

## ANTX 2019 • Gulfport Mississippi, USA • August 2019



**A 5-metre AutoNaut wave-propelled uncrewed surface vessel (USV) served as a communications hub for uncrewed underwater vehicles (UUVs) during the ANTX2019 exercise. Led by ION, the consortium showcased the coordination of multiple marine assets for the purpose of port security.**

Various technologies were incorporated to demonstrate the detection, interception and capture of threats in a simulated scenario with ION's Marlin software being utilised for integrated mission planning. As a vital hub, AutoNaut USV acted as a "friendly" asset remotely tracking and tasking Remus UUVs via acoustic communications.

The underwater position of the Remus UUV was transmitted to the AutoNaut USV via acoustic comms and this was then forwarded to the Marlin system. This acoustic communications link provided a two-way capability allowing the AutoNaut to enable dynamic re-tasking of the UUV as the mission unfolded. The transducer was mounted through a fin on the underside of the hull of the USV. This was linked to a modified ranger system, which was integrated into the payload system of the AutoNaut.

A PAM hydrophone array was also fitted to the hull of the AutoNaut for the passive acoustic detection of targets and rudimentary tracking in two dimensions. Figure 1 shows this 2D tracking of the UUV as it passed to the starboard side of the USV.

The use of PAM was also able to demonstrate a combination of the acoustic communications handshake along with the low frequency pass of the UUV. In Figure 2, the higher frequency acoustic communication "chirps" can be seen along with recording of the passive sound of the UUV itself (highlighted in the red box). These results were possible thanks to the very low sound profile of the USV. Solely under wave-propulsion, the AutoNaut has minimal noise issues which can cause severe interference to both acoustic communications and PAM. This capability also offers the advantage of stealth mobility at the surface.

The AutoNaut was also fitted with instrumentation for AIS tracking, rapid environmental assessment (REA). Data was relayed onshore in real-time over WiFi and Iridium RUDICS.

### Mission Summary

Location: Gulfport, Mississippi  
Duration: 5-day demonstration  
Conditions: light winds and calm near shore conditions prevailed throughout the mission which was conducted in and around the port of Gulfport. Acoustic conditions within the port were challenging due to the variety of sound sources from other vessels and operations around the port.

### Technical Specification

#### AutoNaut Dimensions

Length: 5 metres  
Beam: 0.9 metres  
Displacement: 250kg

#### Power

Wave foils  
Auxiliary thruster  
Batteries: 4x70Ah 12V lead acid batteries  
Solar: 300 Wp Photovoltaic panels

#### Sensors

Hydroid FreeWave acoustic modem  
Seiche uPAM tri-sensor array (hull-mounted)  
YSI Xylem EX02:  
- Dissolved Oxygen  
- Conductivity, Temperature and Depth (Pressure)  
- pH  
Aanderaa Motus 5729 wave sensor  
Airmar wind sensor  
Class B AIS

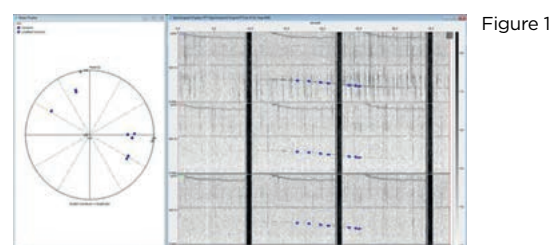


Figure 1

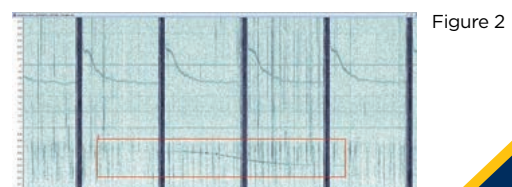


Figure 2