

# MULTI FUNCTION DISPLAY **SHOOTOUT**

## **FURUNO CONNECTIONS**

*Head to Head Comparison of Furuno vs Other Brand Marine Electronics including MFDs, Overall User Interface, Navigation Systems, GPS Chart Plotters, Radars, CHIRP Fish Finders, and Side Scan Sonar for Boats.*

### **SEASON 2**

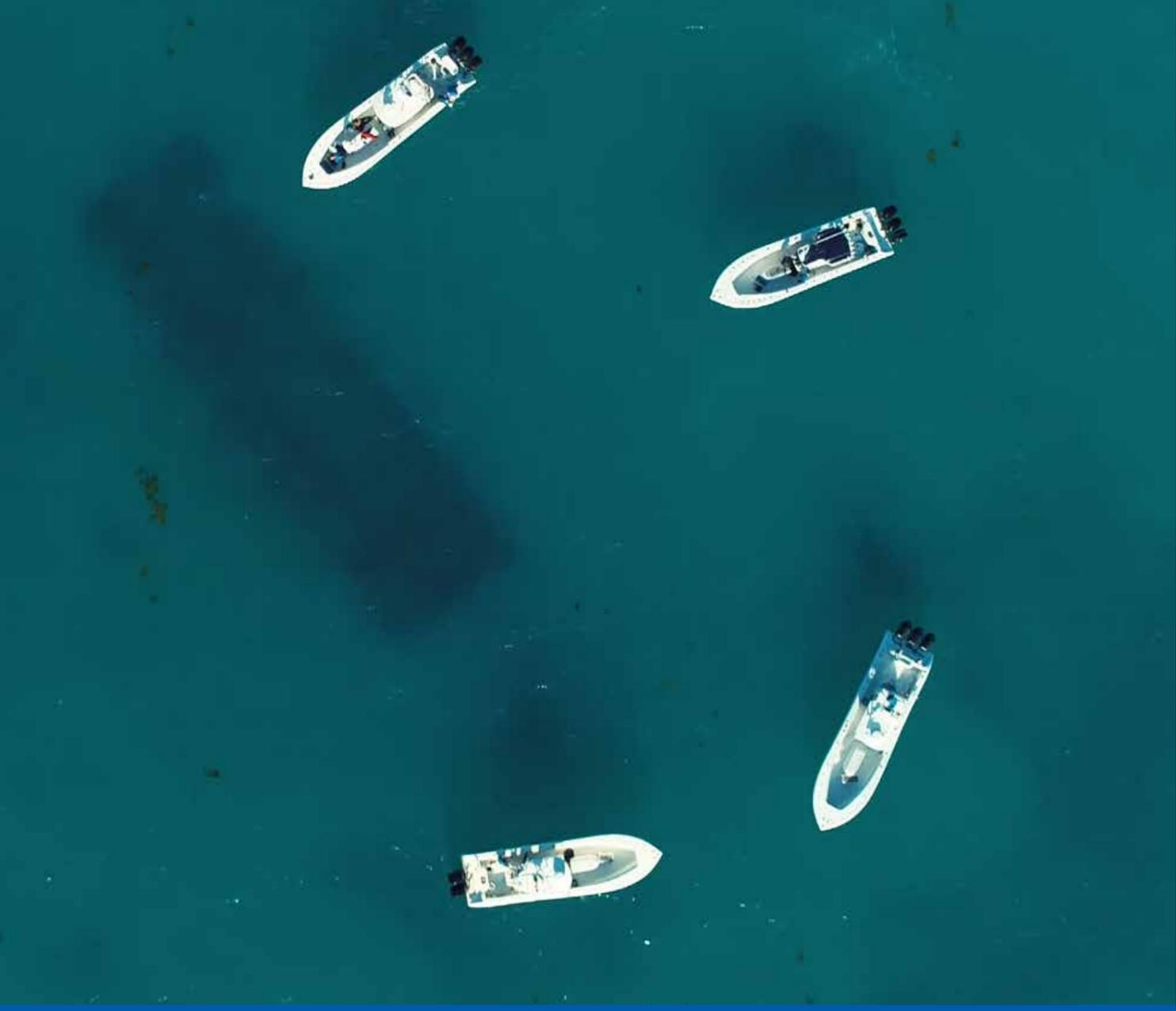


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**FURUNO**  
CONNECTIONS



**We would like to make it clear from the outset that the systems tested are all quality products, which is why they were chosen for this product comparison. To ensure as unbiased a comparison as possible, we went to great lengths to provide a level playing field for our tests, and to solicit honest feedback from our captains and crew.**

**In early 2020**, Furuno USA embarked upon an ambitious project never before undertaken in the marine electronics industry; a side-by-side product comparison of our flagship NavNet TZtouch3 Multi-Function Display system with comparable systems from our three largest competitors.

We began by purchasing complete systems from a major retailer, making sure that each of the systems we tested was operating with the current software available. The systems were installed on four similar Yellowfin center console vessels, each captained by an experienced navigator and fisherman, and all of the tests were performed using the 'out-of-box' default settings. For the Fish Finder tests, each system used an identical Airmar LH275W transducer, and for the Radar tests, we used similar Solid-State Radar Domes from each manufacturer, mounted in the same location on each of the four test vessels. The tests were conducted over 4 days in locations around the Florida coast selected to meet the appropriate conditions for each test.

Because our intention is not to 'single out' any manufacturer, throughout the video series and this document we refer to the competitive packages as "System A", "System B", and "System C". We taped off the names and logos of the manufacturers on their respective MFDs and Radars before filming, and blurred any logos or trademarked names wherever possible.

Each system was put through a series of tests that were designed to be easily duplicated across each of the different platforms. The tests were conducted by knowledgeable Furuno technicians with the assistance of the experienced captains aboard each vessel. The tests were recorded and the results revealed in Season Two of our web series, Furuno Connections, and are presented in this document formatted into easy-to-read tables where possible, supplemented by video and screen captures, and the comments of the captains themselves. Furuno paid for the use of the boats and crews, and requested candid, unbiased feedback, both positive and negative, on each of the systems, including our own.

# MFD Shootout

In Season Two of our video series Furuno Connections, the crew from Furuno Marine Electronics purchased and installed comparable Multi Function Displays with built-in CHIRP Fish Finders as well as Solid-State Dome Radars from three top competitors, with the intent to put them through their paces in an on-the-water, head-to-head competition against NavNet TZtouch3. To accomplish this, Furuno enlisted four of the captains from Two Conchs Sportfishing Charters as test boats. Each of the four Yellowfin center console vessels installed a complete marine electronics package from one manufacturer, and over the course of five days, each of the systems was put through their paces. All of the tests were documented and compiled for the documentary-style second season of Furuno Connections. The goal of this report is to provide a summary of the results of those tests in an easy-to-reference format.

You can view all of the tests in their entirety on our YouTube channel at:

<https://www.youtube.com/playlist?list=PLNAnyrS0eNSzW0sbrm4aAD08TBSf0lp4Q>

## SERIES COMPARISONS:

- ✓ *Comparing the User Interface (UI) for ease-of-use and intuitive operation*
- ✓ *Comparing the features, functions, and performance of built-in CHIRP Fish Finders*
- ✓ *Comparing the features, functions, and operation of the Chart Plotters*
- ✓ *Comparing the features and performance of Side Scan Sonar units*
- ✓ *Comparing the features, functions, and sensitivity of Solid State Dome Radars*
- ✓ *Captain's Round Table discussions with frank, honest assessments of each system*



*"Ultimately, what we want is for you to watch this season and walk away completely informed, so you can come to your own conclusion on how well TZtouch3 stacks up against the competition."*  
**Jeff Kauzlaric, Furuno USA Advertising Manager and Host of Furuno Connections**

## Meet the Crew of Two Conchs Sport Fishing Charters

Led by second generation fishing guide and Furuno Brand Ambassador Capt. Jack Carlson, Two Conchs Charters provide Florida Keys fishing charters out of Marathon, FL. With a fleet of 12 open fishing boats from 24' to 39', Two Conchs' experienced team of professional captains provide their clientele with quality fishing every time.



### Captain Jack Carlson

Capt. Jack boasts 24 Years under his belt as a Professional Keys Fishing Guide from his home port in Marathon, Florida Keys.



### Captain Cameron Null

Capt. Cam Null has been a professional captain with Two Conchs for 3 years. Capt. Cam prefers a more relaxed trip, and always gets the job done.



### Captain Mike Macko

Capt. Mike Macko has been a Two Conchs captain for 6 years. Taking a hardcore approach, Capt. Mike has a true passion for sport fishing.



### Captain Austin Carlson

Capt. Austin Carlson is a 3rd-generation Florida Keys guide with a love for fishing the flats, reefs, and offshore wrecks, and the experience to put his clients on the fish.



### Captain Manny Souza

Capt. Manny Souza has been with Two Conchs for 3 years and prefers going after Swordfish. Capt. Manny is known for filling the fish box.

## Meet the Furuno Team

In Episode 1, we meet the crew from Furuno USA who will be conducting the tests, as well as the captains from Two Conchs Sportfishing who were behind the wheel of the test vessels, assisting our technicians in their tests, and offering their own feedback concerning the systems installed on their vessels. Here is a brief introduction for each of these personalities:



### Eric Kunz Senior Product Manager

Eric is the Senior Product Manager and 28 year veteran of Furuno USA, and was closely involved in the development of NavNet TZtouch3.



### Jeff Kauzlaric Advertising & Communications Manager

Jeff has been with Furuno USA for 21 years, promoting Furuno products in all aspects of the ever-evolving media landscape.



### Tim Moore East Coast General Manager

Tim is the General Manager for our East Coast facility in Denton, Maryland, and has spent his life in and around boats and marine electronics.



### Matt Bray Southeast Region Sales Associate

Matt has been with Furuno for just over one year, providing Furuno customers with his many years of marine electronics expertise.



### Clayton Paddison Light Marine Technical Support Lead

Clayton has been providing assistance to Furuno users in our Light Marine Technical Support department for over 15 years.



### Braden Shoemaker Southeast Region Sales Associate

Braden has been promoting Furuno products and providing support to valued Furuno users in the Southeast region for the past three years.

## User Interface Comparison:

Episode 2 is a focus on the User Interface of all four systems. We wanted to begin the series with the UI tests because it is one of the most important aspects of every Multi Function Display. As Jeff mentions at the beginning of the episode, some Furuno electronics of the past have carried a bit of a stigma with the idea that our products are complicated, unintuitive, or just plain difficult to use. As we see in the comparisons, Furuno has introduced new, innovative ways to control every aspect of NavNet TZtouch3, and we strongly believe that the new UI makes this system the easiest-to-use MFD on the market today.

We began our comparison by seeing how many touches or taps on the screen it takes to perform the most common tasks, such as selecting a built-in screen presentation and building a custom screen presentation. Changing display modes (for example from a Chart Plotter screen to a Radar screen,) was straightforward on all of the systems. Most require only two touches of the MFD, and only System "A" required three.



	TZtouch3	System "A"	System "B"	System "C"
Display Tides on Chart	✓	✓	✓	✓
Tide Graph	✓	✓	✓	✓
Display Currents on Chart	✓	✓	✓	✓
Current Graph	✓	✓	✓	✓
Create Boundary Circle	✓	✓	X	X
Create Boundary Area	✓	✓	X	X
Create Boundary Line	✓	✓	X	X
Boundary Alarms	✓	✓	X	X

	TZtouch3	System "A"	System "B"	System "C"
Change Chart Type	2 Touches	3 Touches	4 Touches	3 Touches
Show Sat Photos	2 Touches	3 Touches <small>(requires premium charts)</small>	4 Touches	4 Touches
Show Depth Shading	2 Touches	6 Touches	4 Touches	4 Touches <small>(requires premium charts)</small>
Turn Off Waypoints	2 Touches	5 Touches	5 Touches	4 Touches
Show/Hide Tracks	2 Touches	5 Touches	5 Touches	4 Touches
Show/Hide Routes	2 Touches	X	5 Touches	4 Touches
North Up to Head Up	1 Touch	5 Touches	4 Touches	5 Touches
Switch to 3D Chart	1 Touch	3 Touches <small>(requires premium charts)</small>	3 Touches	3 Touches
Drop Waypoint in 3D	✓	X	✓ <small>(under boat only)</small>	✓ <small>(under boat only)</small>
Create Route in 3D	✓	X	X	X
Go to Waypoint in 3D	✓	X	X	X
Navigate Route in 3D	✓	X	X	X

We had each of our test boats build a custom screen configuration and record how many touches were required to save it. For this test, we built dual split screen and quad split screen displays on each of the system. As we saw in the tests, TZtouch3 has a very easy-to-navigate interface for this task - but one other system, System "B", required one less touch than NavNet TZtouch3 to accomplish the same tasks. Both System "A" and System "C" required considerably more interaction with the MFD to build a custom screen presentation.

## Edge Swipe Features



We examined the edge swipe capabilities of each system. NavNet TZtouch3 allows you to edge swipe from every edge of the display. Swiping up from the bottom brings up the Layers menu, where you can select the information you want to see on the screen. Swiping down from the top opens the Quick Page menu, where you can choose from a selection of screen presentations with a single tap. Swiping from the left edge brings up a data box with information important to the active function of the display (Radar, Chart Plotter, Fish Finder, etc.), and swiping from the right edge of the screen brings up a menu of shortcuts to often-used functions of the active display presentation.

We found that edge swiping on all of the other system we tested was limited. System "B" allowed for an edge swipe from the left edge to bring up a data box, while Systems "A" and "B" had no edge swiping features that we could discern. Accessing many of the different features available on each of these systems required delving into the menus.

## Chart Plotter Features and Cartography

Episode 3 is a focus on the built-in features of the MFD, including the built-in GPS antenna, Fish Finder, and the chart selections available out-of-the-box.

Each of the systems we tested contains an internal 72-channel GPS/WAAS receiver that functions well. We experienced no issues with any of them - they all functioned as expected, giving us our GPS location without interruption.

Each of the systems also includes a built-in Dual-Channel 1kW CHIRP Fish Finder, as well as a more traditional 50/200kHz Fish Finder. The Fish Finders were tested in a later episode, but in this episode we're only comparing the out-of-box capabilities available in each of the MFDs - the more detailed tests will come later.

Systems "A" and "C" come out-of-the-box with a built-in 3D/Side Scan Sonar, while TZtouch3 and System "B" have these available as an option. Like the Fish Finder, the 3D Sonars were tested in a later episode.

Each of the systems comes with vector charts available, but NavNet TZtouch3 is the only system that comes out-of-the-box with U.S. raster charts available. Navionics charts with different levels of detail are available out-of-the-box for Systems "A", "B", and "C", and C-MAP charts are available out-of-the-box for Systems "B" and "C". Navionics and C-MAP charts are optionally available with NavNet TZtouch3, for those who wish to enhance the system's preloaded U.S. NOAA raster and vector chart library. Many of these charts are preloaded, requiring only a purchased unlock code to make them available. All of the systems with the exception of System "B" come preloaded with satellite photography - with System "B", this is optional and not provided with the base system.

On all of the systems, bathymetric and CMOR charts are available as options. For TZtouch3, these are preloaded into the system, requiring only a purchased unlock code to make them available.

FEATURES	TZtouch3	System "A"	System "B"	System "C"
GPS/WAAS Receiver	Yes (TZT19F is external)	Yes	Yes	Yes
CHIRP Fish Finder	Yes (Dual Chan. 1 kW)	Yes (Dual Chan. 1 kW)	Yes (Dual Chan. 1 kW)	Yes (Dual Chan. 1 kW)
Traditional Fish Finder	Yes	Yes	Yes	Yes
3D/Side Scan Sonar	Optional	Yes	Optional	Yes
Raster Charts	Yes	No	Optional	Optional
Vector Charts	Yes	Yes	Optional	Optional
Navionics Charts	Optional	Optional (Enhanced)	Optional	Optional
C-MAP Chart	Optional	No	Yes (Enhanced)	Optional
Fishing/Bathy Charts	Optional	Optional	Optional	Optional
Satellite Photos	Yes	Optional	Yes	Yes
CMOR Charts	Optional	Optional	Optional	Optional

## Customizing the Display

In testing the capabilities of each system to customize the Chart Plotter display, we looked at their ability to change the size of text and chart objects such as spot soundings and buoys, and adjust the thickness of heading, route, and track lines. We also took a look at adjusting waypoint density, as well as the methods provided for searching your waypoints and keeping the waypoint list organized.

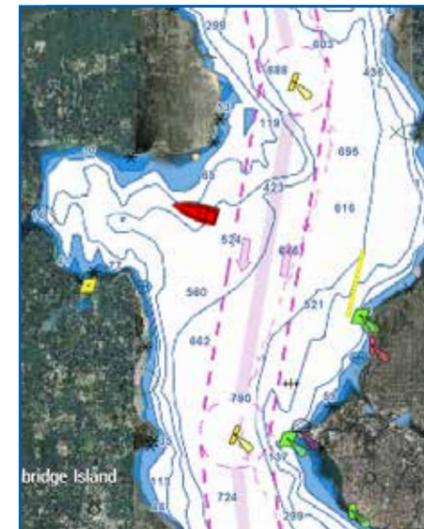
All of the systems provided some ability to adjust the text size. Likewise, all of the systems provided for the ability to adjust the size of most chart objects. System "B" provided a magnification feature that will allow the user to adjust the size of the text. This adjustment affects text throughout the entire system - we found no method to adjust only the size of displayed objects, such as spot soundings displayed on the chart. System "C" allows only for adjusting the text size of the data overlay feature, and provided no way we could see of adjusting the size of the text of objects on the charts themselves.

Both NavNet TZtouch3 and System "C" allowed for adjustment of the thickness of Track, Route, and Heading lines, while Systems "A" and "B" allowed for no such adjustment.

NavNet TZtouch3 has a unique feature called Waypoint Density that allows the user to select the amount of waypoints that will be displayed for given area. This feature can come in very handy to de-clutter the chart when navigating in areas where there are many waypoints that are closely spaced.

Only System "C" has the ability to organize waypoints into custom folders or groups. Waypoints on System "C" can be placed into 'groups' that can be hidden or displayed on the chart so that only those points the navigator wants to see will be visible. We found this to be a very useful feature of the system.

Finally, we tested the capability of each system to create an image file of the screen with the screenshot function. All of the systems can capture a screenshot, but NavNet TZtouch3 clearly makes this easier than the other systems with a custom gesture, a long two-finger press anywhere on the screen. System "A" can capture a screenshot by pressing and holding the Home icon for at least six seconds. System "B" requires the user to first access the Quick Menu and then make a selection to capture a screenshot. System "C" requires the user to turn on the screen capture function in the menus and, once activated, screenshots can then be captured by double-tapping on the status bar.



### Everything You Need Pre-Loaded

NavNet TZtouch3 includes every U.S. chart you need right out of the box, and you can easily switch from raster to vector or fishing charts. The Mapmedia cartography provided integrates cutting edge algorithms with high resolution image processing techniques, and Satellite photography is available to overlay on your charts. With Satellite PhotoFusion™, land areas (zero depth) are completely opaque, displayed as satellite photos on the chart. As the depth increases, the satellite image is merged with the chart data, so you can see details of the seabed in shallow water without losing vital chart information.



## Waypoints and Routes

We found that all of the systems performed competently, although there were different approaches from each manufacturer to accomplish the same tasks. System “A” actually required less interaction to build the route, and navigation was automatic, but it did take extra steps to save the route for later navigation. What was noticeable to us was the speed and responsiveness of the NavNet TZtouch3 MFD compared to the other systems.

Plotting a route on NavNet TZtouch3 couldn’t be more simple. Tap on the screen where you want the first point of your route to be and select New Route from the popup window, then tap on the chart where you want each subsequent point in your route to be. When you’re finished adding points, tap End Route. That’s it. To begin navigation, just tap anywhere on your new route and select Start Nav.

System “A” defaults to building your route in reverse, from destination to origination, but this can be changed in the menus if you prefer a more traditional approach to route building. Tap on the screen for where you want your route to end, and then tap the selection to enter a new route - in our case, this was given the default name Route 2. Tap and drag the chart until the cursor is located where your next point in the route should be, and then tap Add Turn. Repeat this action until you have all of the points you want in your route, and then tap Done. In our test, our operator Matt added more turns than we had planned, but we’ve removed those extra points from our totals, which show only the required amount of touches to create and begin navigating the same 4-point route.

	TZtouch3	System “A”	System “B”	System “C”
Build 4-Point Route	7 Touches	6 Touches	9 Touches	7 Touches
Begin Navigation	2 Touches	Auto-Start	4 Touches	3 Touches

System “B” route creation begins with pressing and holding on the screen and selecting New from the sidebar, and then selecting New Route. You can now tap on the chart where you want each successive waypoint to be. We noticed that there was a significant delay between tapping on the chart and the waypoint appearing on the screen, so you need a little bit of patience. Once you have your point plotted, tap Save, enter a custom name if desired. Pressing and holding on the new route brings up a sidebar menu with the option to begin navigation, and then a popup menu will appear with the option to begin navigating the route either forward or in reverse.

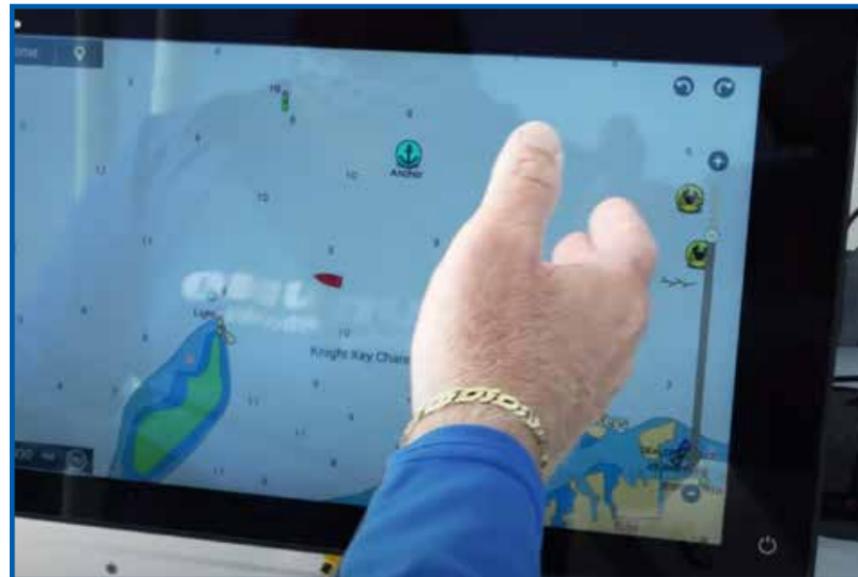
On System “C”, tap and hold on the chart where you want to place the first waypoint, and select Build Route. Continue placing waypoints by pressing and dragging the screen until the cursor is in the correct position for your next point, and then tapping that point to enter it. Follow this same procedure until you have the cursor in position for your last waypoint, and then select Finish Route Build from the top of the screen. Once a route is built, you will have an immediate option to follow that route. To begin navigating a saved route, press and drag the screen until the cursor is above the first waypoint in your route, press down on the control knob, and then select Follow From Here from the popup window.

## Waypoint Management Comparison

We brought our focus deeper into the Chart Plotter, specifically on creating, saving, and editing waypoints. We begin with the most basic of functions for any Chart Plotter - creating a waypoint. We found that the methods for creating, editing, and deleting waypoints are very much alike across all of the systems, but as you'll see, there are important differences in the capabilities of each.

NavNet TZtouch3 makes this a straightforward procedure - simply tap the chart where your new point will be, and then tap New Point. That's it. To save a new waypoint at your current location, just tap on the Event icon at the top left of every screen, and select an appropriate icon from the selection of waypoint icons available. If your event was a catch, you can select the species and log the length and weight of the fish. Using the new TZ First Mate app, you can even use your cell phone to upload a picture of your catch directly to the MFD via Bluetooth connection - no Internet connection required. Editing your waypoints in TZtouch3 is as simple as tapping the point and selecting Edit. From the edit menu, you can adjust the latitude/longitude as well as change the waypoint name, add a comment, or change the waypoint color and symbol by selecting from dozens of available options. If the point was for a previous catch you recorded, you can edit the species, length and weight from here. You can also select Goto point from the edit menu to immediately begin navigation.

To create a waypoint on NavNet TZtouch3 using known coordinates, edge-swipe from the right edge and select Position Entry. This allows you to create a new waypoint using either latitude/longitude coordinates, or Loran C TDs. Loran C was a navigation system that recorded the time difference (TD) between a signal from your unit and land-based stations, then expressed your position as a series of reference numbers. While Loran C has not been in use since 2009, many mariners still have log books of Loran C TDs, sometimes recording decades of information, and the ability to utilize them is a welcome addition to a modern helm suite.



The undo/redo function on NavNet TZtouch3 makes it simple to correct any mistakes you make while editing or deleting waypoints.

Deleting waypoints on your NavNet TZtouch3 Chart Plotter is as simple as tapping on the waypoint and selecting Delete. TZtouch3 also has an Undo feature that allows you to go back and fix any accidental changes you've made, so if you've deleted a point you want to keep, just tap on the undo icon at the top right of the screen and your waypoint will be restored. This feature goes back a great number of steps so, as Capt. Jack explained, you can make a lot of mistakes! There is also a redo function to easily delete the points you just restored if you change your mind after tapping on the undo icon.

Similar to TZtouch3, creating a waypoint on System "A" is as simple as tapping the chart for the new waypoint location, and selecting New Waypoint. To edit a waypoint on System "A", first select the waypoint, and then select the menu key for that waypoint from the top information bar of the screen. From this menu, you can change the waypoint name, symbol, position, depth, and water temperature, as well as add a comment or delete the waypoint. When editing position, you can edit the latitude/longitude numbers directly.

Pressing and holding the chart on System "B" brings up the sidebar menu where you can add a waypoint. Once you've created a waypoint, editing it is as simple as pressing and holding the icon to bring up the edit menu. You can change the waypoint name, icon and color, as well as add a note, the depth, or an alarm radius in nautical miles. You can also select what information you want displayed on the chart around the icon, or navigate directly to the waypoint from this menu. To enter a waypoint using Loran C TDs, you must first open the main menu and select Navigation, then turn on the Loran function. Again, Loran is a defunct system - the system is still using GPS to navigate, and is simply converting the Loran numbers you enter so that you can retain the use of older Loran information you may have.

System "C" waypoint creation is very similar to what we've seen on the other systems. Pressing and holding on the chart brings up a popup window with all of the options to save your new waypoint. From the chart, you can press and hold on the waypoint icon to bring up a small edit window where you can delete the waypoint, begin navigation to that point, or move the waypoint. This menu also includes a selection to edit the waypoint directly, including changing the name, symbol, group, add a comment, delete the waypoint, or navigate to the waypoint. When editing the waypoint position, you have the option to enter new latitude/longitude coordinates, or use Loran C TDs.

## TZtouch3 PIN Code Lock

Episode 5 wraps up with a demonstration of the new PIN Code Lock first introduced by Furuno in the NavNet TZtouch3 MFDs. Activating this feature requires a unique PIN code to be entered into the system, without which the MFD will not boot up. This prevents valuable data from being stolen and used by malicious thieves, data that many captains work hard to acquire over years of hard work. Even if the MFD is stolen from your vessel, you still have access to all of your data via the TZ Cloud feature, ensuring you will never lose your waypoints, routes, or system settings.



## Cartography Features Comparison

In Episode 6, we take a closer look at the functionality of the Chart Plotter, including out-of-the-box cartography options, changing charts and chart orientation on-the-fly, overlaying depth shading and satellite photography, and managing your waypoint lists. We also performed a speed and responsiveness test that we applied to all of the MFDs.

We tested the methods available on each system to sort and search your saved waypoints. When you have a large library of waypoints stored on your machine, being able to easily find the spot you're looking for without having to scroll through a list of hundreds or thousands is very important. We found that each system allowed us to search for waypoints by name, range, and symbol associated with the waypoint. System "C" allowed you to sort your waypoint list by date. NavNet TZtouch3 further allows you to sort your waypoint lists by icon color, date, fish species, and fish length. We found that only System "C" allows you to sort your waypoint list by comment, and also incorporates a folder structure, allowing you to view only those waypoints within that folder, which we found handy.

We took a look at the chart options available on each system, including the cartography that comes out of the box with the MFD, presentation options such as changing your heading, how easy it is to de-clutter the chart and add Satellite Photography or Depth Shading, and how easy it is to switch charts on-the-fly. We also test the 3D functionality of each system and compare the functions available when viewing charts from a 3D perspective. TZtouch3 operates in a full-time 3D environment - even when you're seeing that familiar top-down orientation, the chart is actually in 3D format with all features and functions available to the navigator. We found 3D mode on the other systems to be extremely limited, offering little in practical functionality.

We found that some functions of the other systems were either not available, or only available when using premium chart options. We could not test the functionality of those features, such as Satellite Photography on System "A" or Depth Shading on System "C", as they require the purchase of premium cartography to unlock, while Depth Shading is built-in to TZtouch3, and Satellite Photos for the U.S. are free.

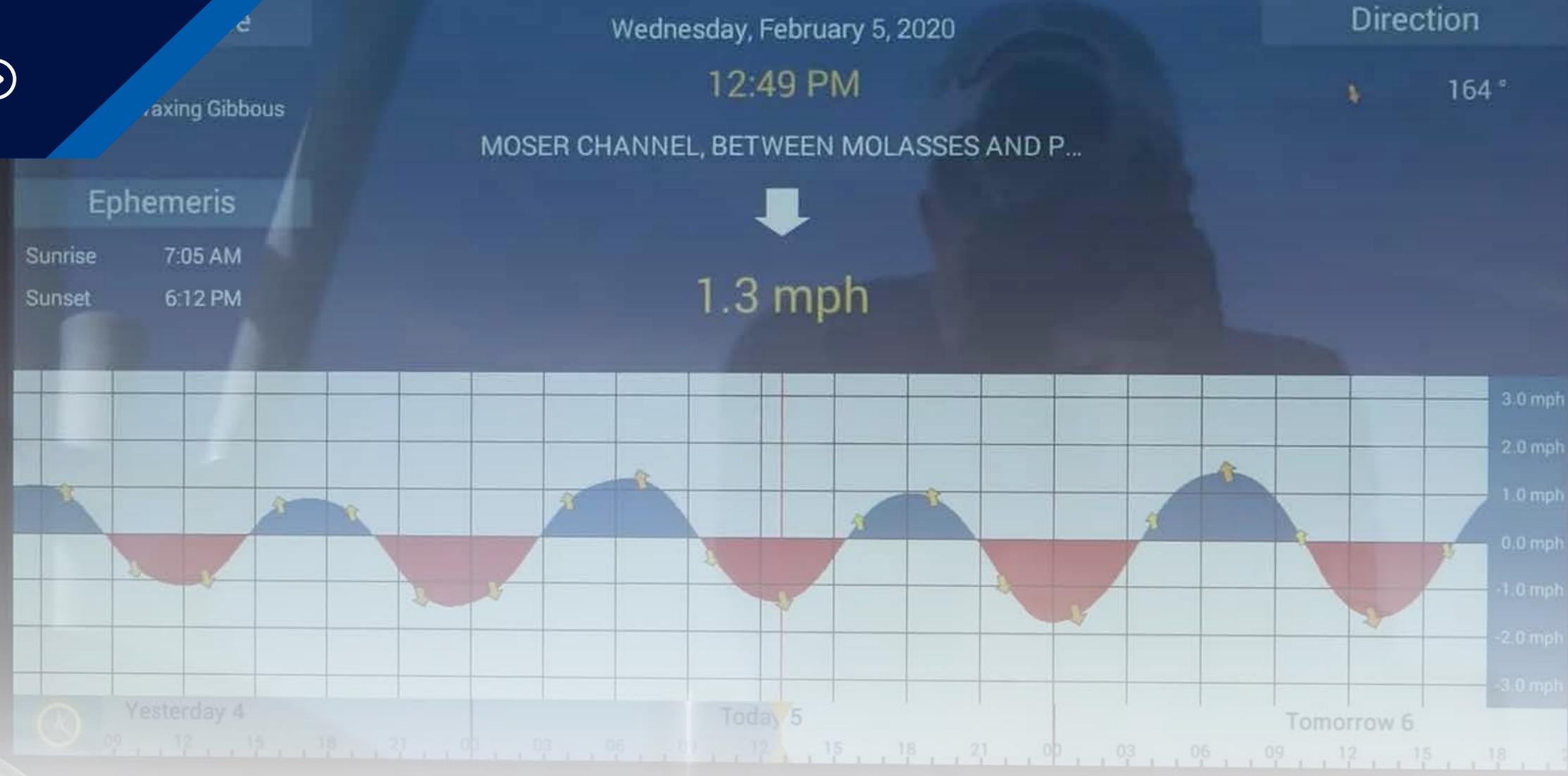
	TZtouch3	System "A"	System "B"	System "C"
<b>Speed Test</b>	No Lag	Lag + Screen Freeze	Lag	No Lag
<b>Search Waypoint (WP)</b>	✓	✓	✓	✓
<b>Sort by WP Name</b>	✓	✓	✓	✓
<b>Sort by WP Date</b>	✓	X	X	✓
<b>Sort by Icon/Symbol</b>	✓	✓	✓	✓
<b>Sort by Icon Color</b>	✓	X	X	X
<b>Sort by WP Range</b>	✓	✓	✓	✓
<b>Sort by Catch Date</b>	✓	X	X	X
<b>Sort by Fish Species</b>	✓	X	X	X
<b>Sort by Fish Length</b>	✓	X	X	X
<b>Sort by Comment</b>	X	X	X	✓
<b>Folders</b>	X	X	X	✓

	TZtouch3	System "A"	System "B"	System "C"
<b>Change Chart Type</b>	2 Touches	3 Touches	4 Touches	3 Touches
<b>Show Sat Photos</b>	2 Touches	3 Touches <small>(requires premium charts)</small>	4 Touches	4 Touches
<b>Show Depth Shading</b>	2 Touches	6 Touches	4 Touches	4 Touches <small>(requires premium charts)</small>
<b>Turn Off Waypoints</b>	2 Touches	5 Touches	5 Touches	4 Touches
<b>Show/Hide Tracks</b>	2 Touches	5 Touches	5 Touches	4 Touches
<b>Show/Hide Routes</b>	2 Touches	X	5 Touches	4 Touches
<b>North Up to Head Up</b>	1 Touch	5 Touches	4 Touches	5 Touches
<b>Switch to 3D Chart</b>	1 Touch	3 Touches <small>(requires premium charts)</small>	3 Touches	3 Touches
<b>Drop Waypoint in 3D</b>	✓	X	✓ <small>(under boat only)</small>	✓ <small>(under boat only)</small>
<b>Create Route in 3D</b>	✓	X	X	X
<b>Go to Waypoint in 3D</b>	✓	X	X	X
<b>Navigate Route in 3D</b>	✓	X	X	X

Note that during these tests, we noticed System "B" beginning to glitch, with flashing data boxes at the top of the screen. This glitch and others persisted throughout all five days of our testing.



For our speed and responsiveness test, our operators traced a simple figure-8 pattern on the touch screen of each MFD, dragging the chart along with their fingertip. As we saw in the episode, NavNet TZtouch3 had no problem keeping up with the operator during this test, exhibiting no lag due to its quad-core processor and ample memory. Likewise, System "C" performed well, keeping up with the operator the entire time. System "B" displayed lag during the entire test, and was unable to keep up with the operator's motions. System "A" was able to keep up with the operator at first, but quickly started to lag, and finally froze completely. We had to disconnect power and reboot System "A" after performing this test.



## Tides, Currents, Boundaries, and Weather

In Episode 7, we finish our chart plotter testing by examining the tides, currents, boundaries, and weather options available on each system, including which functions are available out of the box, how useful they are in practice, and how easy they are to access.

Tides and currents are important to any navigator, and all four systems have the ability to display them. However, we found that some systems make it easier to access than others. On TZtouch3, a simple swipe from the bottom of the display and a single tap turns on tides and currents, displayed as icons on the chart. Tapping one of these icons gives the navigator detailed information and access to an interactive graph view.

An important feature to any navigator is the ability to create custom boundaries. While there are many uses for a custom boundary, they are commonly used to note areas on the chart to avoid. For example, if you're fishing near an MPA (Marine Protected Area), this is important information to have. NavNet TZtouch3 and System "A" both have provisions to quickly create boundaries in the form of a circle, a line, or a custom shape that is created in a similar manner as creating a route, and proximity alarms can be set for the boundaries you create. Systems "B" and "C" offered no provision for creating boundaries.

All of the system can utilize the Satellite Weather service provided by SiriusXM with the purchase of a receiver and an active subscription. In our out-of-the-box test, we did not purchase this add-on feature, so none of the MFDs displayed live weather information. However, out of the box, NavNet TZtouch3 provides a feature called NavCenter Weather, a free service that gives you the ability to download up to two weeks of weather forecasts for anywhere in the world you choose. NavCenter weather provides forecasts for wind, waves, clouds, rain/

snow, air pressure, sea surface temperature, ocean currents, and altimetry. Simply select the area and data that you'd like to have, then download the information. The file size is very small, so the download is very fast (our test took 20 seconds). As long as you have WiFi or a cellular connection using your phone as a wireless hotspot, you can update NavCenter weather information as often as you need. NavNet TZtouch3 was the only system we tested that offers this kind of free weather service.

	TZtouch3	System "A"	System "B"	System "C"
Display Tides on Chart	✓	✓	✓	✓
Tide Graph	✓	✓	✓	✓
Display Currents on Chart	✓	✓	✓	✓
Current Graph	✓	✓	✓	✓
Create Boundary Circle	✓	✓	✗	✗
Create Boundary Area	✓	✓	✗	✗
Create Boundary Line	✓	✓	✗	✗
Boundary Alarms	✓	✓	✗	✗



## Captain's Chart Plotter Discussion

In Episode 8, we're back at the dock at the end of the first day of testing for a lively discussion and recap. Our captains and crew gave us their impressions on the Chart Plotter functions they tested, telling us what they liked, what they didn't like, what worked for them, and what they found lacking. Here is a look at some of the opinions they offered:



*"The pin code, I know those other boats aren't going to have that. I've been asking for years, why doesn't somebody come out with that? I've seen it online, people complaining about it and Furuno, home run. You guys did your homework. You came through. If someone were, to God forbid, steal the unit, no way they're going to get all the spots I've worked so hard for."*

**Captain Jack , Two Conchs Sportfishing**



*"I currently use System "B" on my boat and the Furuno unit blew me away with the speed and response when we did the figure 8. With the other one, you couldn't get more glitchier. The TZT3 was just flawless. The speed of it, how it repainted, how it did everything. I mean, that really blew me away. I can't be more jealous of my guys that I don't have it on my boat."*

**Captain Manny Souza, Two Conchs Sportfishing**



*"I've been running it for a while now and it's hard to compare it to the other units. I think just the fact of the ease of it, to run through these machines and find everything you need. You know, I'm not going to knock Unit A. It did good, but it definitely lacked in a lot of areas the TZTouch3 has just overcome. They're in a league of their own."*

**Captain Mike Macko, Two Conchs Sportfishing**



*"System C was actually pretty good. As far as the speed test, it kept up with the figure 8, not a lot of lag at all compared to the TZT3. It was a pretty good unit. If you had to get out there and do it and get around, that unit would be great for you. But, it just seemed outdated. It seems like Furuno is on the leading edge of all this stuff and is just kind of hard to match."*

**Captain Cameron Null, Two Conchs Sportfishing**

*"One of the great things about the TZTouch3 user interface is we have edge swiping. We've got a quad core processor and plenty of memory to do whatever you want to do. The TZTouch UI and when we go into the points menu and being able to sort by species, to find the nearest other catch spots, that's going to be so valuable to these guys. It's really pretty cool."*

**Eric Kunz, Furuno USA**



*"It's all there. It's simple to use. You have a few extra touch commands, but System "B" is slow. You know, the redraw time is slow. The more time your eyes are on the screen, the less they are on the water which is a huge deal. When you're out there in the chop and you're underway trying to find points, that's a big deal."*

**Clayton Paddison, Furuno USA**



*"We were trying to change to north up (on System "A"). It is a four-step process, where on the TZT2 and TZT3, it's instantaneous. We found all the features we wanted to find, it had everything we were looking for. I know it's only four steps. That might seem trivial, but it's not trivial to somebody operating a boat - that's three more steps than Mike wants to take."*

**Tim Moore, Furuno USA**



## Radar Target Separation Comparison

In Episode 9, we begin our Radar tests, including both short range and long range target detection. We took a look at target separation and target resolution, and we also test how well the systems can see beyond structures like bridges, and how well they detect and display ever-elusive bird targets.

We wanted to create an apples-to-apples comparison, so we used the latest Solid-State Doppler domes from each manufacturer. We removed the existing Radars from all of the test boats and installed the four Radar domes onto the T-tops, placing them all at the same height off of the water. All of the systems except for System "C" offer a 24" dome, while System "C" offers a 21" dome. All of the Radars except for System "C" have a range of 48 nautical miles - System "C" has a maximum range of 24 nautical miles. The peak power output for each of the systems is different, with System "C" being the lowest and System "A" being the highest. We used the default, out-of-the-box auto settings for each of our tests.

As we saw in this episode, all four systems did a very good job of displaying close in targets at a short range scale. As we started to zoom out and increase the range, some of the systems started to blend those close-in targets together more than others due to the antenna's broad beamwidth. We also noticed that one of the systems had a greater 'main bang' than expected which came as a surprise to our crew.

The three competitor's systems we tested have a Harbor mode, and we used that automatic setting for our tests. The Furuno DRS4DNXT has a feature called RezBoost that can be used in the same way, providing an automatic adjustment for situations like this. At it's maximum setting, RezBoost provides the sharpness of a 2° beamwidth Radar.

	DRS4DNXT	System "A"	System "B"	System "C"
<b>Solid-State Dome Radar</b>	24" Dome	24" Dome	24" Dome	21" Dome
<b>Retail Price</b>	\$2,095.00	\$2,799.00	\$2,799.00	\$1,949.99
<b>Power Output</b>	25 W	40 W	29 W	20 W
<b>Range</b>	48 N.M.	48 N.M.	48 N.M.	24 N.M.
<b>Beamwidth</b>	3.9° (2.0° with RezBoost)	3.7°	3.9° (2.0° with target set on high)	4.9°
<b>Antenna Speed</b>	24*/36/48 rpm (24 rpm only in dual range)	24/48 rpm	Up to 60 rpm (range dependent)	24 rpm



We selected Boot Key Harbor in Marathon, Florida Keys for our short range target detection test. Boot Key Harbor provided the perfect testing ground for these Radars, with a narrow channel and ample, tightly-packed boats moored in symmetrical columns. This area provided the perfect opportunity for each of the systems to demonstrate their proficiency at detecting close-in targets as well as separating targets that are closely spaced.

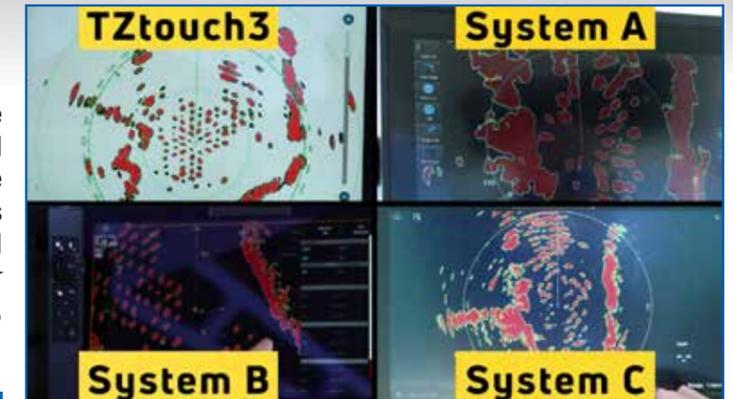
All four systems did a great job displaying the targets when we were close in, but as we started to zoom out and increase the range, some of the systems started to blend the targets together. It's important to remember that target resolution will get even better if you switch from the dome Radar to an open array, and as the array gets larger, target resolution gets even sharper.

The DRS4DNXT performed well in this test, clearly separating individual targets in the harbor in Auto mode. We found that with RezBoost set to Enhanced 2, we were able to see a little more definition between the targets and higher bearing resolution on our Radar.

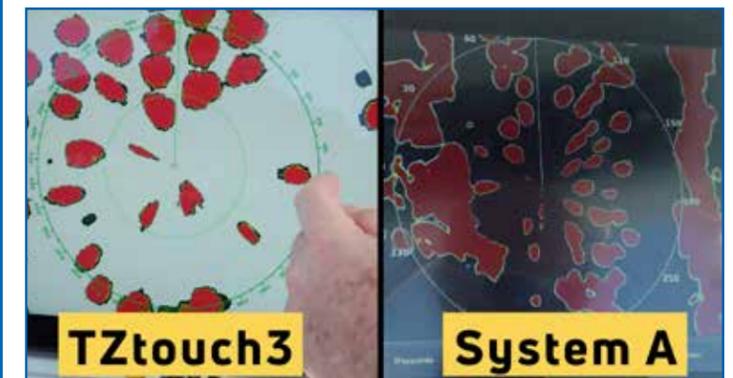
System "A" also performed well in this test, displaying most targets individually, as well as painting nearby land masses clearly for us. There was some blending of targets, but due to the broad beamwidth of a dome Radar, that is exactly what we expected to see. In looking at the double-targets on System "A", we could almost see that they are actually two different targets and the dome for System "A" just can't break them apart.

Likewise, System "B" performed well in this test. We found that switching to Harbor mode improved the Radar picture considerably. We were able to get a little bit more definition from all of the sailboat targets as well as for the surrounding landmass at both short and medium range scales.

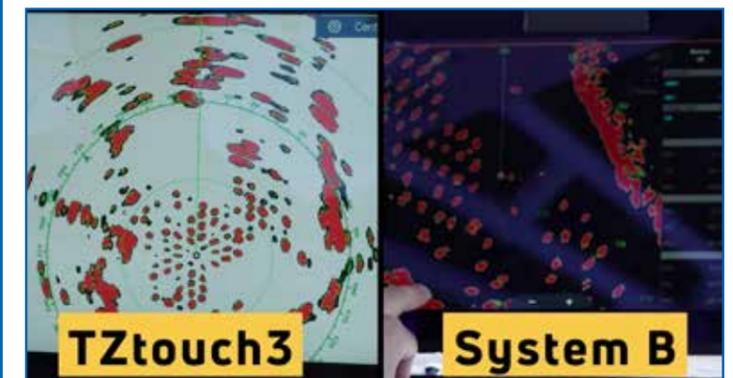
With System "C" in Harbor mode, we found the Radar offered good target separation at 1/8 mile range. Once we got past that range, the targets began to blend, and what we knew to be multiple targets would show as a single target on the display. We noticed that there was a large 'main bang' for this Radar. 'Main bang' can be described as an area directly around the vessel where the Radar cannot detect targets. Solid State Radars are known for their ability to detect close-in targets, and so this large 'main bang' was surprising.



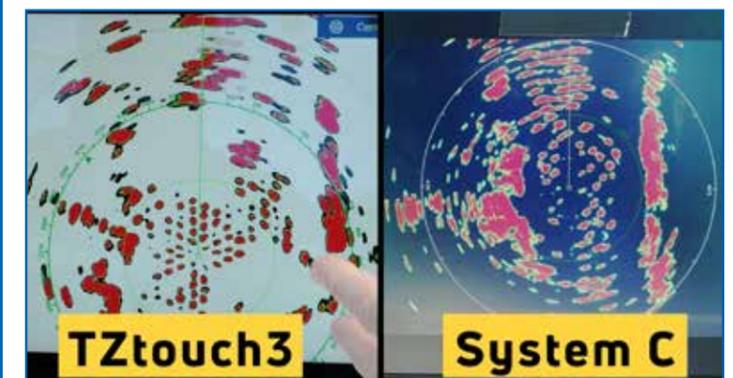
Comparison of Radar returns from all four systems



Comparison of the Furuno DRS4DNXT Dome Radar with the Radar from System "A"



Comparison of the Furuno DRS4DNXT Dome Radar with the Radar from System "B"



Comparison of the Furuno DRS4DNXT Dome Radar with the Radar from System "C"



## Close Range Radar

In Episode 10, we ran a skiff at different distances within a narrow channel with an eye on how well each Radar separates the target's Radar return from those of the mangroves. This was a very tough test for each of the systems - we're talking really close quarters. Target resolution is extremely important, because when you're cruising along a channel and there's a boat in that channel, you don't want that target blending in with the land.

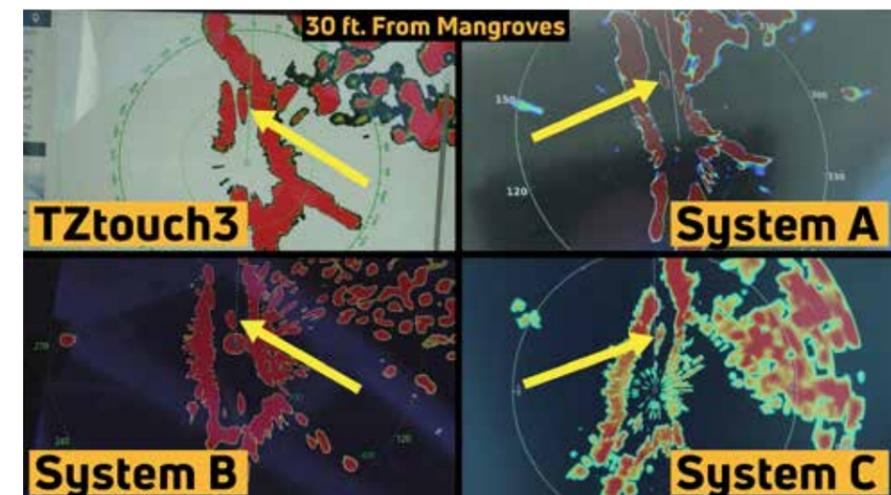
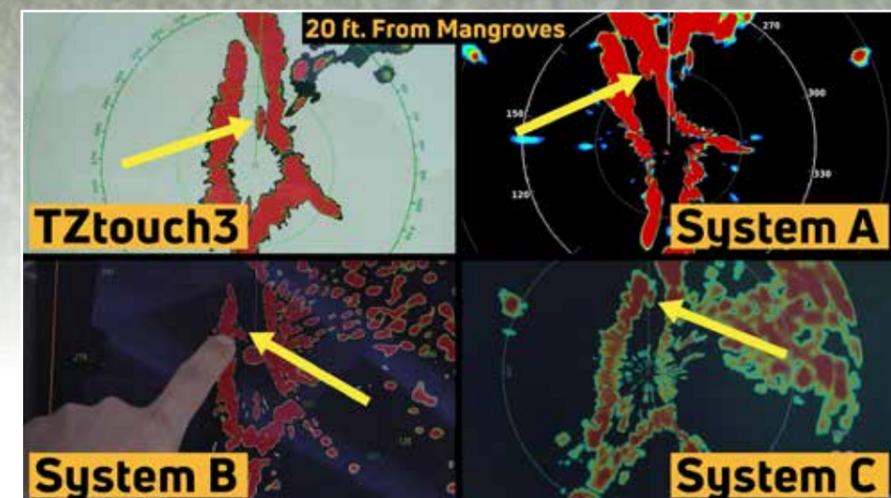
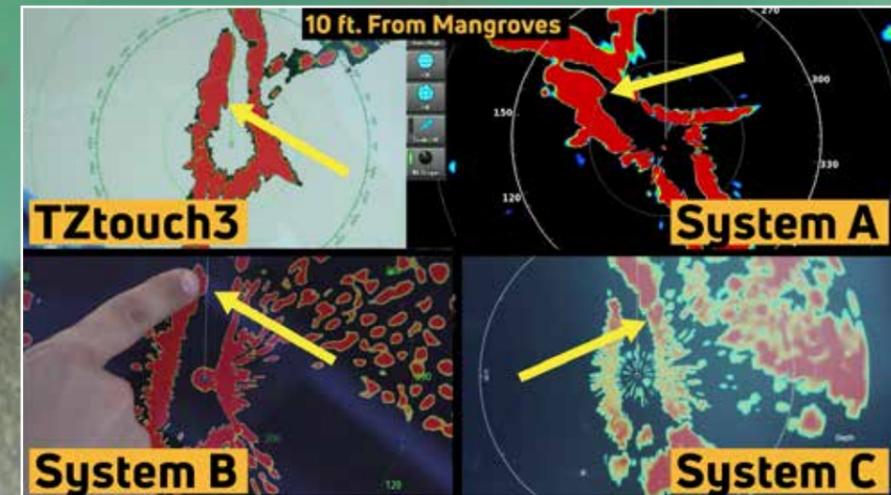
Episode 10 is a close range Radar performance test. We took a 17' skiff into a narrow channel called Sisters Creek in the mangroves outside of Marathon Key. Our goal was to test the ability of each Radar to separate the skiff from the mangroves, and as we saw, some of the systems performed much better than others in this target separation test. For this test, the DRS4DNXT was in Full Auto mode, while the other systems were manually set to Harbor mode to improve their close-in target detection and target separation.

With the DRS4DNXT, we did see the skiff blend in with the mangrove returns when they were within ten feet. We noted that we could detect movement in the Radar presentation the entire time indicating the presence of the skiff, and it quickly returned to complete separation on our display as it returned. If we would have manually adjusted the gain, the results would have been even more impressive.

System "A" could detect the skiff as a separate target only when it was in the center of the channel. As it got closer to the edge, the skiff blended into the Radar returns from the mangroves. We noticed that as the skiff passed our test vessel, its return was lost in the Radar's main bang. Another thing that our operators noticed while we were underway to this test location, though, was that System "A" had trouble separating vessels moored in the channel from the mangroves.

System "B" also had difficulty separating the skiff from the mangroves, showing a distinct target only when the skiff was located in the center of the channel. Like the DRS4DNXT, System "B" showed movement of the target even when it was blended in with the mangrove targets, but it was clear that not as much movement was detected as we could see on the NavNet TZtouch3 display.

System "C" could not display the skiff when it was 10 feet from the mangroves. At 20 feet, the skiff was slightly visible but still blended in to the mangrove targets. The skiff was fully visible as a separate target only when it was in the center of the channel. What was more concerning to our crew, though, was the main bang issue on System "C" that we'd seen in the previous Radar test. At one point, we lost the skiff target within the main bang as it was passing the vessel.



## Long Range Radar Detection

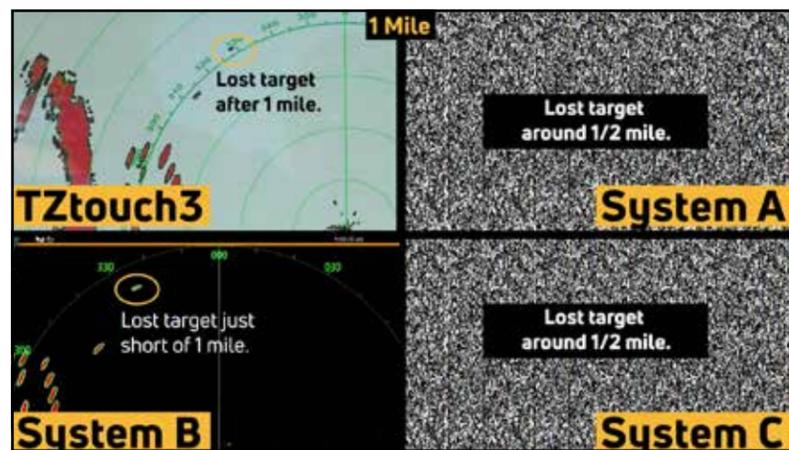
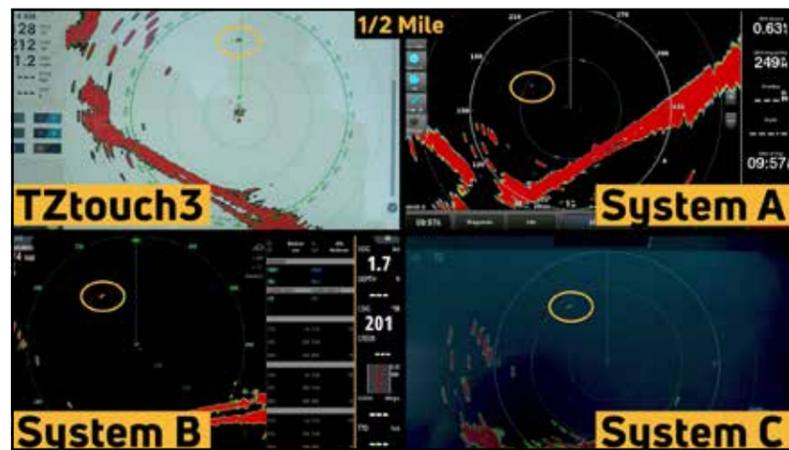
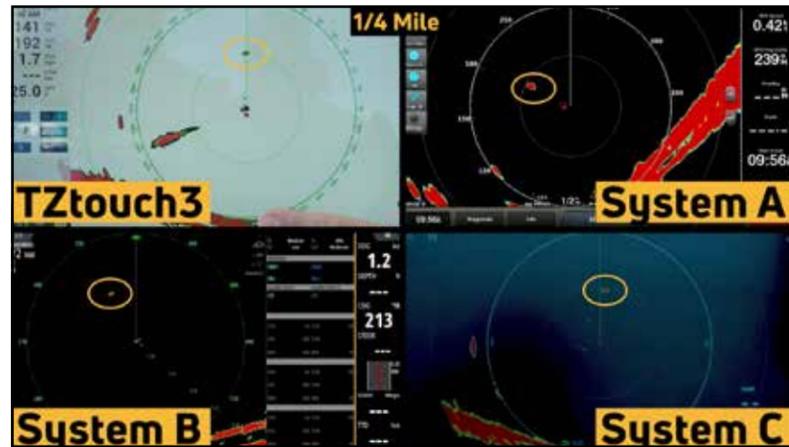
Episode 11 is a long-range Radar performance test. We took our 17' skiff out on the open water to see how far out it can go before we lost it's return on each of the Radars. The shallow flats boat has a very small Radar cross section, and such a challenging target is exactly what we wanted for this test. The skiff began from about 100 yards away, and then ran out to just over a mile.

On the DRS4DNXT Radar, the skiff gave us a consistent target beyond half of a mile before it began to drop and reappear. From about 3/4 of a mile to one mile, the skiff continued to drop and reappear on our Radar screen. We were still able to detect the skiff intermittently on the DRS4DNXT when it had reached just over one mile from our test boat.

System "A" presented a strong target for the skiff, and then began to drop and re-acquire the target just after 1/4 mile. System "A" lost the skiff target at 1/2 mile.

System "B" also delivered a consistently strong target on the skiff out to about 1/2 mile range. The skiff target continued to disappear and reappear from 1/2 mile out to about 3/4 mile, but the target was lost completely before reaching the 1 mile mark.

System "C" displayed a strong target out to about 1/4 mile before it began to drop. From 1/4 mile to 1/2 mile, the skiff target would disappear and reappear on the Radar. System "C" could not detect the skiff beyond 1/2 mile.



	TZtouch3	System "A"	System "B"	System "C"
Distance Target Lost	Slightly past 1 N.M.	1/2 N.M.	Slightly below 1 N.M.	1/2 N.M.

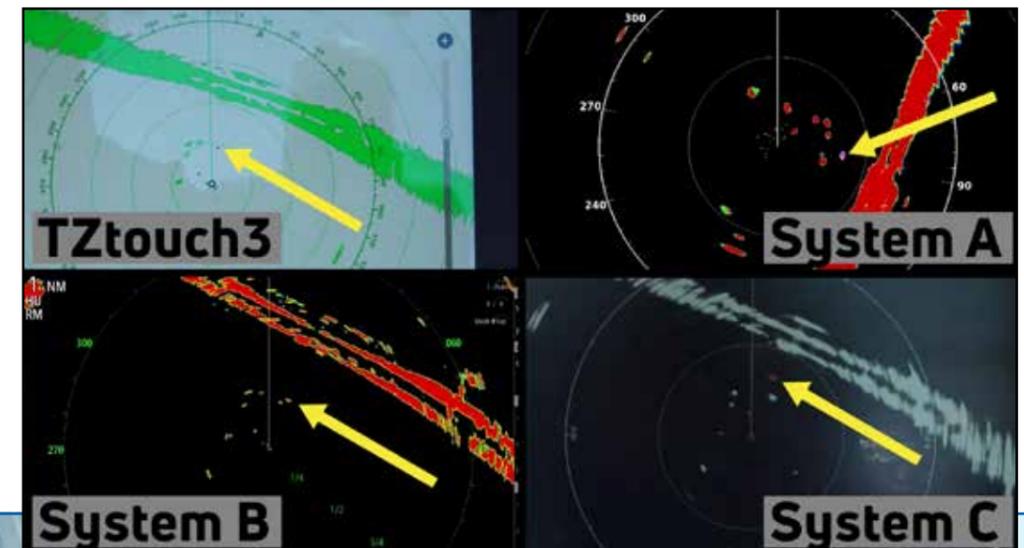
## Doppler Radar Performance

Episode 12 is a long-range Radar performance test where we take a look at the Doppler function of the solid-state Radar domes. We also tested the ability of the Radars to track targets when there is an obstruction. For this test, we sent the skiff past the 7-Mile Bridge in Marathon, Florida in order to determine if the Radars would see the skiff, or if the skiff target would be lost beyond the bridge.

In this test, the DRS4DNXT on NavNet TZtouch3 was the only Radar that could detect the skiff as it passed beyond the 7-Mile Bridge. All of the other systems were able to detect the skiff as it approached the bridge, allowing our crew to track it's progress.

As expected, most of the Radars lost the target as it went under the bridge. Only the DRS4DNXT was able to display the skiff as a distinct Radar target beyond the bridge.

One other feature of the Radars that we tested is a feature that Furuno calls Target Analyzer. Doppler Radars have the ability to track the speed and direction of targets and determine if the target presents a threat to your vessel. On NavNet TZtouch3, if a target is approaching at a speed of 3 knots or greater, the target will be shown in red on the display. Stationary targets or targets not approaching your position are shown in green. Target Analyzer makes it simple to discern dangerous targets on your Radar at a glance. A similar function is available on all of the other Doppler Radars we tested. When the skiff returned from the bridge and was approaching our position, all four systems were able to re-acquire and display the target. NavNet TZtouch3, System "A", and System "C" MFDs correctly displayed the color of the target, indicating a hazardous object was approaching the vessel. System "B" never changed to color of the skiff target as it approached to indicate the Radar was tracking a hazardous object.





## ARPA/MARPA, Target Trails, and Bird Mode

In Episode 13, we test some of the extended features of these Solid State Radars, including ARPA/MARPA capability, Radar Overlay, Target Trails, Dual Range capability, and Bird Mode. Features such as Radar Overlay and ARPA may require a heading sensor, and since we were testing these systems as they come out-of-the-box, we could not conduct all of the tests that we would have liked - but knowing that these features are available is important to any mariner.

The Furuno DRS4DNXT features a full ARPA (Automatic Radar Plotting Aid) that automatically acquires up to 100 Radar targets. Once a target is acquired, the system will place a circle icon around that target, along with a vector line indicating its heading and speed. Tapping on any acquired target will give the navigator more information about that target, including distance from the vessel, CPA (closest point of approach) and TCPA (time to closest point of approach).

Systems "A", "B", and "C" include MARPA, or "Mini ARPA" functionality. MARPA is basic ARPA with a limited set of features. While the DRS4DNXT on TZtouch3 allows for tracking of up to 100 targets, the other systems we tested allow for tracking of far less targets. Systems "A" and "B" require the operator to manually select up to ten targets that the operator would like to track, with no provision for automatic acquisition of targets. System "C" can automatically acquire up to 25 Radar targets, but those targets must be within a Guard Zone previously set by the operator.

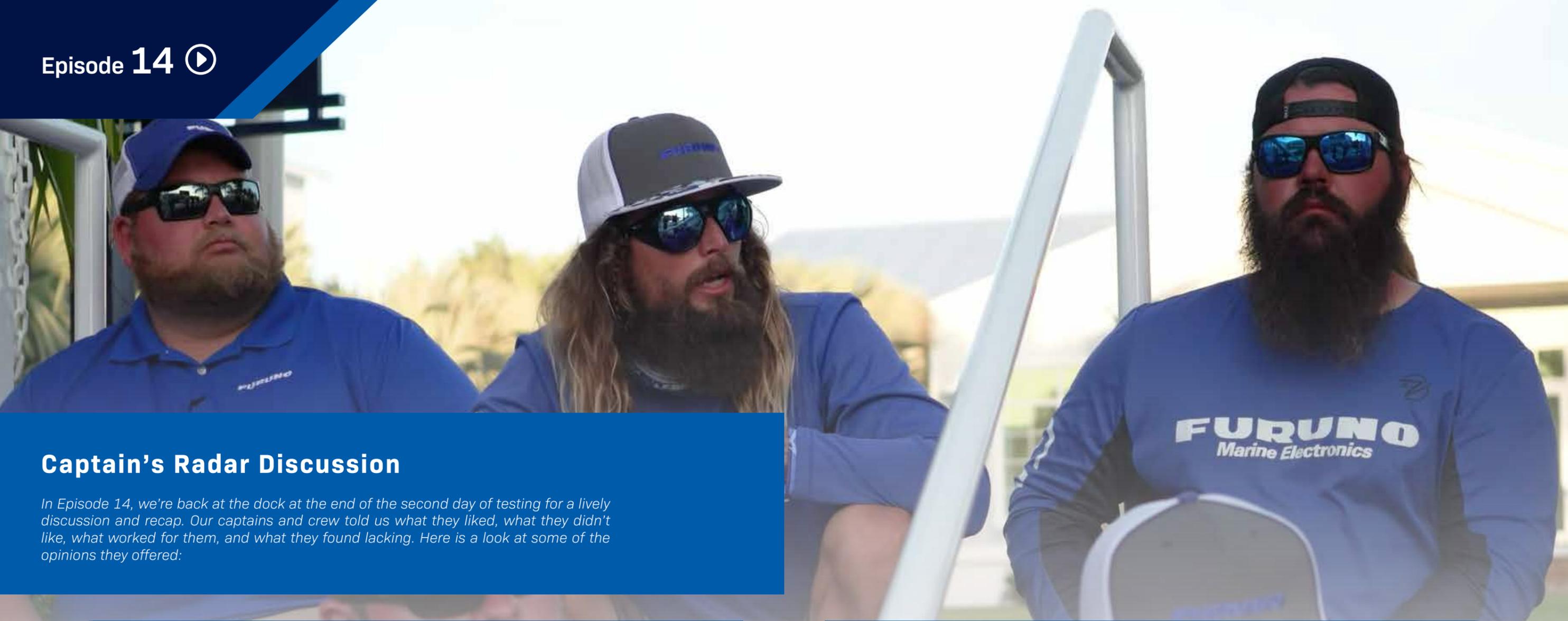
All of the Radars we tested offer Target Trails, allowing the operator to see the past movements of targets on the Radar screen. This is useful for understanding the movement of targets on the screen in relation to your vessel. The problem with Target Trails is that, as the operator's vessel moves, stationary targets will leave trails on the Radar display, even though they have not moved - the apparent 'movement' of these stationary targets is in relation to the operator's vessel only.

	TZtouch3	System "A"	System "B"	System "C"
ARPA or MARPA	ARPA	MARPA	MARPA	MARPA
# of Targets	100	10	10	25
Auto Acquire	✓ (40 Doppler, 30 Manual, 30 Guard Zone)	✗	✗	✓ (Standard trails only)
True Target Trails	✓	✗ (Standard trails only)	✗ (Standard trails only)	✓
Dual Range	✓	✓	✓	✗
Bird Mode	✓	✓	✓	✗
Rain Mode (not tested)	✓	✗	✗	✓

True Target Trails takes into account the movement of the operator's vessel, displaying trails only for the actual movement of targets. Stationary targets such as landmasses, buoys, or vessels at rest will not leave a trail on the Radar screen. Only the DRS4DNXT and System "C" Radar offer True Target Trails.

The DRS4DNXT, System "A", and System "B" have Dual Range capability, allowing the operator to display two separate Radar presentations at different ranges. This allows the operator to have a clear short-range presentation, displaying close-in targets clearly, while also being able to keep an eye on Radar targets that are further away. Of the Radars we tested, only System "C" does not offer Dual Range Radar capability.

Finally, we tested Bird Mode on all of the systems where it was available. Bird Mode adjusts the Radar display to automatically to track birds, a technique that fishermen have used for decades using the Gain and Clutter controls to 'dial in' the Radar in order to see them. Automatic Bird Mode does all of that work for you. This feature is available only on NavNet TZtouch3, System "A", and System "B".



## Captain's Radar Discussion

In Episode 14, we're back at the dock at the end of the second day of testing for a lively discussion and recap. Our captains and crew told us what they liked, what they didn't like, what worked for them, and what they found lacking. Here is a look at some of the opinions they offered:



"I was very impressed with (Target Analyzer). For me, safety is number one and when I was able to see those targets in red coming at me, then turn to green as it passed me, that was most impressive. This is the best feature that I personally see on this Furuno unit, and after testing, we blew the competition away."

**Captain Jack , Two Conchs Sportfishing**



"As we did all the tests, it was neck-and-neck with the Furuno. The only part that it did lose some was during the bird mode and when we were in the creek. The skiff blended into the mangroves a bit, but we were able to show a lot more on System "B" than the other ones. It did impress me all day. I don't have much bad to say about it."

**Captain Manny Souza, Two Conchs Sportfishing**



"I really don't have too much good to say about System "A". I mean, it worked. We lost a lot of marks, they would just disappear. I use these Radars for weather and finding birds. We had Bird Mode on and we weren't really picking up birds at all."

**Captain Mike Macko, Two Conchs Sportfishing**



"As far as what we do, as far as fishing, finding birds, finding weather, seeing objects running kind of away from you or to you, System "C" just didn't really keep up with what we use day in and day out with Furuno. So, you know, it just wasn't the worst thing, but it also wouldn't be my choice."

**Captain Cameron Null, Two Conchs Sportfishing**



"The features, in the Doppler Target Analyzer mode did not function at all (on System "B"), we couldn't get it to work. We had it set for approaching only. We saw no color change on targets at all. Not once, the entire day."

**Clayton Paddison, Furuno USA**



"System "B" was actually quite a good Radar. It was comparable to the DRS4DNXT in terms of overall performance. The features set around the radar in terms of the Doppler signal processing and the target analyzer mode, not quite as good. Honestly, the Radar on System "A" and System "C" were kind of unimpressive to me."

**Eric Kunz, Furuno USA**



"Using System "A", the feature set around the Radar is really good. They put a lot of thought into the features in that Radar. Then, there's performance, and I just can't say too many good things about that. My expectation was that I was going to see good target separation, but what we found is targets came and went off the screen, and I couldn't explain why."

**Tim Moore, Furuno USA**



"System "C" on that 1/8 mile range, we had really good target definition and target separation. When we moved past that 1/8 mile range, my targets really started to get blended together. The biggest con, and the biggest thing that surprised me, was being a Solid State Radar, you're not really supposed to have a main bang."

**Braden Shoemaker, Furuno USA**



## Deep Water Fish Finder Comparison

Episode 15 is the beginning of our Fish Finder testing. For these tests, all of the units used identical Airmar 275LHW transducers. The first test location for these units was a location called the Marathon Hump, and undersea range off the Florida coast that offers a minimum depth of about 500 feet that quickly drops off to about 1,000 feet. Experienced fishermen know these waters hold many of their favorite target species such as tuna, amberjack, albacore, and sharks, along with plenty of baitfish. What our captains focused on for this test was the performance of each Fish Finder to clearly show bait, game fish, and bottom contour in depths from 500 feet down to 1,000 feet.



*"There's different styles of fishing out here. In certain styles of fishing, you want to be able to see what you're actually going to be fishing for. Jigging's a lot of work. You don't want to be jigging blindly, wearing yourself out on these fish. If I can see these fish very clearly, it's going to let me drop these jigs down right in the middle of the fish, and that's going to be a guaranteed hookup."*

**Captain Mike Macko, Two Conchs Sportfishing**

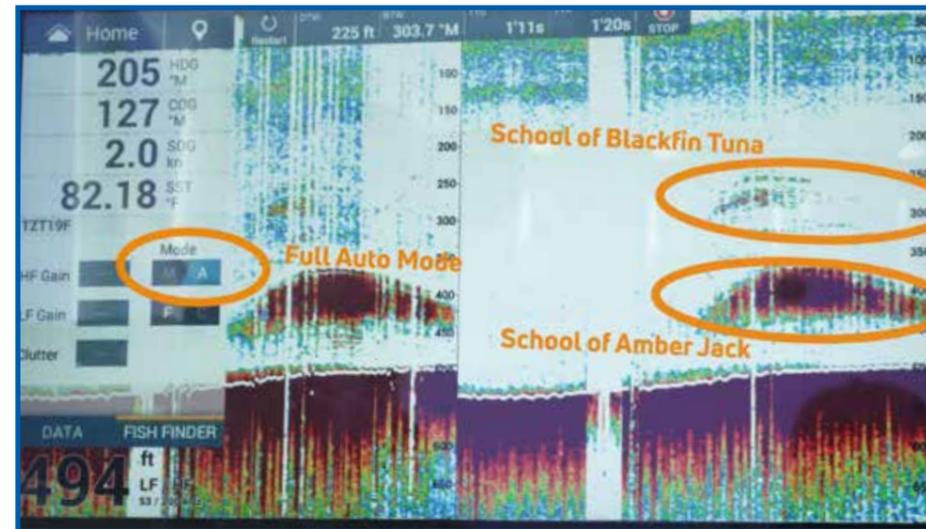
Seeing deep into the water column is a function of the power output and frequency of the Fish Finder, coupled with the processing of the return signal. Low frequencies 'see' deeper than high frequencies, returning stronger echoes from bottom contour and fish targets. The way the Fish Finder processes that signal is proprietary to each manufacturer.

The built-in 1 kW dual-channel TruEcho CHIRP Fish Finder in NavNet TZtouch3 performed well in this test, as we expected. The system clearly showed schools of fish and consistently painted a strong bottom return on the display. We were able to see individual game fish on the display as well bait fish and larger schools of game fish. Even in depths of over 1,000 feet, the TZtouch3 TruEcho CHIRP Fish Finder was showing very strong bottom returns in full auto mode.

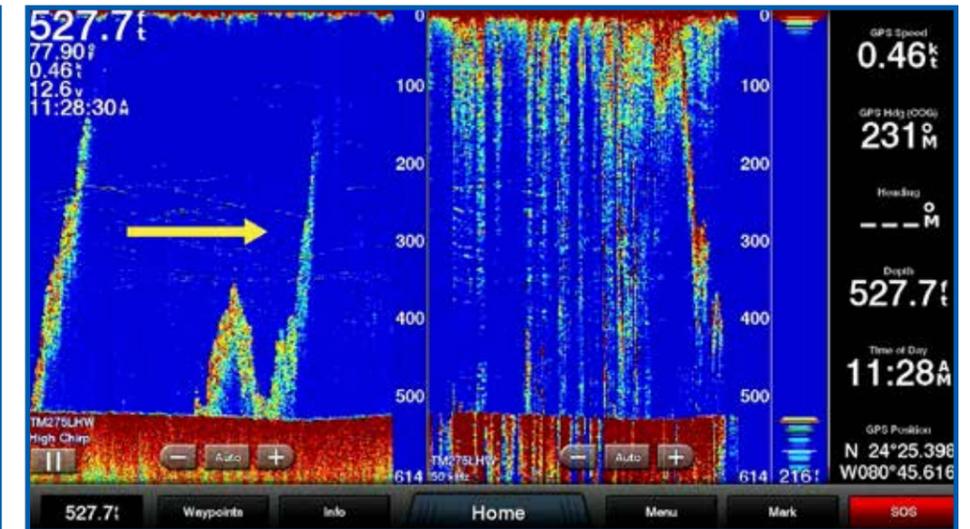
The 1 kW dual-channel CHIRP Fish Finder on System "A" performed well, showing our captains and crew the bottom contours and fish targets. Captain Mike was pleased to see the bottom contours painted solidly on the display. While we did experience some noise on the screen and weak returns on the high frequency side at greater depths, this was exactly what we expected to see. A rule of Fish Finders is that lower frequencies can 'see' deeper than higher frequencies, and so we did expect to lose that strong bottom return on the high frequency side.

System "B" had problems from the beginning. The Fish Finder would operate only at its higher frequencies of 200 kHz/800 kHz, and because we did not have any lower frequencies available, we saw weak returns in our deep water tests. We also saw the same screen glitching that we experienced in previous testing, with data bars along the top of the screen 'flashing' constantly. Unfortunately, because of the unavoidable technical problems our captains and crew experienced, we could not record an apples-to-apples comparison using the exact same criteria as all the other MFDs.

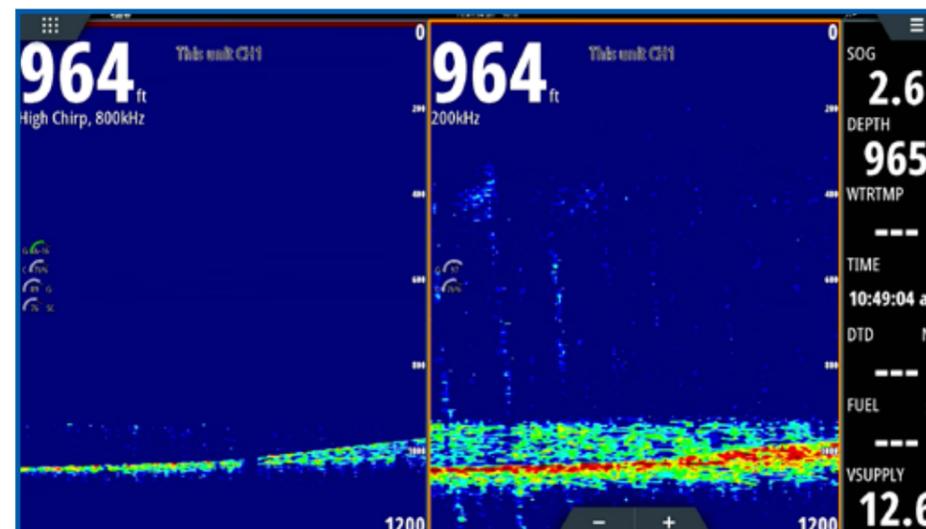
System "C" performed well in our deep water tests, showing bottom and marking schools of game fish. Captain Cam did note that while bottom and fish returns were clearly visible on System "C", fish returns were not as prominent or 'bold' as he's used to seeing on his own Furuno MFD.



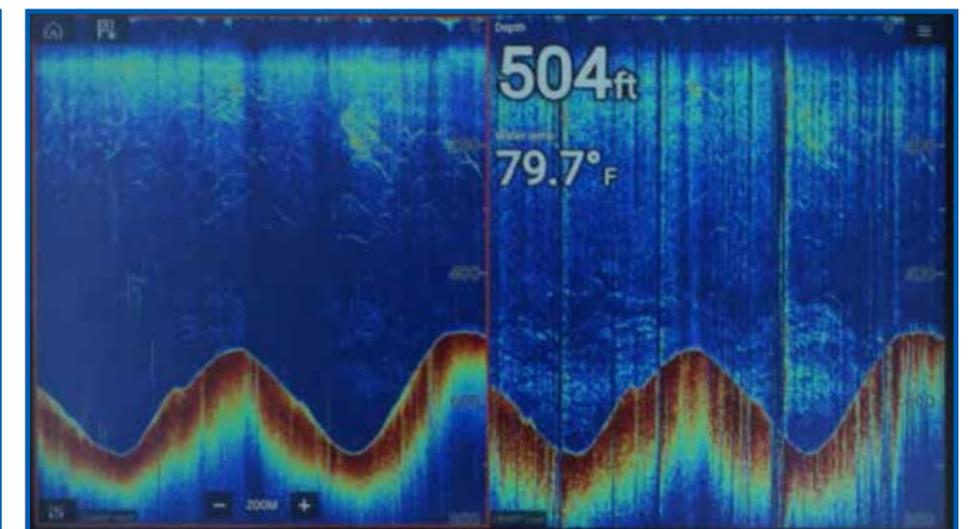
TZtouch3 showing schools of game fish on both the high and low frequencies in full auto mode



System "A" showing schools of game fish on both the high and low frequencies in full auto mode



System "B" showed comparatively weak returns as we could get the MFD to work only when it was set to higher frequencies than our criteria



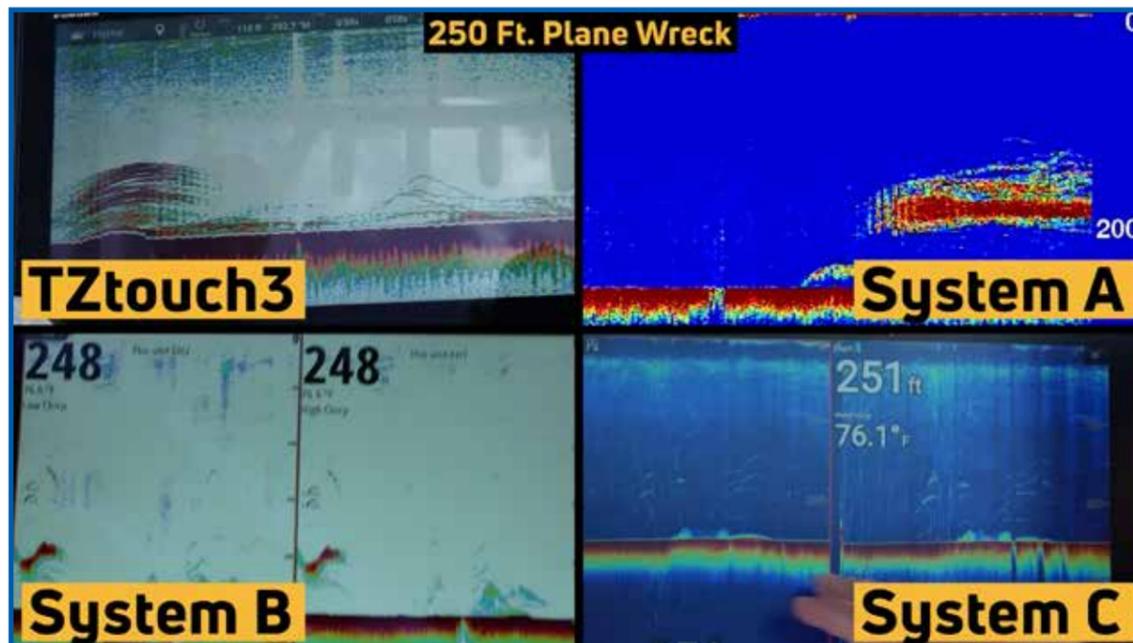
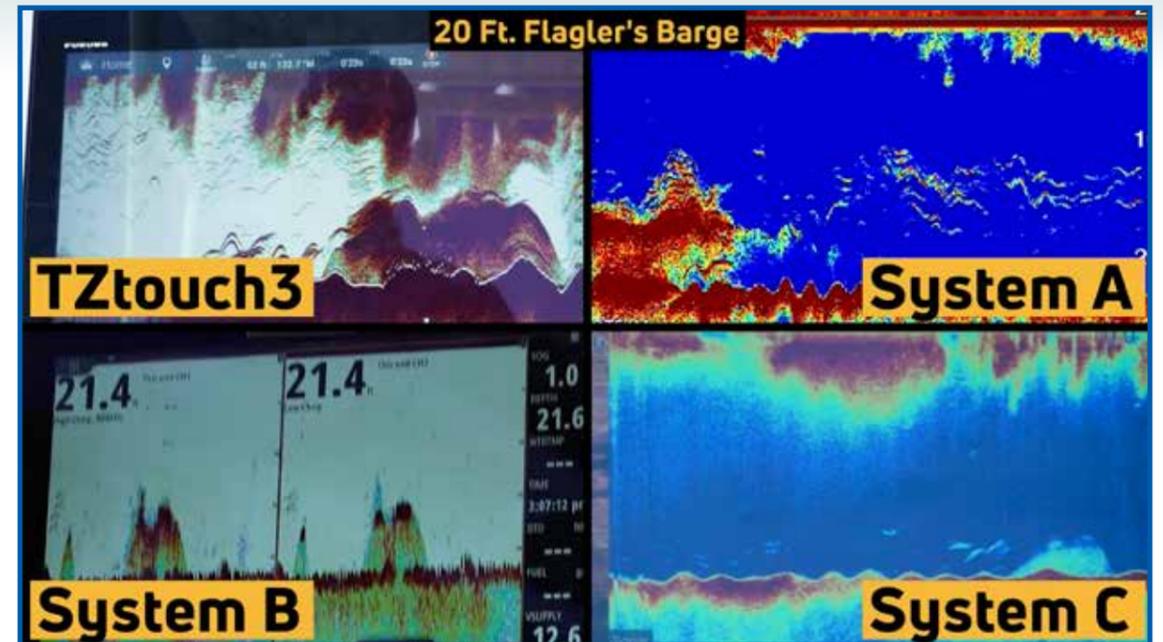
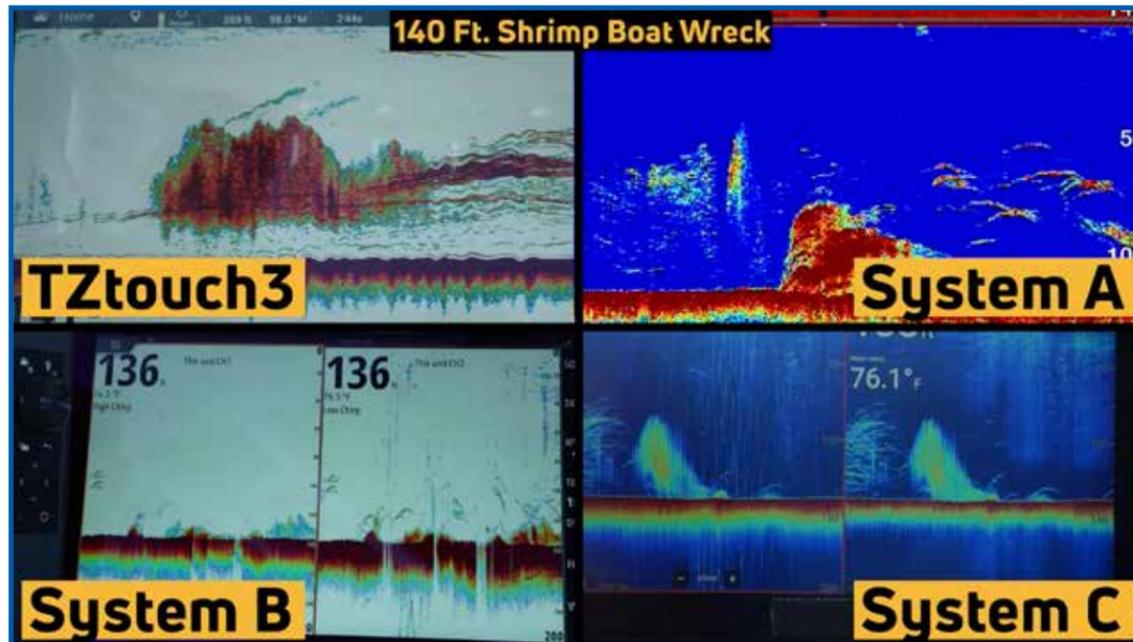
System "C" showed good returns for the bottom, but the fish returns we saw were not as strong as we expected to see

## Shallow Water Fish Finder Testing

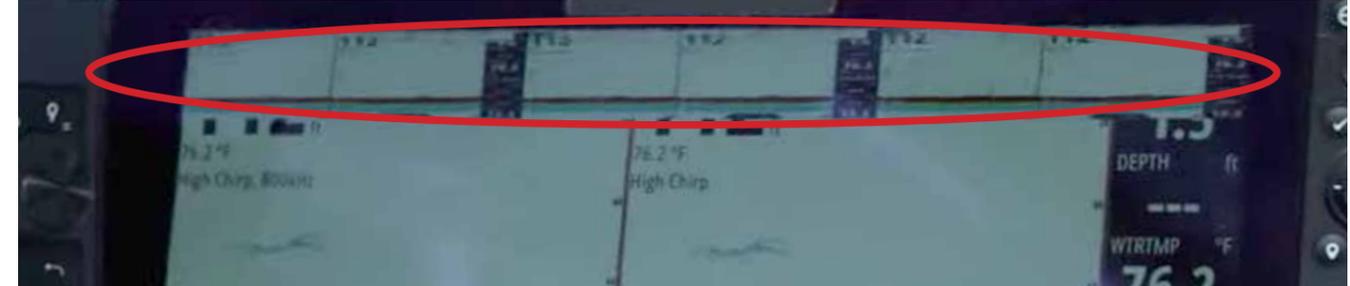
Episode 16 is a shallow water test of the built-in CHIRP Fish Finder on each system. In 140 feet of water over the wreck of an old shrimp boat, the internal 1 kW CHIRP Fish Finders on all four MFDs did a great job of displaying structure and fish targets.

The next destination for our shallow water tests was over the wreck of an airplane in 250 feet of water, and once again we were able to report very good performance from all 4 systems.

Finally, we traveled to Flagler's Barge, a sunken wreck submerged beneath 20 feet of water. All three systems again did a good job of showing the structure as well as fish in these shallow waters.



During this test, System "B" began to glitch again, with what looked like a duplicate of the Fish Finder screen blinking rapidly in and out of each of the three data boxes along the top of the display. Our captains and crew could not fix the problem without restarting the system. It is difficult to show this error in an image, so we refer you to the episode to get a better idea of what the system was doing.





## Fish Finder Features Comparison

Episode 17 is a comparison of the additional features available on the built-in Fish Finder of each of the MFDs. In this episode, we took a look at a function that Furuno calls Accu-Fish, a feature of the TZtouch3 Fish Finder that allows you to see fish size and fish depth. We also took a look at Bottom Discrimination, a feature that allows you to see the composition of the sea floor. Finally, we discussed the Bottom Lock and Bottom Zoom features. Our testing in this episode showed that the built-in NavNet TZtouch3 Fish Finder was the only system that includes a complete set of tools for any captain to increase their chances of success.

The episode begins with a look at the new TZ First Mate App. TZ First Mate allows you to connect your mobile device to TZouch3 so that you can log your catch and take a picture to upload to your MFD via a simple Bluetooth connection. Once you've logged your catch, you can view & edit the marks on your MFD or smart devices with the TZ First Mate App, TZ PC Software, or TZ iBoat.

As any experienced fisherman will tell you, the more information the captain has about the fish they're targeting, the more successful they will be. Only NavNet TZtouch3 offers a fish size assessment tool. Furuno's Accu-Fish" feature estimates the length of the fish targets appearing on the Fish Finder screen, as well as the depth of the fish target. The algorithm analyzes echo returns in order to calculate fish size ranging from 10 cm up to 199 cm (>4" to <78"). This feature is available with specific transducers. System "B" can display fish icons on the screen that will tell the captain the estimated depth of the fish, but cannot estimate the length of the fish target. Neither System "A" nor System "C" offer similar features.

Only NavNet TZtouch3 offers a tool to determine the sedimentation of the seafloor, a unique feature that Furuno calls Bottom Discrimination. Bottom Discrimination provides detailed information about the composition of the seabed, displaying this graphically as one of four different categories: Rocks, Gravel, Sand, or Mud. Knowing the composition of the seafloor can be very beneficial when searching for the most productive fishing grounds, as well as for finding favorable anchoring spots. This feature works with specific transducers.

All of the systems except for System "A" offer a Bottom Lock feature. Bottom Lock automatically flattens the bottom returns on the Fish Finder screen and display it in a simple presentation so the captain can see exactly how far off the bottom the fish are. In our case, we were in 250 feet of water, looking at a section of the bottom and fish returns from 220 feet down to 250 feet.

All of the systems we tested include a Bottom Zoom feature. Bottom Zoom is similar to Bottom Lock, but this mode won't flatten out the bottom presentation on the Fish Finder screen. Instead, it will zoom in on the bottom section that the captain is interested searching, showing all of the depth changes and undulations of the seafloor. In our test, we could see that the bottom wasn't flat. We were zooming in on that same bottom 30 feet where we tested the Bottom Lock feature, and we could see the actual bumps and holes along the seafloor. Bottom Zoom is an effective method to easily determine the fish distribution in the area above the seafloor.

	TZtouch3	System "A"	System "B"	System "C"
Catch/Species App	✓ (TZ First Mate)	X	X	X
Fish Size Tool	✓	X	X	X
Fish Depth Tool	✓	X	✓	X
Bottom Discrimination	✓	X	X	X
Bottom Lock	✓	X	✓	✓
Bottom Zoom	✓	✓	✓	✓



## Captain's Fish Finder Discussion

In Episode 18, we're back at the dock for a lively discussion and recap of the day's tests. Our captains and crew gave us their impressions on the Fish Finder functions they tested, telling us what they liked, what they didn't like, what worked for them, and what they found lacking. Here is a look at some of the opinions they offered:



*"I was very impressed with it (the 1 kW built-in NavNet TZtouch3 Fish Finder). I was able to decipher which ones were tuna, the amber jacks, and even the bottom fish we were marking on there too - queen snapper or albacore jacks hanging deeper. So, the marks were great. I was very impressed."*

**Captain Jack, Two Conchs Sportfishing**



*"Other than System "B" glitching and us not being able to use all the features, it worked really well. The low CHIRP picked up very well. The high CHIRP also performed well. And then when we did come in the shallow water, it performed even better. But, we did have a lot of issues with the unit that would turn me away from it because it was such a headache."*

**Captain Manny Souza, Two Conchs Sportfishing**



*"High CHIRP (on System "A") worked well. It marked the bottom really good. Low CHIRP pretty much stayed noisy most of the time, even playing with it a little bit. Once we got in the shallow water, it really took off. I mean, it marked well, read the bottom well. I could tell what kind of fish were down there. But, the low CHIRP was very noisy. It was a little tough to work with."*

**Captain Mike Macko, Two Conchs Sportfishing**



*"We had System "C" on the high-low CHIRP and you could kind of paint your picture that way looking at the system. We thought we'd see a lot more with the low CHIRP 1 kilowatt, but, it was what it was."*

**Captain Cameron Null, Two Conchs Sportfishing**



*"I had two things that actually surprised me on System "C". The first was how well the high CHIRP did mark bottom. I expected the high CHIRP to fall off a little bit in that deeper water, but it really was giving me a good bottom. The fish targets that were in the water column, though, seemed a little weak. I was expecting to see better fish targets."*

**Braden Shoemaker, Furuno USA**



*"In 500-600 feet, System "B" was kind of weak. We weren't getting very good returns with the high CHIRP. The low CHIRP was okay. We took it out of auto and put it into manual and dialed the gain up, and we could get a really nice, strong picture. It was gorgeous. Then switched it back to auto, and all of it goes away. So, auto mode seemed to be a little bit lacking."*

**Clayton Paddison, Furuno USA**



*"Low CHIRP was exceptionally noisy to the point where we were looking for ways to clean it up. When we split the screen three ways, I was able to actually have three different frequencies on the screen at the same time with the combo sounders built into System "A". So, it was pretty neat to be able to compare those three different frequencies at one time."*

**Tim Moore, Furuno USA**

## Multi Beam Side-Scan Sonar Deep Water Testing

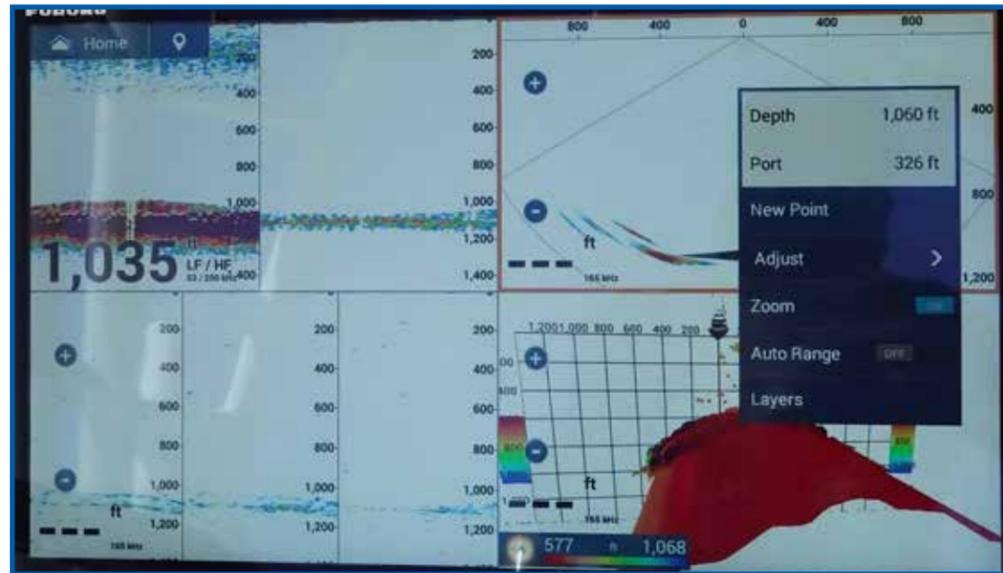
Episode 19 begins our 3D Multi Beam/Side Scan Sonar test. In these tests, we had no choice but to use the transducer that comes with each of the four systems. Each of the four boats had a different transducer matched to the Side Scan Sonar for the system installed on that vessel. Because of this, and because of the very different mechanical specifications of the four systems, we expected to see huge differences in performance, and that is exactly what we recorded in our tests.

The DFF3D Multi Beam Sonar on NavNet TZtouch3 operates at 165 kHz, a much lower frequency than any of the other systems. We chose this low frequency to enable far greater depth penetration, allowing NavNet TZtouch3 to show fish targets and strong bottom returns in water depths that are unfathomable to the other systems. In our tests, only the DFF3D Multi Beam Sonar was able to show us consistently strong bottom and fish returns at depths beyond 1,000 feet.

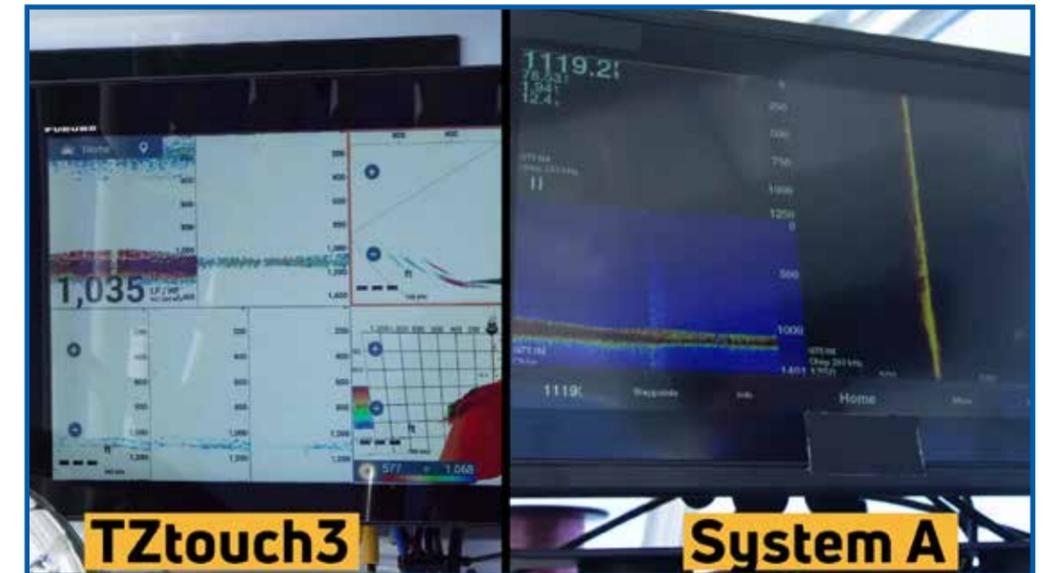
System "A" operates at a higher frequency, and was able to show some bottom returns, but was not showing our operators any fish returns. At the same time, the DFF3D was showing consistent fish returns.

Unfortunately, System "B" experienced an out-of-box failure at the beginning of our Multi Beam Sonar tests. The system was plagued with problems throughout our four days of testing, and so our operators were not able to provide a fair assessment of how well the system should have performed.

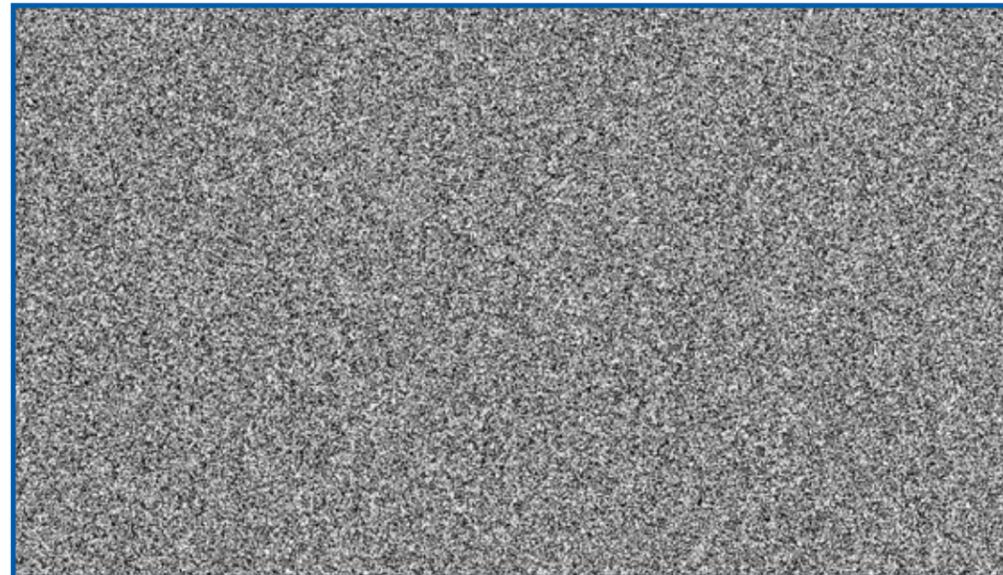
System "C" was showing weak bottom returns down to 500 feet, but was not able to perform well beyond that depth. Our operators had the system displaying a four-way split screen with Side Scan and traditional down scan and we were able to see the bottom on the high frequency sonar. They also were able to mark some fish on the 3D view, but were unable to get any other useful information from that function.



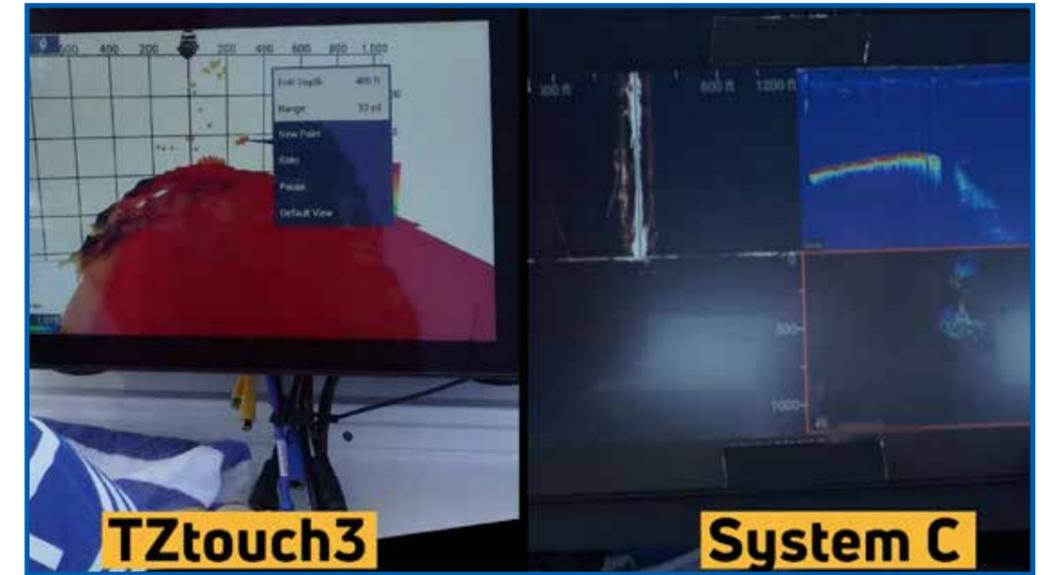
DFF3D showing bottom and fish at depths of over 1,000 feet



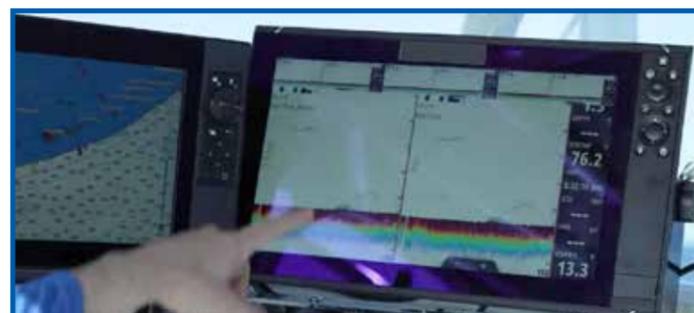
System "A" showing the bottom, but no fish returns



System "B" was not functioning at all for these tests



System "C" showed some bottom returns, but the fish returns we saw were not as strong as we would have liked to see



"We swapped transducers and got everything hooked up, but unfortunately, it doesn't seem to be responding. The source should be in this box here and it's not showing up now. We're going to have to go back to shore and get with their manufacturer support to find out what's going on."

**Clayton Paddison, Furuno USA**



## Multi Beam Side-Scan Sonar Medium Water Testing

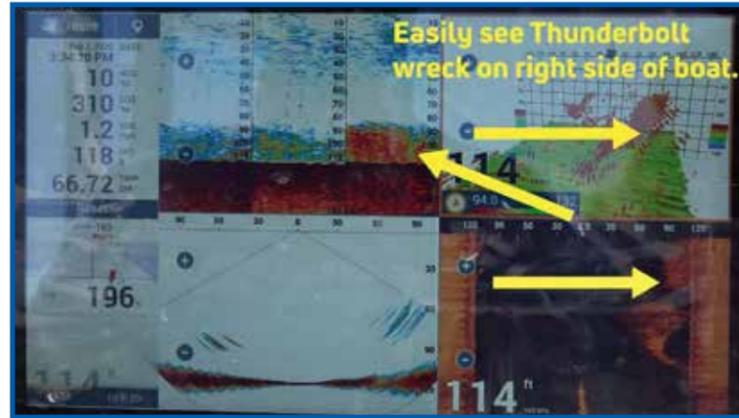
Episode 20 is a mid-water 3D Multi Beam/Side Scan Sonar test. Depths between 100 and 250 feet is where we expected the other systems to perform at their best, and as we see in the episode, we were able to really see these systems begin to shine.

System "B" was still malfunctioning. Unfortunately, our operators could not test System "B" in the mid-range depths.

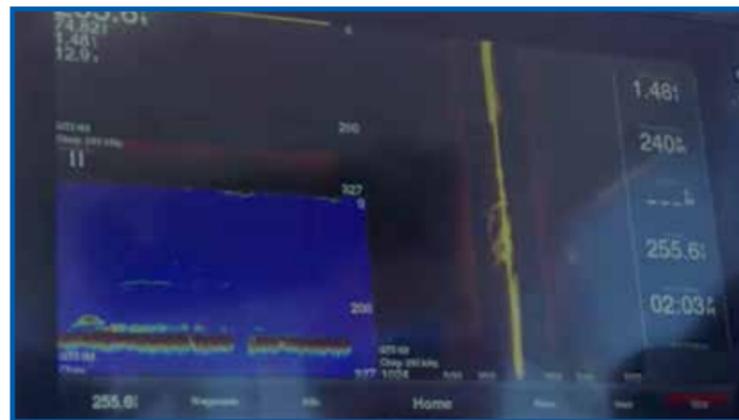
The tests begin in 250 feet of water with a flat bottom, over the wreck of a sunken airplane. The DFF3D was easily showing fish targets as well as the wreck detail in the triple-beam view (top left), 3D view (top right), and in the cross-section view (bottom left). Our operator Eric Kunz takes this opportunity to point out to Capt. Jack how the 120° beam of the DFF3D allows him to determine where the fish are located. The triple-beam view is showing three different areas beneath the vessel - a 40° beam to port, a 40° beam directly beneath the boat, and a 40° beam to starboard. Knowing where the fish are located makes it easy to determine where to drop your lines.

Moving on to 100 feet of water, our captains took us to the wreck of the USCG Cutter R/V Thunderbolt. We could clearly see the wreck on all of the DFF3D presentations, along with strong fish targets. Importantly, we could see on which side beneath the boat the wreck was located.

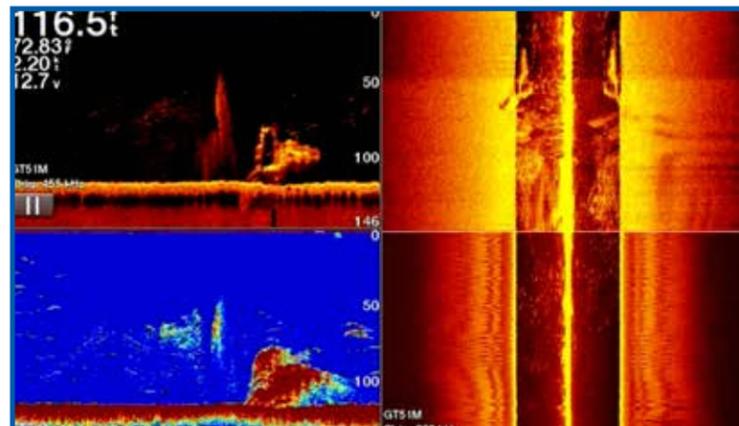
As expected, the DFF3D Side Scan Sonar performed even better in these depths than it did in the deeper water.



The DFF3D performed well in the mid-water tests, showing our operators the fish and structure, as well as which side of the boat the targets were located



System "A" performed much better in the mid-water testing, displaying good fish and structure targets



System "C" still seemed to struggle in the 250' depths, but performed much better in the 100' ranges

System "A" began to perform better in the 250 depths, and we were seeing good targets for fish and structure. Due to the higher 260 kHz frequency of System "A", we still were not seeing as strong of targets as the DFF3D was showing us at this depth. Tim particularly liked how System "A" allowed him to select three different frequencies to display and compare simultaneously. Capt. Mike pointed out where the bait fish were congregating around the wreck, and also pick out individual predator fish, likely amberjacks, that were attacking the bait balls. Our assessment was that System "A" worked very well in the mid-range depths, demonstrating greater performance than it did in the deep water testing by far.

Moving into the 100 foot depth was where we were able to get the best performance from System "A". Fish and structure targets around the wreck were stronger and clearer with the lower 260 kHz frequency setting than we could obtain at the higher 485 kHz frequency setting.

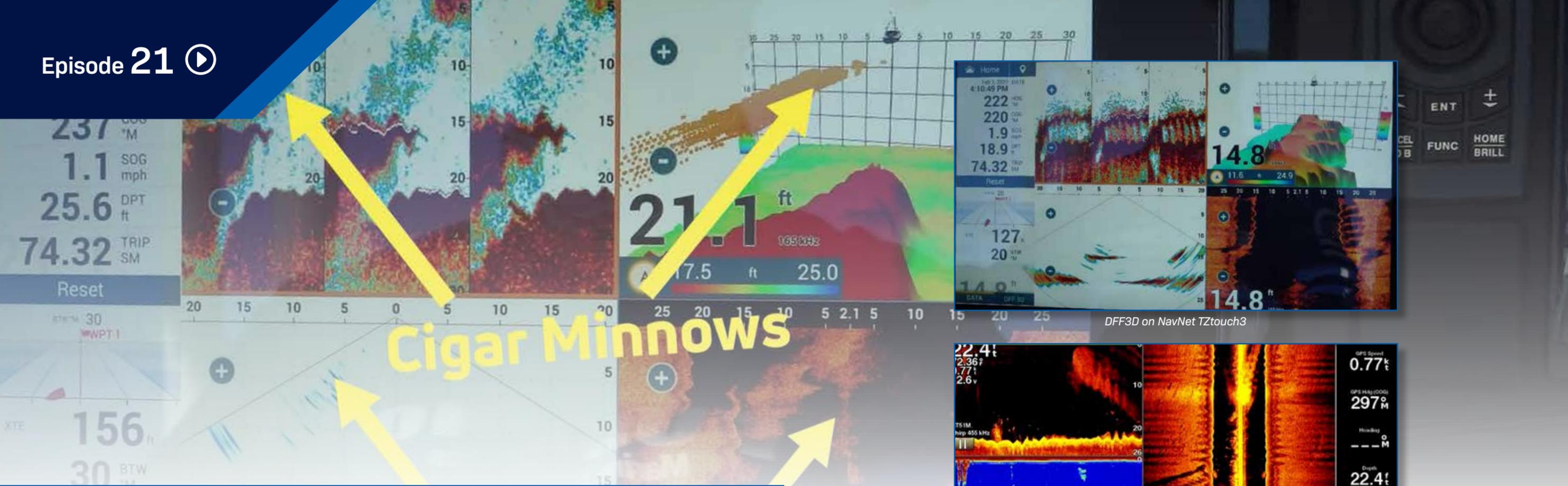
In 250 feet of water, System "C" was still having difficulty showing us strong fish and structure targets with the kind of detail that we would have liked to have seen. It wasn't until we were in the shallower depths of around 100 feet that we could really begin to get good, detailed fish targets on System "C".

Although we did begin to see some useful targets on the System "C" 3D Fish Finder display, the DFF3D continued to out-perform all of the other systems in these mid-range depths.



During our filming, Capt. Mike dropped his lines in the water every chance he had. When he hooked up during this episode, Capt. Jack was able to spot his catch on the DFF3D Multi Beam Sonar's Cross Section presentation. We watched as Capt. Mike reeled the fish up and out of the DFF3D's 120° beam in real time.





## Multi Beam Side-Scan Sonar Shallow Water Testing

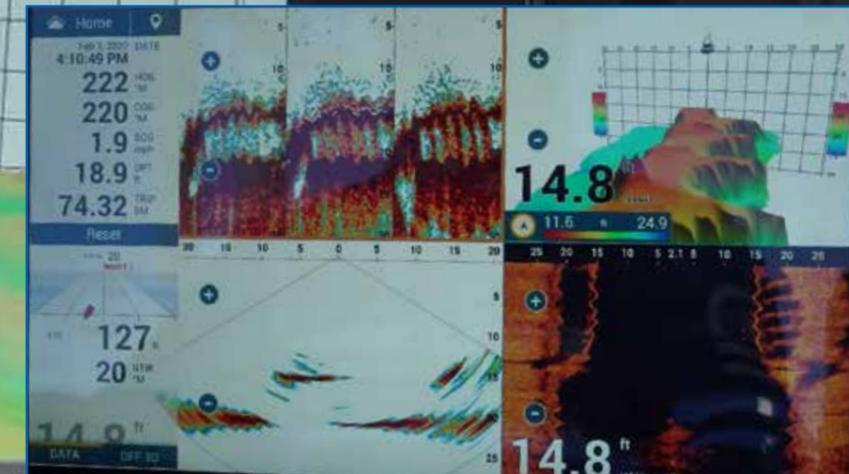
*In Episode 21, we tested the 3D Multi Beam Fish Finder and Side Scan Sonars in shallow water, running our test vessels over structure in 15 and 25 foot depths. In particular, the DFF3D not only showed fantastic structure including the individual ribs of the sunken wreck, but also showed very good marks for the cigar minnows in the area compared to Systems "A" and "C". System "B" continued to malfunction, and we could not use it during our shallow water testing.*

In Episode 21, we see that Systems "A" and "C" offer their best performance in shallow water.

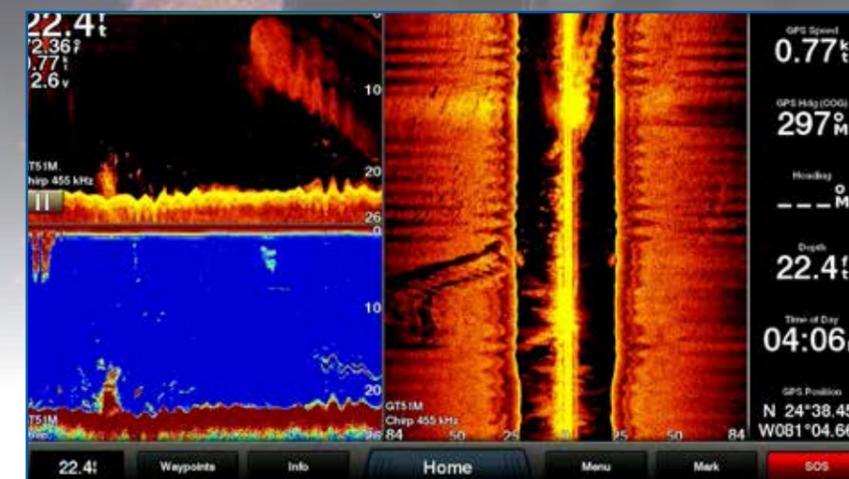
The DFF3D on NavNet TZtouch3 clearly showed the individual ribs of a sunken wreck. Captain Jack runs diving charters in this area, and he's familiar with the layout of the wreck. The DFF3D displayed the bottom structure clearly, while also showing us all of the cigar minnows gathered in the area. We were able to gather useful information from every presentation of the DFF3D Multi-Beam Sonar.

System "A" definitely gave us a lot more detail in 15-20 feet of water. We determined that System "A" offered its best performance in shallow water with the system operating at 455 kHz. Our operators saw good target separation and structure in these shallow waters. They were impressed with the system's shallow water performance.

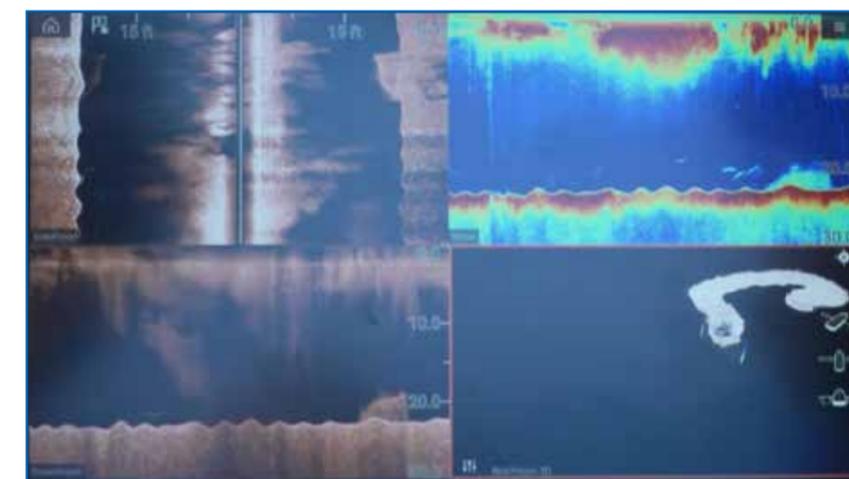
System "C" also performed much better in shallow water. Our operators were able to see good fish and structure targets in the 15-20 foot range due to the higher frequency of System "C". We found that the 3D view was not as useful as we would have liked. We also noticed that the 3D view on System "C" was 'spinning' the entire time, and we could not explain why this was happening.



DFF3D on NavNet TZtouch3



System "A"



System "B"





## Captain's 3D Fish Finder Discussion

In Episode 22, we're back at the dock for a lively discussion and recap of the day's tests. Our captains and crew gave us their impressions on the 3D Fish Finder and Side Scan Sonars they tested, telling us what they liked, what they didn't like, what worked for them, and what they found lacking. Here is a look at some of the opinions they offered:



*"When I'm out there and I'm using the DFF3D every day, I need to know where they are. If they're 200 feet this way, 100 feet this way, whether they're up high or down lower, that's what gives me the advantage. I can mark them and I know I can just stop the boat and tell my customers, cast to the right 100 feet and guess what? They hook up every time."*

**Captain Jack , Two Conchs Sportfishing**



*"You get out there and you're excited to use it and it doesn't even pop up. Imagine the frustration of somebody who just spent that kind of money, or a captain like me who is a professional and needs it every single day, for the unit to completely fail. We really would like to give some feedback, but we unfortunately don't have any for System "B". It just did not work for us today."*

**Captain Manny Souza, Two Conchs Sportfishing**



*"The deep water on System "A" was just not good. It just did not work at all. I do a lot more deeper water fishing, so for me, it doesn't work as well. But, when we got into that shallow water, it really lit everything up. I could see the contours of the barge. I could see everything pretty well. But, anything in that deep water, it wasn't cutting it. Not at all."*

**Captain Mike Macko, Two Conchs Sportfishing**



*"The conclusion was for a guy like me that does a lot of deep water fishing, System "C" really didn't cut it. When we got to the shallow water, it held up. But as far as what we do, for deeper water, it just wasn't good for that."*

**Captain Cameron Null, Two Conchs Sportfishing**



*"What I was really impressed with today was how we compare with the competitors in shallow water. It kind of shocked me. Even at 15 feet, marking that one wreck out here and seeing individual ribs in that sunken boat or the sunken barge. It kind of blew me away. I didn't expect it to look that good!"*

**Eric Kunz, Furuno USA**



*"At that 500 foot mark I got the faintest of a bottom line. It was trying real hard. But, out there trying to use it for catching fish and trying to use it for lining up on the bottom, really not usable. When we moved into that 250 foot mark, that's really where we started to see a little bit more with System "C". I was able to make out the wreck and see some schools of fish around."*

**Braden Shoemaker, Furuno USA**



*"We were kind of thinking for the frequency it was operating at, it would be pretty much useless in deep water. Well, it was useless, period. We didn't even get a chance to use it. We can't say System "B" was terrible. It just flat out didn't work."*

**Clayton Paddison, Furuno USA**



*"In 1,000 feet of water, there was nothing on the screen using System "A". But, when we moved into the shallower water, we started to see things. When we were in that 200-250 foot range, the targets were so small they were almost unusable. Once you get below 100 feet, it gives you a really good picture. It has it's pros and cons, you just have to pick what works for you."*

**Tim Moore, Furuno USA**



## Captain's Final Thoughts

In Episode 23, our captains and crew came together to offer their final verdict on all of the systems we tested. Here is a look at some of the opinions they offered on their favorite features of the new NavNet TZtouch3 MFD:



*"Furuno hit the home run. They've finally made the units easy. It's the easiest one of all. The GPS is easy, the Radar is easy, the Fish Finder is easy. The Edge Swipes, the automatic mode, everything about it is easy. Its faster. There's no comparison."*

**Captain Jack , Two Conchs Sportfishing**

*"My favorite has definitely got to be the edge swiping on TZT3. Swipe up is completely dedicated to that page. There's so much useful information on that swipe up that the angler or the captain would need, and it's right at their fingertips, where on some other units we were finding it was two, three, four, sometimes six button pushes away. It's just a great feature."*

**Braden Shoemaker, Furuno USA**



*"The weather that you can download on TZT3, that's everything I ever wanted. I also like the Radar where you can lock on a target and it will follow it. That, to me, is amazing. Before, you had to have all these different systems. You can now have a unit that has it all in one, built-in. Easy to use and it looks amazing. TZT3 really blew me away."*

**Captain Manny Souza, Two Conchs Sportfishing**

*"My favorite part of TZtouch3 has got to be the UI, because that's the foundation on which the MFD system itself is built. If you can't get that right, that's where the battle is won or lost. For us to have a UI that's so easy, to just point and click and you're done."*

*We know because we've been using the other system for a week. It's no contest."*

**Clayton Paddison, Furuno USA**



*"My favorite part about TZtouch3 is the fact that I can download weather onto the unit and have that right at my fingertips. No more looking at the news every day, checking my phone for weather apps. I can get that right on my TZtouch3 right while I'm fishing. It alleviates a lot of stress and keeps you moving forward to catch fish."*

**Captain Mike Macko, Two Conchs Sportfishing**

*"We spent a lot of time on the UI. Everybody's got a solid product, but I think overall, when you combine everything together, you look at everything - the Radar, the TruEcho CHIRP sounder, the deep water capabilities of the DFF3D - combine that with the UI, we have the best system. TZTouch3 is the best system."*

**Eric Kunz, Furuno USA**



*"My favorite feature on TZT3 was the new event mark button in the top left hand corner of the screen. That's something that I'll be able to use fishing day in and day out for finding new spots and getting new catches on the old spots. So, that's a very effective, cool thing that I found."*

**Captain Cameron Null, Two Conchs Sportfishing**



*This has been pretty exciting for all of us, and it was a pretty big undertaking to try and bring all of this product comparison together and get it to execute the way it did. We tested the Chart Plotter, the Radar, and the MFD itself. We looked at the Fish Finders and also the 3D scanning Multi-Beam Sonar. All in all, I have to say that I think the TZTouch3 stood out above the rest. And it may seem a little biased on our part, but when you take a look at the videos and go through each episode to see how the tests resulted, I'm hoping that you felt the same way.*

*I want to thank you for joining us on this journey. It was a lot of fun. Hopefully, you had fun watching, and please share this with your friends, because there is a lot of information here that we spent a lot of time pulling out for you to be able to make a decision that makes the most sense for you. Whether it's a retrofit or a new build, this is the kind of stuff you need to know. Thanks for joining us and we'll see you next time!*

**Jeff Kauzlaric, Furuno USA Advertising Manager and host of Furuno Connections**