percent, with reduction gears (which are used in most applications) and V drives leaning closer to the higher end of that range. Therefore, the difference between BHP and SHP is typically small, although losses imparted by add on equipment and running gear can be significant.

For instance, when belt and friction losses are taken into account, it's not unusual for a high output alternator to absorb, at full output, as much as 10 hp. If it's doing so while the engine is idling, then it's worth considering that you may not have enough power for maneuvering or hydraulic thruster operation. A hydraulic power take off (PTO) can draw significantly more, enough to stop an engine cold in some cases if the gear attached to them is engaged while an engine is idling. This is why some vessels rely on smaller "pony" or wing engines for hydraulic PTO use while at idle, or a PTO on each engine in twin screw vessels.

In short, the unit or method of



measurement of horsepower for a marine engine is less significant than the importance of comparing like measurements and units. If you are comparing engines or completed vessel's engine, make certain you are also comparing BHP to BHP or kW to kW etc, and take into account add-on accessories such as alternators and hydraulic systems.

Torque

Like horsepower, torque is also a measure of energy, however, it has nothing to do with time; it could be imparted over one minute or one year. If horsepower is energy measured over time, torque could be thought of as the process for transforming or converting that energy into a useful motion, one that twists, like an axle or propeller shaft.

The definition of torque or the understanding thereof, can, however, be a bit difficult to grasp, that is until the details are explained. For illustrative purposes, imagine torque is simply a force in pounds multiplied by distance. You've almost certainly demonstrated this yourself by using a longer wrench or an extension pipe slipped over a socket wrench (the "extension" is used in this case on the handle, not to be confused with extensions used on the socket end) when removing a stubborn nut or bolt, or a piece of pipe used on the handle of a stiff seacock. The extension multiplies the torque applied to the fastener by virtue of the distance that the force is applied by your hand from the point where it's applying twisting motion. Ten pounds of force applied to a one-foot-long wrench imparts 10 pound-feet (it's *pound-feet* in this case, not foot-pounds, the latter represents work or an expenditure of energy) of torque, or 13.5 Newton meters/Nm in the metric system, while ten pounds of force applied to a two-foot long extension enables you to subject the fastener to 20 pound-feet of torque or 27 Newton meters. It's a rare case where Mother Nature seems to be offering up a free lunch.

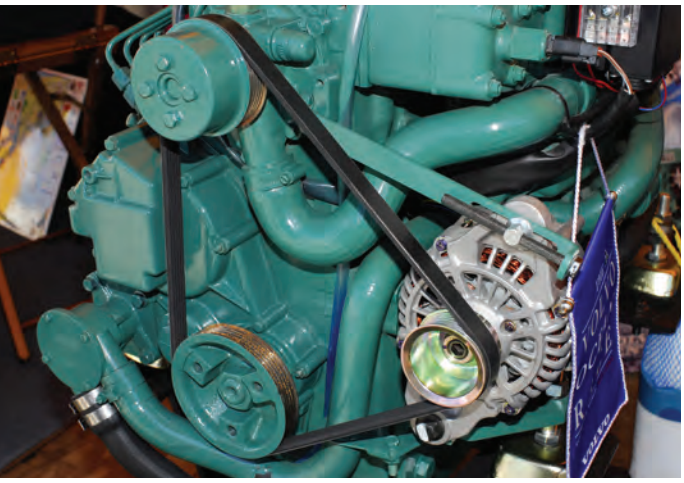
Engine torque is measured using the following formula, (5,252 x hp) ÷ rpm. In order to get more power from an engine, and because horsepower is a measurement of power over time, it would seem then that one way to squeeze more of that power from an engine would be to make it turn faster. In fact, this approach works well and it's why the small, light yet powerful engine on my Italian motorcycle spins up to 8,000 rpm, to develop more power from a smaller power plant package. That isn't a free lunch, however, as turning engines at higher speeds comes with its own set of side effects, increased wear, decreased longevity and increased cost of engineering, materials, balancing and machining to name just a few.

Math-minded readers will have noticed in the above formula, however, that as rpm

Left, the captain of this vintage vessel monitors instrumentation for its 400 HP, 390 rpm Union Diesel engine. Below, there is a direct link between rpm and horsepower production.

Right, marine gears (V drive shown) are typically coupled with reduction gears, which convert higher engine speed into slower, more torquey prop shaft rpm. Below, small diesel engines have become lighter, more powerful, and faster-turning.

increases, torque decreases, and there goes the free lunch part, yet again. This is why traditional, large, *slow turning* diesels deliver mountains of torque. It's why my Ford F-250 Powerstroke diesel pick-up can haul a 4,000 pound boat up a ramp at idle speed, with my foot *off* the accelerator pedal (with a little help from its reduction gears, I'll get to that in moment), and why the 1940 vintage former tugboat, turned fishing charter vessel, *Union Jack* is powered by a six cylinder, 400-hp engine that turns at 340 rpm and produces a whopping 6,180 pound-feet of torque. It's a heavy slow turner, weighing in at 38,000 pounds. By way of comparison,



a modern, high speed 400-hp diesel may produce around 600 pound-feet of torque (measured at the engine's crankshaft output) and weigh around 1,000 pounds.

Does this mean that if you want torque, which is what really turns the prop, then you must have a large, heavy diesel? The short answer is no, because while Mother Nature can't be fooled, you can barter with her. What if we could keep the engine rpm high, to maintain horsepower, while slowing down the shaft/prop rpm in order to coax more torque out of the equation? In fact, this is done regularly by using a component known as a reduction gear, which is bolted to and often appears to be part of the marine gear (often erroneously called a transmission). Reduction gears do just that, reduce rpm at the shaft using gears, while allowing the engine to continue to turn at higher rpm.

For example, a 150 hp engine that turns at 4,000 rpm can produce 197 pound-feet of torque. Not bad for a small, light, high-speed diesel engine. However, with a 2:1 reduction gear installed, the shaft rpm will be reduced to 2,000 rpm, making the torque available to the propeller about 394 pound-feet, a significant increase. Once again, there are tradeoffs for the reduction gear, and rules that must be followed, however, I'll save discussion of those for another article. In general, however, the price paid for this gear magic is two-fold. First, there's the inefficiency and friction induced by the reduction gear, which may account for a 3 to 5 percent loss. Second, the reduction gear adds weight, complexity,

and expense to the installation. In the end, however, it's a net gain, and it's why smaller, lighter high-speed diesels have become more popular in the past 25 years. While heavy, slow turning diesel engines are desirable in many ways they also have drawbacks and as such the higher speed engine and reduction gear combination makes good sense in many applications.

When comparing engines and power output ensure like units and measurement methods are being used and remember, it's *not* about horsepower alone. ■

Steve D'Antonio has managed boat yards and custom boat building shops is an ABYC expert and written more than 1,000 articles. His company (www.stevedmarineconsulting.com), offers marine systems consulting, management and technical training.

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Samuel "Bully" Samuels

BY DAVID BERSON

For the past two nav problems, we have written about the 19th-century American master mariner, Captain "Bully" Samuels.

When we last left Captain Samuels, he had just won the very first transatlantic race in 1866 aboard the schooner *Henrietta*.

The schooner *Dauntless* in an 1888 photo.

Captain Samuels was next aboard the schooner *Dauntless*. Four years after his transatlantic victory, *Dauntless*, with Samuels in command, raced across the Atlantic Ocean, from east to west against the English schooner *Cambria*.

The race began off Ireland on July 4, 1870. *Cambria* was owned by Sir John Asbury. Built by Michael Ratsey, *Cambria*, at 188 tons, was a powerful schooner, though with a mixed racing record. Asbury was bringing the schooner to New York to challenge for the America's Cup. The smart money was on *Dauntless* yet *Cambria* crossed the finish line first winning by one hour, 43 minutes. The time was 23 days, 5 hours, 17 minutes.

It was not an easy race. On the third day out, *Dauntless* ran into a gale and two crew, Charles Scot and Albert Demer, were lost overboard while furling the jib.

In 1887, at 61 years old — an octogenarian by todays standards — Samuels once again took command of *Dauntless*, now owned by Cauldwell Colt, the son of Samuel Colt the gunmaker. He was racing against the more modern schooner *Coronet* only a couple of years old. *Coronet* won by more than 30 hours, but Samuels pushed *Dauntless* to reel off 328 nautical miles in one 24-hour period, a record that stood until the schooner *Atlantic* broke it in 1905.

The race was the third trans-Atlantic race and Samuels had competed in all three.

It is March 20. We will be using the 2023 *Nautical Almanac*. The DR of *Dauntless* is 34° 30' N by 28° 10' W. The height of eye is 15 feet. We're doing a morning nautical twilight observation. We will be using HO 249 Volume I, Selected Stars.

In order to reduce the complications of the problem, I have already calculated the Ho from the Hs of each star. HO 249 Volume 1 is a great tool.

For the sake of this exercise, Captain Samuels observed three stars, Deneb, Antares, Alkaid. We'll use the common time of 07 hours 0 minutes GMT. The Ho of Deneb is 46° 01.9'. The Ho of Antares was 29° 7.3'. HO of Alkaid was 52° 29.3'. For the sake of this exercise, we won't include the correction for precession and nutation. ■

A. Find the time of nautical twilight in GMT at sunrise.

B. Find LHA of Aries.

C. Find the intercepts and azimuths.

D. Plot the three star fix and find estimated position.

Answer

A. The time of nautical twilight is 7 hours 0 minutes 40 seconds.

B. LHA of Aires is 254°.

C. Intercepts & azimuths: Deneb: 2.9 nm toward at 058
Antares 6.7 nm away at 187°;
Alkaid: 0.7 nm away at 308°.

D. EP 34° 36' N by 28° 10' W.

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