

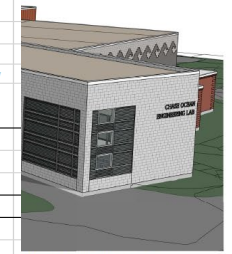
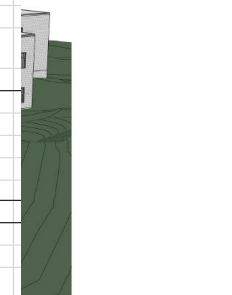
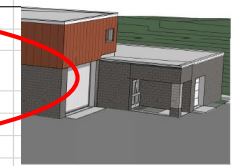
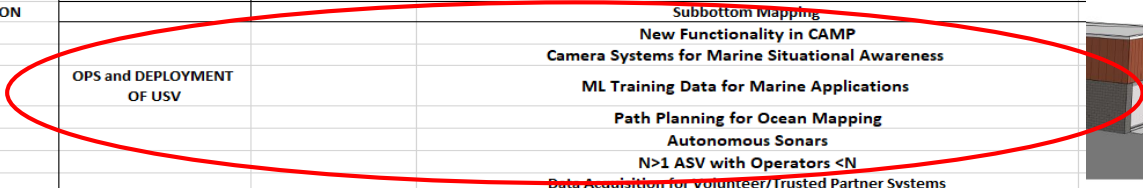


NOAA – UNH Joint Hydrographic Center

Joint

Mapping

PROGRAM PRIORITIES	THEMES	SUB-THEMES	TASKS
ADVANCE THE TECHNOLOGY TO MAP US WATERS	DATA ACQUISITION	INTEGRATED SF MAPPING	System Performance Assessment
			Underway Sensor Integration Monitoring
		ACOUSTIC BATHY AND BS	Backscatter Calibration
			Environmental Monitoring
			New Sensors
	DATA VALUE	LIDAR	Lidar Systems, providing both bathymetry and reflectance
			Water Column Mapping
		WATER COLUMN AND SB	Subbottom Mapping
			New Functionality in CAMP
			Camera Systems for Marine Situational Awareness
RESOURCES OF CONT SHELF	OPS and DEPLOYMENT OF USV	ML Training Data for Marine Applications	
		Path Planning for Ocean Mapping	
		Autonomous Sonars	
		N>1 ASV with Operators <N	
		Data Acquisition for Volunteer/Trusted Partner Systems	
	DATA FROM TRAD SOURCES	Bathymetry Data Processing	
		Backscatter Data Processing	
		Object Detection	
		Chart Features	
		sUAS Mapping for Safety of Navigation	
ADVANCE THE TECHNOLOGY FOR DIGITAL NAV SERVICES	NON-TRAD DATA	Millimeter Resolution Mapping with Frame Sensors	
		Enhance Data d Underwater 3D Construction	
		Volunteer Batymetric Observations	
		Alternative Uses for ICESAT-2 and other Laser Altimeter Data	
		Ocean Mapping Data Analytics	
	AI/ML/CLOUD	Support of US ECS Efforts	
		Offshore Marine Resources	
		Management of Living Marine Resources from ECS and ICESat-2	
		Improvements in Change Detection	
		Delivery of Bathymetric Data Services from Enterprise Databases	
VISUALIZATION IN SUPPORT OF NAVIGATION AND OTHER APPLICATIONS	AI/ML/CLOUD	Innovative Approaches to Support Precision Navigation	
		Managing and Transforming Data to Navigation Products: Computer Assisted Cartography	
		Spatial Data Technology in the Context of Charting and Ocean Mapping	
		Application of Hydrodynamic Models to Navigation Products	
		Tools for Visualizing Complex Ocean Data Sets	
	GENERAL SEMIOTICS	Artificial Intelligence and Machine Learning for Analysis and Filtering	
		Hydrographic Data Manipulation Tools	
		Real-time Display of Ocean Mapping Data	
		BathyGlobe	
		Semantic Understanding of Nautical Charts for Autonomous Navigation	
DEVELOP AND ADVANCE EXPERTISE MARINE GEOSPATIAL AND SOUNDSCAPE EXPERTISE	CURRICULUM DEVELOPMENT	Contributions of Echoshounders to the Ocean Soundscape	
		Delivery of Results – Publications and Presentations	
		Outreach	



W - SOUTHEAST OVERALL



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UNCREWED SURFACE VESSEL Research and Development Program at the NOAA – UNH Joint Hydrographic Center/Center for Coastal and Ocean Mapping

ASV Global CW-4



Seafloor Systems Echoboat



Teledyne Oceansciences Z-Boat

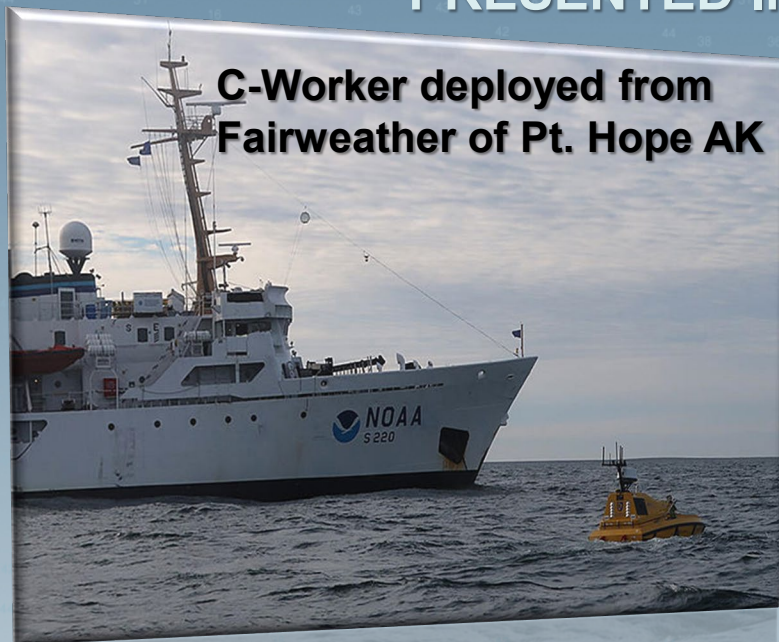


iXBlue DriX



The NOAA-University of New Hampshire Joint Hydrographic Center

PRESENTED IN NEW ORLEANS:



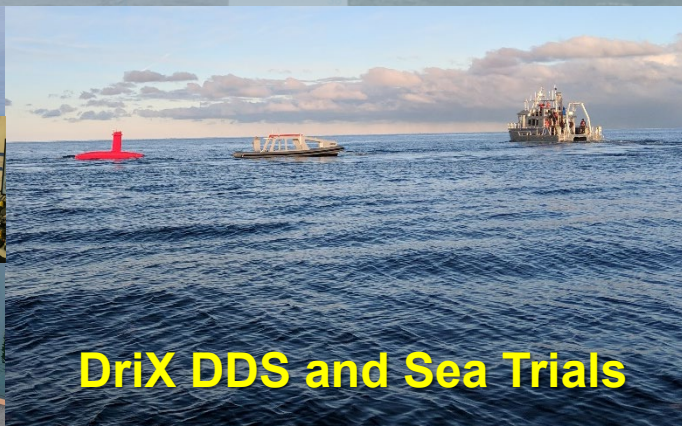
C-Worker deployed from Fairweather of Pt. Hope AK



C-Worker working in high-risk environment off Channel Islands



Shore-based ops in Thunderbay NMS



DriX DDS and Sea Trials



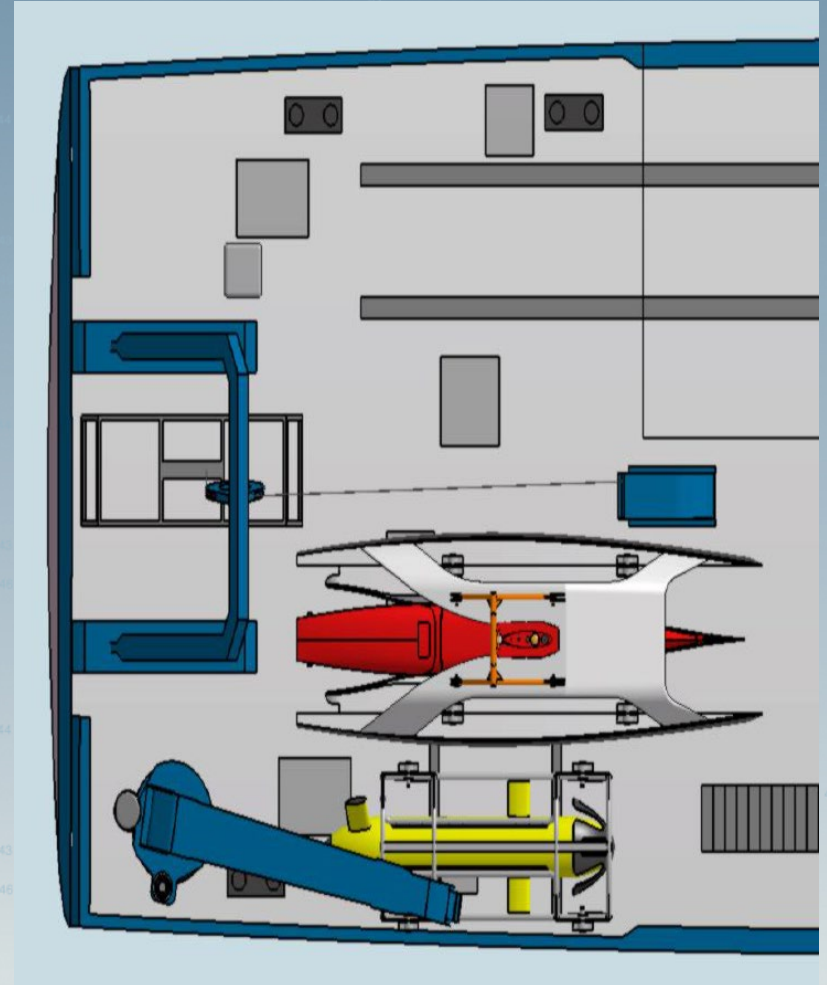
The NOAA-University of New Hampshire Joint Hydrographic Center

DriX Trials on *Thomas Jefferson* Sea Trials



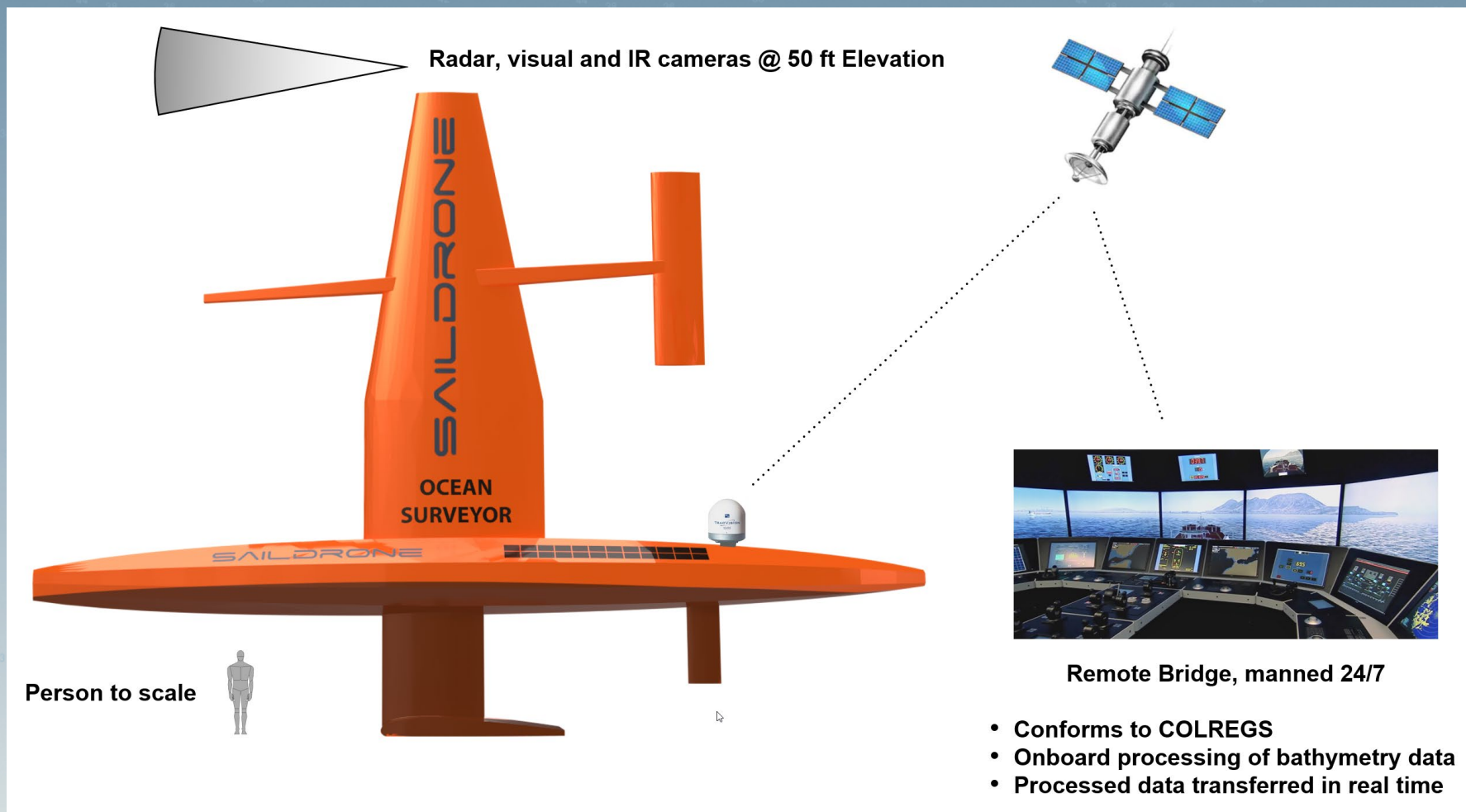
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From DDS → Universal Delivery System – Transportable Crane



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Saildrone SURVEYOR– 72ft (22m) UNMANNED VEHICLE



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Saildrone SURVEYOR

Environmental Measurements

Atmospheric Measurements

- 1 **WIND** Gill Windmaster 3D 20Hz @ + 5.0 m
- 2 **AT / RH** Rotronic HC2 - S3 @ + 2.2 m
- 3 **PRESSURE** Vaisala BAROCAP PTB210 @ + 0.2 m
- 4 **RADIATION** LICOR LI-192SA @ + 2.2 m

Ocean Measurements

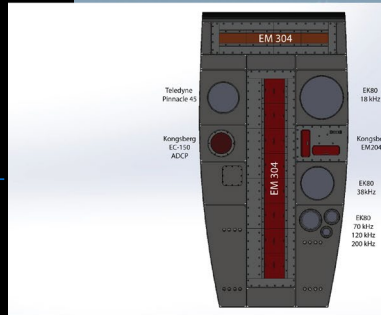
- 5 **CTD** SBE 37 & RBR Conductivity @ -0.5 m
- 6 **DO & TEMP** RBR Coda ODO & SBE 37 ODO @ -0.5m
- 7 **CHL-A** Wetlabs ECO-FL-S G4 & Turner Cyclops-7F
- 8 **SKIN SST** Heitronics CT15.2 @ +2.2 m
- 9 **WAVES** Dual GPS aided IMU - VN 300
- 10 **CAMERAS** Sky, Sea and Horizon Cameras

Acoustics

- 11 **ADCP** Teledyne RDI Workhorse 300 kHz @ -2.0 m
- OR
- 12 **ECHO-SOUNDER** SIMRAD WBT Mini (EK80) @ -2.0 m

Saildrone Surveyor Specifications:

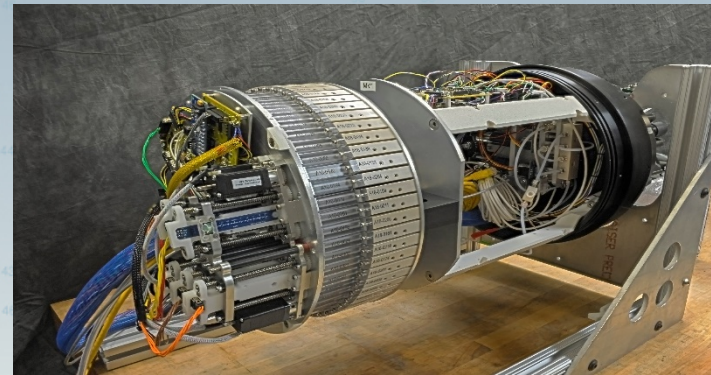
Length: 22m
 Draught: 3m
 Survey Speed: 10 Knots
 Transit Speed: 15 Knots
 Continuous Operation: 6 Months
 Depth Capability: 7000 meters



Mapping Sonars



MBARI ESP – eDNA Sampler



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UPDATE ON SAILDRONE SURVEYOR



HYDROGRAPHIC SERVICES REVIEW PANEL



noaa

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Saildrone Surveyor Sea-Trials – Sonar SATs



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Mission Portal

The screenshot displays the SAILDRONE Mission Portal interface. On the left, a satellite map shows San Francisco Bay with a red mission track and several red circular markers. A blue polygon highlights a specific area in the bay. The map includes a coordinate grid and a zoom control panel. The top navigation bar includes 'SAILDRONE Mission Portal', a dropdown menu for 'OER NOPP Bathymetry 2020', and icons for 'Data', 'Comms', 'Nav', 'Layers', 'Plan', and user settings. The right-hand panel is titled 'SD-1200' and contains several data visualization components: a 'Time Series' tab, a 'Filters' button, a 'LIVE UPDATES' indicator, a video player for 'Argus Forward Mast Head' showing the Golden Gate Bridge, and two time-series plots for 'Wind From (°)' and 'Wind Speed (kn)'. Both plots show a period of unavailability for the data.



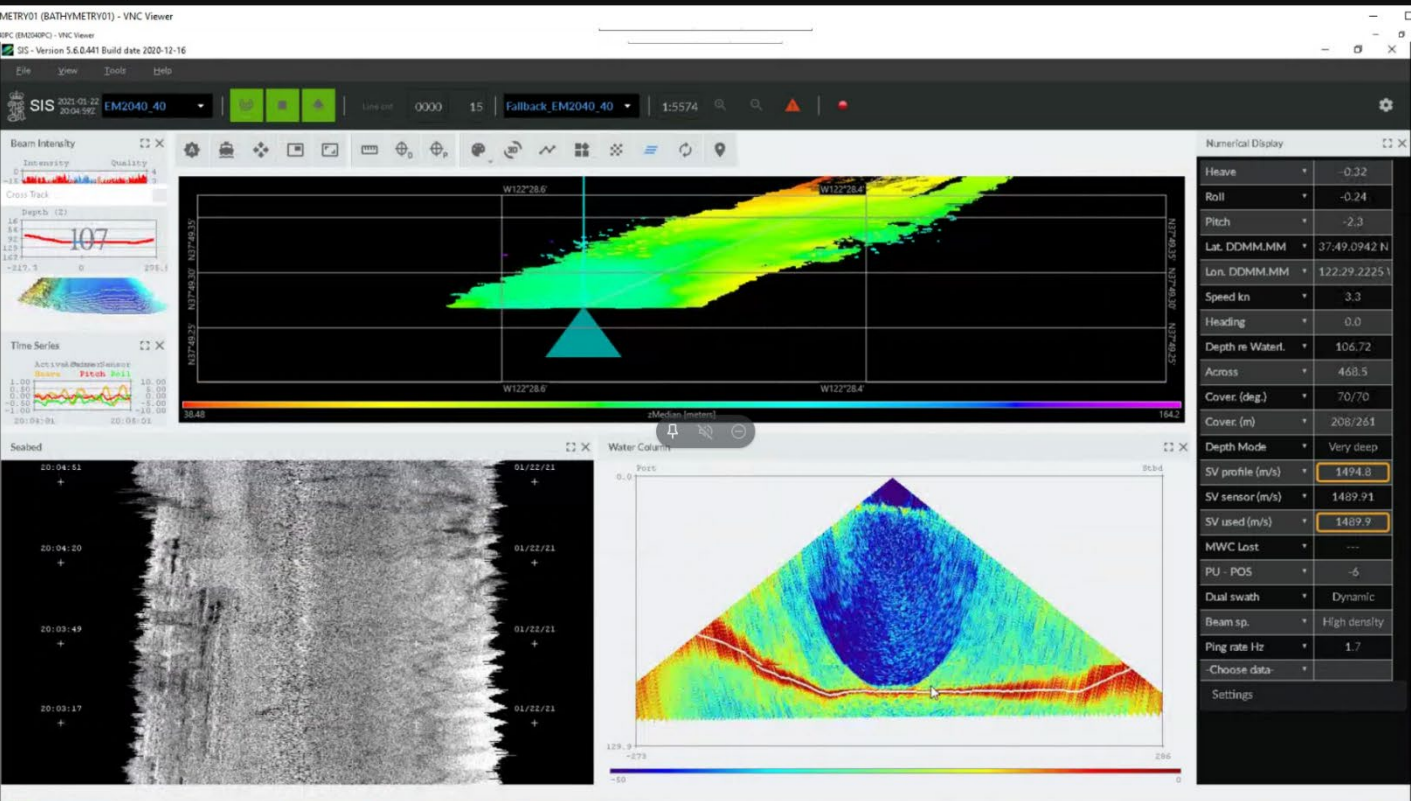
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Remote SIS....

Kevin Jerram is presenting

BATHYMETRY01 (BATHYMETRY01) - VNC Viewer

SIS - Version 5.6.0-441 Build date 2020-12-16



Heave	-0.32
Roll	-0.24
Pitch	-2.3
Lat. DDMM.MMM	37:49.0942 N
Lon. DDMM.MMM	122:29.2225 W
Speed kn	3.3
Heading	0.0
Depth re Waterl.	106.72
Across	468.5
Cover. (deg.)	70/70
Cover. (m)	208/261
Depth Mode	Very deep
SV profile (m/s)	1494.8
SV sensor (m/s)	1489.91
SV used (m/s)	1489.9
MWC Lost	---
PU - POS	-6
Dual swath	Dynamic
Beam sp.	High density
Ping rate Hz	1.7
Choose data	
Settings	

Windows taskbar: 12:04 PM 1/22/2021

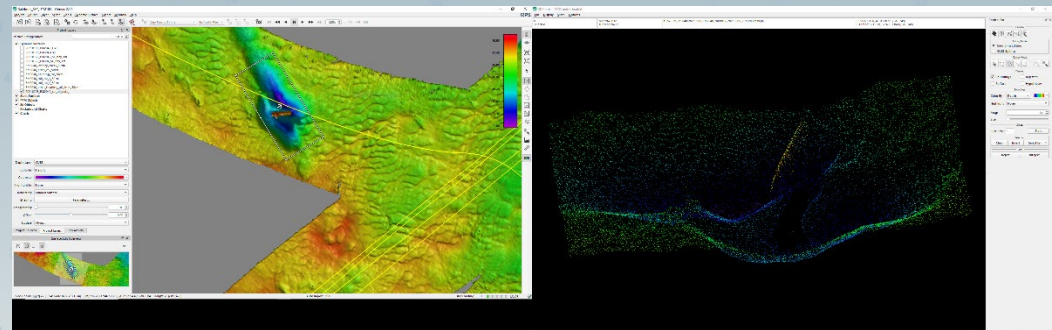
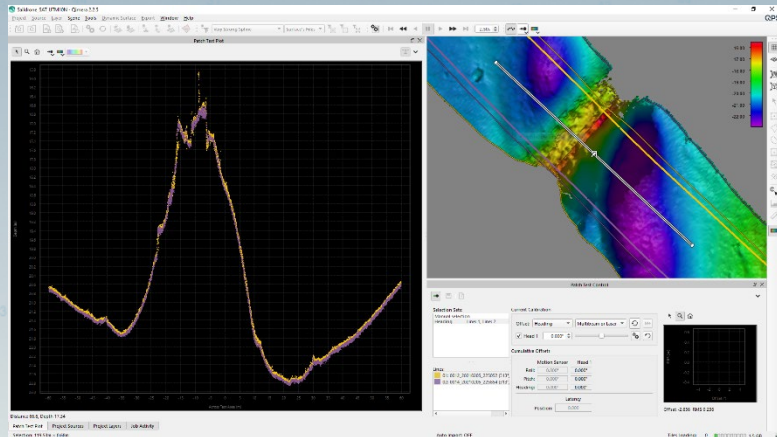
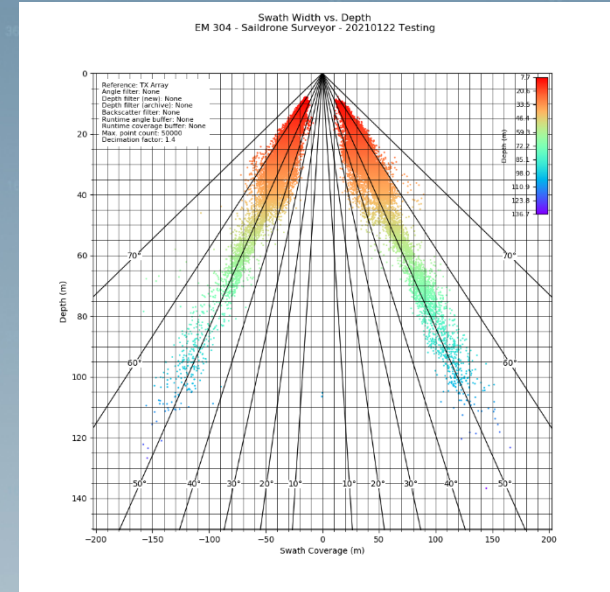
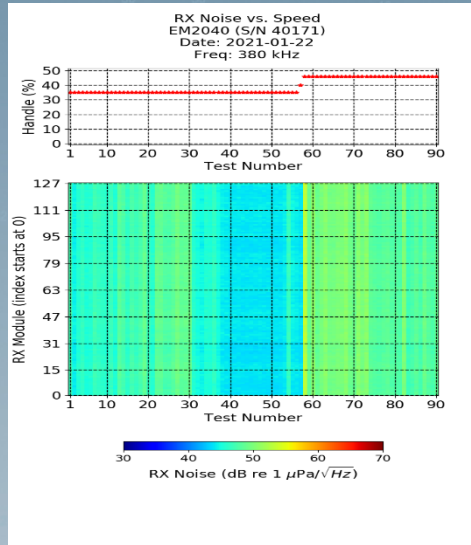
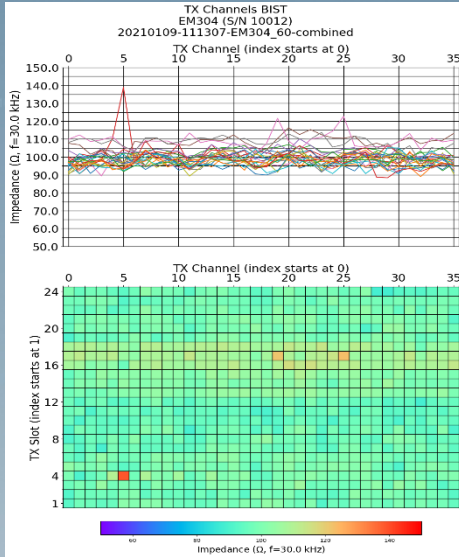
Zoom Meeting: 2:55 PM

Participants: You, Matt Paulson, Tony Dahlheim, Paul, Kevin Jerram



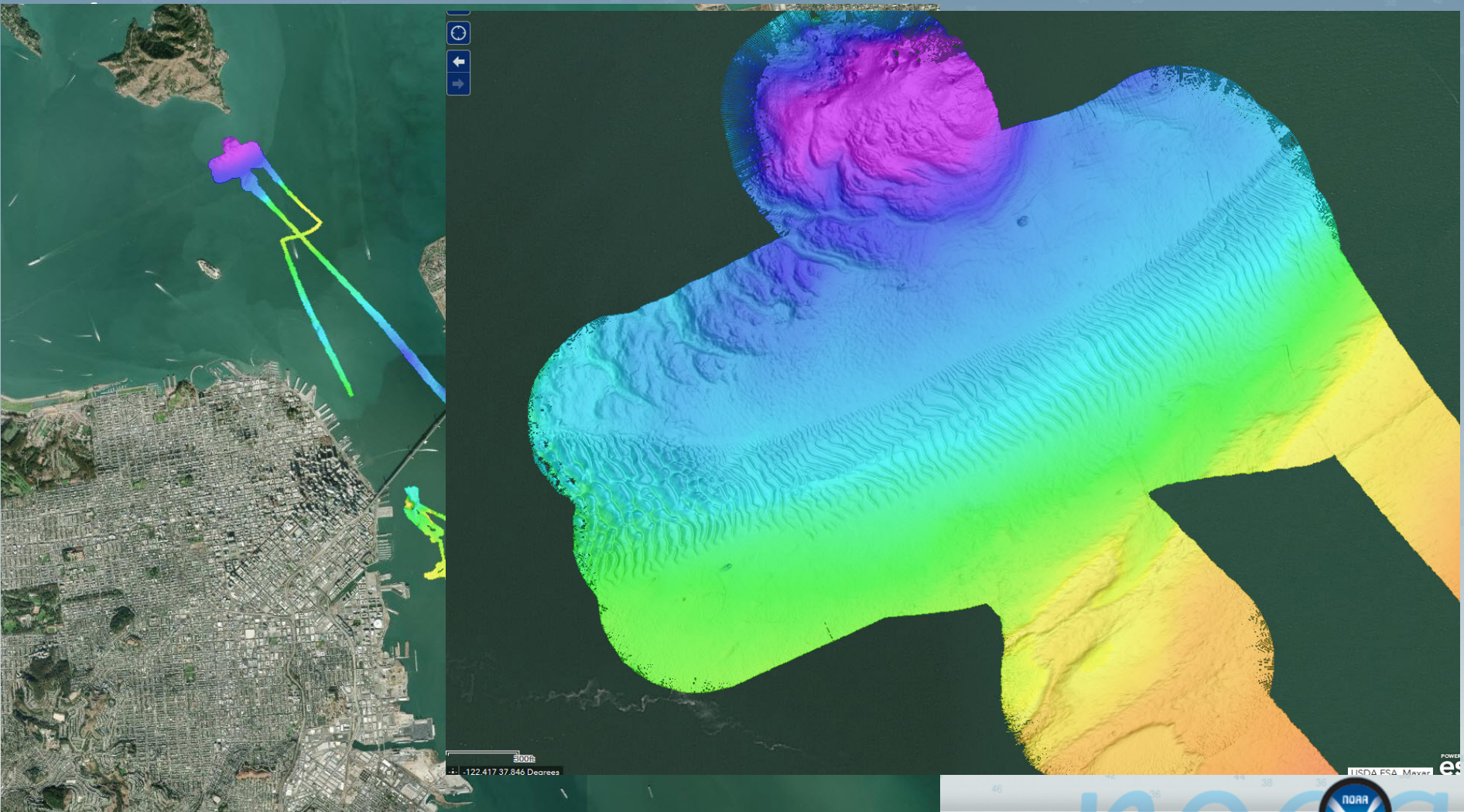
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Remote System Checks

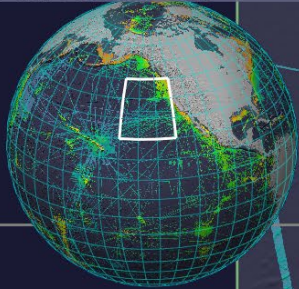


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Initial Patch Tests and SAT



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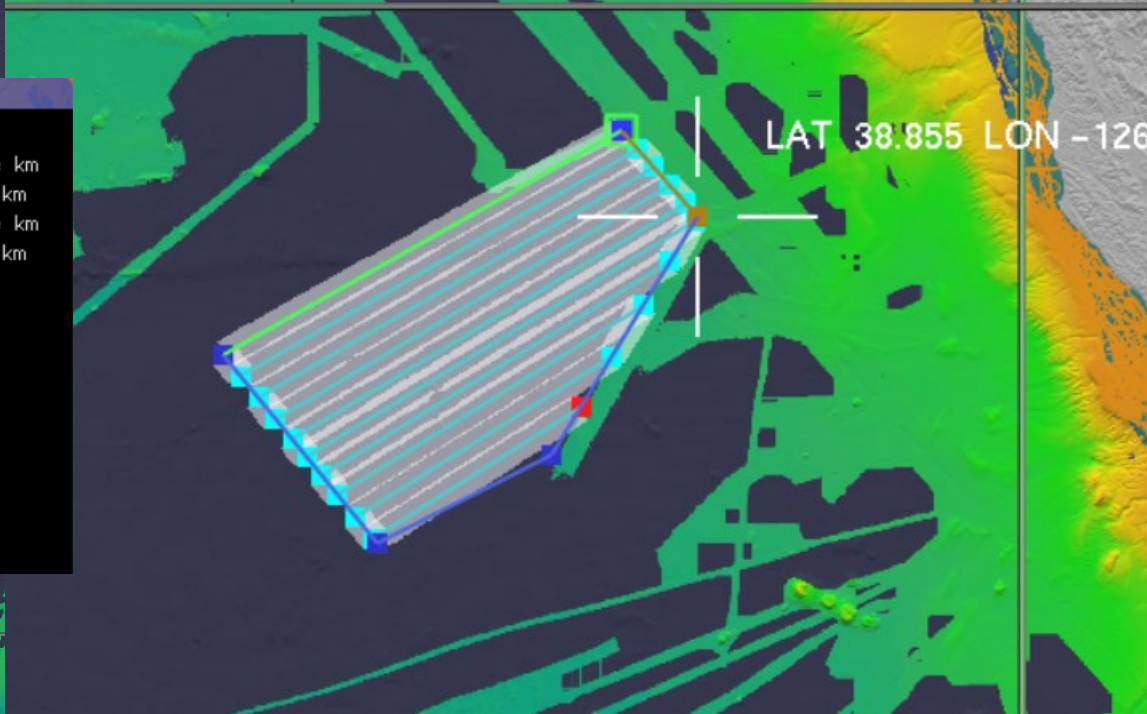
NEW GAP-FILLER TOOL

Plan Stats

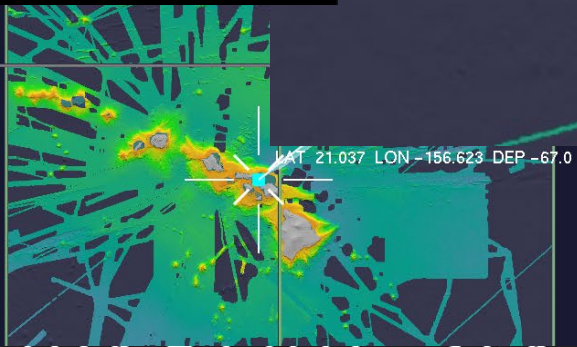
Close

Total Mapped Area	: 42072.44 square km
Overlap GEBCO 2020	: 1910.86 square km
New Mapping	: 40161.59 square km
Self Overlap	: 7790.85 square km

Distance 1478.75 nm at 9.00 kts
Mapping Time : 6 days, 20.31 hr



LAT 38.855 LON -126



LAT 21.037 LON -156.623 DEP -67.0



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Uncrewed → Autonomous

CCOM/JHC TEAM WON COMPETITION



Team	Affiliation	Total	Ranking
TeamCCOM ¹	University of New Hampshire	8	1
the_italian_job	None	9	2
bumblebee	National University of Singapore	12	3
gt-mrg	Georgia Institute of Technology	13	4
teamKanaloa	University of Hawaii at Manoa	18	5

Sponsored by:
 ONR
 Naval Postgraduate School
 Open Robotics

Simulation with Lidar

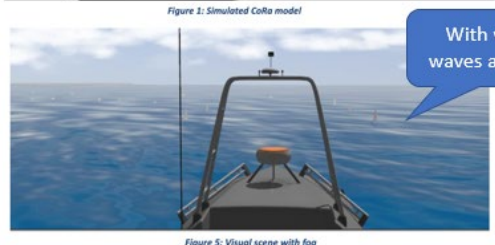


Figure 2: Simulated Colia model



Buoys to navigate, obstacles to avoid, and a "pinger" to localize.

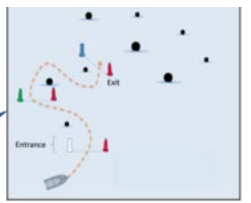


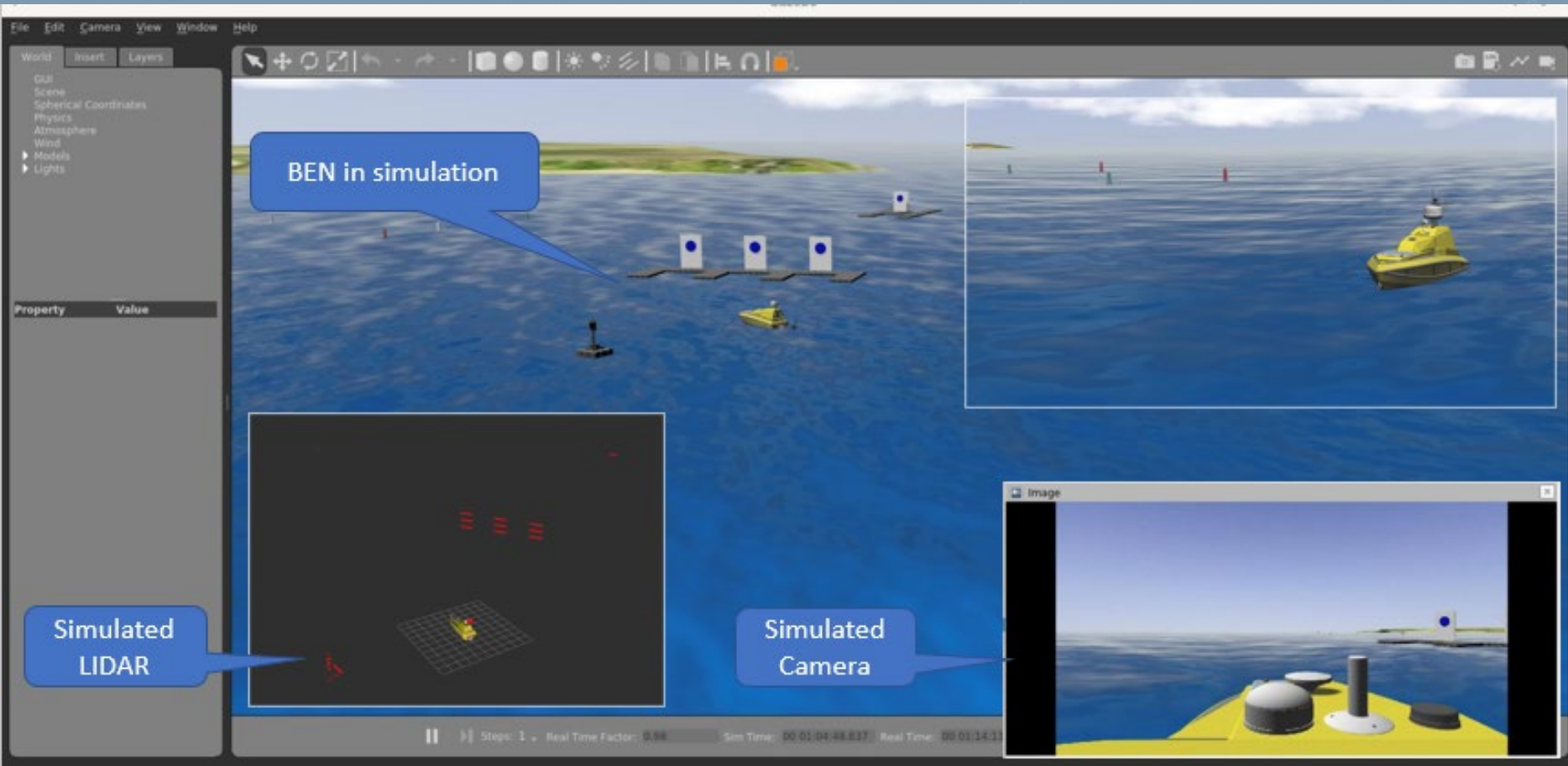
Figure 5: Black Box Gymkhana

Figure 5: Visual scene with fog



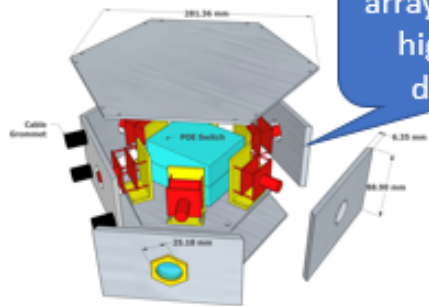
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Uncrewed → *Autonomous*

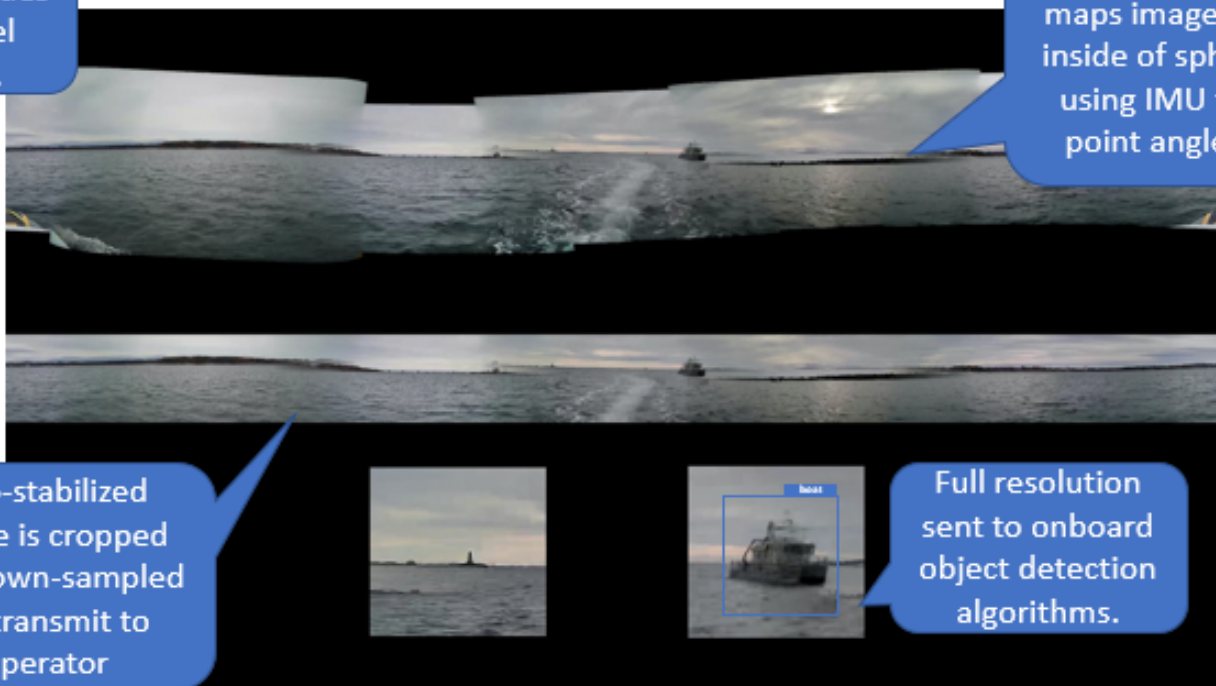


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Prototype Multi-Camera with POS/MV Stabilization



Six camera array provides high pixel density.



Custom software maps images to inside of sphere using IMU for point angles.

Geo-stabilized image is cropped and down-sampled for transmit to operator

Full resolution sent to onboard object detection algorithms.

This is important because it will be a big step toward reducing the telemetry bandwidth while retaining high operator situational awareness.



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Enhanced Operations through AR and VR visualization

