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## ESSENTIAL INTELLIGENCE

Mixing Water and Electricity  
Sparks a Revolutionary Idea from  
Northrop Grumman pg. 24

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# FOUR IMPRESSIVE TECHNOLOGIES EXHIBITED AT OCEANS 2019

The annual OCEANS conference and exhibition is a hotbed of the latest amazing tools, and this year's edition in Seattle, Washington did not disappoint. Below are four technologies that caught our eye during OCEANS '19. You can find these technologies in our Check the Tech spotlight (pg. 24) and catch a sixth in our Subsea Intervention and Survey Section (pg. 34).

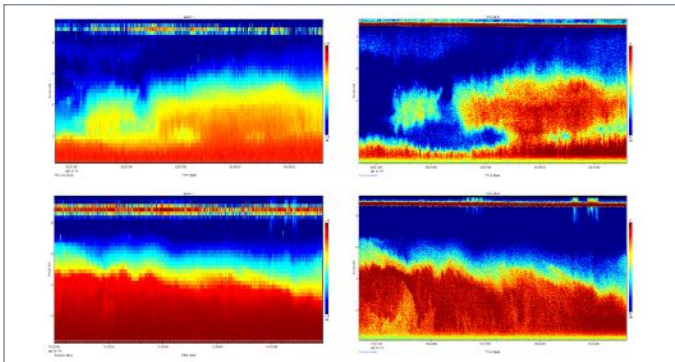


Figure 1: Regular backscatter (left) and echosounder data (right) from Signature1000. Both events are records of 15 minutes of data. The vertical resolution of the echosounder is 1 cm. It does not show any outliers near the surface.

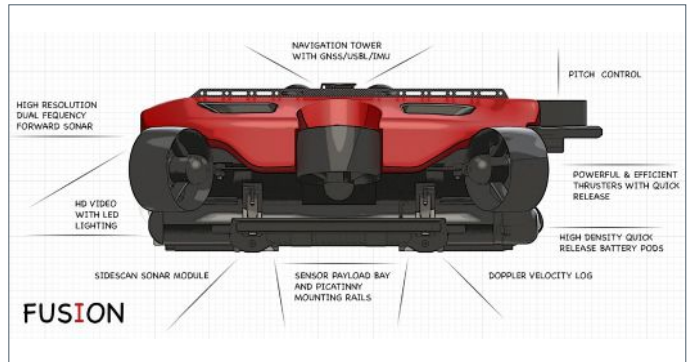


Figure 2: SRS' Fusion works as an ROV or an AUV and includes a highly intuitive interface.



Figure 3: The MSS Defender is designed for precise control, heavier payloads, and demanding intervention.

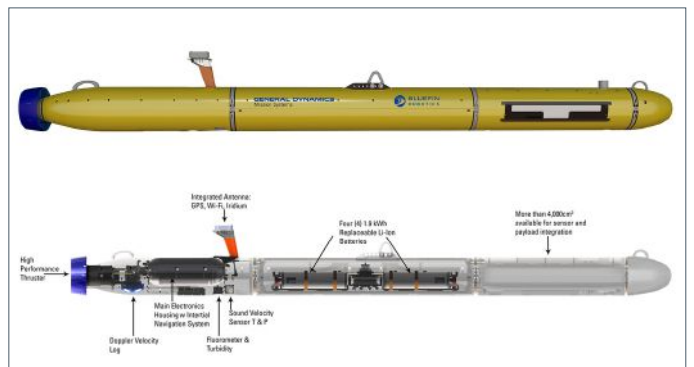


Figure 4: The base Bluefin-12's extended modularity supports the integration of user-designated sensors and payloads to deliver new mission-critical capabilities.



### **Nortek's New Echo-Sounder Mode for ADCPs Aids Interdisciplinary Research**

Acoustic Doppler Current Profilers (ADCP) are great for current measurements, but users have found them lacking when it comes to biomass assessments. However, the new scientific echosounder hardware and firmware feature added to Nortek's existing ADCP line enables high-resolution imaging of particles (such as biomass) in the water column. The new capability is available in the Signature 1000, 500, 250, and 100 systems.

Dave Velasco of Nortek says, "ADCP and echosounder data complement each other and are often deployed together. However, these two technologies have historically been developed by separate companies, with different objectives, leaving the end user to integrate the two solutions together. Nortek's approach has been to leverage its expertise in underwater acoustic technology, transducer manufacturing, electronics and firmware architecture design to combine these two tools into a single instrument."

The Signature 100 version operates in multiple frequencies in both narrow and broad bands. At one megahertz, that translates into the ability to image down to 3 mm resolution. Data can be transmitted in real time or stored on the device until it returns to shore. Nortek provides software for core data processing, analysis, and triage, but Nortek ADCP systems also work seamlessly with existing software.

Velasco demonstrated how the Signature 100 ADCP (equipped with a broadband fisheries echosounder) works in a fish tank where bubbles played the part of krill.

As bubbles migrated vertically within the tank, a screen showed a red line rising on a digital plot. Velasco explained that the device also works well for sediment plumes, plankton, fish, or anything else with a decent acoustic signal. It was easy to envision how useful this tool could be in tracking pollution, chemicals, or even harmful algae blooms back to their source. The device measures flux components of water (how fast, what direction, how deep), which is key for tracking, modelling, or assessing particulates.

"The device has a 300- to 400-meter range, so users can do both physics and biological work at the same time," said Velasco. (Figure 1)

### **Strategic Robotic Systems' Fusion Next Generation UUV**

The Fusion underwater vehicles exemplify design, capability and intuitiveness. As a

tightly integrated system built around a high-end suite of sensors, the exhaustive attention to detail establishes Strategic Robotic System's Fusion as a benchmark for professional unmanned underwater vehicles.

Fusion incorporates a suite of high-end sensors designed for complex missions. From imaging sensors to navigational aids, the Fusion improves vehicle dynamics and eliminates troublesome cables/connectors. Beyond the included sensors are optional instruments designed to quickly interface with the Fusion system through auxiliary ports, picatinny rails or the unique utility cavity located on the underside of the vehicle.

Fusion's intelligent control and navigation system features intuitive supervisory control. Vehicle characteristics and dynamics are carefully mapped to improve responsiveness, stability and predictive nature. Careful attention was given to ensure accurate feedback and precise data.

Speaking to ON&T, Doug Austin of Strategic Robotic Systems said, "The Fusion can work as an ROV with a very slim tether, or you can unplug the tether and use it independently as an AUV. As a battery-operated vehicle, it can operate on a single-fiber tether, which allows the compact Fusion to pull up to 3 kilometers of cable."

Fusion's flexibility has appealed to defense customers who use the onboard sensors to inspect for mines, dispose of explosive ordnance, and so forth. However, the device also provides superior survey capabilities for offshore energy and other commercial activities. Austin told us that because the Fusion runs on SRS' proprietary navigation and command and control software with a single user interface, it presents an entire package of data on a single screen, making the Fusion highly intuitive for new users. The company also offers a two-day training course at the client's location, which is enough for even beginners to master operation, according to Austin. (Figure 2)

### **VideoRay Adds to Its Mission Specialist Series**

VideoRay brought two vehicles from their Mission Specialist Series to OCEANS '19, both with exceptional capabilities:

"The Mission Specialist Series design methodology includes modular components. All of the modules—thrusters, lights, the camera, and communications—are connected using mateable adaptors. This makes repair and maintenance easy," said KevinMcMonagle of VideoRay. "If a thruster were to fail in the

field, you could unplug that thruster, plug in a new one, assign its job task, and be up and running again."

The VideoRay Mission Specialist Series (MSS) Pro 5 configuration is designed for speed and efficiency, weighing in at 10kg. The three-thruster system has forward speed of over 4.4 knots, and utilizes a system of interchangeable, modular components residing on a single, intelligent network. The Pro 5 is designed to handle missions with size, space, weight, and deployment speed constraints, such as infrastructure inspections beyond the reach of divers, search & recovery, exploring the ocean floor up to 305m, and various others.

The Mission Specialist Defender configuration is designed for more precise control of the vehicle position and orientation, heavier payloads, and demanding intervention, such as rendering unexploded ordnance safe or cleaning nets for offshore fish farms. With seven thrusters, the Defender is able to move in any direction, and maintain active pitch to face the vehicle in an upward or downward orientation. The addition of third-party control and navigation software from Greensea Systems or Seebyte makes the Defender a popular configuration for dangerous or heavy-duty missions. (Figure 3)

### **General Dynamics Mission Systems' Redesigned Bluefin-12 UUV**

General Dynamics Mission Systems showcased their new Bluefin-12 autonomous UUV. This new vehicle builds upon proven Bluefin autonomy and uses shared Bluefin Robotics' core capabilities, increased mission modularity and embedded intelligence to complete users' long endurance, high-consequence and changing missions.

The base Bluefin-12's extended modularity supports the integration of user-designated sensors and payloads to deliver new mission-critical capabilities. Its core autonomy with Standard Payload Interfaces, open-architecture compatibility and greater than 4,000 cubic centimeter-payload section supports the rapid integration of sensors and payload.

The illustration shows the base model configuration, but the Bluefin-12 may also be configured with an optional turnkey survey package delivering integrated survey capabilities including high-resolution sonar, environmental sensing, powerful on-board data processing and highly accurate navigation. (Figure 4)