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JOURNAL

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Version 1.00 released

**Troubleshooting
Autopilots**

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- Megayacht monitoring & control
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Learning through these different times



Mark Reedenauer
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As I write my bimonthly editorial to you, the membership, several items come to mind—some good and some sad. The past two months have been busy for NMEA member companies as boat sales are up, and the average age of boat buyers is down. This is encouraging because younger people are deciding to buy boats. Millennials and Generation Xers are tech savvy. They like their phones. They like social media. They want electronics on their kayak, PWC, center console, sportfish or yacht. This eventually trickles down to increased electronics sales for our manufacturer members and more installation and service jobs for our dealer/installer members. The same boom is happening in the RV industry, as families are passing on hotels and flights and using their RVs—and in our case using their boats more.

I was notified of some sad news that three former volunteers of the NMEA Board of Directors have passed away. Cheryl Richards, a NMEA Board member in the late 1990s, passed away in August after a battle with cancer. Cheryl is the wife of Mark Richards of Richards Marine Marketing in Washington state. Don Ehrlich, owner of Yachtronics, also passed away in August during a hiking trip near Lake Tahoe. Don was a past NMEA Board member, industry veteran and lifetime NMEA Certified Marine Electronics Technician (CMET). Additionally, as I was writing this editorial I received a call from Allen Schneider at SI-TEX, who told me that long-time industry veteran George Lariviere, owner of WhiffleTech, former Chair of RTCM (Radio Technical Commission for Maritime Services) and NMEA Board member had died at the age of 79 after a long battle with cancer. NMEA's condolences go out to the Richards, Ehrlich and Lariviere families (see page 21).

This fall will be interesting as most boat shows are being cancelled through the winter months. Many companies historically have relied on boat shows to carry their business for months after a specific show. As I talk to NMEA members, everyone seems very busy—some busier than ever. It will be interesting to see if the physical presence at a boat show will remain the same in the years to come. Will boat show exhibitor and visitor attendance ever recover to pre-pandemic levels? I honestly do not know. Only time will tell.

I want to thank all members who participated in the NMEA Virtual Education Week at the end of September. This event was uncharted territory for NMEA. There were 59 webinars submitted by 22 NMEA manufacturer companies. There were 628 total webinar views (see page 22). Our top webinar viewer was Frederic Dallant of FD Marine Services in St. Martin, who viewed 50 of the 59 webinars. Nice job Frederic! I feel that if NMEA had this Virtual Education Week in April, our numbers would be much larger, as many people may have “virtual fatigue” by now.

I am happy to announce that the NMEA Board of Directors approved the release of Version 1.00 of the OneNet IPv6 Ethernet Standard (see page 14). This standard has been almost 10 years in the making by countless NMEA Technical Committee volunteers, led most recently by Chair Nate Karstens. The next step for OneNet is the certification tool, which is planned for completion by the end of 2021. Until the certification tool is released, and manufacturer members can come forth to certify a OneNet device or application, NMEA will not charge manufacturer members for the standard itself. The member price of \$2,000 for the OneNet Standard will be deferred until the end of 2021 (or after) when the tool is planned for release. We hope this initiative helps get the standard into NMEA manufacturer members' hands, without any budgetary constraints, as who knows what 2021 will bring our industry. The standard is now available in electronic format for NMEA manufacturer members. Please email or call the NMEA National Office to obtain your copy of OneNet Version 1.00.

P.S.—Be on the lookout for a NMEA Board member voting ballot arriving in your email box any day now. These great Board member candidates need your votes for the upcoming 2021-2023 term!

Best Regards,
Mark Reedenauer

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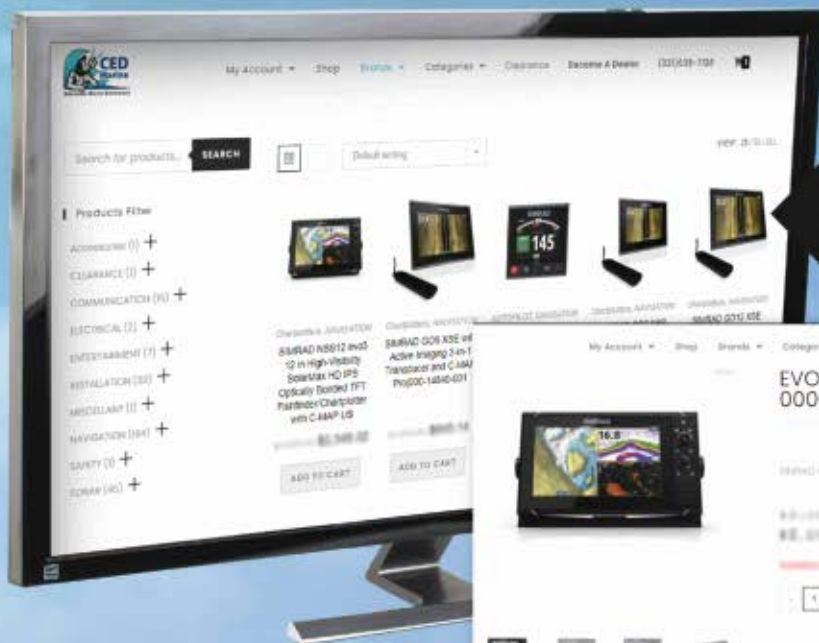
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Standards Update



From Director of Standards Mark Oslund

NMEA releases OneNet Version 1.00

Dear marine electronics industry colleagues, NMEA is pleased to announce the launch of its latest protocol, the NMEA OneNet Ethernet Standard. We thank the NMEA Board of Directors for approving the release of the standard in a unique fashion. We also thank the OneNet Technical Standards Committee chaired by Nate Karstens for their hard work, as the standard has been in development since 2011. Version 1.00 of OneNet is now available to all NMEA manufacturer members.

NMEA is deferring the purchase price of the standard to all manufacturer members until the certification tool is complete, which is estimated to be the end of 2021. When the OneNet certification tool is available for sale by NMEA, and manufacturers are able to certify a OneNet device or application using the certification tool, NMEA will then charge manufacturers the associated fees for the standard, certification tool, and certification verification by



NMEA. The certification process for OneNet will be similar to the certification process for NMEA 2000®. However, a different certification tool will be used.

Faster adoption

Deferring the purchase price of the standard is a great concept. This will get the standard into NMEA manufacturer members' hands so they can begin to understand OneNet, with the hopes to speed up the adoption of the standard. All manufacturer members who request the standard will need to sign a purchase agreement, stating they will pay the associated fees for the OneNet Standard at time of device or application certification. This approach does not exclude non-NMEA member companies from getting their hands-on Version 1.00 of OneNet. These companies would need to join NMEA as a manufacturer member, sign the purchase agreement, and the standard will be issued to them.

The remainder of 2020 and into 2021 will focus on the certification tool test specification document, which is in development at the time of this writing. This document is the link between the OneNet Standard itself and the certification tool. The document explains in detail each test that the certification tool needs to perform, and the criteria in which the test is performed, including failing a test or passing a test. Once the OneNet certification tool test specification document is complete, work can then start on the certification tool itself. NMEA will have absolute control and ownership of any test tools used as part of the certification process. This means ownership of the build environment and the test tool source code base for future upgrades and maintenance.

Interoperability testing

The vision for the OneNet certification program is to include both a conformance test suite (the OneNet certification tool) and interoperability testing. The NMEA has teamed up with the University of New Hampshire IOL, who are experts at IPv6 interoperability testing. Large-scale companies like Juniper Networks and Dell have used the UNH IOL for this purpose. The long-term goal would be for the IOL to have a test bed of OneNet products, permitting interoperability testing with other certified OneNet devices, and live (in person) or virtual plug fests to occur.

Now let's look at a few key components within the OneNet Standard.

Standardized connectors

It has taken NMEA 2000 almost 20 years to finally adopt a standardized connector. Your NMEA has learned from this long battle. The NMEA OneNet Technical Standards Committee has requirements in the standard of an X Coded M12 connector for OneNet devices installed in exposed environments, and a standard RJ45 for devices installed in an enclosed, watertight cavity within the vessel.

(Continued on page 54)

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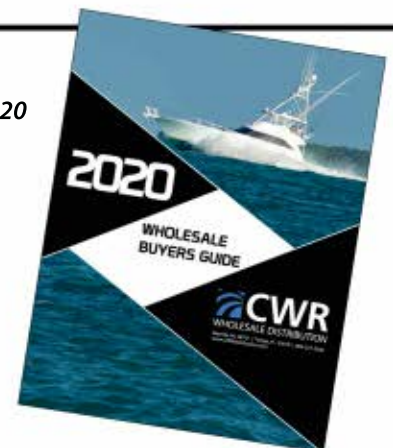
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By Joe Hersey

RTCM Report

Addressing the MMSI problem in the US

Unlike most maritime countries, the United States never fully implemented all of the Maritime Mobile Service Identity (MMSI) options allowed by the International Telecommunications Union. MMSIs are unique 9-digit identities which normally include three Maritime Identification Digits (MID) and a station identity. US MIDs are shown in the table below. MMSIs are managed within the US by the Federal Communications Commission (FCC) with the advice and assistance of the Coast Guard. The RTCM has been and remains active in addressing these and other MMSI problems due to its close relationship with both agencies. MMSIs are necessary to the operation of digital selective calling (DSC) and the shipborne automatic identification system (AIS).

How MMSIs are assigned and registered

Ship station MMSIs – MIDXXXXXX: MMSIs are assigned as part of the ship station licensing process in most countries, and that is true in the US as well. About the time MMSIs came into effect 25 years ago, Congress authorized FCC to license boaters and other vessels that do not travel overseas and are not required to carry radios “by rule.”

Vessels licensed by rule do not need to apply and pay for an FCC ship station license, but these vessels would not have been able to obtain an MMSI. To address this problem, FCC and the Coast Guard authorized BoatUS and US Power Squadrons (USPS) to register and maintain MMSIs for these vessels licensed by rule. Sea Tow, unfortunately, withdrew from this program and its MMSI registrations are presently not being maintained.

MMSIs used on federal vessels are assigned by the National Telecommunications and Information Administration (NTIA) through their agency radio spectrum managers.

The US Coast Guard routinely collects registered MMSI information from the FCC, BoatUS, and US Power Squadrons (but not from NTIA) for use by its Rescue Coordination Center (RCC) watchstanders whenever a DSC distress alert is received. The FCC also routinely sends new and updated MMSI information assigned through ship station licenses to the ITU for use by foreign RCCs. Because MMSI users can easily forget which organization issued their MMSI, the US Coast Guard Navigation Center (NAVCEN) website maintains a listing of MMSI ship station blocks issued in the US by these various organizations. Boaters can find out who registered their MMSI from that list.

US Maritime Identification Digits

303 (Alaska, no longer used)

338

366

367

368

369

Group ship station call identities – 0MIDXXXX:

Group identities are used by DSC-equipped radios and man-overboard devices to alert predetermined groups of vessels. In the US, they can only be created from an FCC-issued ship station identity, which always ends in a zero, simply by moving that zero from the end of the MMSI to the beginning. For example, a valid group identity of 036612345 can be created from the FCC-assigned ship station identity of 366123450.

Coast station identities – 00MIDXXXX:

Although FCC does issue coast station licenses, its software cannot generate a coast station MMSI. If one is needed, it can be manually assigned by the FCC Wireless Telecommunications Bureau, or for federal coast stations by the agency’s spectrum manager.

Shipborne AIS units needing to be operated ashore for test or other purposes are not able to use this identity. If the AIS is attached to the ship, it can be operated using the assigned ship MMSI. If the AIS is not associated with a ship, it cannot be operated without an MMSI specially assigned for this purpose. RTCM’s GMDSS Task Force and the Coast Guard will be working with FCC to address this need.

Search and rescue aircraft – 111MIDXXXX:

Because this MMSI is primarily intended for use by AIS transceivers used on aircraft for search and rescue purposes, these identities have only been assigned to the Coast Guard. However, the Coast Guard and FCC are considering possibly assigning a single MMSI (e.g. 111366770) for use by DSC-equipped aircraft ditching over water to transmit a distress alert to nearby ships.

AIS aids to navigation (ATON) – 99MIDXXXX:

AIS ATON MMSIs are primarily operated by the US Coast Guard, Army Corps of Engineers, or as private ATONs authorized by the Coast Guard.

(Continued on page 53)



Search and rescue watchstanders can spend hours attempting to identify a vessel sending a DSC distress alert if the MMSI registration information has become outdated. Courtesy USCG



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Industry News

Navico opens new Fort Lauderdale office

Navico has opened a new US office in Fort Lauderdale, FL, which will allow the company to work more closely with resellers, dealers, boat builders, consumers and major shows. The new location will offer pre-sales guidance, post-sale support, extensive in-house recreational and commercial product technical training for dealers and installers. In addition, classroom training will be available for consumers looking to get the most from their Lowrance, Simrad, B&G and C-MAP purchases.

Christian Olsson, Vice President of Sales for the Americas, has relocated from Navico's corporate offices in Merrimack, NH, to oversee operations. The office features a current staff of 10 employees focused on sales, support and marketing.

"Florida is the largest marine electronics market in the world," said Olsson. "It has long been a goal of Navico to be closer to our customers in this region, and with our new office, we now have the local resources to deliver an unparalleled level of service and support."

In addition to in-house support and training, Navico also plans to host a regular series of try-before-you buy events throughout the region, leveraging available demonstration boats in the vicinity of the office.

Siren Marine wins IoT product award

Siren Marine has taken a 2020 IoT Evolution Product of the Year Award, earning a spot among a select group of global companies honored for creating and applying advanced Internet of Things (IoT) technology in ways that positively impact businesses and enhance the lives of everyday people.

The award is presented annually by TMC, a global integrated media company and its partner Crossfire Media. Winners are chosen by the editors of *IoT Evolution World* magazine, a leading journal focusing on success stories and evolving trends in the rapidly changing world of IoT. According to the publication, the award honors today's best and most innovative products and solutions powering the Internet of Things movement.

Award winners were selected from a broad cross-section of IoT disciplines, including manufacturing, communications, security, public utilities, public safety, transportation and more. Siren Marine was honored for its Connected Boat platform that applies the latest IoT technology to take the stress and worry out of boating through advanced security, monitoring and remote control of connected onboard systems via the Cloud.

"We are honored to be recognized alongside other global leaders in the IoT field," said Siren Marine CEO and Founder Daniel Harper. "I founded Siren Marine more than a decade ago to apply basic IoT technology to help solve the unique challenges faced by boaters and that I experienced daily as an avid sailing enthusiast and professional yacht captain.

"As our company and capabilities evolved over the years, it became clear to us just how much more our cloud-based system had to offer boaters and the industry, beyond just security, monitoring and tracking. By bringing in some of the brightest minds in the field of IoT and combining them with experienced boaters and marine industry veterans, Siren Marine has evolved into the industry's leading IoT resource. This award is truly a team accomplishment," added Harper.

TRAINING MATTERS.

2020 – 2021 NMEA Installer Training Schedule

November

Virtual Training Event, Start Time 6:00 pm EDT

- 11/17 Basic NMEA Marine Electronics Installer
- 11/18 Basic NMEA 2000® Installer Training
- 11/19 Advanced Marine Electronics Installer

December

Virtual Training Event, Start Time 7:00 am EDT

- 12/15 Basic NMEA Marine Electronics Installer
- 12/16 Basic NMEA 2000® Installer Training
- 12/17 Advanced Marine Electronics Installer

January 2021

Virtual Training Event, Start Time 11:00 am EDT

- 1/12 Basic NMEA Marine Electronics Installer
- 1/13 Basic NMEA 2000® Installer Training
- 1/14 Advanced Marine Electronics Installer

February 2021

Virtual Training Event, Start Time 7:00 am EDT

- 2/23 Basic NMEA Marine Electronics Installer
- 2/24 Basic NMEA 2000® Installer Training
- 2/25 Advanced Marine Electronics Installer

March 2021

Virtual Training Event, Start Time 3:00 pm EDT

- 3/23 Basic NMEA Marine Electronics Installer
- 3/24 Basic NMEA 2000® Installer Training
- 3/25 Advanced Marine Electronics Installer



For a full training schedule or to enroll online, visit Upcoming Training at: www.nmea.org



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Industry News

Omnisense grows its US headquarters

Omnisense Systems USA, Inc. has announced the expansion of its US headquarters in Fort Lauderdale, FL. With approximately 10,000 square feet of office and warehouse space, the move supports the introduction of the company's Ulysses line of marine cameras and SENTRY MK4 Mass Fever Screening System.

"The SENTRY MK4 is the best in class and a global leader in mass fever screening systems," according to Omnisense Systems. "The Ulysses Series is also the best in class of marine thermal imaging products, with streamlined integration that works seamlessly with all major MFD manufacturers' systems. The Ulysses series offers superior quality and performance at an affordable price."

Survey software integrates FarSounder sonars

Quality Positioning Services (QPS), which specializes in maritime geomatics software and services, has integrated FarSounder's Argos Forward Looking Sonars (FLS) into their Qinsy survey software package. Argos sonar users are now able to display their FLS bathymetric data in the Qinsy platform along with the rest of the survey data they are capturing.

QPS's hydrographic software products are used by a variety of commercial and scientific survey vessels along with many militaries around the world. The Royal Netherlands Navy recently installed FarSounder's Argos 1000 sonars on two of their latest upgraded vessels. The ability for the Royal Netherlands Navy and other survey vessels to include this data in the Qinsy platform will provide valuable information during their missions.

"The ability to stream data from FarSounder's sonars into Qinsy will allow operators to not only use their Argos systems to navigate in real time, but also monitor bathymetry and detected hazards in Qinsy," said Heath Henley, FarSounder's hydrographic & advanced solutions specialist. "Users will now be able to incorporate bathymetric data collected using FarSounder's forward-looking capability into their workflow."

ON THE MOVE

Brian Vlad joins Airmar as Marine Product Line Manager

Airmar Technology Corp. has hired Brian Vlad as Marine Product Line Manager. He will focus on the direction and evolution of Airmar's line of marine products. Vlad has over 20 years of marine electronics experience, primarily in product development and line management.

"We are excited to have Brian on board and are looking forward to the fresh approach and experience he'll bring to the table," says Jennifer Matsis, VP of Sales and Marketing. "Having worked with us on many projects over the last 20 years, he already understands our business quite well. He is an outstanding addition to the team."

"I intend to apply my experience to help Airmar develop and launch new products and technologies that will improve boating and fishing overall," says Vlad. "Airmar has a long tradition of developing innovative technologies, such as Chirp, that pull marine electronics evolution forward, so my efforts here have the potential for significant impact on the marine industry in general."

Previously, Vlad worked for Raymarine where he managed over 30 product introductions. In his new role at Airmar he will help structure and focus Airmar's product roadmap through market analysis and VOC feedback from both the dealer base and the general marine public.

CED Marine names Dustin Travis SVP of Business Development

CED Marine has brought Dustin Travis aboard as SVP of Operations and Business Development in the company's Rockledge, FL, location. In making the announcement, the company reported that "Travis will be an integral part in building CED Marine's management team with experienced industry veterans that will focus on the growth of CED into the #1 Technical Distributor in the marine industry."

"Growing up in the Finger Lakes region of upstate New York, I have always had an interest in being on the water. After I joined the United States Navy in 1998, I really found a passion for it," Travis said in a statement. "Over the past 22 years I have held almost every position onboard a boat and have worked for some of the best government and recreational manufacturers in the boating industry. I am excited to transition into my new role at CED Marine and continue to support the marine industry."

Along with bringing seasoned professionals on board, in recent months CED Marine has invested in dealer-facing technology, including a new website and dealer portal, as well as adding new product lines and focusing on the top-notch customer service their dealers expect.

Al Sundoro to lead Business Development at Dometic Marine

Dometic Marine has hired marine industry veteran Al Sundoro to serve as the company's new Vice President of Business Development.

Sundoro brings with him a wealth of related marine industry experience. For the past 12 years, Sundoro has worked with Garmin International, where he influenced the company's research & development, product management and business development efforts. He was instrumental in the transformation and growth of emerging markets, a skill set that supports Dometic Marine's goal of expanding into new markets.

Working under Dometic Marine President Eric Fetchko as a new member of his senior staff, Sundoro will spearhead Dometic Marine's aggressive business development efforts. "Our company is focused on growing our influence and expanding our business into new areas of the marine industry," said Fetchko. "Al has a track record of success in doing this very thing. His experience and energy will be invaluable to us as we develop the products and business strategies that will take our global marine business to new levels. We are thrilled to have him on our team."

PASSAGES

Cheryl E. Richards (1949 – 2020)



Cheryl Eileen Richards, 71, passed away Aug. 30, 2020, after a two-year fight with cancer.

Cheryl was born in August, 1949, to Bob and Charlotte Hemmert in Brooklyn, NY. Her family moved to Davenport, IA, where she grew up and attended high school. Later, Cheryl moved between the San Francisco Bay Area and Vancouver, WA. In 1976 she settled in Vancouver, where she began her career in the marine business.

She met her future husband Mark through a mutual friend. They were married shortly after in 1978 and enjoyed 42 wonderful years of marriage. Cheryl's career began at local boat dealerships. She later joined Rodgers Marine Electronics and worked there for many years. In 1995 Mark started his own

marine manufacturers' representative company and Cheryl joined him in 2000. They worked together building Richards Marine Marketing for the next two decades.

Cheryl served on the NMEA Board of Directors from 1995 to 1999 as Northwest Regional Director. During her tenure, the Board worked to finalize the NMEA 2000 Standard and how it was to be marketed. Cheryl and Mark were frequent attendees at NMEA's annual conventions.

"She was also the only female Regional Director at that time (and maybe the last)," said former NMEA Executive Director Cindy Ensley. "Cheryl worked hard to keep the region actively involved in NMEA including the annual conventions and exhibits—and was always willing to lend a helping hand when needed. She and Mark made a good team in support of NMEA, and it was much appreciated."

She was also heavily involved in her synagogue, Congregation Kol Ami, and served as a board member and as a two-term president. Cheryl was a long-time teacher in the Sunday school and enjoyed imparting knowledge of Judaism to her young students. *(Continued on page 57)*



Don Ehrlich (1962 – 2020)

It is with great sadness that we announce the passing of Don Ehrlich, 58, of Hollywood, FL, on Aug. 11, 2020. Don passed away while doing one of the things he loved—hiking near Lake Tahoe, CA. He is survived by his long-

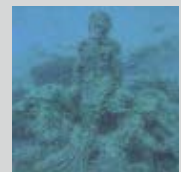
time girlfriend and love of his life, Cherie Wachter, and their three cats Mini, Taraji, and Zorro.

After graduating from Tampa Tech Institute in 1982 with an Associate Degree in Computer Technology and an FCC (Federal Communications Commission) license, he began work at Rich Electronics' Fort Lauderdale office. Don worked in the marine electronics industry for 37 years. In 1992, he and partners Dave Deacle and Eric Feenstra founded Yachtronics.

Don became a CMET (Certified Marine Electronics Technician) in 1995 and later achieved a lifetime CMET certification. Yachtronics became one of the first companies to acquire the NMEA Master Dealer designation. Don served on the NMEA Board of Directors 2000-2003. He attended multiple NMEA conventions in Las Vegas, on the Pacific Coast and in Florida. His contributions to the marine industry are legendary.

He was a mentor to many and took an active interest in the lives of his seven nieces and nephews. Don was passionate about hiking, fishing, lobster mini-season, biking, scuba diving, snowboarding, traveling, tailgating at Miami Dolphins games, gardening, and herding cats.

One of Don's projects was ocean and beach clean-up and preservation. Donations can be made to Free Our Seas at www.freeourseas.org where an artificial reef will be placed off the coast of Fort Lauderdale in his memory.



George E. Lariviere (1940 – 2020)



George E. Lariviere, a major figure in the marine electronics industry for more than 45 years, passed away Oct. 7 at the age of 79.

George received his electronics training as a US Air Force airborne radar technician supporting the aircraft of the Strategic Air Command. From that baseline of experience, he soon entered civilian life and found his calling in the maritime sector of communications and navigation.

George initially operated his own business in York, ME, then worked for various companies, including Brocks Electronics, EPSCO, Koden, Northern Airborne Technologies, before he and his wife Charlene founded Whiffletree Corp. (later renamed WhiffleTech) in Bridgton, ME. Throughout the years

he assisted in the development of the first track plotter, color fishfinder, river radar for push boats, GPS-enabled EPIRB and Personal Locator Beacons (PLB). He helped get PLBs approved for both marine and land-based use, increasing the number of lives saved.

In 1995, George was elected to the RTCM (Radio Technical Commission for Maritime Services) Board of Directors. In 1997, he was elected Chairman of the Board, a position he held for 18 years.

Some of the awards he received over the years include *Sail Magazine's* 1999 Freeman K. Pittman Award for safety gear and the NMEA Lifetime Achievement Award in 2003. In 2016,

(Continued on page 57)



VIRTUAL EDUCATION WEEK

CONTENT ON DEMAND

NMEA BUSINESS MEETING

NMEA PRODUCT AWARDS CAP A BUSY WEEK

WEBINAR SERIES BOASTS 59 PRESENTATIONS

An online presentation Sept. 26 of the annual NMEA Product of Excellence Awards and a brief business meeting highlighted NMEA's Virtual Education Week, which featured an extensive webinar series called Content on Demand. The member-only sessions were held this year in lieu of NMEA's regular in-person Conference & Expo due to the ongoing pandemic.

In announcing the virtual sessions back in May, NMEA President & Executive Director Mark Reedenauer said, "Safety of our members and getting their businesses back on track is our number one priority as we look into the summer and fall. Many of our members have suffered financial losses during the pandemic, and we do not want to burden them with a decision of attending a conference in person."

Content on Demand webinars

Two-dozen manufacturers, dealers and service companies offered 59 separate online education webinars, providing information about products, installation, calibration and other topics. The sessions ranged from brief introductions to a comprehensive two-hour course in Autopilot Installation and Troubleshooting.

Presenters included: Actisense, Airmar, Boat & Yacht Electrical Services of Mass Bay, Boning Ship Automation, Digital Yacht, FarSounder, FLIR Systems, Furuno USA, Fusion Entertainment, GOST, Humminbird, Intellian, KVH, Lowrance, Midcoast Maine Electronics, Nobeltec, Octopus Autopilot Drive Systems, Raymarine, Simrad, Vesper Marine, Warwick Control Technologies, Wave WiFi, and Yacht Sentinel.

President & Executive Director Mark Reedenauer opened the meeting a few minutes past 7 p.m., welcoming everyone to the online session and introducing Chair Steve Katz.

Katz pointed to the difficult 2020 global landscape caused by the pandemic, and explained that NMEA has taken several steps, including moving to a virtual business meeting and trainings, to adapt to those challenges.

Secretary Jason Young briefly addressed issues faced by the industry in 2020 then asked for approval of the 2019 minutes, which he received.

Treasurer Richard Baker gave a financial report on the current state of NMEA, pointing out that the association is in good shape financially and has a year-to-date surplus despite challenges presented by the pandemic.

In his President's Report, Reedenauer described how the restrictions of in-person training presented the NMEA with an opportunity to move most trainings into a virtual classroom environment. He said they have been extremely successful but that virtual training could not replace the benefits of in-person training. Reedenauer expressed hopes that 2021 will have fewer challenges and allow the return of the traditional conference, which is due to be held next year in Anaheim, CA. He said NMEA has seen an all-time high of new members for a year, even though membership at 704 is slightly down from 2019 due to some non-renewals. In closing, he asked members to consider becoming Board members.

With no new business suggested, Katz adjourned the meeting at 7:26.



Left to right: President & Executive Director Mark Reedenauer, Chairman Steve Katz, Treasurer Richard Baker



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NMEA PRODUCT OF EXCELLENCE AWARDS

A total of 19 products in 17 categories received awards, including the return of a Marine Specialty category. There were ties in two categories. NMEA members selected the winners through an online voting process.

Two separate product awards that traditionally are presented at the Conference & Expo were not offered this year because they are selected through a hands-on judging process. They are the NMEA Technology Award and the NMEA Best New Product Award. Both will resume at next year's Conference & Expo scheduled for late September in Anaheim, CA.

Saluting this year's winners:

- Marine VHF—ICOM M605
- Radar—Furuno DRS4DNXT
- Satellite Communications Antenna—KVH TracPhone V3-HTS
- Multi-Function Display—Garmin GPSMAP 8616xsv
- Multimedia Entertainment—Fusion Apollo RA770
- NMEA 2000 Sensor—Furuno SCX20 Satellite Compass
- Autopilot—Garmin Reactor 40 with SmartPump v2
- Satellite TV Antenna—KVH TracVision UHD7
- Fishfinder—Furuno DFF3D Multi-Beam 3D
- Marine Camera—FLIR M364C
- AIS—Vesper XB8000 smartAIS
- Marine PC Software—Nobeltec TZ Professional V 4.1
- Remote Monitoring—GOST Apparition SM GPS XVR
- Wi-Fi/Cellular Device—KVH TracPhone LTE-1 (tie)
- Wi-Fi/Cellular Device—Wave WiFi Tidal Wave AC + Cellular (tie)
- Marine Apps-Utility—Garmin ActiveCaptain
- Commercial—Furuno FAR2228BB IMO Radar
- Marine Specialty—Maretron N2KBuilder (tie)
- Marine Specialty—Furuno DI-FFAMP CHIRP Amplifier (tie)



MANUFACTURER OF THE YEAR AWARD

NMEA members also voted on the manufacturer that demonstrated superior support of their products to all who install and service them in the field. NMEA and the membership congratulate Garmin on winning this award.

The NMEA Awards are coordinated by a committee consisting of: Brian Kane, Chief Technology Officer, GOST; Todd Tally, General Manager, Atlantic Marine Electronics; Chris Labozza, Executive Vice President, Precision Marine Center; Paul Comyns, Vice President of Global Marketing, Intellian; Bruce Cole, Manager and Advertising Director, *Marine Electronics Journal*; and Mark Reedenauer, President & Executive Director, NMEA.



“On behalf of the NMEA Board of Directors, staff, and membership, we congratulate all 2020 award winners,” said Mark Reedenauer, NMEA President & Executive Director. “The member voting count exceeded our expectations. This certainly sends the message to the market that manufacturers have focused on producing top-quality products for the boating public, even during a pandemic. NMEA members, installers and manufacturers have surely kept their eye on the ball.”

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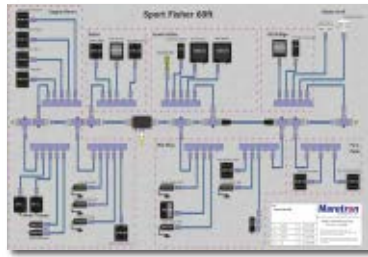


KVH

- TracVision UHD 7 • TracPhone LTE 1 • TracPhone V3 HTS

MARETRON

- Maretron N2KBuilder



FLIR

- FLIR M364C



FURUNO

- Furuno DRS4DNXT • Furuno SCX20 Satellite Compass
- Furuno DFF3D Multi-Beam 3D • Furuno FAR2228BB IMO Radar • Furuno DI-FFAMP CHIRP Amplifier



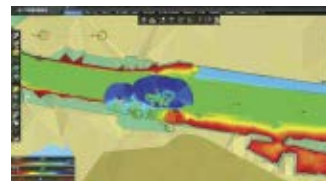
GARMIN

- Reactor 40 with SmartPump v2
- GPSMAP 8616xsv
- ActiveCaptain



ICOM

- ICOM M605



NOBELTEC

- TZ Professional V 4.1



FUSION

- Apollo RA770



GOST

- Apparition SM GPS XVR



WAVE WIFI

- Wave WiFi Tidal Wave AC + Cellular



Fishermen use their electronics to, well, find fish. Fair enough, but how do they use them, which functions are important and which are not? Turns out, that depends—and anyway, technology and younger tech-savvy fishermen are changing the seascape. We asked avid angler and veteran electronics and boating editor Chris Woodward to fill us in.

BY CHRIS WOODWARD

Tech Transition

Once a hard sell, the fishing market comes of age

As he arrives at his offshore waypoint, the charter captain glances at the horizon, visually lining up two buildings on shore to the south with a tower and a row of trees to the north. A formless blob of red pixels scrolls across the sounder screen—an artificial reef. He motors upcurrent of the sunken wreck and drops anchor.

He has been here countless times before. He knows that the current's direction and strength mean grouper will hang near the stern of the wreck with the amberjack on top. He focuses all his attention on describing the bottom fishing routine to his anglers while he baits their hooks.

Only this time, he finds no fish. His choices: motor around looking at the sounder or try a different hotspot from his log. In the end, he knows his methods will work. They always do.

Rising tide

For decades, this typical saltwater angler has relied on his experience and reports from other fishermen rather than his electronics. If he turned them on at all, he used them to find a specific fishing spot with his plotter and then verify his position over a reef or other structure using his sounder. His display always showed a plotter screen and a sounder screen side by side, with a water-temperature reading.

“The average fisherman has great expertise in fishing, and his focus is on the details of that. So he wants his electronics to do ABC, but doesn't necessarily care about DEF,” says Raymarine/FLIR Market-

ing Manager Jim McGowan. “There’s an art and a science of catching fish, and we fall into the science. People are more into the art of it.”

However, McGowan and others see a new tide rising. The wow factor introduced by side-imaging, 3-D and live sonar has sparked a competitive edge, something virtually all anglers share.

“If you can combine the knowledge you have as to what these fish are supposed to be doing, and back it up with electronics, you’re way ahead of the game,” says Capt. Greg Hildreth (georgiacharterfishing.com), a long-time inshore and offshore fishing guide from St. Simons Island, GA,

Hildreth stands at the crest of that new tide: He has run the same 7-inch Garmin unit on his 25-foot charter boat for seven years, but is poised to jump headlong into high-res side-imaging sonar. “I’ve always just used my electronics to get me to a spot, running offshore, and then once I get there to show me the bottom. I know I’m missing out,” he admits.

Fellow tarpon guides in the region run side-imaging units. “When these tarpon are out in deeper water in the channel, the guides are finding fish with side-scan. They can tell how deep they are and how many are there,” he says. “I’ve got to have some of that.”

Money talks

But not all saltwater anglers treat electronics like they’re a necessary nuisance. “Pro captains who run larger sportfishing boats tend to know a little more about what they want or are interested in before we ever start a conversation,” says Braden Shoemaker, Furuno Southeast Regional Sales Associate. “But this makes sense as it is their job.”

Shoemaker also sees a trend among offshore anglers toward buying more powerful fishfinders capable of 2kW or 3kW output. Some tournament fishermen even invest in commercial-grade sonar that’s omnidirectional. When finding fish might result in a multi-million-dollar tournament payoff, it makes sense to know your technology.

Tournament captain Mark Maus runs three Simrad units aboard his 36-foot Yellowfin. His electronics save him valuable time finding bait and locating fish during competitions. He says saltwater fishermen are looking for simplicity, and he sees the market gravitating in that direction with streamlined user interfaces and better auto settings—particularly on more advanced products such as radar.

Just look how far anglers have come, he says. “I remember my father used to drop a bar of soap to find hard bottom,” says Maus, a fourth-generation Florida angler, who is also sponsored by Simrad. “He would drop it on a rope, and it would come up with sand or coral.”

He also acknowledges that when operating a smartphone, he’s just as ‘unevolved’ as many of the old salts whose progress with marine electronics has been incremental. “We’re set in our ways. If I wasn’t who I am [a sponsored tournament angler], I would be one of those guys.”

While offshore saltwater anglers—who can cover hundreds of miles in a fishing day—might put more emphasis now on their electronics, inshore anglers find less motivation to adapt. The same marsh shoreline that produced redfish on a rising tide yesterday should produce today.

But new technology seems to be changing minds. And as younger anglers jump into the market, suddenly the technology that literally defines their generation holds broad appeal.

“They ask a lot of questions,” McGowan says. “How much memory does it have? How do they network together? Can I link it to my phone? Can I transfer data? People ask me literally every single day: ‘When will Element [units] stream to my phone?’”



Simrad-sponsored captain Mark Maus (top photo) says saltwater fishermen are looking for simplicity. He sees the market moving in that direction with streamlined user interfaces and better auto settings.

Furuno’s Braden Shoemaker talks about a trend of offshore fishermen installing more powerful 2kW or 3 kW fishfinders. He even sees some tournament anglers buying commercial-grade omnidirectional sonars in an effort to land some of the big cash prizes.

Fresh approach

For freshwater anglers, the technology tide rose a few years ago. “For freshwater fishermen, it’s all about electronics, especially with LiveScope,” says David Dunn, Garmin Director of Sales and Marketing. “We can’t build them fast enough. We tripled our forecast since January and still can’t keep up. At the Bassmaster Classic, we took first, second and third. All three pros called out LiveScope on stage.”

Pro bass anglers must stay very in tune with electronics trends. Currently they’re focused on Humminbird MEGA Imaging and Garmin Panoptix, which includes LiveScope technology, says James Hall, Editor of *Bassmaster Magazine*. Crappie anglers gravitate toward LiveScope



Bassmaster Magazine Editor James Hall draws a distinction between professional and recreational anglers. He says the pros focus closely on electronic trends such as Humminbird's MEGA Imaging and Garmin's Panoptix while sport fishermen are "like old saltwater captains" who follow marks on a chart and look to sounders for depth checks.

too; panfishermen want side-imaging, kayak fishermen like to record sonar and generate their own charts, and walleye anglers want all their technology working together as a system, such as with Humminbird's One-Boat Network, he says.

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In general, though, many purely recreational anglers are "like the old saltwater captains. They have a map with a little line that tells them how to get back, the machine tells them how deep they are, they're satisfied," Hall says.

Technology definitely drives retail sales, says Scott Heffernan, Vice President of Sales for TheGPSStore.com. "We see the largest increases when there's new technology. And the latest has been in sonar," Heffernan says.

On a scale of electronics knowledge in the marine world, he says that sailors often seem to have the most product savvy followed by the coastal fisherman. "I think the large majority of sailors spend a lot of time on their boats. They get away from the greater population and from the places where they can buy things. They also spend more time in researching and studying," he says.

But defining such a knowledge scale seems to elicit differing opinions among industry experts. Raymarine's McGowan, for instance, sees powerboat cruisers at the top of the list of knowledgeable buyers. "They use their boat like an RV; they're actually going places. They know their navigation and radar inside and out," he says.

Behind cruisers, sailors seem to grasp the highly technical, followed by tournament and hardcore fishermen. "I'd say that [those top three] are probably the top 20% that do the research, weigh the pros and cons, get all the specs and lay them out," he says.

Garmin's Dunn says fishermen would top his list: "I think fishermen learn their electronics faster and more in depth than any other boater. That's based on what we see at shows, even if we're talking weekend warriors. They don't get to fish every day, so they want to maximize their time."

Easy ABCs

Some of that disparity might rest on perspective. While cruisers might have the upper hand historically, anglers have definitely developed greater interest in recent years. In fact, electronics makers have improved their user interfaces to the point where it's easy to navigate through choices that once required a technical manual. That reduces the intimidation factor.

"We know that the vast majority of customers use 10 to 15% of what a unit can do," McGowan says. "So, we need to set it up so that out of the box, it's not intimidating."

The first time a buyer turns on a Raymarine unit, he sees a startup wizard. As an angler walks through the questions and answers, for instance, the unit becomes configured for fishing. "Some of the menus change around depending on what profile you selected. For instance, a fishing unit will show water temperature in more places than one set up for cruising."

Most units also run quite optimally in auto mode, which is a god-send among anglers, particularly those who avoid pushing buttons for fear of changing or breaking something. Having a unit that turns on and immediately shows you the right information also reduces the learning curve. "We know that a customer is not going to pick up a manual," McGowan says. "We don't even provide it printed anymore. The PDF is about 600 pages long. That's how much stuff that unit can do."

As an example of this new age of simplicity, Simrad's Maus says radar has gone from being "one of the more feared items" to an incredibly user-friendly system. "If I'm going offshore, I touch the input for 'offshore,' and the unit auto-adjusts to that mode. I hit 'harbor mode'

and now the radar changes its beam angle, it changes everything,” he says.

Sales pitch

Current boat-buying trends do suggest that fewer future anglers will have to do the dirty work of studying and researching electronics as more manufacturers sign exclusive provider agreements with new-boat builders. “It’s getting more like buying a car,” Dunn says. “You go to the dealership and find what you like and you leave with it that way. In years past, you bought a boat then the customer had to find another \$5,000 or \$10,000 and wait a month to get everything installed. That was a bad experience.”

Still, used-boat buyers and anglers who want to upgrade their electronics, which usually happens every five to seven years, experts say, must dive into the details. And that, of course, is where the rubber meets the road.

“Our goal is to make their time more enjoyable and make the electronics easy to use,” Dunn says. “We want to know what they’re fishing for and steer them to the best experience they can have.”

More fishermen seem to be on a budget, he notes. “These days, they can buy something today and add on later. We get them enough to get started and if they want more, it’s easy to sale up from there.”

To attract fishing buyers, most electronics makers invest in expert spokespeople, the top tier of which might produce a fishing show or compete on a national tournament level. Many also employ regional pros who are reaching local customers at the dock and marina level.

“You have to be believable,” says Jeff Kolodzinski, Humminbird Brand Manager. “Having someone from a particular locale run a product who’s well respected and uses it with great results goes a long way toward instilling confidence. We all want a national method, but it’s not national, it’s local. That’s true in both fresh water and salt water.”

McGowan, who has been in marketing for 17 years with Raymarine (out of 22 years total), says the profile of the top pros has expanded over that time. Much of that has to do with the proliferation of outdoor television shows and social media. However, he says, the pro ambassador pool—those folks who fish locally and talk to everyday anglers—probably rank as most important.

“You see them every day, and you’ll notice when they have something new,” he says.

“Then when they go online or tune in on TV, that’s where the media end of it really comes in. They see the same product that the local guy has and they see it on something brand new and expensive and super sexy.”

Anglers also exchange product and buying information over forums, which these days seem antiquated yet they invite questions and discussion like no other format.

And finally, customer service drives many buying decisions for anglers. “I think a lot of buying habits of fishermen come back to how they were treated by whoever made the last piece of gear that they owned,” he says. “How easy was it to get an answer? How painful or painless to get a problem taken care of?”

Heffernan adds: “The thing we do that sets us apart is we really try to learn about the products and educate our staff so we can really try to help the customer. Plenty of times we’ve downsold them. Somebody might want to buy this 1 or 2Kw fishfinder. Well, what are they doing? Are they trolling in 100 feet of water? They don’t need that, it’s overkill. We try to figure out what somebody needs and match the system.”

Moving forward

Electronics makers expect the fishing market to grow even more tech savvy as younger anglers eventually dominate the sport and as everyday life continues to dwell in the digital.

“We’re seeing all buyers becoming more knowledgeable today, just by virtue of the internet alone,” Dunn says. “The questions are more educated. That causes all of us to step our game up too.”

The technology also stands to transform the sport. New sonar capabilities take much of the guesswork out of finding fish, which was often a tightly held secret among pros and guides. Now, if someone would just invent a bait that no fish could resist, all anglers would look like heroes. **MEJ**

About the author

Chris Woodward is Executive Editor and Boating/Electronics Editor for the Bonnier Fish Group of publications, which includes Sport Fishing and Salt Water Sportsman. She is also vice president of Boating Writers International. For her job, she has fished domestic and exotic locations, both offshore and inshore. Most consistently, she focuses on fishing the saltmarshes near her home in coastal Georgia.



Asked which user group scores highest in electronics savvy, Raymarine’s Jim McGowan points to powerboat cruisers while TheGPSStore.com’s Scott Heffernan names sailors. Garmin’s Dave Dunn says: “I think fishermen learn their electronics faster and more in depth than any other boater. They don’t get to fish every day, so they want to maximize their time.”

Autopilot Tro

Lots can go wrong—here's how to get it right

BY JOHN BARRY

Boaters take much for granted and a working autopilot is one of them. Autopilots are complex devices and they have a difficult job to do. But when the pilot breaks and the operator has to steer manually, he or she quickly learns the advantage of an autopilot.

often warn operators that the pilot adds a level of distraction and complacency that can be dangerous. The truth is that a properly working autopilot actually increases safety because it does not get distracted, tired or drunk!

Let's look at some of the failures that occur on autopilots. Back in 2018, I wrote about installations and compasses in my Tech Talk column (see Jan/Feb issue, p. 48). We discussed the five components of an autopilot—compass, RFU (Rudder Feedback Unit), drive, processor and controller.

Troubleshooting an autopilot starts with the basics of troubleshooting. A close visual inspection is first. Did it ever work is next. Breaking a complex system down to its simplest form follows—what does work? Making accurate and repeatable observations is essential. As I've said before, the technician must channel both Sherlock Holmes and Albert Einstein together. This means you must investigate the service history and understand the function. You can't troubleshoot something if

you can't tell if it is working! Here's a look at some marine autopilot failures.

A quick check

There is a quick check that works on many pilots. It is so fast and easy that I do it on almost every pilot I encounter. This check works for boats that can steer at the dock. Boats with power steering may require the motors running to steer.

- 1) First, turn on the pilot and observe the display. Typically, there is a RAI (Rudder Angle Indicator) on the screen. Steer the boat manually, counting turns on the wheel and observe the RAI. Proper operation is obvious.
- 2) Return the steering to midship by counting down half the turns from hard over. Observe that the RAI indicates approximately midship position—zero rudder. Next, engage AUTO and give a STEER PORT command (usually turn the knob or push the button). Observe that the RAI indicates a port turn and applies some port rudder.

- 3) Immediately press STBY (Stand By) so the pilot does not continue to attempt to steer the boat while tied up. Next, return the rudder to midship and engage AUTO and give a STEER STARBOARD command—the RAI should indicate some rudder movement to starboard. Observe the displayed compass heading and compare to ship's compass—probably way off—but both the electronic compass and the magnetic compass should be stable. This completes the basic dockside nominal operation test.

Rudder feedback unit

Most rudder feedback units are potentiometers. They present a variable resistance which the computer uses to sense the rudder's position. Using an ohmmeter with the wires disconnected from the processor, you can test a resistive feedback. Many manufacturers use 500 ohm pots. Some feedbacks use a frequency to sense the rudder. NMEA 2000 RFUs use PGN #127245.

A good way to test the rudder feedback unit is to observe the pilot display and steer slowly hard over to hard over several times. The displayed rudder angle should move smoothly with no jumps or herky-jerky stuff. As I said in 2018, installation of the RFU is critical and it is done wrong a lot. A linear response or a one-to-one ratio of movement between the rudder and the RFU is essential. Since the rudder feedback unit lives in the bilge it is prone to failure and sometimes difficult to observe.

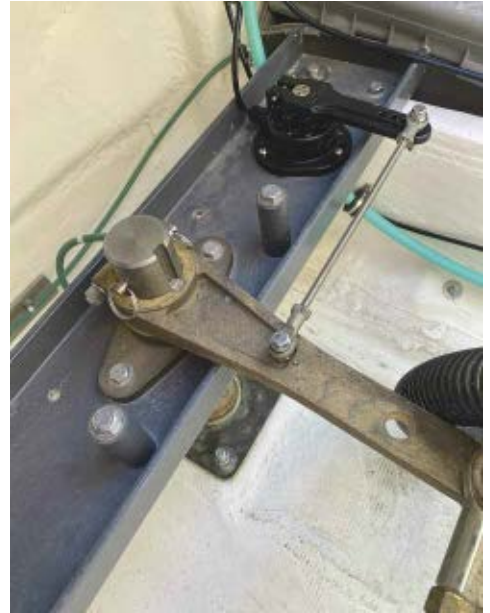
Compass

The electronic compass comes in many flavors. The heading sensor is the heart of the marine autopilot. Gyrocompasses, satellite compasses and fluxgate compasses are types



Autopilots provide a wealth of information while helping the captain keep the vessel heading in the right direction—as long as everything is installed and calibrated correctly. That's often easier said than done, according to troubleshooting reports from the field.

Unblesshooting



Autopilot drives come in a variety of types, including mechanical linear, hydraulic linear, mechanical rotary, solenoid and others. Reversing hydraulic pumps are common. A failure complaint heard often is No Drive—the pilot is engaged but there's no rudder movement. The drive can be tested by direct connection to the supply voltage. If the drive tests good, check the computer for output voltage.

of heading sensors. Gyro and sat compasses sense true north, fluxgate compasses sense magnetic north. Most recreational pilots use a Rate Sensor, which is a fluxgate compass with accelerometers, often outputting an NMEA 2000 PGN for heading (PGN #127250). The sensor itself is smart, compensating for real-world conditions, often internally.

When rate sensors fail they often get unstable and can cause sudden and erratic turns of the vessel. The compass is delicate and sensitive and may fail unexpectedly. All autopilot users should understand that an autopilot needs watching!

Testing the compass and detecting instability in the sensor frequently requires a sea trial. Nominal operation can be observed by moving a magnet near the sensor and observing the display. Of course you would expect to see a wild swing depending on the strength and proximity of the magnet. An unstable compass can be intermittent and difficult to find. If it only happens after 12

hours of fishing, substitution may be the only option.

Drive

Autopilot drives come in many flavors and sizes also. They all have one thing in common, they steer the boat. Most do this by moving the rudder port or starboard as appropriate. Reversing hydraulic pumps are common. Other types of drives include mechanical linear, hydraulic linear, mechanical rotary, solenoid and others. Some pilots send steering commands to a digital steering system like IPS (Inboard Performance System), etc.

A common failure complaint with any autopilot is “No Drive.” User engages pilot but nothing happens, no rudder movement. This symptom can be easily duplicated at the dock using the nominal operation test described above. Once a “No Drive” condition is confirmed, the drive can be tested separately by direct connection to the supply voltage.

Some drive types have a clutch that needs

to be engaged for drive movement. If the drive tests good, check the computer for output voltage. This voltage is computer controlled so it may seem low, but an increase in voltage after a steering command is given is a good indicator that the computer drive circuit is OK.

A blown fuse in the computer often indicates a stiff steering system or possibly obstructed rudders. Blown fuses have a cause and could be the result of low or high voltage, over-torqued or stiff steering, electrical failure, etc. Always determine the cause of a blown fuse.

Controller

Autopilot controllers range from simple button pads to MFDs. A dedicated autopilot control head is a good idea to include with a system. Failures of the control head are uncommon, but they do depend on communications with the computer. MFDs are being used more and more as autopilot controllers, which some users may find confusing. I like a hard STBY button, preferably red, always in



Gyrocompasses, satellite compasses and fluxgate compasses (like Furuno's PG700) are types of heading sensors. The PG700 detects terrestrial magnetism and outputs compass data to CAN bus devices.

When rate sensors fail they often get unstable and can cause sudden and erratic turns of the vessel. Testing the compass and detecting instability in the sensor frequently requires a sea trial. Inset photo is Furuno's FAP700 processor for its NAVPilot700 series.

the same place, which is why I recommend a dedicated control head. The usual bad connection or software issue may explain erratic controller behavior. The pilot is so dynamic in its operation that there are often mysterious intermittent failures that only the operator sees.

"Keeps Going Into Standby," "Doesn't Track Well," "Turned Suddenly" and many more symptoms are common. These can be caused by lack of communication between devices, bad processor, bad compass, bad connections, a failing RFU or even data programming. Obviously further information is needed to nail down intermittent failures.

Sea Trial

Eventually, even if the problem is duplicated and repaired at the dock a sea trial must be performed. Read the manual! Great attention to detail is required. Most pilots have an auto calibration feature that senses the vessel's steering characteristics and sets the rudder gain, response and counter rudder automatically. This learning is accomplished by an algorithm that depends on accurate information from the vessel's sensors. These programs usually work really well.

Even if everything is installed perfectly, the sea conditions at the time of calibration mean that the auto calibration result may not be the optimum setting to steer any given vessel. Always check the performance of the pilot in differing conditions. Autopilots wander off course when they oversteer and when they understeer. Being able to tell if it is oversteering or understeering is easy. Fast "S"ing is oversteering, slow "S"ing is understeering. Play with the rudder gain to compensate for these conditions.

Once the boat can drive straight, confirm that it can make course corrections. Turn to port and starboard, into the wind, across the wind and in following seas and observe the steering action. If the vessel overshoots the new course or is reluctant getting onto the new course, the Counter Rudder may need adjustment. (Continued on page 53)

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ED'S ELECTRO-TECH TIPS

ALL THINGS ELECTRICAL



ABYC standards updates you need to know about

Each year the ABYC Technical Department releases what it refers to as a new “supplement” to its standards and Technical Information Reports, typically in

August. This year was no exception

BY ED SHERMAN

with 13 standards reviewed and updated, two of them new this year. Additionally, three Technical Information Reports were released, one brand new and two updated. In this installment of Ed's Electro-Tech Tips we'll take a look at the specific areas that may have an impact on electronic equipment installers—one of new standards and one of the new Tech Info Reports that could have a big impact on how you perform your installation work and advise your customers.

Of the 16 updated areas, only five have specific pertinence to electronics folks, so we'll focus on just those.

A-14, gasoline and propane gas detection systems

This one is fairly easy to work with. The primary considerations here are that the unit in question be tested to comply with a UL 1110 Marine Combustible Gas Indicator standard by an independent testing lab. The sensors are required to be installed in any compartment that contains a fuel system fitting, not just a tank. The other key element to remember is that both propane and gasoline are heavier than air and will naturally sink to the low points in a boat, so that's where the sensors need to be, above bilge high-water marks of course. These devices, if installed, must not shut down the boat's main propulsion engine and they need to be powered by the boat's DC electrical system. Remember that these systems are not part of recreational boat USCG mandatory requirements but are highly recommended although optional.



All lithium-ion batteries should have a battery management system (BMS) to prevent damage to the battery and provide for battery shut down if potentially dangerous conditions exist. It's important to remember that conventional fire fighting systems won't extinguish a lithium-ion thermal runaway event like the one above.

At right is a ProNautic charger that has lithium-ion capability.



A-24, installation of carbon monoxide detectors and alarms

Carbon monoxide deaths on boats have risen to become one of the major concerns among boaters and boat builders over the last decade. As a result of that, the ABYC A-24 Standard as well as others have been “tweaked” several times to help address this sad reality. Unlike gasoline or propane, carbon monoxide is odorless, colorless and does not sink or rise in air. In fact, its density is similar to the air we breathe and that fact is part of why this gas is so dangerous.

Boat builders have embraced the installation of carbon monoxide detectors on new boats with accommodation spaces for a few years now. Therein lies one of the potential problems for field technicians when dealing with their customers. Even the ABYC was

slow to respond to this issue. Until only several years ago, requirements only addressed gasoline-fueled boats, but the reality is that a diesel-fueled boat can also be impacted by carbon monoxide via open hatches in a docked situation or rafting with other boats.

That has changed and the requirements now include all boats with accommodation spaces. Therein is the potential problem. I'm thinking here about one of the most popular boat types on the market today, pontoon boats, but this also applies to other boat types that get heavily modified with canvas enclosures. Entire families have been lost due to carbon monoxide exposure on small outboard-powered boats with “camping” enclosures installed. I consider it part of a field tech's duty to inform customers of potential risks when they see this sort of modification.



ABYC's updated standard requires carbon monoxide detectors to pass a third-party test and meet a UL 2034 standard. Detectors sold by home improvement stores like Home Depot or Lowe's may not have the certification, which could present serious liability issues if death resulted.

A potential liability risk for field techs is that the standard quite explicitly requires the detectors used to pass a third-party test and meet a UL 2034 standard that includes sections addressing use on recreational boats. The point here is that the Home Depot or Lowe's variety of detector may not have the certification. In the event of death, and the inevitable lawsuit, if you were the installer you could become liable if the unit you installed did not meet the standards-based requirements. Don't go there! Also, understand that on commercial vessels carrying passengers for hire, additional requirements are found in 29 CFR Part 1917.24.

It is imperative that any carbon monoxide detector you install as a marine professional meet UL and CFR requirements and be labeled as such. Additionally, these units have a "replace by" date on their labeling. Most customers think these are forever items, so it's good practice to check these when on board a customer's boat and advise them accordingly. As for the sensor locations, I advise technicians to locate them where passengers' heads are most likely to be located in a given cabin and where they are able to acquire a good sampling of the air in that cabin, not diluted by an open hatch and the like.

A-31, battery chargers and inverters

This standard went under review and is an integral part of all ABYC electrical coursework. As for installation requirements, they remain unchanged. There is, however, an interesting addition to the appendix for the standard, which I quote here in its entirety:

AC ripple current in DC feeders to inverters

"Inverters can impose substantial ripple current in the DC supply current. This current can cause excessive heating of fuses, switches, wires, and batteries. The ripple current and its effects are not detected by typical DC meters. Composite RMS current may be determined by taking both a DC measurement and an AC RMS measurement and combining these as the square root of the sum of the squares of the two individual measurements. The composite RMS current specified for this device is determined for a full-rated AC output into a resistive load taken at the minimum specified DC operating voltage. High harmonic currents imposed by certain AC loads such as variable frequency drives may cause the ripple current in the DC source current to further increase. If high harmonic currents in the AC are suspected, measurements should be made to determine the maximum composite RMS current under actual circumstances."

The revelation above may indicate the need to upsize wiring and such. To learn more about this phenomenon, I recommend getting a copy of the ABYC's latest Advanced Marine Electricity Certification study guide.

P-28, electric/electronic control systems for propulsion and steering

Joysticks, wireless remotes, and fly-by-wire systems are clearly entering the mainstream on new boats. With that reality in mind this new ABYC standard homogenizes and replaces both ABYC P-24 and P-27, which covered Electric/Electronic Propulsion and Steering Control Systems as separate standards. Due to the extremely serious nature of this standard, a look at the scope of the standard to see what is and is not covered is important. The liability implications here are huge!

28.1 SCOPE

This standard addresses the design, construction, testing, and installation of electric/electronic control systems that consist of any one or more of the following features:

Steering, forward or reverse thrust, speed, and tilt/trim of propulsion machinery on boats. This standard applies to physically wired and wireless electric/electronic control systems for steering equipment, propulsion machinery, and trim/tilt of propulsion machinery on boats. This standard also

addresses the marking and orientation of controls.

EXCEPTIONS:

1. Electrical on/off switches addressed by ABYC P-14, Mechanical Propulsion Control Systems
2. Electric propulsion motors that produce less than 115 lbs. (512 N) thrust
3. Hull-mounted trim plane systems with non-integrated independent control systems
4. Bow and/or stern thruster systems with non-integrated independent control systems
5. Personal watercraft
6. Autopilot systems

New requirements found within this standard are crucial for both equipment manufacturers and vendors as well as field installers. Specific requirements can be found covering the following areas:

- Propulsion control zone of protection
- Neutral holding system
- Dynamic positioning
- Portable control units
- Wireless controls
- Joy sticks

It is interesting to note here that the ABYC has always embraced a 1-year compliance window when a standard is presented to allow for inventory control and internal design changes for those attempting to comply. In this case, the committee has allowed a two-year compliance window. To my mind this allowance reflects the significance of this standard and this equipment to safety. I recommend a thorough review of this standard if you are working with this type of equipment and get any questions answered by the ABYC Technical Department.

TE-13 lithium-ion batteries

I almost can't believe I'm typing this as the report has been a long time coming. I for one have seen plenty of potentially dangerous Lithium battery installations over the last decade and expect I'll see more in the future. All that said, I can't really blame the ABYC Tech Department for the delay. Much of the information found in this Technical Information Report came from hard-earned lessons from the field, changes in prevailing chemistries used, conflicts and manufacturers trying to protect their own interests.

The truth is, this technology landed in our marine laps rapidly and we needed some time

and history to help guide us into making statistically safe recommendations. No lithium-powered skateboards bursting into flames for our gang!

This brings me to a point relative to ABYC Standards v. Technical Information Reports. I often get asked, what's the difference? A Tech Info Report is just that, a series of recommendations based on our best knowledge at the point of publication. It is designed as a guide for field personnel and engineers and intended for general guidance only.

Standards on the other hand are tried and true and based on years of application as best practices. In the case of batteries, it is reasonable to expect that we'll see further development in the field of batteries as the push for electric propulsion in the automotive world continues to expand. Let's take a look at some of the key recommendations found within TE-13.

A brief look at TE-13

One fundamental that starts right at the beginning is that ALL lithium-ion battery systems should have a battery management

system (BMS) to prevent damage to the battery and provide for battery shut down if potentially dangerous conditions exist. This BMS is allowed to be external from the battery itself.

Consideration should be given to providing alternative power in the event of a battery shutdown. (Yanmar, for example, requires this.) If conditions are such that a shut down is eminent, the BMS needs to notify the operator with a visual and/or audible alarm prior to disconnecting.

Battery manufacturers are required to clearly define both temperature and voltage operating parameters for charging levels, discharge levels and battery storage, and these specifications must be adhered to as a part of the installation. This is defined as the safe operating envelope (SOE). Operation outside of these prescribed specifications can create a hazardous condition.

Battery and BMS installation locations must be designed to ensure no exposure to water ingress under normal operating conditions.

Battery disconnect switches must be read-

ily accessible without reaching over the battery top.

Battery output conductors require over-current protection. TE-13 makes several recommendations in this area.

Batteries must be secured per ABYC E-10, Storage Batteries and 33 CFR 183.420.

Battery cell venting should be as per battery manufacturer recommendations.

Here are some of the key points related to the design of the battery management system:

- The BMS should be equipped with control functions when the programmed functions in charging sources, inverters or inverter/chargers fail to do so.
- Monitoring must be at the individual cell level.
- Protective means should not disconnect critical loads without prior warning.
- The BMS should ensure that parasitic loads on board will not create a dangerous low voltage event.
- All lithium-ion battery systems should be tested and commissioned per manufacturers' requirements. *(Continued on page 56)*

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TECH TALK

TALES & TIPS FROM THE BILGE

Radar

Making sense of symptom alerts

Radar is essential equipment aboard many vessels. They're required on commercial vessels, even two radars. Requirements vary and most pleasure boats are generally exempt from radar carriage requirements. Still, a working radar (and a skilled operator) is the primary collision avoidance device on board. Nothing replaces a good watchman—eyes through glass—but in low visibility, darkness or fog, the watchman becomes crippled and the radar can be a lifesaver. As you may know, radar is an acronym for Radio Detection And Ranging.

BY JOHN BARRY
CMET & NMEA Instructor

Reading the symptoms

When a radar fails, several symptoms are common. These days, with digital radar, the connection to the display is through Ethernet, so “No Radar Detected” may show up on the screen if a network problem occurs or if the radar goes completely dead. Troubleshooting Ethernet is beyond the scope of this article, so instead let's look at radar symptoms that occur when the radar is not dead.

“Radar Rotates But No Targets” is one of those symptoms. When everything looks normal, the screen turns on and counts down, the transmit engages, but you have no targets. This can be a symptom of no transmit or no receive. To determine which is the problem, put the radar on the longest range, defeat the clutter filters (Sea and Rain Clutter OFF) and turn up the gain. If the screen remains completely blank, there is likely no receive. If there is “grass” (scattered clutter, evenly distributed) on the screen, then the receive side is likely OK and there is no transmit.

On analogue radar, there is a composite video signal on a coax within the interconnect cable and this can fail, causing no targets, no grass but in this case only a broken coax is the problem. “No Targets” is a common complaint and is usually a transmit problem, either magnetron, modulator board or power supply. Repairing a radar requires an FCC GROL with Marine Radar Endorsement.

Operator error

Sometimes the complaint is “Weak Targets.” On pleasure boats this problem is usually operator error. Here's an example: A customer told me the other day that he had radar, even though I could clearly see no radar on the boat. He explained that the display on the dash was his radar, while in fact it was a chartplotter. Once we educated him about what a radar is, we added one. Now he needs to practice operating it in fair conditions, so that when he needs the radar he can operate it without the book.

Weak targets can be caused by weak transmit or out-of-spec-receive.



Troubleshooting radar issues is tied closely to understanding the probable causes of symptoms ranging from Radar Rotates But No Targets to Weak Targets. Make sure to read the installation instruction carefully. Sometimes a restart, a software upgrade or a menu setting is all you need to do to get the system working properly. Knowing how something works is the key to understanding why it does not work.

It is usually caused by the operator setting the Sea/Rain Clutter filters too high, the Gain too low or the Tune maladjusted. If you can not improve the targets by tuning, check the magnetron current to confirm strong transmit.

Another symptom that I have seen is “Targets Blank Out” or “Targets Move Around.” This is a symptom of synchronization. When pulsed radar transmits, it measures time to determine distance and it uses bearing pulses to determine direction. If the orientation of the targets on the screen changes, the bearing pulses or the heading pulse may be missing or erroneous.

Which way is up?

The heading pulse is generated when the array passes the 12 o'clock position and then the bearing pulses are counted to determine direction. If the heading pulse or bearing pulses are missing, the radar will usually show an error code. When these signals are intermittent or noisy, the targets become disoriented to the bow and “jump around” the screen. The heading pulse is generated by a magnet passing a reed switch. Failure of the head-up switch means the radar does not know where the bow is. Bearing pulses are typically generated by the motor or an optical interrupter. Failure of the bearing pulses means that the radar does not know how far past the bow the radar has rotated.

The symptom “Missing a Pie-Shaped Piece of Targets” where the screen goes blank at a certain bearing is almost certainly caused by the

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BUSINESS SENSE

PUMPING UP PROFITABILITY



Check, Call, Care

What to do in a business emergency

BY STEVE KATZ

Not unlike a medical emergency, a business emergency needs immediate action to ensure survival. Until recently, a pandemic and economic standstill would have been unheard of, but now that it has occurred business owners should add this to the list of “rainy day” planning. The Red Cross teaches the three C’s—Check for anything unsafe, Call for help and provide Care. Your business could be affected suddenly by many factors beyond your control, such as flood, fire, hurricane, theft, the economy and even a pandemic!

■ Check

Recognizing there could be a business problem is one of the first things an owner or manager needs to do. What’s the best way to stay on top of a business’s financial performance? The Budget. A business owner or manager needs to regularly check the financial budget and be sure the business is within its operating parameters.

Having a detailed budget along with historical performance numbers allow you to assess the business with a quick glance. Maybe you do not have a budget because you think your company is too small. Every size company needs a budget!

A budget is like a map, helping to guide you from January through December (or your fiscal year). Naysayers may comment that since they can’t predict sales or service—there is no need for a budget. That’s just the reason you need a budget. You can start with your company’s fixed and variable costs (rent, leases, insurance, payroll, etc.) and work back into the amount of sales and service revenue needed to main the expected profit level. It then becomes management’s job to be sure the sales and service revenues are met each month.

Check into the future events affecting your business. Are your rent, lease, or property

taxes going up? Is there a new regulation in the works that may affect your operations—both positively and negatively? Check with competitors, distributors and manufacturers to get a feeling about where when industry is headed. The marine publication *Soundings Trade Only* often has economic reports and information that may be helpful in keeping up to date on the marine industry.

Check your reserves and credit. There is always room for additional reserves of cash or credit, but be sure you have enough for the unexpected. Your budget will help you learn the minimum amounts needed.

Check the sales forecast regularly and be sure it is as accurate as it can be. Incorporate outside factors that could influence your sales volume.

Check the receivables. Be sure that completed sales and service revenue is up to date with your business payment terms. Analyze your progress billing to at minimum be sure your costs are covered based on the percentage of completed work. Take immediate action if customers are falling behind. Look into other forms of payment that may allow customers to pay faster.

■ Call

If you recognize a financial problem may be looming it’s time to start making calls, sending emails and making visits where needed.

The first contact should be with your bank and or financial intuitions. If you need more time to pay a debt, ask before it is an

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NMET stands for National Marine Electronics Technician, which is similar to Certified Marine Electronics Technician (CMET), but without the Federal Communications Commission (FCC) requirements. The NMET certification is designed for businesses and individuals who focus on the recreational marine electronics market. The NMET candidate is an advanced installer/troubleshooter who has extensive “experiential knowledge” related to installing, troubleshooting, and repairing marine electronics. The CMET/NMET exam question pool, now nearly 500 in all, has been expanded and modernized by subject matter experts in the areas of radar, sat comm, GPS, Sat TV, autopilots, AIS, video displays, computers, heading devices, Ethernet, MFDs, Wi-Fi, VHF, DSC, SSB, NMEA 0183, NMEA 2000, Electrical Principals, RF Principals, Transducers / Hydroacoustics, and Power Distribution.



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MARINE ELECTRONICS

INTERNATIONAL FOCUS

Despite the current ban on all non-essential travel across the long border separating the US and Canada due to the COVID-19 pandemic, trade remains a top priority between the two nations under the US-Mexico-Canada Agreement. With that in mind, we want to take this opportunity to salute NMEA manufacturer members that are either based in Canada or have major Canadian operations. Snapshots of those companies lead off our annual International Section.

Following that lineup we drill deeper into one of those manufacturers that recently changed hands—Xantrex. Headquartered in British Columbia but now owned by US-based Mission Critical Electronics, Xantrex is expanding its line of power products and now offers fully integrated power systems.

Technical training is a critical component on both sides of the Atlantic. The expansion of electric and hybrid-electric propulsion in Europe is helping to drive the need for more advanced electrical knowledge by technicians who install and service this technology. Our third article checks in on programs run by the British Marine Electrical and Electronics Association and some of the UK's marine-oriented trade schools.

Moving farther afield into the global market we talk to the founder and head of Palladium Technologies, which provides some of the incredible electronics aboard the world's largest megayachts. The Fort Lauderdale, FL-based company is harnessing artificial intelligence and augmented reality to take its sophisticated monitoring & control systems to new heights.

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Palladium Technologies pushes M&C to a whole new level

INTELLIGENT DISPLAYS



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Canadian Connections

Electronics manufacturing in the 'Great White North'

Some Americans may joke that Canada is an empty wasteland where everyone has a pet beaver and lives in an igloo. In fact, Canada is the world's second largest country by area, after Russia. It has the longest coastline in the world (243,042 km/151,059 miles). More than half of all the lakes in the world are located in Canada. The nation also holds the third largest reserves of oil in the world, after Venezuela and Saudi Arabia—and it really does have four seasons. It is also known to those in the US and international electronics business as a center of excellence when it comes to power conversion products, steering systems, autopilots and other essential components of commercial and government vessels, megayachts and pleasure craft.

Most of the companies profiled here (which is not all-inclusive) are Canadian owned and all their design, engineering and manufacturing take place in Canada. However, two other companies are included because American-owned Xantrex does all their design and engineering in Canada and

Swedish owned Dometic/SeaStar Solutions does their design, engineering and manufacturing there as well.

It is interesting to note that despite no real connection between the individual companies, all of them are located in and near Vancouver, British Columbia, except for Ontario-based Nauticom.

Dave Bockhold is CEO of Kobelt Manufacturing. He says that with so many important marine products companies located in the Vancouver area, the area has become a local hub of expertise. "That gives us a bit of an advantage in some cases. For example, if you go down to the WorkBoat Show in New Orleans or any of the bigger international commercial shows, it is quite astounding, in a positive way, to see the number of Canadian, and specifically BC, manufacturers. This speaks to the industry here and the amount of technology that comes out of here. There's a credibility that goes along with that and an acceptance that goes along with that that kind of gets you in the door in some areas."

Below are insights into what these companies do and how they interact with their major markets in the USA.

Analytic Systems

Canadian-owned Analytic Systems, based just outside Vancouver, was founded in 1976 and manufactures battery chargers, battery isolators, voltage converters, power supplies and other power conversion products. The company's focus is on customization for commercial vessels, the military and larger yachts, with the majority of their business in the USA. CEO James Hargrove explains, "We go after the much lower volume, higher value-added niches in the marketplace where there's room for people who are willing to pay for the customization and the quality."

Analytic Systems does all their design, engineering and manufacturing locally. Most of their components come from the major North American electronics distributors. "We decided that in order to guarantee the quality of the finished product we had to control the entire process, including manufacturing and that means our costs and overhead are substantially higher."

Hargrove notes that because the American market is 10 times the size of the Canadian market, his company has to sell into the US to be viable. "The vast majority of our business is



ANALYTIC SYSTEMS
Power Conversion Solutions



ComNav



DOMETIC

in the US and we've learned that if you're going to sell in the US, you have to get your product out the door, across the border and into the client's hands without them having to do anything extra than when buying from an American distributor. That's why we pay all costs to ship our products across the border. That's one of the keys of doing business with American companies from Canada."

When it comes to the dollar exchange between the US and Canada, Hargrove says that sometimes the currency exchange works for him, sometimes it works against him. "Right now, the dollar is down to about \$0.76, so at the moment that works in our favor. We're essentially paying US dollars for all of the components, but our labor is in Canadian dollars, so basically, it's only the labor that we're discounting by about 30%."

Concludes Hargrove, we strongly believe in Made in North America. "Now with Covid, people are starting to realize that we need more manufacturing in North America. We've been preaching that for the past 20 years."

ComNav

ComNav is a world leader in autopilots and marine navigation electronics. The Canadian-owned company's design, engineering, manufacturing and sales and service are based in Richmond, just outside Vancouver. The company offers a wide range of leading-edge autopilots, precision GNSS smart antennas, long-range night vision and ultra-low light thermal cameras and AIS. ComNav's primary market is the commercial, recreational and government sectors.

The company has an extensive sales group throughout the USA and provides product support through an Authorized Technical Servicing dealer network in all maritime USA

states, coastal Canadian provinces and in over 100 countries worldwide.

Satish Narayan is ComNav's Manager of Sales and Marketing. "Our firm manufactures mixed modules on multiple continents, with all critical final assemblies, quality control and quality assurance programs assembled and tested directly at our Richmond facility."

Narayan believes the company's Vancouver location is perfectly positioned just minutes driving from the US border. "Thanks to NAFTA, there are no applicable duties, and our location ensures all USA sales and service shipments, incoming and outgoing, are seamless to our American customers and this helps make us competitive with global manufacturers." Narayan says the Canadian location also has the benefit of lower labor costs due to foreign exchange.

Dometic Marine/SeaStar Solutions

SeaStar Solutions (now under the Dometic umbrella of companies) has its origins in a basement in Ontario, Canada, in 1943, when it began manufacturing push-pull cables to remotely control the radio frequency knob for military Spitfire aircraft under the Teleflex brand name. A few years later, a facility in Limerick, Pennsylvania, was opened to garner more military business and it eventually became the head office.

The company branched out into mechanical steering systems for boats in the early 1960s, and in 1974, purchased Vancouver-based Capilano Engineering, an injection molding company that had developed rudimentary hydraulic steering for fishing boats. Teleflex saw that marine power was increasing and to grow it would need something beyond push-pull cables. The acquisition allowed Teleflex—later to become SeaStar Solutions—to meet the needs of boats with

higher horsepower engines and become a dominant player in marine steering and control.

SeaStar Solutions was purchased by Dometic of Sweden in 2017, and is now headquartered in Litchfield, Illinois. The Canadian division is headquartered in Vancouver and is the largest manufacturing component of Dometic Marine. Here, they do all the design, much of the machining and most of the assembly for SeaStar hydraulic steering, electronic steering, electronic shift and throttle controls, joystick controls and jack plates—including the world's only retrofittable joystick steering system. As with all the other companies profiled, Dometic Marine's main customer base is in the US.

Brian Dudra is VP and GM of Dometic Vancouver. The only disadvantage he sees to the Vancouver area is that he doesn't have a lot of industry to draw resources from (especially as Dometic Marine employs 450 people and operates 50 CNC machines and 50 manufacturing cells). "There's not a lot of manufacturing in this area and in many cases we're training people how to design parts for production, how to manufacture parts for production, and so on." On the flip side though, he sees advantages of having several local universities from which he can draw engineers.

Managing the supply chain in Canada can also be tricky. While a lower Canadian dollar seemingly helps with competitiveness, it also decreases the company's buying power as the majority of their suppliers sell in US dollars. "Dometic Marine prefers to work on continuous improvement, automation and strong lean principals to remain competitive and complement the natural hedge we employ with currency," Dudra says.

Another advantage of being in Canada is



KOBELT



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that the company's R&D qualifies for Canadian government tax credits under a program called Scientific Research and Experimental Development. This helps offset the company's research and development costs. In Canada, these tax credits are cumulative, whereas in most states in the US, they are "use it or lose it" within a year.

When it comes to competitors in North America, Dometic Marine really has few. "We had one competitor, Hynautic out of Sarasota, Florida. It was owned by Morse Controls, but in 2001 Teleflex bought Morse," says Dudra. Today, Dometic Marine controls over 90% of the sales of steering systems in North America.

"Just because you're in the lead doesn't mean you shouldn't strive to be better. Innovation will always be at the core of what we do at Dometic Marine," says Dudra.

Kobelt

Kobelt Manufacturing was founded in Vancouver in 1962. It is a major worldwide manufacturer of propulsion systems, hydraulic marine steering systems, including helm pumps and cylinders thrusters and stabilizers, industrial brake systems and, most recently, an electronic vessel monitoring system called Vitals. Their industry sectors include pleasure yachts, military, police and Coast Guard and all types of commercial vessels. Their products are all designed, engineered, manufactured and tested at the company's facility just outside of Vancouver. Kobelt's major market for their marine products is the US and Europe, followed by Asia and the rest of the world.

CEO Bockhold finds that with his company's well-established channels to US and international markets, they can be competi-



NMMA helps companies expand

Over the last eight years, the Canadian arm of the National Marine Manufacturer's Association (NMMA) has been able to secure over \$600,000 to assist Canadian marine companies through a government program called CanExport Associations. The program helps manufacturers obtain funding in order to expand their markets.

Sara Anghel is President of NMMA Canada. "We've been very successful in getting money every year so far," she says. "We've taken a number of marine electronics manufacturers to trade shows in places such as Dubai, Sydney and Sanctuary Cove, Australia, Eurasia in Istanbul, Thailand, Shanghai, METS, and Cannes, to name a few. In 2021, we expect to support members at METS, Genoa and Biograd in Croatia.

"Sometimes we've exhibited at these shows, like METS for example, under a Canadian banner. In other cases, we walk the shows. We also introduce the companies to the Canadian Embassy Trade Commissioner in the specific country.

Trade missions are all about exposing companies to distributors in those countries. It is harder for smaller and medium-size companies to do it on their own, so our association helps with introductions and the government program covers 75% of their travel costs. We do help the big guys if they were to apply, but we love to support small and medium-size enterprises that are manufacturing in Canada, providing jobs in Canada."

In the USA, there are number of states that also provide export support for manufacturers. For example, Florida and North Carolina support manufacturers to exhibit at METS and elsewhere, but there is no federal program like the one in Canada. For many years NMMA's export development program has brought both Canadian and American manufacturers to various markets, including Australia, Dubai, Croatia as examples.

The NMMA also supports Canadian members when it comes to dealing with trade issues, such as aluminum tariffs and countermeasures. The association supports its members by advocating on their behalf on topics like a proposed Canadian government luxury tax that would impact the electronics industry as well.



Sara Anghel, President, NMMA Canada

tive against most competitors. "There may be somewhat of an isolationist trend for Americans to use US products, but honestly, if we have the right product and the right component for a certain customer, we find they will buy it from us."

Being located in the Vancouver area has both advantages and disadvantages over being located in the USA. The disadvantages, according to Bockhold, are primarily the very high cost of real estate and labor (as much as double) compared to elsewhere in Canada and the US. "That's definitely a challenge, and from a general cost perspective, we're certainly paying a premium." The advantages include proximity to their main markets.

"I'd say Canada is currently being better received in some areas of the world than a US manufacturer might be," he says. "I think Canada is seen as a more neutral place. We're very open to foreign trade and dealing with other countries and we believe in a global economy. I think most business in the US share our views, it's just they have a bit of a headwind from the bluster of the government

right now which is making it a little more difficult for them in some areas."

Nauticomp

Nauticomp Inc. has been providing LED and LCD displays for superyachts, heavy commercial vessels, Coast Guard, military, police, fire rescue, special ops vessels and industrial applications since 1997. It is known around the world for its comprehensive line of rugged display screens. Their waterproof, sunlight-readable and dimmable DC-ready monitors, including glass bridge displays, can accept most types of data input. All of Nauticomp's displays are designed, engineered and assembled in Ontario, though some components are sourced from the US and offshore.

Ryan Moore is President of Nauticomp. He doesn't see any disadvantages of being a Canadian company in what is primarily a US market for his products. "The nicest part about us as Canadians is that we get along with everybody in the world really well."

"We have a good globally central location,
(Continued on page 56)

Xantrex



Powering a great boater experience

Xantrex is probably best known for its high-quality battery chargers, inverter/chargers and solar charge controllers for the mobile market, which includes boats, recreational vehicles, heavy-duty trucks, military, buses and specialty vehicles.

Recently, Xantrex expanded its footprint in the solar market by developing a broad range of solar panels, including revolutionary flexible and peel-and-stick products. They now manufacture their own line of lithium-ion batteries. Combined with their chargers, inverters and solar charge controllers, the company offers fully integrated power system solutions to customers. This means customers don't have to piece together components from different suppliers that may or may not be compatible or configurable.

BY PETER A. ROBSON

Solar systems and lithium-ion batteries

While Xantrex is a market leader in converting DC energy from solar panels to usable AC power, it only recently started producing solar panels. This fits into the company goal to reduce the need for generators to provide mobile AC power. The company went on to design and engineer a range of rigid and flexible panels in a variety of sizes and output. Several things make them stand out. One is their

mesh grid technology, which gives more points of contact for the sun and therefore more power even in shaded and low light conditions. The panels are very flexible and have peel and stick capabilities (also screw-down options) that allow them to be mounted on pretty well any curved surface (including canvas Bimini tops).

While a properly sized inverter can power just about any AC device, the amount of time an inverter can provide that power is directly related to the amount of available battery power. To this end, several years ago Xantrex began to invest in energy storage and developed their own lithium battery.

"We're seeing a trend in customers being more environmentally conscious and wanting to reduce their carbon footprint," says Albert Shuen, Director of Product Management. "Customers want the ability, the freedom, to operate their AC equipment, when, for example, they're on their boat, without having to run the generator. Having that energy storage in a lithium battery, and a much longer service

life (i.e. six to eight times), enables them to do that much more than with standard lead acid batteries. They can also be charged at a much higher rate than lead acid batteries."

The difficulty with lithium batteries is that until now you had to buy your battery from Shop A and an inverter from Shop B. The difficulty was making them work together. With lead acid and AGM batteries, it was easy to make them compatible, but today's lithium batteries are much more sophisticated and need to be able to communicate and integrate with inverter/chargers and battery management systems to charge and control the battery usage.

We've all heard horror stories about lithium batteries starting fires and exploding. With safety as one of Xantrex's key objectives, the company explored the various lithium chemistries out there. Tesla, for example, uses nickel cobalt aluminum (NCA). Another common one in the automotive industry is nickel manganese cobalt (NMC). The problem with both of these is that cobalt is very volatile and can thermally run away and potentially explode.

Xantrex chose to go with lithium iron phosphate (LFP), a much more stable and safe chemistry. The trade-off is that while NCA and NMC are more volatile, they also pack more power and therefore are the choice for automobile manufacturers that want to maximize the driving range for their electric cars. Xantrex's LFP batteries were the first and



Developing and testing new products are done in house. Most Xantrex products are customizable to suit OEM customers' specific applications. The company's Highly Accelerated Life Testing system puts new products through a battery of tests, including rapid temperature increases along with vibration and shocks.

Xantrex photos by Peter A. Robson

INTERNATIONAL SECTION 2020



Director of Engineering David Miller (right) says the goal of the testing program is to produce products that won't fail for their entire working lives: "We want to test our new products to the point where they fail, then find the weaknesses and replace those components that aren't up to snuff."

Marketing Director Mitul Chandrani (left) emphasizes the importance of understanding inverter surge ratings. Rather than simply reading a label that may indicate the inverter is capable of handling twice the rated output, a customer needs to ask how long it can handle a surge. Many lower-end inverters are limited to 200-300 milliseconds.

only in North America to be certified under UL1973 (the battery safety standard for mobile applications).

Another well-known advantage of lithium batteries is their useful energy. Xantrex's batteries are the same physical size as equivalent lead acid and AGM batteries and have the same amp hour rating. However, a 100-amp-hour battery can only provide about 50 usable amps before requiring recharging

while a Xantrex lithium battery provides about 90% or more useful energy, essentially doubling the available amp hours. This makes it possible to run an inverter for a much longer time. Alternately, if a customer only needs that 50 amps, they can get a lithium battery that's half the physical size with the same usable power.

Together, the combination of solar panels, solar controllers, chargers and inverters and lithium batteries, all manufactured by the same company, means less chance of issues with connectivity. The entire system can work seamlessly.

Surge protection

One of the things that sets Xantrex apart

from less expensive inverters is their surge capability. Customers unfamiliar with chargers-inverters may wonder what the difference is between products. Why is one cheaper than the next? Most people understand you must pay more for quality, but there's another consideration.

"When most people go into a store looking for an inverter, they read the label," says Director of Marketing Mitul Chandrani. "In almost every case, the inverter label will typically claim that the product can handle surge demand to twice the rated output—1,000 watts can surge to 2,000 watts. That's what's on the box. However, the key question is how long can the product handle a surge? The

How the company was created

Xantrex was founded in 1983 as a DC power supply company in British Columbia's Greater Vancouver area. The company's transition into the world of single-unit inverter/chargers came about after their acquisition of four of the leading companies in the field: Statpower, Heart Interface, Trace and Cruising Equipment.

"These companies were pioneers in the field in North America in the late 1990s and early 2000s," says Mitul Chandrani, Xantrex Director of Marketing. "They were the first to combine battery chargers and inverters into a single 'box' for mobile use." The company's first recreational inverter/charger combination unit was called Freedom, introduced in 1992. The marine version, called Freedom Marine, was the staple of the marine industry for two decades until replaced by its successor, the Freedom SW. "This meant owners of boats and RVs were not tied to household sources of AC power at docks or campgrounds. They could now plug in their AC appliances when out cruising or on the road." The Freedom series has evolved over the past 29 years and is available in a variety of models.

In 2005, Xantrex went public. Their goal, according to Chandrani, was to be able to grow the company, develop new products in the mobile environment and expand their footprint in the renewable energy space. Chandrani explains that one of their early successes was a revolutionary new product series called GT. "It was one of the first residential style of inverters to convert solar power from DC to AC."

In 2010, Xantrex was acquired by Schneider Electric, a huge European multinational energy company. They were looking to expand their renewable energy business, which was exploding around the world at the time and they knew that Xantrex was well positioned in the field. While Schneider had their fingers in pretty well everything electric, including utilities around the world, they didn't have a renewable portion that would allow them to offer their off-grid customers a full range of products, including those for power conversion, for large solar farms.

While the main focus was now on the renewable side, the mobile division was a constant and steady business for Schneider. It was well established and dominant in the heavy-duty truck and RV OEM market, as well as marine.

In 2018, Xantrex was acquired by Mission Critical Electronics, a company made up of many well-known brands in various markets. The company offers (among other products) electronic power products for fire trucks, ambulances, commercial marine boats and other emergency and specialty vehicles. Mission Critical wanted to establish their foothold in the leisure marine, RV and heavy-duty trucks to expand their reach into related markets. Instead of starting from scratch, they looked for an existing company that could meet their needs. Xantrex, with its suite of power conversion, solar and battery products, was a perfect fit.

Freedom SW or the newly introduced Freedom XC PRO can surge to full five seconds or more. Many cheaper inverters are known to surge for 200-300 milliseconds only. And these cheaper brands don't specify the duration of surge in their advertising."

Integration trends

Embracing the popularity of onboard integration of devices, Xantrex supports the use of one multifunction panel to control battery charging, the inverter, solar control and charging and so on. This is one of the key projects that Shuen and Director of Engineering David Miller are working on.

"Connectivity is one of the big trends we're seeing in the world and not in just our industry segment," says Shuen. "Every industry segment has moved to integrated user interfaces. In the marine world, we've got systems from companies such as Maretron and Garmin that can see everything and control everything and allow a single user interface with all the pieces integrated and talking to each other through that single panel rather than having so many different gauges and readouts. In the marine world, that communications protocol is NMEA 2000®. While dedicated remote display panels are available for most of our products, our newer products such as the Freedom XC Pro series inverter/chargers have an integrated communications box that can talk to and display information on the Maretron and Garmins of the world through a simple NMEA 2000 connection."

"There are 20 or 30 different things you can find out about your inverter," adds Miller. "Voltage output level, pulse, battery voltage, everything you could see on the actual inverter/charger display itself, you can now see through these integrated display panels, as well as on the actual unit. Many of our products have Bluetooth connectivity to mobile phones and can display the same information."

Integration of multiple charging sources is also occurring and is growing more and more complex. "It is Xantrex's goal to provide customers the freedom from worrying about how everything fits together," says Shuen. "If you're parked, you can likely plug into shore power. But with solar panels, they can charge batteries at any time the sun is shining. When cruising or driving from point to point, the engine alternator will provide charging. Same goes for when you run a generator, though one goal of Xantrex is to provide solutions that reduce or eliminate the need for a gener-

ator. When these various charging sources are tied to powerful 600 amp-hour lithium batteries that can store the energy, the consumer can significantly extend the amount of time away from shore power.

Custom OEM options

Providing customization as opposed to simply producing one-size-fits-all off-the-shelf products is another area where Xantrex is increasing its footprint within the OEM market. "We customize our solutions. You won't find many of our products that we produce specifically for OEMs in the aftermarket or mentioned on our website," says Miller. "They are strictly designed for an OEM to meet their engineering standards. This applies to batteries, solar panels, power products.

"Most of our products are configurable. For example, if an OEM wants an 1,800-watt inverter and we don't make one, we can program an existing inverter to produce 1,800 watts or whatever the OEM requires. We can also program when to cut off the inverter from the batteries and give the customer an alarm at whatever point the customer requires. We don't need to change diodes or design a new product or make a new box—things that take a lot of time. We can preconfigure it in house or tell the customer how to program it on their assembly line. Ultimate flexibility is the goal."

When it comes to solar panels and lithium batteries, they can allow an OEM to significantly reduce the size of the generator or, depending on how long a customer is going to be out on their boat, eliminate the generator completely. While solar panels and cells traditionally were available only in limited sizes, they can now be customized to size and output wattage for OEMs and be placed where normal panels would not fit. Also, the increasingly compact chargers/inverters make installation in tight spaces much easier.

"The ultimate goal for us," says Chandrani, "is to create a satisfying customer experience so that when they use their boat or RV, they can go about everyday life and turn on the microwave or air conditioner and not worry. We want to make sure our products provide that experience so they can say I had a wonderful vacation and never had to worry about the inverter and charger. The user doesn't generally care what product they have, they just want to be able to do everything they could do at home. If your inverter trips out at the start of your vacation and you don't know how to reset it, your vacation can be ruined. That to us is very important." **MEJ**

Putting products to the test

In the mobile environment, it is vital that electrical components can handle stresses such as shock, vibration and extreme temperatures without failing. Xantrex takes reliability to the extreme with their Highly Accelerated Life Testing (HALT) system. It serves to validate new designs through specialized equipment such as thermal testing that can ramp up temperatures rapidly between -40°C and +85°C to thermally stress components and mimic conditions in which Xantrex products are used.

New products are also subjected to vibration and shock testing for long periods to make sure nothing loosens or breaks. "If things break, we make design changes to make them more robust," says Director of Engineering David Miller. "We want to test our new products to the point where they fail then find the weaknesses and replace those components that aren't up to snuff. We continue to test until we get a product that won't fail for its full life."



With an eye to the ever-expanding integration of onboard devices, the company supports the use of a single multifunction panel to control battery charging, the inverter, solar control and more. Albert Shuen, Director of Product Management, says newer products like their Freedom XC pro inverters/chargers can talk to and display information on Garmin, Maretron and other brands via NMEA 2000.

About the author

Peter A. Robson is an editor and writer based in Vancouver, BC. His work regularly appears in marine and other publications in the US and Canada.

In the UK

New propulsion systems help expand electrical training

Electrical training for marine technicians in the UK continues to make great strides. In addition to technical courses developed by the British Marine Electrical and Electronics Association (BMEEA) are comprehensive electrical curricula offered by various colleges that are focused on the marine trades.

BY JIM FULLILOVE, *Editor*

Part of the need for additional training is the growing popularity of electric and hybrid electric propulsion systems on vessels. BMEEA is expanding the guidance for marine electricians regarding how to integrate these systems on board and deal with the higher voltages they require.

“With smaller-scale electric drives on vessels, they’re not at normal voltages we expect. As soon as you go to high-power propulsion systems the voltages change,” says Jamie Marley, who owns Marine Electrification Solutions, Ltd., an electric and hybrid propulsion consulting and engineering company based in Christchurch, UK. He worked closely with BMEEA to help develop the training guidelines. “It’s more economical and efficient to run them at higher voltages and therefore we end up with DC voltages that we don’t normally see on vessels. It’s important to understand how to safely integrate these systems into vessels.”

Marley explains that in most cases marine electricians would be trained in 12, 24 and 48



Marine electrical specialist Jamie Marley has helped BMEEA develop training guidelines. He says that higher-power propulsion systems have meant working with systems that are in the 400-volt neighborhood. Several years ago there was no training for this power range that was specific to marine use.

voltages. “For the past five or six years I’ve worked with systems that are around 400 volts DC,” he says. “At the time there wasn’t any training for this specific to marine. I had to come at things from the AC point of view and bring some of the common best practices and safety concerns—you have to be very aware about what you’re dealing with as far as DC voltages.”

(Continued on page 58)

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Palladium Technologies

Palladium Technologies plays in the very rarified world of top-end megayachts. Based in Ft. Lauderdale, FL, the global company has created and provided sophisticated integrated monitoring and control systems (M&C) since 1991. Included in that portfolio are IT, AV entertainment, cyber and ship security, lighting control and monitoring/ alarm systems, along with glass bridge design and turnkey electrical systems for the entire vessel. At the heart of some of these innovative systems is the application of AI (Artificial Intelligence) and AR (Augmented Reality).



Mike Blake

In 10 years' time, "I see boats being much more mechanically sound because they're monitored 24/7 remotely—the boat will be ready when you get there using your smartphone."

Powering M&C to the next level and beyond

If you've gone to major boat shows or METS over the years, you've undoubtedly seen Palladium Technologies' SIMON on display, which got its launch more than 20 years ago. Today's version—SIMON X-AMS (Alarm Monitoring and Control System), steps up its game with improved graphical user interface and support for 4K ultra high-resolution displays, among other advancements.

BY JIM FULLILOVE, *Editor*

More recently minted is the Titan automated electrical distribution system, which replaces traditional large electrical breaker distribution panels with multiple smaller remote-controlled and monitored panels set up with hydraulic magnetic Octoplex breakers from partner Carling Technologies. This reduces cable runs and also vessel construction time because sections can be prewired with the remote breaker panels.

We sat down with Palladium founder and President Mike Blake to learn more about Palladium's approach and get his take on topics ranging from automation to hybrid electric systems.

Based on conversations I've had with marine electronics people over the years, and from your website, it's obvious that Palladium is involved in a number of cutting-edge technologies aboard high-end yachts. How do you describe what Palladium does?

Mike Blake: We're a technology solutions company, not an AV or IT company. Our sweet spot is yachts 70 meters and above. The largest we've done is 164 meters, which is the second largest yacht in the world. Other projects we're working on are about 140 meters.

We start with a conceptual design—some of our proposals go over 200 pages. If accepted we move to engineering. Our CAD team and electrical engineers develop installation and support drawings. Purchasing gets involved to order parts, which come here—we have two other buildings across the street—and are crated and shipped. Everything is custom—there's no assembly line—and tested here. At the other end, the shipyard or other contractors build the foundations and cabinets, pull wire and install the equipment—we do the cable terminations and fire up the system to check it. We come back later for sea trials.

At the very high end of the yachting market, how do you go about finding customers or do they find you?

Mike Blake: Mostly everything we do is relationship. We can advertise but it's difficult to measure its effectiveness. It's more about relationships we've developed in the industry. In one case I have a relationship with a group in China owned by two Americans, Dynasty Yachts, which specializes in 70-meter-and-up yachts. That dovetails with CSIC [China Shipbuilding Industry Corp.], a very large shipyard that also builds nuclear submarines. We do all of the technology [on the yachts]. It's a difficult industry to penetrate at the very upper end. It takes a lot of time. When you do, the relationships tend to bring you into the projects.

Are the projects mostly newbuilds or refits?

Mike Blake: It's a mixture. The percentages depend on the economy. We do fewer larger yachts but the revenue is more. Some of the vessels are sail but mostly power. Titan is difficult

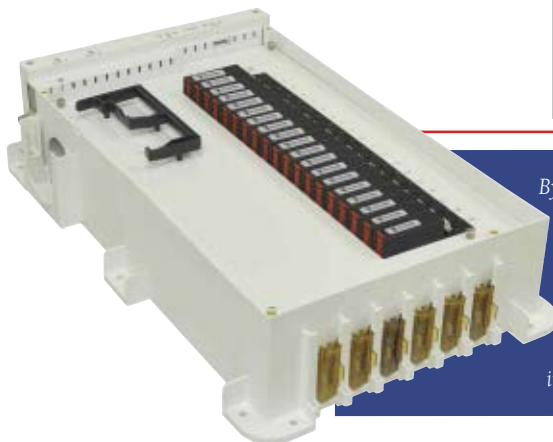
to refit into a vessel unless it's a conversion where it's totally stripped down. Otherwise it's too expensive to rewire.

I talked to Rick Sorenson of Carling Technologies several months ago about a partnership you two have struck to couple their Octoplex power distribution system with your Titan system. How's that going?

Mike Blake: Octoplex is targeted at smaller production boats but we found a way to incorporate it on our larger boats and found substantial cost justifications. That's a first for us because most of our projects involve emotionally driven needs (lighting, AV, security, etc.)—not financial. Fifty meters is about where we start. If the vessel is smaller the solution is probably Octoplex by itself.

Titan's 3D software allows you to see the entire electrical system and nodes, which I call Titan panels. We're able to monitor that and add AI into it to make it much more proactive to analyze loads and breakers that are tripping. There's a lot of information we can gather and make it very effective for engineers onboard. Installing the Titan system is less complicated than traditional installations because there's less labor involved.

With the Titan-Octoplex combination we can go into a shipyard and say I can save you this many tons of cable and installation costs—and save space, which is a big issue on yachts. Another benefit is dynamic monitoring of all breakers. You're not turning breakers on and off, which is the case on production boats. It's for circuit protection



By combining its Titan automated electrical distribution system and Carling Technologies' Octoplex system, Palladium Technologies can offer boat builders much lower cable and installation costs—along with space and weight savings. The combination also allows dynamic monitoring of all breakers.

only. One project we're working on is a 216-meter cruise ship that has over 1,000 Octoplex panels. If there are 10 breakers per panel that's 10,000 breakers.

We can locate the monitoring and control function in a small closed area in a cabin. In traditional systems, when a breaker trips it can take the engineer a while to find the right panel and reset the breaker. With our system they can click on the breaker and see photos of where it's installed along with electrical drawings of the circuit. We build a lot more information into our system.

Asia offers much greater opportunity for our system than Northern Europe, which is very conservative. When we showed it to some Chinese engineers they almost came across the table. They said, 'We need to do this!'

I believe that Octoplex for production boats and our Titan system for larger boats will become the standard.

How do you characterize Palladium's role in the evolution of onboard monitoring and control systems overall?

Mike Blake: We have a pretty high level of autonomy in the bridges we design—the Simon system, AV and IT systems, cybersecurity, lighting, an incredibly vessel sophisticated security system—all very high-tech.

One onboard system that has not been touched is the electrical side. The attitude has been, 'The old way worked, why change it?' The projects we're doing in Asia will give our approach visibility and show it is viable. Just like smart homes that allow you to do many functions remotely, the IoT (Internet of Things) can't afford to neglect the electrical system because it contains a lot of information—adding our AI makes it more of a live system. The last thing

you want is for the owner to come aboard and have something not work—this is part of the solution.

What is your working relationship with the yacht's crew regarding any technical issues involving your systems that may arise?

Mike Blake: We have a support agreement for the yacht 24/7. Most yachts are staffed with highly experienced and intelligent people. The largest yacht we deal with has four electronic technical officers aboard. When they can't resolve an issue, it's pretty serious and they call us. Ninety percent of the issues are resolved here but we'll send a technician there if needed. Our techs have to accept 80% travel time per year, but that varies.

Most superyacht captains come from the cruise ship/commercial industry, not the recreational side. The are highly licensed and the yacht bridges are very commercial. The captains rarely do any troubleshooting.

The largest yacht we've worked on has a crew of 107, including a huge engineering team. It's broken down into engineers who take care of the 12 diesel electric engines, a group that specializes in water makers, engineers that handle electrics, an engineer that deals with bridge electronics, plus security engineers and others.

How do you keep your techs up to date and proficient with the sophisticated technology that you put aboard megayachts?

Mike Blake: It's like a treadmill—every hour you're cranking up the speed. Technology is on an incredible exponential curve. To stay current most of our senior people are passionate about what they do here and don't shut down when they leave. We attend high-tech conferences and gather as much information as possible because we're putting together technology solutions. Our technicians must be highly versed in a lot of technologies.

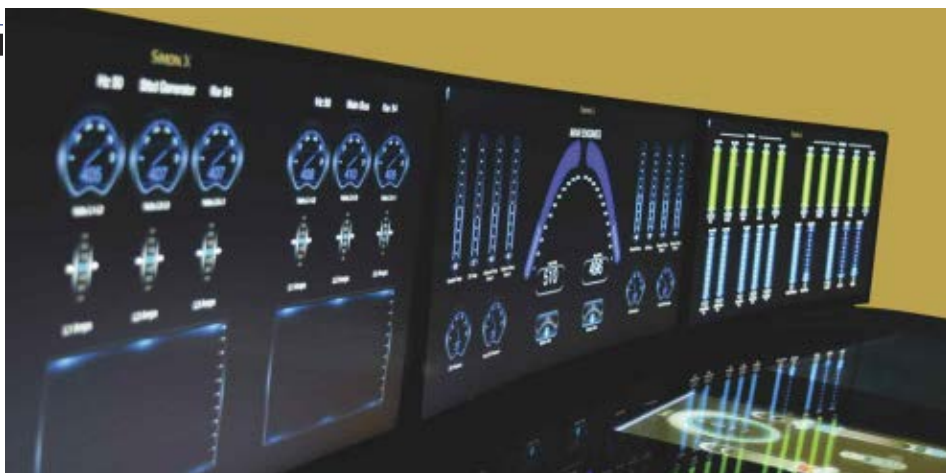
Compared to most techs, our group come to us at a higher level. Our team includes very bright electrical and electronics engineers and we also have people who have worked in the field. The

team has a solid foundation—they can get into details like harmonics and go deeper into some extremely sophisticated systems. We have a very good group of software people also—we've probably written a million lines of code.

Does Palladium's role include suggesting bridge electronics to owners?

Mike Blake: Sometimes—some of our projects are stem to stern, in which case we bring in other companies to do part of the installation of marine electronics—we know radars and chartplotters but they're not our forte. It's only the bridge electronics we don't get into—we do the rest.

The shipyard looks at us as a prime contractor. We have electrical managers on site to monitor the work. A big benefit of one company doing the work is that you can get the teams to resolve issues. Sometimes there are challenges if someone does the AV and we do the IT. It's a benefit for the yard also since there's only one neck for them to put in the noose if there's a problem.



Introduced more than two decades ago, the SIMON monitoring and control system now sports an array of advancements, including an improved graphical user interface and support for 4K ultra high-resolution displays.

One of Palladium's focuses is cybersecurity. Is there equipment or software that's effective in defending against attacks?

Mike Blake: We have applications and software we install that is AI driven. The only way to counter these attacks, which are also AI driven, is to have something that's a little more intelligent

second by second. Once they detect a pushback they morph and come at you a different way.

Attacks aren't coming from just VSAT. They're coming from within the vessel itself. Could be a crewmember plugging in a USB that's infected. You have to protect from that dynamically. We had an equipment vendor that was installing software. It had a virus that

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took important information off the boat.

Guests also come aboard with infected devices. You can't just look at a single interface to the internet. You have to look at every possibility because there's financial information and passwords on an owner's devices relating to their business that can be stolen. There's also listening devices that can be installed to listen to the conversations onboard by someone wanting to spy on the owner and his businesses. These we can capture by analyzing their RF footprint, and eliminate them before the information can be stolen.

We're connecting everything. On a large yacht we often put in 12 strands of fiber, each carrying 100 gigs of data. You can hack into a vessel's systems and shut down the engines, fire doors—everything.

We rarely see information about the number and severity of cyber attacks on yachts? Why is this?

Mike Blake: Two reasons—naïveté and people don't want to say 'I've been hacked into and lost \$20 million'—it doesn't look good to friends. We polled yachts last year—95% reported being unprotected and I think that's conservative. All of our yachts are protected.

What's the biggest challenge in making all of the equipment and systems work together?

Mike Blake: I don't know if there is one challenge. I'm very proud of our team—they make it work. Every project is a challenge, from mislabeled wires to equipment installed upside down or maybe we make mistakes here, but we're set up to solve problems. We don't have all the answers but we can get the right answers.

Do you work at all with NMEA 0183 or 2000? What about when OneNet is online?

Mike Blake: No. [Former NMEA Standards Director] Steve Spitzer asked me to review OneNet in the early days of its development. I was on the NMEA 2000 Committee. I think it's a big improvement over NMEA 2000, but we don't see those devices on the yachts we work on. We're dealing at rocket speeds rather than highway speeds. There's no need to wrap all our data into a protocol.

That said, we are using it with Octoplex, which is CAN bus NMEA 2000. We interface to the Carling PGNs through our higher-level controller. We do a bridge there.

At METS last year I noticed a lot of interest in hybrid electric technology among European boat builders and other companies. Is Palladium involved?

Mike Blake: All of our large newbuilds are diesel electric. There may be eight to 12 big diesel engines turning variable speed generators and delivering 10,000 volts to a DC bus, which powers the azipods. It's exciting because people are waking up to the benefits of diesel electric and demanding it.

Aboard our yachts we have a drop-down transformer that gives us 600 volts, which drives our house switchboard that goes to Titan distribution panels. From there it goes to 4-pole breakers, each driving 3-phase Octoplex panels with individual circuit breakers.

The diesel electric concept—or call it hybrid electric—works incredibly well. You get better utilization of those engines. You can run engines at just the load level you need for house and/or propulsion depending on needs. You can shut down the engines dynamically. For today's solution, that's the best. It's much better than the battery bank solution—a huge bank of lithium-ion batteries raises safety, protection, management and weight issues—that will change but I see li-ion technology as a stepping stone. Ultimately I'd like to see all fossil fuels removed from boats.

What's your take on autonomous vessels?

Mike Blake: A few years ago I gave a talk in Amsterdam to a group of captains. I told them that autonomy will

(Continued on page 58)



Blake says vessel autonomy is inevitable: Most of the technology already exists on bridges. In the years ahead the captain will become more of a vessel manager.

RTCM Report

(Continued from page 16)

MMSIs are provided by the Coast Guard through the pertinent USCG District Aids to Navigation Office via a USCG Private Aid to Navigation (PATON) application (CG Form 2554 or 4143) with USCG eATON Addendum.

Craft associated with a parent ship – 98MIDXXXX. These MMSIs are used by AIS or DSC-equipped radios used on launches, lifeboats, life rafts, rescue boats or other craft belonging to a parent ship. Unfortunately, no means currently exist for assigning such identities in the US. Shipowners have considered various workarounds, such as obtaining a second FCC ship station license for the daughter craft if the ship travels overseas, or obtaining an MMSI from BoatUS or USPS if it doesn't. MMSIs assigned in this way are registered and available to rescue authorities. Another shipowner, having a MMSI ending in three zeros, derived daughter craft MMSIs simply by dropping the last three zeros, adding "98" to the beginning, and adding an identifying digit to the end. MMSIs derived in this way would be unrecognized by rescue authorities, and MMSIs ending in three zeros are no longer being assigned by the FCC.

RTCM raised these and related MMSI problems in its Part 80 petition submitted to the FCC four years ago, and these are also being addressed

it in RTCM's periodic GMDSS Task Force meetings. This problem, however, remains unresolved.

VHF handheld MMSIs – 8MIDXXXXX: These MMSIs are intended for DSC and global navigation satellite system (e.g. GPS) -equipped VHF handhelds used in the maritime services with boats, but not necessarily on a specific boat. They are only available for VHF handhelds, not AIS nor VHF fixed-mount units.

VHF handheld MMSIs are not yet available in the US. RTCM and the Coast Guard, with FCC permission, have been working with BoatUS and USPS to consider assigning and registering these types MMSIs. Those wishing to travel overseas with their VHF handheld, for example a diver's radio, will first need to get it licensed and a VHF handheld MMSI manually assigned by the FCC.

Search and rescue transmitters (SART) – 970XXYYYY

Maritime survivor locating device (man overboard) – 972XXYYYY

EPIRB-AIS – 974XXYYYY

AIS-SARTs, MSLDs meeting RTCM 11901 and 406 MHz EPIRBs meeting RTCM 11000.3 standards use these identities. Identities are encoded by the manufacturer before sale, but not registered. "XX" identifies the manufacturer and "YYYY" is a sequential number. The International Association for Marine Electronics Companies (CIRM) has been working with ITU to address the depletion of manufacturer identities used in this identity.

Maintaining an MMSI registration database

Coast Guard search and rescue watchstanders have often complained about the hours spent researching and responding to each unlocated DSC distress alerts coming from boaters who do not have a registered MMSI or who have not maintained that registration. MMSI registrants often ignore emailed reminders to update information, and FCC licenses' 10-year renewals create their own problem. Roughly half of DSC distress alerts reportedly contain one or another registration error hindering RCC response. FCC has indicated that corrections can be made anytime to ship station license information at no charge, and in so doing, corrected MMSI registration information will be sent to both the ITU and Coast Guard.

RTCM will continue addressing problems like these as long as they hinder safety of life at sea. **MEJ**

About the author

Joe Hersey is former director of the US Coast Guard's Spectrum Management Division. Among his many appointments over the years, he served as technical advisor and administrator of the US National Committee's technical advisory group for TC80, the International Electrotechnical Commission's committee for maritime radiocommunications and navigation equipment.

Autopilot Troubleshooting (Continued from page 32)

During a sea trial we confirm rudder center on RAI by steering straight with motors synced, minimizing weather effects. Confirm compass accuracy by using a known reference or comparing to GPS COG (Course Over Ground). Remember to account for local variation, know the difference between true and magnetic north. Check the compass every 15 degrees around the rose to detect deviations caused by magnetism on board the vessel.

Autopilot training

Three years ago, Kevin Boughton, who is NMEA's Education Chairman and a Board of Directors member, wrote an autopilot training curriculum. Originally, this presentation was given as a training track during the annual NMEA Conference & Expo. Since then, it has been further refined and improved and is an excellent half-day class. This training is different than any other training the NMEA has done before in that it is a single subject that is

dealt with in more depth.

The focus of our MEI (Marine Electronics Installer), Advanced MEI and NMEA 2000 Installer courses is understanding and adherence to the NMEA 0400 Installation Standard. AMEI covers autopilots this way. As our offerings expand we can focus more on industry best practices, installation techniques and troubleshooting. An autopilot can be installed in accordance with all standards and rules and regulations and still not work. The NMEA continues to train technicians and installers worldwide to further the NMEA mission.

As I said in the introduction, marine autopilots are one of the most desirable additions you can make to a boat—but it is also one of the most complex. I see many different levels of performance in autopilots because they are so finicky to install and calibrate. Boats steer very differently and conditions vary widely. Getting everything right on the

installation is a start, but calibration is still essential. From cruising speed to maximum rate of turn, a boat's steering system defines how well a boat steers for a person or an autopilot. Always make sure the steering system is 100% before installing or troubleshooting an autopilot! After all, staying on course is in everyone's wheelhouse. **MEJ**

About the author

John Barry owns Technical Marine Support Inc. in Pleasant Prairie, WI. He is a CMET and holds both FCC GROL with Radar Endorsement and GMDSS Maintainer's certifications and regularly instructs NMEA technical courses. Barry also writes MEJ's Tech Talk column.

CMET Kevin Boughton of Midcoast Marine Electronics in Rockland, ME, contributed significantly to this article. As stated earlier, Boughton is the author of NMEA's dedicated autopilot training course.

STANDARDS UPDATE

(Continued from page 14)

OneNet IPv6 adoption

This feature brings mobility to center stage. Many of you understand the growing limitations of IPv4. This problem will now dissolve for any new marine electronic device that supports the OneNet protocol. Aside from the possible undecillion address range, IPv6 security is mandatory and is customized within the security section of the standard.

OneNet pairing key

OneNet has a security feature for pairing mode (similar to bluetooth pairing but over Ethernet). Before a OneNet device can connect to another, dialog occurs to guarantee the certified device is working with another certified device.

NMEA 2000 messages over OneNet

Yes, that is correct. NMEA 2000 data messaging we have come to rely on can now be sent via OneNet in a standardized manner. The benefits include multiple independent NMEA 2000 networks can become one. MFDs become the bridging apparatus, creating the possibilities for a centralized processing center for all boat sensors and controls.

We will probably see the first OneNet devices natively converting NMEA 2000 to OneNet as gateways and bridges. Next to show up will be sensors that provide innovation for safety, security, monitoring and control. We will find new ways to read, store and analyze information, and have data at our fingertips. For each day that passes, low-cost global internet becomes a reality, and OneNet could be the protocol to deliver commercial-grade solutions through this medium. Now manufacturers will be able to build easily replaceable devices, requiring minimal configuration, including remote support.

Your 2021 OneNet Committee and working group volunteers are led by Gary Kessler, a maritime cybersecurity subject matter expert. The OneNet Committee will be brainstorming the next version of OneNet to answer all of our industry's needs.

We always welcome new volunteers and academics who can help improve this standard for the betterment of all. New NMEA standards development will consist of smaller workgroups, flexible collaboration, and reduced travel requirements. NMEA feels that these changes will help increase the efficiency of our standards development cycles. We are actively seeking individuals who have an interest in participating with standards; we only require that you sign an NDA (non-disclosure agreement) and a Copyright Assignment document. NMEA is happy to answer any questions you might have about getting involved with our standards!

BUSINESS SENSE

(Continued from page 38)

emergency. If you need to obtain a revolving credit or a line of credit inquire long in advance before you need it. This process can take a long time and you may have to check with more than one financial institution. Working with a smaller local financial institution is often the best for small business. These are people from your community who will often understand your business and be more inclined to help compared to large national operations.

Reach out to suppliers and let them know you would like to discuss your relationship and possibly payment terms. Maybe you can extend your terms, maybe you can return unsold inventory, maybe you can drop-ship to your customers instead of warehousing the products. There are many options a dealer and supplier may be able to arrange that can help in tough economic times.

Talk to your employees. If you are over-staffed for the current level of revenue, start by asking for volunteers willing to take a day or week off, staggering the workdays of staff while providing normal business hours with reduced capacity. There are many creative ways that are worth a try to restructure your labor force before starting a layoff or firing.

Care for your employees and customers

When things get tough your business may need to make drastic changes to stay afloat. Discussing ideas and keeping employees in the loop are good ways to maintain loyalty. Often, employees hear and see more about the company's operations than do some managers. These keen employees may have viable ideas that can help in tough times.

Your customers are the number one reason why you are in business. You will need to

keep them up-to-date on changes to your business operations. Customers are much more understanding and often willing work with you if they are kept in the loop.

Over-communicate with your customers in trying times! Customers may be questioning every purchase with your company, past present and future. Studies show that more than half of customers that leave existing suppliers do so due to a feeling of indifference. An economic emergency is complicated for all of us, so be sure not to complicate the issue any further with your customers.

Personalized and signed written letters to your customers are always received more favorably than bulk emails. Make a phone call to your customers. In these days of electronics communication it may come as a surprise that you are calling, although it is a good way to follow up other forms of communication such as a written letter or personalized email. Though it may be difficult, a face-to-face greeting is one of the best ways to communicate with your customers. If this is not possible (in the case of social distancing) find out if you can schedule a video call with your customers. Working with these communication tools opens a dialogue for both parties and can often lead to additional business for your company.

Successful businesses have weathered tough economic times in the past (as recently as 2008), while the recent unprecedented global pandemic has put us all to the test. Today's successful businesses have re-engineered themselves to adapt to the current times and have been able to weather this storm and support their employees and customers.

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ED'S ELECTRO-TECH TIPS *(Continued from page 35)*

Regarding pertinent safety information, the onus is on the battery manufacturer to provide a comprehensive list of safety information. The details are outlined within TE-13.

The matter of thermal runaway

You would have to have been living in a far-away monastery for the last decade not to have heard the term “thermal run-away” relative to Li-ion batteries. The appendix for TE-13 does a good job of explaining this phenomenon. Essentially, the report puts the onus on the battery manufacturer but centers the thought process on two key areas:

1. Additional protection for the boat in the event the various battery protection mechanisms fail and a thermal runaway event occurs, and
2. External heat sources that have the potential to initiate a thermal runaway in the battery.

Understand this, conventional fire extinguishing systems WILL NOT extinguish a Li-ion thermal runaway event! I know of one high-end boat builder that apparently thought otherwise and installed a conventional auto extinguishing system. When a battery charger failure induced the runaway, the boat burned to a total loss! TE-13 advises consulting closely with the battery manufacturer about this and the design of the battery storage compartment. My recommendation is to follow the advice to the letter and document any correspondence for your records. This is an area where photographic documentation of the entire system installation is prudent in the event of a failure and fire.

In closing

We're entering a wired and wireless, lithium-powered world on boats as I look forward. Much of this is to satisfy customer demand and/or perceived needs based on

areas outside of their boating lives—their car, their home, crips, even their lawn mower! As field technicians we are more and more going to need standards to guide us and help us avoid liability situations. Consider this short synopsis of these selected standards and Tech Info Report just that, a short overview.

My best advice is that if you find yourself involved in any of the areas mentioned here, get the latest copy of your ABYC standards and have the entire standard available for reference. The ABYC has made this easy and available online, so there are really no good excuses for not using the advice these documents provide.

MEJ

About the author

Ed Sherman was Vice President/Education at ABYC—the American Boat & Yacht Council—for many years. He has also written several books, including the ABYC Electrical Certification Study Guide and Powerboater's Guide to Electrical Systems, along with numerous technical articles.



Canadian Connections

(Continued from page 44)

a large dealer network, good presence in all the major centers. We do a lot of shipping from Canada and work well with electronic dealers and installers around the country.”

Octopus Autopilot Drives

The parent company of Octopus Autopilot Drives is the CMP Group, a leading producer of marine anodes. The CMP Group is made up of other well-known brands, including Titan Marine Products, Marine Tech Products, Dock Edge+ and the Rocna and Vulcan line of anchors. Head office for the CMP group is in Delta, just outside Vancouver.

Gary Notenbomer handles aftermarket sales of Octopus for the Americas and Australia. He is also the Canadian marine distribution Sales Manager for the CMP Group. Notenbomer explains that CMP's experience with manufacturing die cast nonferrous metals, CNC machining, metal stamping, metal fabricating and its production capabilities for both metal and plastics meant it was not much of a leap to modify their tooling to be able to

manufacture pump housings, manifolds and other steering components at their Delta facility. The purchase of Octopus 15 years ago merged well with the company's extensive engineering resources and metallurgical testing laboratories.

Like other Canadian companies we talked to, Notenbomer says that the people are the main reason that keeps Octopus based in Canada. “We have a very talented knowledge base here. All the design and engineering, all the capability, it's all here. It's a technical product compared to pouring an anode. To us, the knowledge base is more important than anything.”

When it comes to manufacturing, 90% of Octopus Drives components are built and assembled in Canada. All of Octopus's North American products are distributed through warehouses in either Vancouver or Suffolk, Virginia. “Even though it's all made here, we keep a full inventory in Virginia,” explains Notenbomer. “This is really important for the Octopus products as they are closer to our major market and it makes it easier to ship and to reduce lead times. Fortunately, there are no cross-border issues that impact shipping between our two countries.”

Xantrex

Since its beginning in 1983, Xantrex Canada ULC has become a dominant player in

the power conversion market for battery chargers, inverter/chargers, solar panels, solar controllers and lithium batteries. Xantrex is owned by US company Mission Critical Electronics. Although headquartered just outside Vancouver, 90% of Xantrex's business is in the US. Despite this, the company's product design and engineering have been headquartered in BC, where it currently employs 45 people.

“In the Mission Critical world, Burnaby is the center of excellence,” says Mitul Chandrani, Xantrex's Director of Marketing. “We're not just designing and engineering for Xantrex, we're also designing and engineering similar core products for our sister US companies, such as Newmar, ASEA Power Systems, Kussmaul Electronics and Purkey's Fleet Electric.” The majority of Xantrex's manufacturing takes place in Asia, though the parent company also has assembly plants in California, New Jersey, Arkansas and Georgia.

Chandrani doesn't feel there are any disadvantages in being a Canadian company dealing primarily in the USA. “We have US-based sales offices and our warehouses in the US, and because Xantrex is such a strong name in North America, we don't have any issues at all.”

(For more information about Xantrex, see the profile on p. 45).

Cheryl E. Richards *(Continued from page 21)*

Cheryl and Mark enjoyed motorcycle touring and traveled most of the US. They also enjoyed scuba diving while traveling to Caribbean and Hawaiian destinations. During the last decade they traveled in Europe, concentrating on Italy. Cheryl loved her dogs and left behind Ginger (Vizsla) and Freya (Weimaraner)

She was one of five children—she had one sister and three brothers. Cheryl had six nieces, including Beri who was with Cheryl and Mark during Cheryl’s last days at home.

Due to the current pandemic, the family will schedule a celebration of life next year. Cheryl would want nothing more than for all us to remember her as a light that will forever shine.

In lieu of flowers, your thoughts and kindness would be truly appreciated through:

- Clark County Food Bank: In memory of Cheryl Richards, Clarkcountyfoodbank.org
- Congregation Kol Ami, Endowment Fund: accounts@jewishvancouverusa.org

George E. Lariviere *(Continued from page 21)*

RTCM presented him with the Chuck Husick Memorial Award “for outstanding contributions to the marine industry and safety of the boating public through advocacy of marine radio and electronic navigation systems.”

Throughout his career, George was always dedicated to improving safety for the men and women who worked in the marine industry and the boating public. His presence in the marine industry will be greatly missed.

George is survived by Charlene, his wife of 59 years, son Edward Mark Lariviere and his family, daughter Lynn McLeod and her family, brother Larry, sister Wilda Southard, along with two grandchildren and two great-granddaughters. He was pre-deceased by two brothers, Jean and Ray.

Please consider a contribution in George’s memory to the Special Olympics of Maine, 125 John Roberts Rd., Ste. 5, South Portland, ME 04106.



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In the UK

(Continued from page 48)

Historically in the UK, much like the US, the marine electrician and electronics trades overlapped so that one person handled both. Today they are separate disciplines, as are the education and training courses offered by vocational colleges. Electrical training can involve a few years of formal classroom instruction combined with skills development served up apprenticeship style, splitting students' time between classroom instruction and employment at a marine business.

BMET

A central component of the overall effort is a national qualification created by BMEEA called British Marine Electrical Technician—BMET—for the installation and servicing of electrical equipment. In addition to providing the training and testing for a BMET qualification, the association also offers the Marine Electronics Installer (MEI) and Advanced MEI programs developed by NMEA.

The BMET curriculum is a two-day session that provides the skills needed for installation and maintenance of electrical equipment and systems on boats. Coursework is aimed at individuals with at least one year's experience in marine electrics. It is based on the BMEEA Code of Practice, which is the industry-recommended standard that is directly applicable to UK marine electrical systems.

The curriculum also adheres to appropriate ISOs (International Organization for Standardization) and the UK's long-standing Recreational Craft Directive. Created many years ago and modified in 2003, the European Union directive established minimum technical, safety and environmental standards for boats and personal watercraft from 2.5 to 24 meters along with marine engines and components built since 1998. It ensures the suitability of these items for sale and use in Europe.

BMET candidates are trained in AC and DC circuits, circuit diagrams and standard conventions, test and measurement equipment, generators, motors, distribution systems, batteries, charging systems, cables and terminations along with health and safety.

BMEEA trainer Richard Broden-Crowell provides instruction at The Marine Technology Centre. His experience includes years as Managing Director of Sure Power Marine and working with marine companies in addition to a college instructor teaching boat electrics. Broden-Crowell also instructs the MEI and AMEI courses.

Palladium Technologies

(Continued from page 52)

occur—we have most of the technology on bridges now—and that the captain will be more manager of the boat. I expected to be stoned. Instead there was interest, although I thought autonomy would occur sooner than they did.

■ **So with all of the advances—AI, AR, autonomous monitoring & control, full connectivity and so on—how do you envision yacht operations in 10 years?**

Mike Blake: I see an owner driving to the marina and hopping into the boat and sitting back and enjoying it like you should—not having to deal with all the issues involving a lot of crew, for instance. I see boats being much more mechanically sound because they're

monitored 24/7 remotely—the boat will be ready when you get there using your smartphone.

A yacht is an escape. Why would an owner want all of the complexities of a crew onboard, and captains who are human and can make mistakes? If you had the knowledge of all of the captains in the fleet—that's the AI side of it—the probability of mistakes is much less.

Same on the service side—I see it going a lot more to robotics. We see it today. We can give consistency to owners, family and guests by AI learning the nuances of everyone onboard, so when they come aboard they always get that martini exactly like they want it and the food is impeccable every time.

TECH TALK

(Continued from page 36)

bearing pulse generator. The symptom "Paints Targets in Wrong Direction" is more likely the heading pulse reed switch. Optical bearing pulse generators are susceptible to debris or moisture blocking some of the holes in the interrupter card. This causes a one-shaped blank spot.

Network issue

Manufacturers are pretty good at troubleshooting radars. When seeking assistance, make sure you have tried the easy stuff. "No Radar Detected" on the screen means a network problem and the manufacturers do this differently. Sometimes a call to tech support can resolve this, but always read the installation instruction carefully if a radar does not show up on the network. Sometimes a restart, a software upgrade or a menu setting is all you need to do. If the problems persist, use some of the tried-and-true troubleshooting methods: What does work? Did it ever work? Simplify the system to just a display and radar. Make close and repeatable observations. Understanding how something works is the key to understanding why it does not work.

Radar troubleshooting is best left to the pros. Understanding how it works helps eliminate the easy ones like weak targets that just need operator training to resolve. This topic is deep and whole books can be written about it.

Hopefully this discussion helps the curious understand what is happening when you run a radar. Repeating what I said earlier, always tell your customers to use their radars in clear conditions and often so that when (not if) the radar becomes an essential safety device, the operator can harness it. Stay safe with radar!

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