



Greensea IQ
Intelligent Ocean Solutions



WOODS HOLE
OCEANOGRAPHIC
INSTITUTION

mROV

UNOLS Council Meeting

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Woods Hole Oceanographic Institution



NDSF NATIONAL
DEEP SUBMERGENCE
FACILITY



Technical Note

Note: All screenshots are for demonstration purposes only and are considered preliminary.

This slide deck contains proprietary material related to the mROV project. These designs are preliminary and subject to change. Do not share, distribute, or reproduce without explicit authorization.



Key Personnel, Leadership, and Partnerships



- Andy Bowen, PI and Director of National Deep Submergence Facility (NDSF)
- Molly Curran, co-PI and Lead Engineer
- Anna Michel, Chief Scientist for Deep Submergence
- Lead Design and build mROVs, Operate NSF-funded mROV



- Leila Hamdan, Associate Vice-President for Research
- Operate NOAA-funded mROV



- Regina Yopak
- John Dunn
- Greensea IQ software and user interface, including vehicle electronics

DeSSC White Paper

Deep Submergence Science Committee (DeSSC) Recommends Acquisition of a Medium-Sized Remotely Operated Vehicle (mROV) to the National Deep Submergence Facility

16Nov 2022
DeSSC

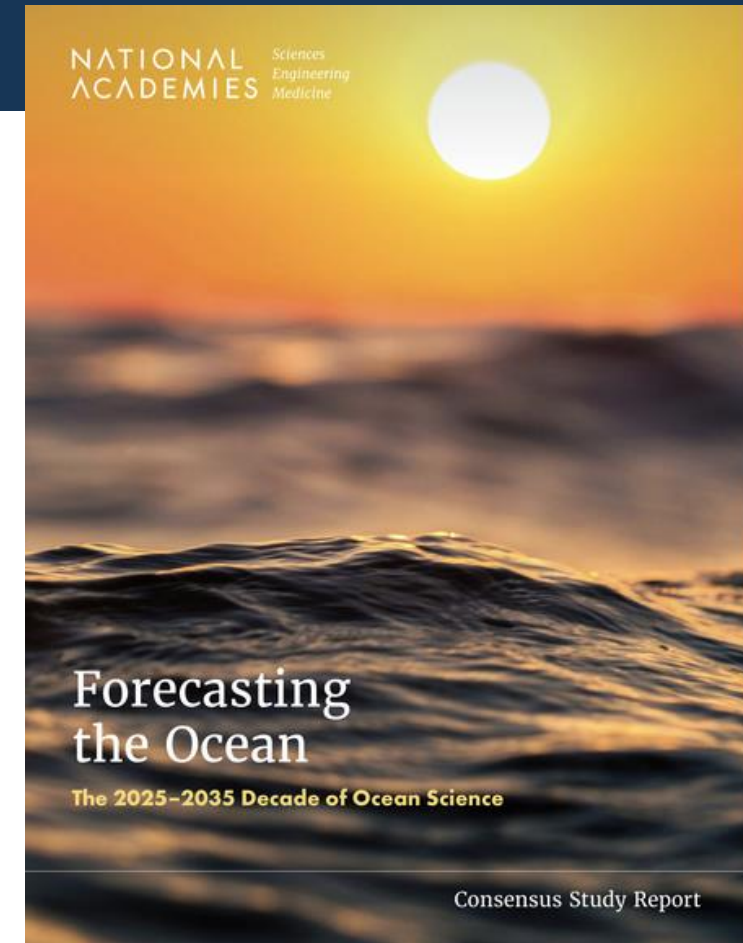
- Increase **accessibility** to deep-sea research
- Provide **redundancy** for the heavily used ROV Jason
- **Design concept:** Similar capability to **ROV Jason**, but usable on **smaller ships** (especially Regional Class Research Vessels, RCRVs).



2025 Decadal Survey

“decreased number of vessels in the ARF, along with **sustained demand for deep-submergence vehicles**, has meant that some scientists wait 4 or more years to see their expedition realized.”

“a persistent and **growing interest in using ROVs and AUVs in the coastal and nearshore environment**, but NDSF assets are often oversized for use in these locales and on regional vessels”

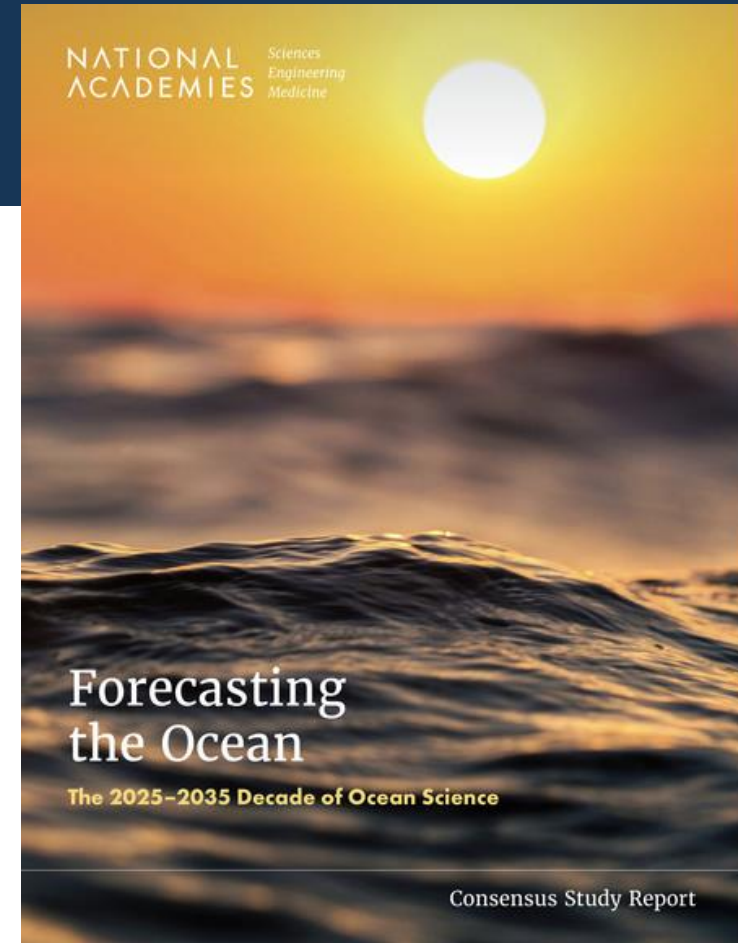


2025 Decadal Survey

“NDSF’s ongoing efforts to develop the midsize ROV need to be supported”

“Expand the array of assets available to users, including **lower cost ROVs** and AUVs for **deployments on coastal and regional vessels** (i.e., used in nearshore and coastal regions).”

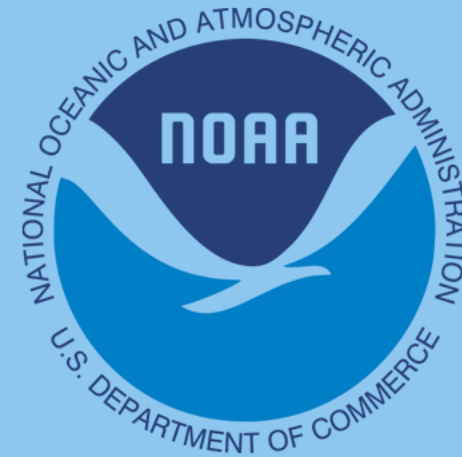
“Expand the scientific footprint of each HOV, ROV, or AUV dive by **enhancing remote science capabilities** and the inclusion of autonomous assets that can work alongside the vehicles and perhaps be deployed simultaneously.”



Funding for two mROV vehicles



The NSF-Funded vehicle will be operated by WHOI and once it is accepted into the NDSF, it will be requestable through MFP.



The NOAA-Funded (MDBC and OE through the OECl) vehicle will be operated by the University of Southern Mississippi. Priority to MDBC activities but available for NOAA and non-NOAA activities.

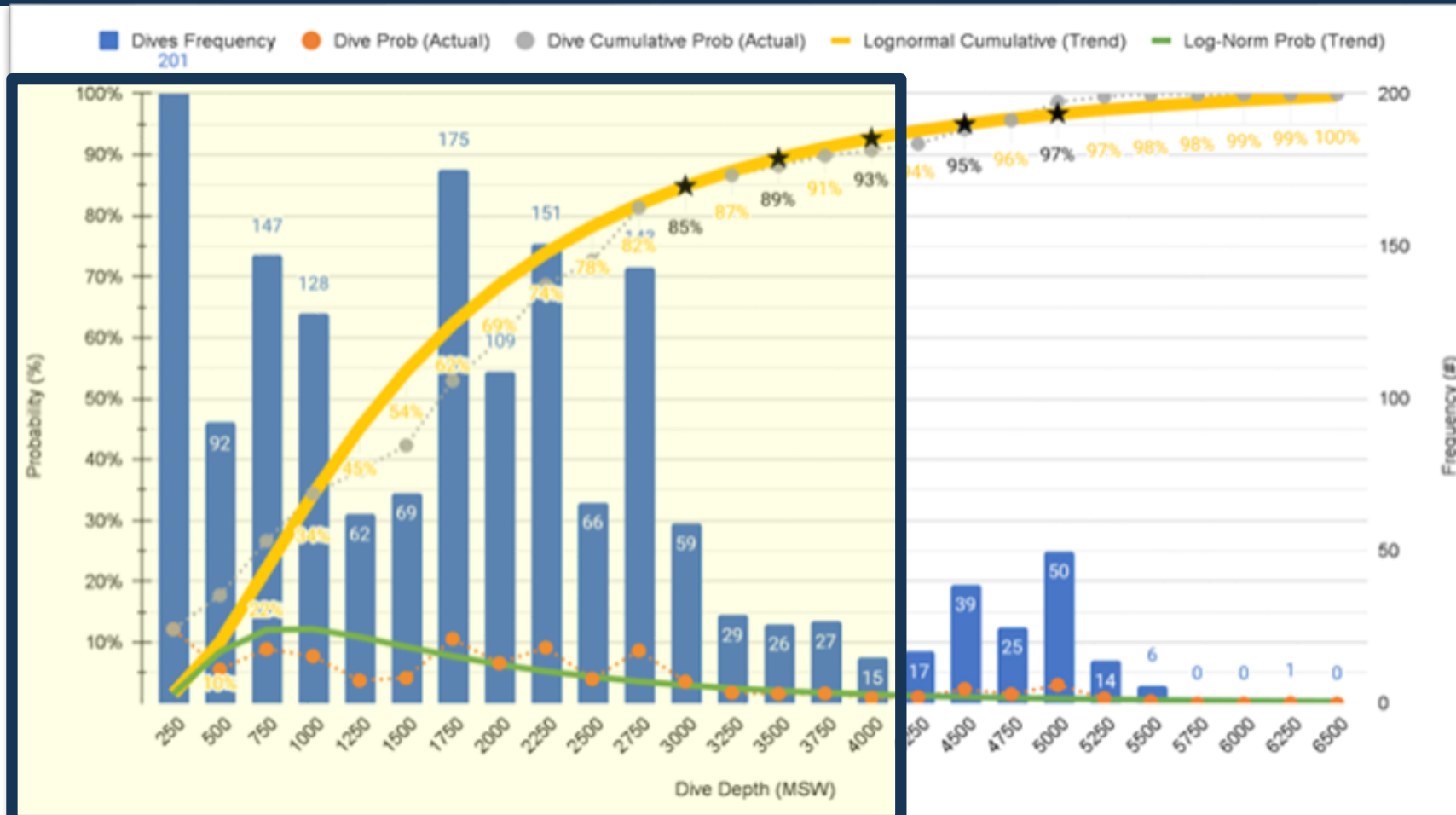


What are the medium-sized ROVs (mROVs)?

- Compatibility with US ARF, RCRVs, and NOAA vessels of opportunity
- Maximize use of shipboard equipment
- Leverage proven designs
 - Reusable and modular WHOI/GSIQ supplied components & off the shelf components
- Optimized system concept
 - ~85% Jason capability in reduced footprint
 - Reducing operational costs
 - Remote operations



4000m rating can accomplish 93% of ROV Jason work



Ship Compatibility

- Reduced vehicle size and deck space needs compared to ROV Jason
- Able to operate from small to medium vessels including RCRVs
- Designed for remote operations
- Smaller operations team, data flow to shore, easier access to data, shore-based engineering support



Two Hi-Cube Containers / Vans

Vehicle Shipping Van

- Hi-cube 20' container for shipping vehicle and docking head
- Can be left on the dock

Tool / Power / Server Rack Van

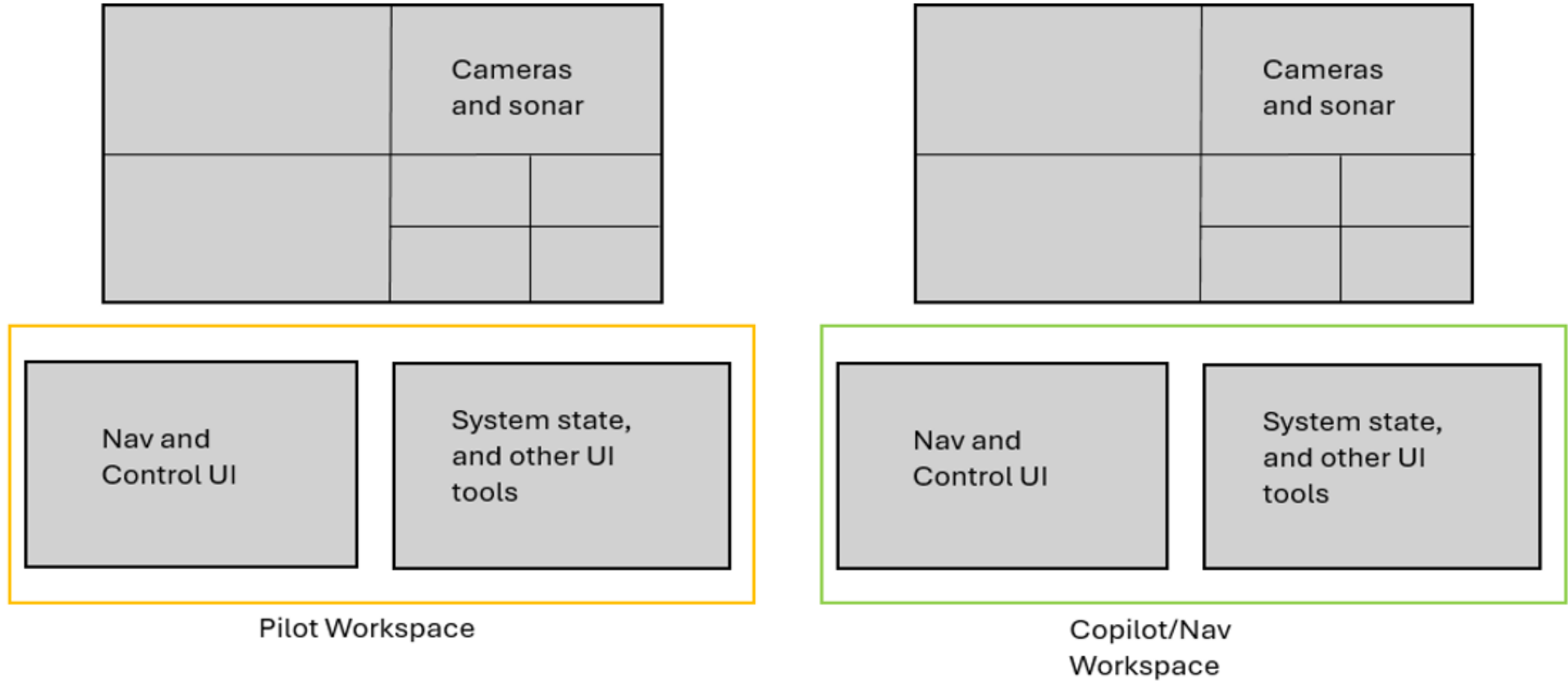
- Hi-cube 20' container
- Needs to be on board for ops

Logistics

- 1-2 Trucks (weight will likely drive need for 2 trucks)



No control van → Operation in the lab



Design Overview

Size, weight, and depth

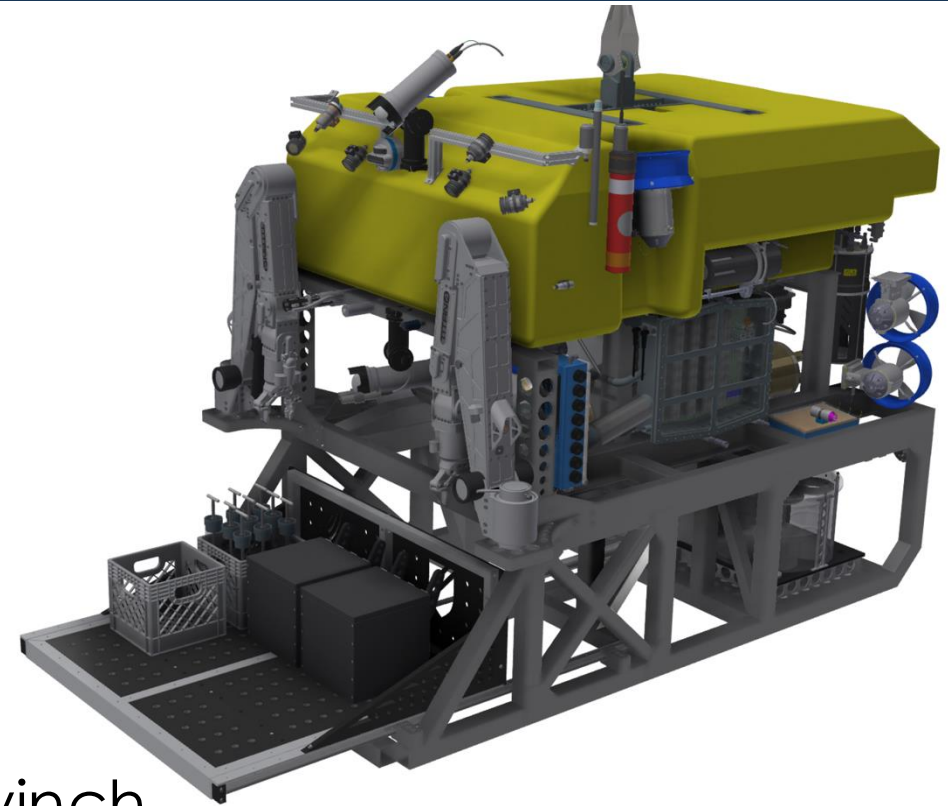
- 4000m rated
- 85% physical size of ROV Jason
- ~7000lbs

Payload

- 300lbs wet, ~900lbs dry

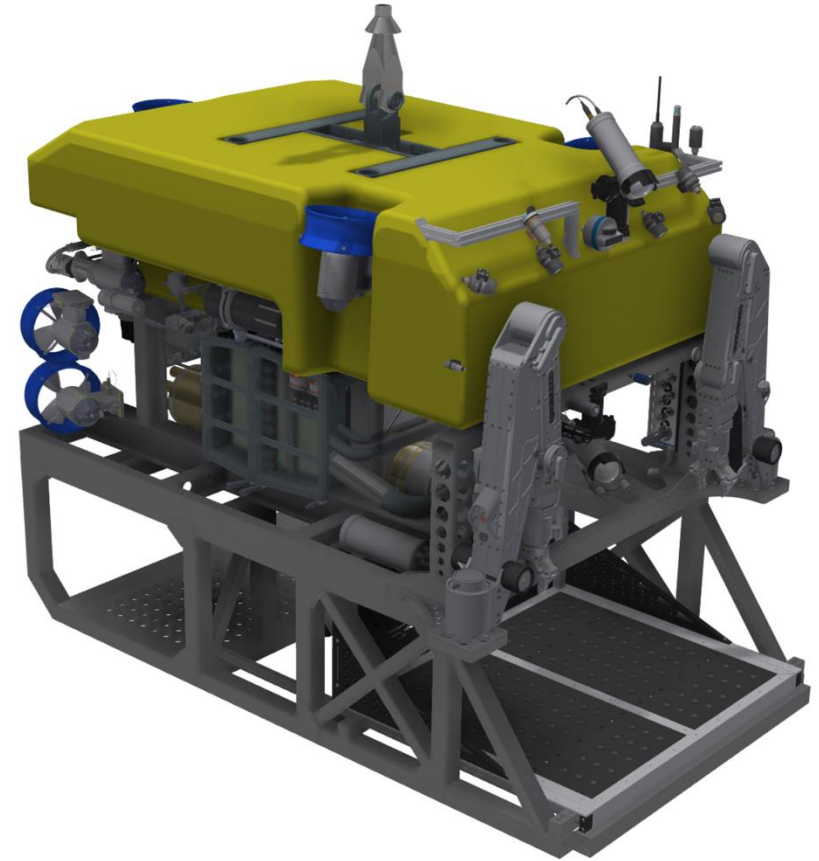
Launch and recovery

- Single body
- A-frame - using ship's 17mm EOM cable and winch
- mROV docking head for safety and ease of operations



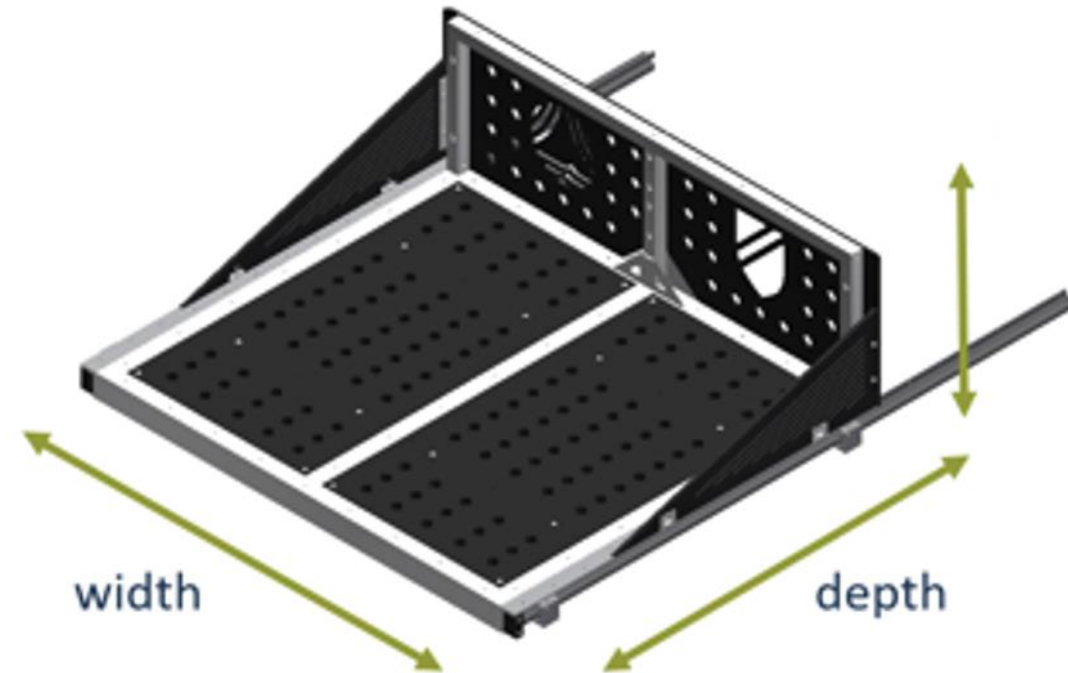
Science sensors and sampling payload

- **CTD** (Seabird SBE 49 FastCAT)
- **Sound Velocity** (Valeport miniSVS)
- **Oxygen Optode** (Aanderaa)
- **Temp Probe** (WHOI-NDSF Design)
- **Magnetometer** (APS 22-bit 3-Axis Fluxgate)
- **Multi-chamber suction sampler**
- **Bio-boxes**
- **Push Cores**
- **Power, communication, and hydraulic ports** for auxiliary sensor and sampling integration



What can science expect?

- Two 7-DOF **manipulators**
- No swing arms
- **Basket:** 56" x 46" x 23"
ROV Jason basket area: 58" x 37" x 23"



- **Aft Science Bay:** 36" x 24" x 65"
Fits all aft bay equipment previously installed on ROV Jason



Lighting and Imaging



- **Imaging sonar** (Blueprint Oculus MD750d)
- **4K Camera** (Insite Pacific Mini Zeus 4k)
- **HD/SD Cameras** (DSPL Multi Seacam)
- **Pan and tilts** (ROS Accu-Positioner)
- **Scaling Lasers** (SubC Imaging Mantaray)
- **Lights** (DSPL LSL-2000)

Partnership with GSIQ

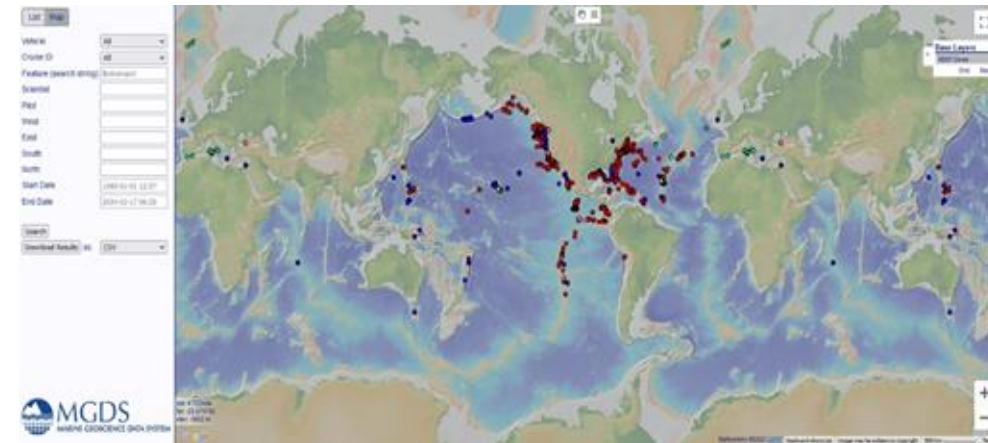
- Commercial partnership, readily scaled outward
- Open architecture collaboration (OPENSEA software)
- Systems Engineering expertise
- Customizable ROV electronics, control software, and topside interface solutions
- Turn-key reliability of a commercial solution with the adaptability and configurability of a science-driven research ROV



NDSF Data Package

- Real-time automated vehicle and navigation logs, raw data collections, user events, vehicle video, video stills, and post-processed products
- Built to NDSF data package standards
- Focus on data access to the community
- Standardized content across vehicles

The screenshot shows the Sealog interface for a submersible mission. At the top, it displays the mission ID 'RR2102' and a timestamp '2021-04-19T00:08:17.134Z'. Below this, there are four video feeds from different cameras: 'SciCam', 'BrowCam', 'PitchCam', and 'IP-Cam'. The 'SciCam' feed shows a submersible with a yellow light. To the right of the video feeds, there are two data tables. The first table, 'Navigation', shows real-time data: Time (UTC) 2021-04-18T19:01:57.192Z, Depth 2546.553 meters, Latitude 8.89490661 deg, Altitude 3.3 meters, Longitude -104.30033526 deg, Heading 250.422 deg, Pitch -6.4 deg, Roll 0.1 deg. The second table, 'Original Nav Data', shows historical data: Latitude 9.5055620 deg, Longitude -104.2947872 deg, Heading 98.77 deg, Depth 2555.30 meters, Altitude 5.94 meters. Below the tables is a timeline and a list of 'Filtered Events'. One event is highlighted: '2021-04-19T00:08:17.134Z -> free_text: possibly three orifices present on the top of this chimney'. On the right side, there is an 'Event Filter' section with input fields for 'Text' (containing 'e.g. SAMPLE'), 'Start Date/Time (UTC)', and 'Stop Date/Time (UTC)'. The bottom of the interface shows 'ASnap: OFF' and a license notice: 'Sealog is licensed under the MIT public license'.



Science Advisory Committee



Chair: Anna Michel – Woods Hole Oceanographic Institution

Roxanne Beinart – University of Rhode Island

Jill McDermott – Lehigh University

Jason Sylvan – Texas A&M University

Amanda Demopoulos – USGS

Jeff Beeson – Oregon State University, NOAA PMEL

Geoff Wheat – UAF / MBARI



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Timeline to operations

Build and
Assembly
On-going

NOAA Sea
Trials and
Science
Verification
Expedition
(Aug/Sept
2026)

NSF Sea
Trials
(September
2026)

NSF Science
Verification
Expedition
(Q1/Q2 2027)

DeSSC
Meeting May
2027

Available for
science
(~Q3 2027)

