

Update Autonomous Surface Vehicle

NDSF NATIONAL
DEEP SUBMERGENCE
FACILITY



Waveglider Operations

Impacts to NDSF & Science community

- Added Capability for over the horizon operations
- Increased overall efficiency of cruises
- Has “saved” several Sentry dives from abort
- Reasonably low maint.
- With no increase to at sea staffing, issues or problems with waveglider can be resource limited.
- Increase in Facility staffing and overall workload increased.



Talking points

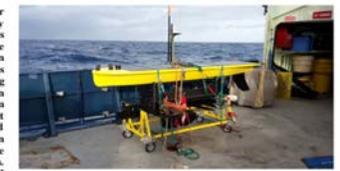
- Opportunities for the waveglider w/out vehicles?
- Whats is community consensus on past experience with the waveglider?
- Usage is only increasing leading the facility to be more reliant on access to the vehicle (Which we don't own) and a more robust funding structure.
- Can this capability be added to the facility?
- Remote/Telepresence capabilities are driving new technologies and methods for ocean research



Toward an Autonomous Communications Relay for Deep-Water Scientific AUV Operations

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Abstract—We are developing an over-the horizon deep-water autonomous underwater vehicle (AUV) supervision capability by introducing a second autonomous vehicle, an autonomous surface vessel (ASV) with continuous access to Iridium satellite communications, that acts as a communications gateway between operators on the ship or on shore and the AUV. This enables operators to monitor dive progress remotely, including uplinking science data and optionally modifying the AUV's mission in response, frees the ship to conduct other operations remote from the AUV, and enables new operations paradigms. An important question is whether these benefits outweigh the costs associated with managing another vehicle and the degradation in navigation and map quality that results from operating outside the range of the ship's Ultra-Short BaseLine (USBL) positioning system. We undertook trials in 2018 with the Sentry AUV and an LRI Wave Glider ASV, operating the system for a total of 15 Sentry dives. The Wave Glider was recovered once for a planned 24 hr hardware upgrade but otherwise remained deployed for nearly all of our time on station.



We report the coordination algorithm employed, along with assessments of system performance in terms of acoustic link reliability, the impact on post-processed AUV navigation from the absence of the ship, and logistical footprint—the impact of the system on the Sentry operations team and other ship operations.

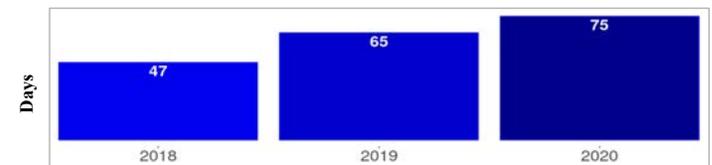
Fig. 1. LRI Wave Glider SV configured as a communications relay. The bulb on the “sub” houses a WHOI Micro Modem. One of the payload modules in the “float” contains a WHOI-designed Iridium modem/GPS receiver module that relays messages to and from the Micro Modem over Iridium as Short Burst Data (SDB). The relay functionality is decoupled from normal operation of the vehicle except for slaving power.

Other science activities could proceed in parallel if Sentry could operate independently from the ship, an obvious benefit.

NDSF waveglider usage to date

Days at sea 187

Cruises 4

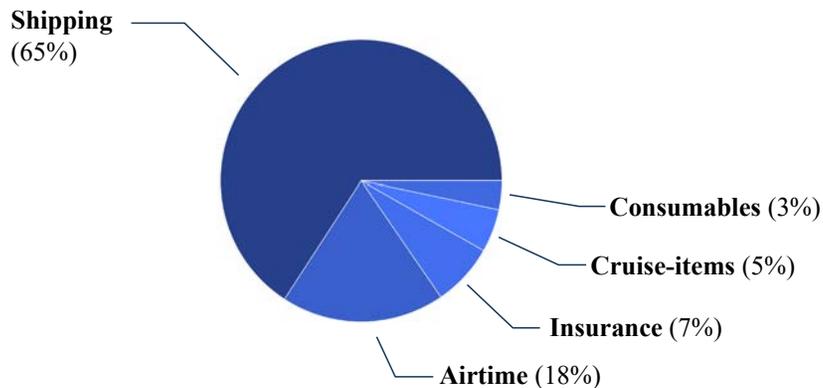


Year *2020 lost COVID days excluded from count

Waveglider Operations



Typical waveglider cruise budget



Including waveglider in NDSF budgets

If added to NDSF budget: **+1%**

If added to Sentry day rate: **+4-5%**

projected day rate: **\$700 - 1000/day**

Facility

- Increase in staffing/support for waveglider on shore
- Increase in logistics and shipping for waveglider operations
- More complex mobilizations for Sentry/Jason

Reduction in operating costs

- An expected decrease in costs once spares are better allocated for the vehicle from more frequent use.
- Integrate into Sentry containers if possible to save shipping costs.
- Reduction in airtime costs with reduced and more efficient data transfer.

Future capabilities

- Waveglider is necessary for bootstrapping multivehicle ops in NDSF and other WHOI vehicles.
- Potential use with Alvin/Jason to monitor seafloor equipment such as elevators or landers during cruise?
- What else ???