

Unmanned Surface Vessels for Hydrography

Coast Survey Experiences

LCDR Damian Manda, NOAA
24 Feb 2020

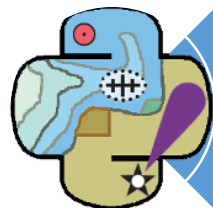


Office of Coast Survey
National Oceanic and Atmospheric Administration

Coast Survey UxS Strategy

Coast Survey Strategic Plan:
Integrate new and innovative technologies into mission priorities.

Coast Survey Development Lab
Focus: More efficient, effective, and safer acquisition of data to support OCS requirements.



Develop Enabling Technologies



Build and Maintain Operational Expertise



Operational Innovation



Collaboration



NOAA UxS Strategy

NOAA Unmanned Systems Strategy Maximizing Value for Science-based Mission Support



National Oceanic and
Atmospheric Administration
U.S. Department of Commerce



NOAA Science & Technology Focus Areas:

Unmanned Systems • Artificial Intelligence • 'Omics • Cloud

February 2020

Goal 1: Coordinate and Support UxS Operations at an Enterprise Level.

Goal 2: Expand UxS Applications Across NOAA's Mission Portfolio.

Goal 3: Accelerate transition of UxS Research to Operations.

Goal 4: Strengthen and Expand UxS Partnerships.

Goal 5: Promote Workforce Proficiency in UxS Use and Operations.



Office of Coast Survey
National Oceanic and Atmospheric Administration

Primary Impacts and Use Cases

Unmanned Surface Vessels

- Shallow water mapping (small platforms)
- Dangerous or unknown situations
- Long duration missions

Unmanned Underwater Vessels

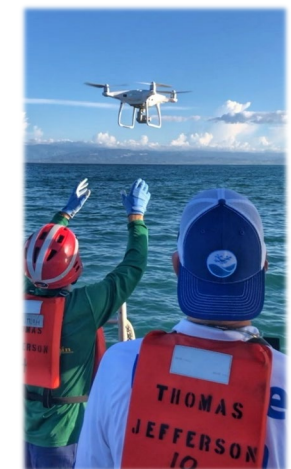
- Response (small platforms)
- Deepwater high resolution mapping

Conversion/Multimodal

- More utilization of existing platforms
- Workforce preparation for next generation

Unmanned Aerial Systems

- Faster shoreline
- Response imagery/assessment
- Shallow water bathymetry



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Autonomous Hydrographic Survey Launch (AHSL)

Purpose

- Maximize use of current infrastructure and expertise
- Expedited, moderately priced, and scalable means to integrate unmanned systems
- Technical and operational development & testing
- Build shipboard knowledge & expertise

Possible Benefits

- More effective use of survey personnel
- Increased survey efficiency



AHSL Components

Aft Compartment
Camera

Power Panel
Camera

Launch Interface
System

POE/Network H/W

Autonomous
Mobility System

Situational
Awareness
Cameras

Data Radios

Forward Camera & Engine Room Camera not shown



AHSL Development & Testing

2017

- Contracting and requirements

2018

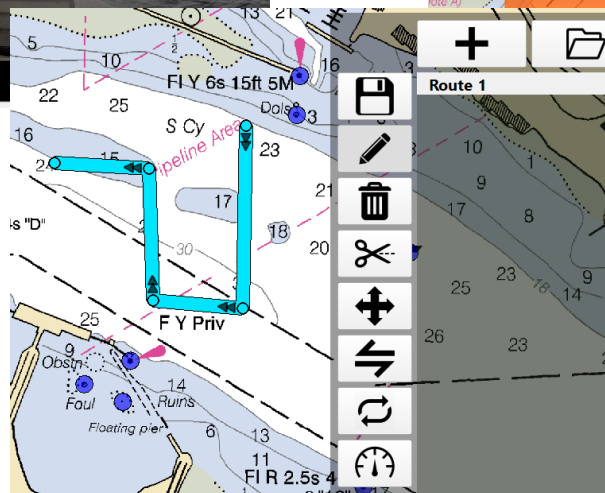
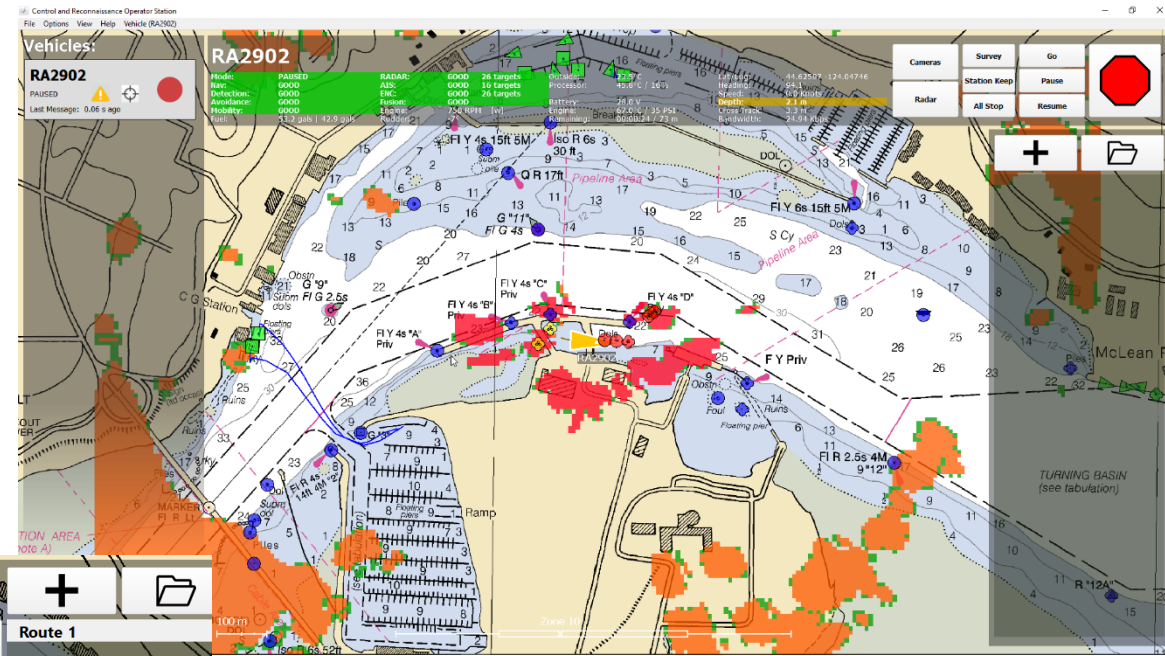
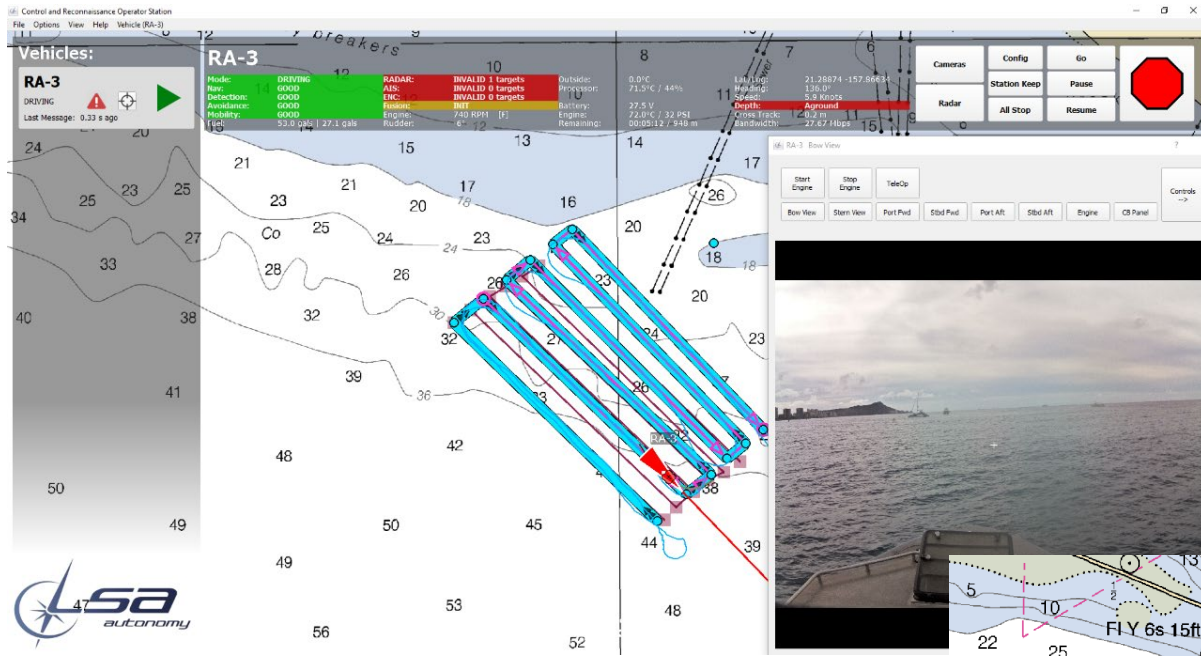
- Initial Development and Testing

2019

- Acceptance Tests
- Phase 1 – Training
- Phase 1.5 – Local Operation



CROS – Control & Reconnaissance Operator Station



A detailed nautical chart of Buzzards Bay, Massachusetts, serves as the background for the top half of the slide. The chart shows various navigational features, including depth soundings, buoys, and landmarks like Point Judith and Buzzards Bay Entrance Light. A red circle highlights a specific area in the central part of the bay.

Testing Results

Personnel

- Staffing – 1:1 Operator-to-AHSL ratio likely possible
- Qualifications – May require specialized coxn

Operations

- Launch and recovery challenge
- Survey System Control – Power cycling lacking
- Situational Awareness – Camera views clear, require > 1 Hz update rate
- Communications: Bandwidth sufficient for LOS,
- Route Planning – Fairly intuitive, Hypack import



Dedicated USVs

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Conversion/Multimodal

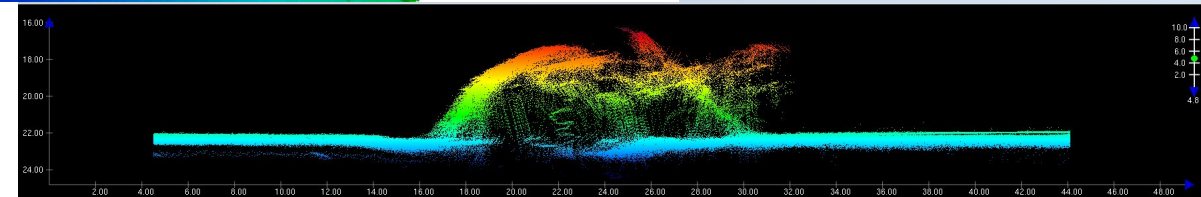
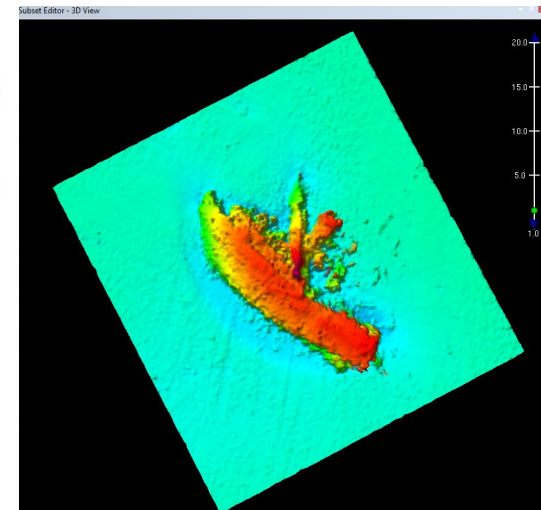
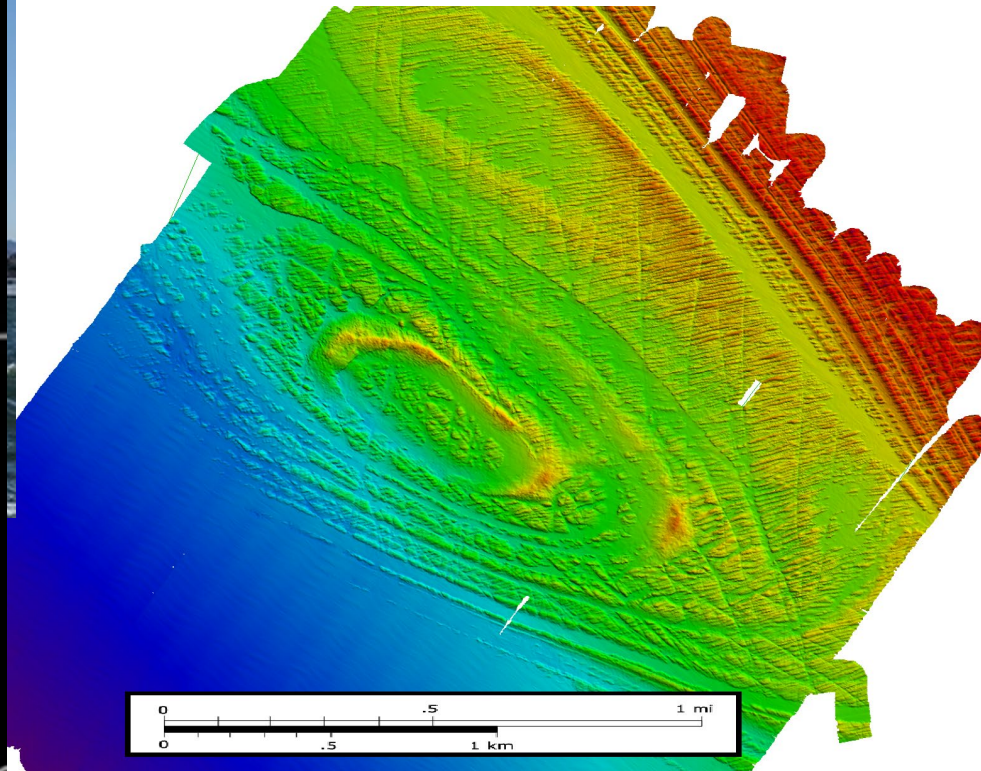
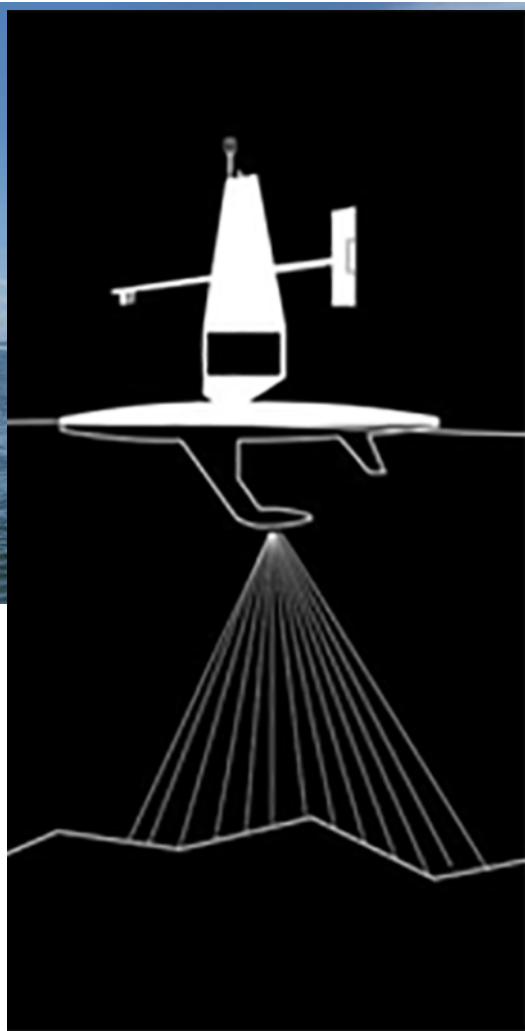
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Unmanned Aerial Systems

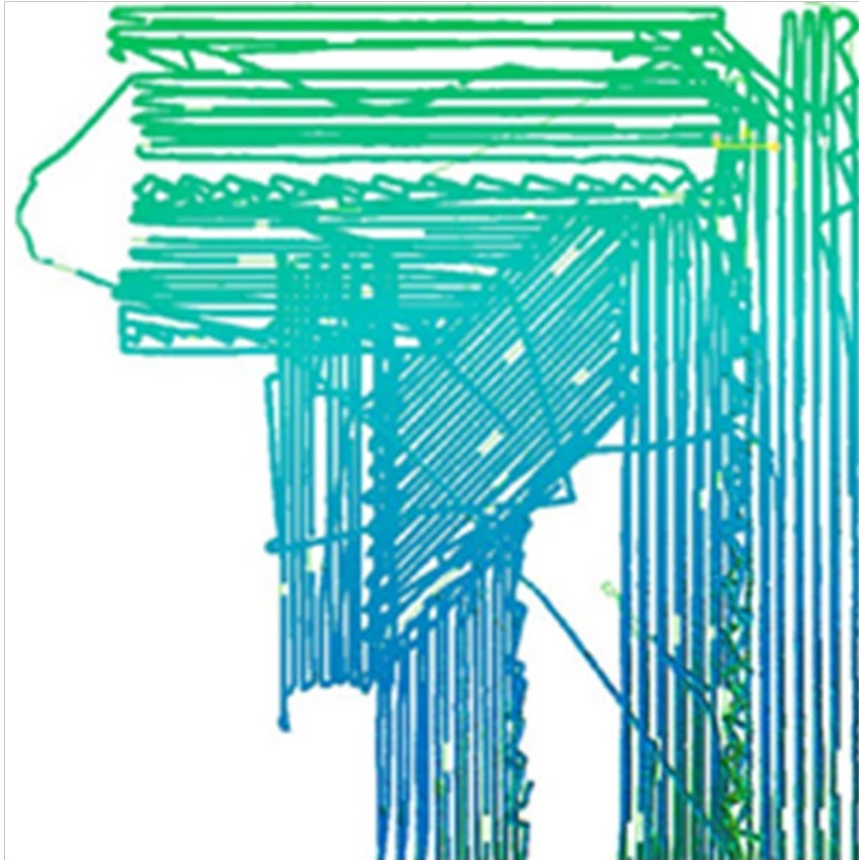
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2019 Activities – Partners: USM & Saildrone



Saildrone – Lessons Learned



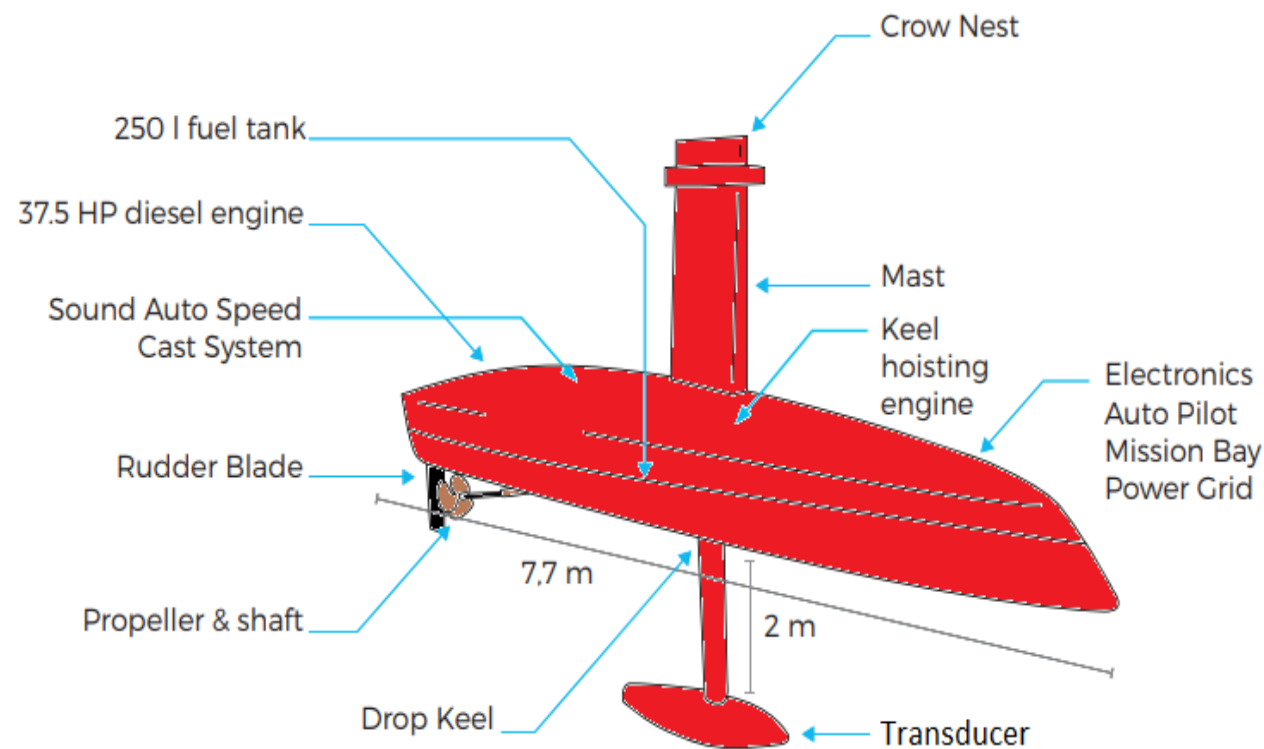
Wind Condition Adaptation



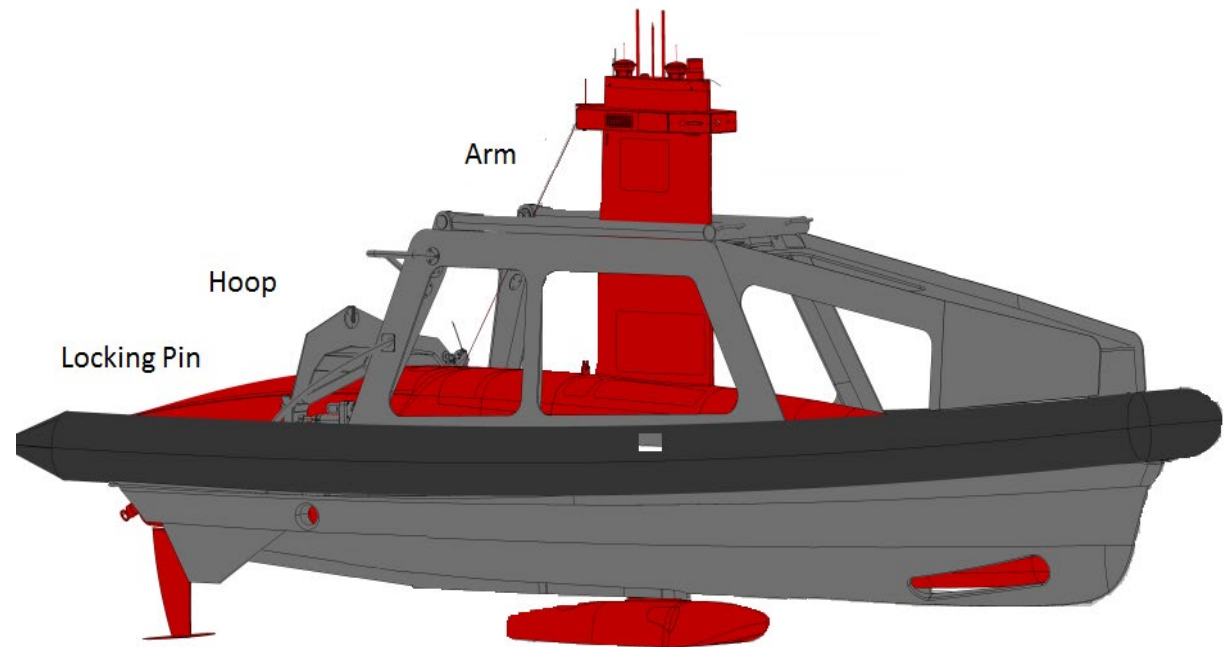
Biofouling



2019 Activities – Partners: UNH & iXBlue DriX



DriX



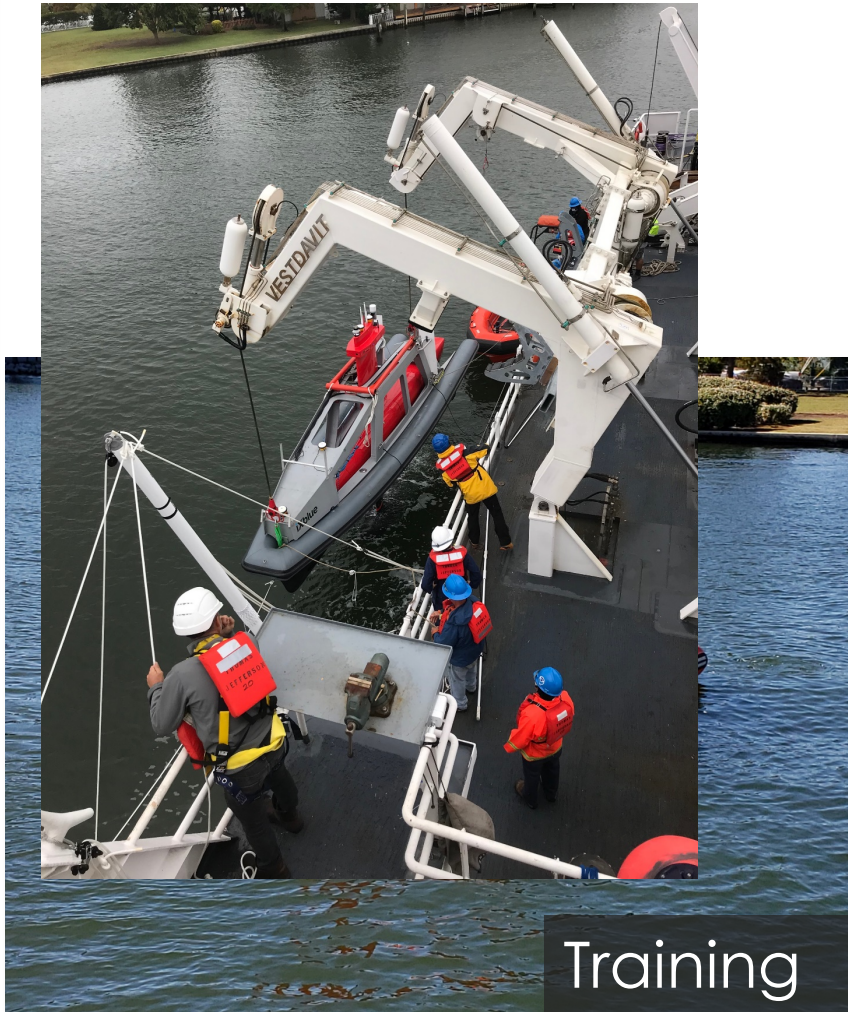
DDS – DriX Deployment System

Endurance: ~7 days @ 7kts, ~4 days @ 9-10 kts



NOAA Ship *Thomas Jefferson* Trials

Retractable Boom



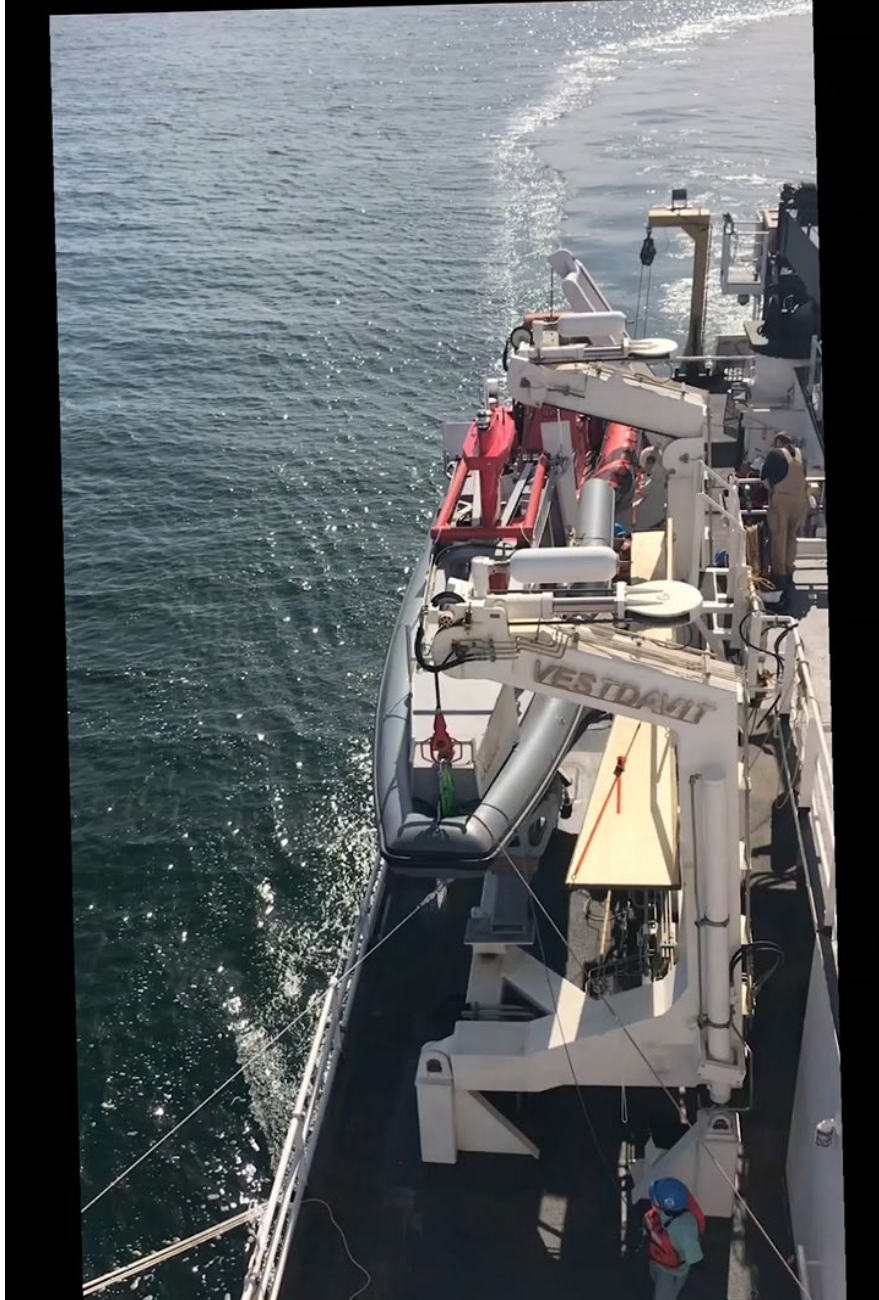
Training



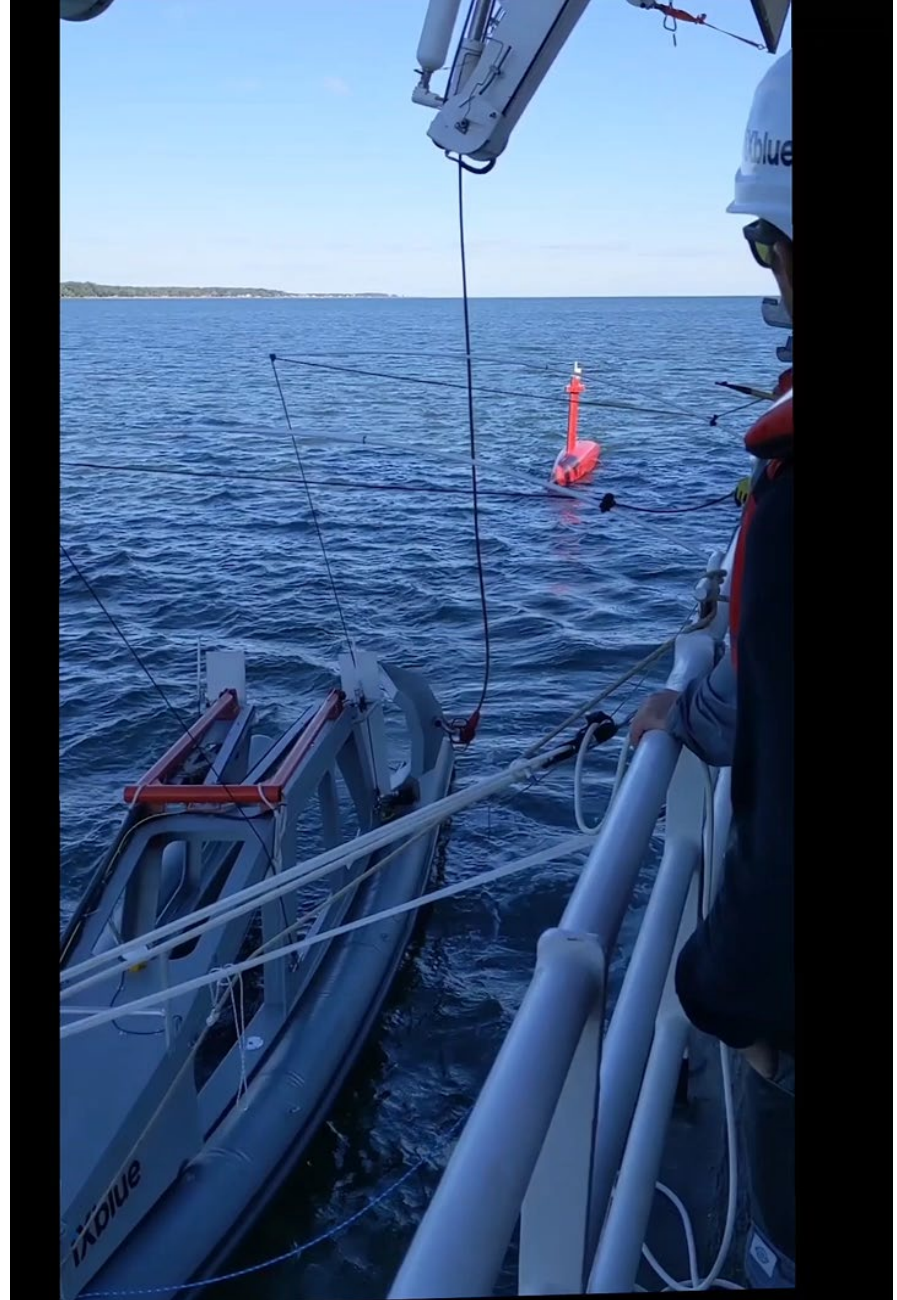
Davit Retrofit



Launch



Recovery





DriX – Results

- Deployment and recovery up to 1 m seas
 - Room for improvement in handling
- Must be able to intercept with small boat for emergencies
 - Contingency plans and creative responses crucial
- DriX itself has a fairly wide sea state operating range
- Operator situational awareness is limited - Short range Lidar, camera systems, AIS (no Radar)



2020 Planned Activities

AHSL

- Conversion of *Fairweather* launch
- Phase 2-3 Testing on *Fairweather*
- Continued Operational Use

DriX

- Crew Training
- Thunder Bay Survey
- *Thomas Jefferson* Round 2

Saildrone

- Additional Tandem Operation
- Power management & endurance extension
- Deepwater system (w/ UNH)

