



KONGSBERG

COMPANY PRESENTATION

# Serving the Ocean Space

Seabed 2030 – Nadi, Fiji 06Nov24

13/12/2024

Kongsberg **Discovery**

Dr Martin Gutowski

Vice President Sales & Marketing, APAC



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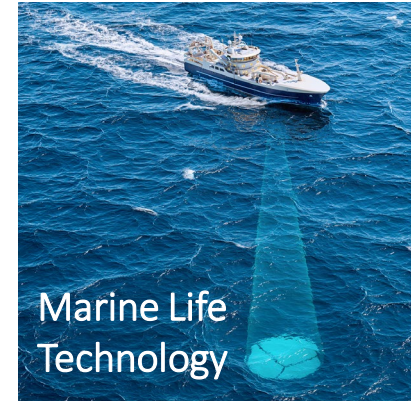
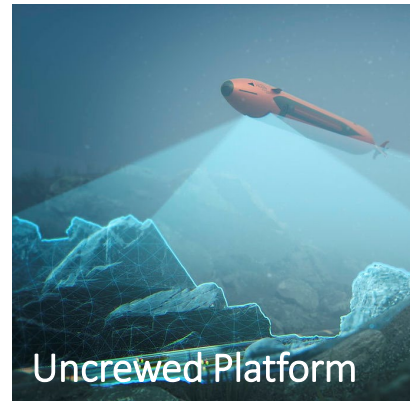
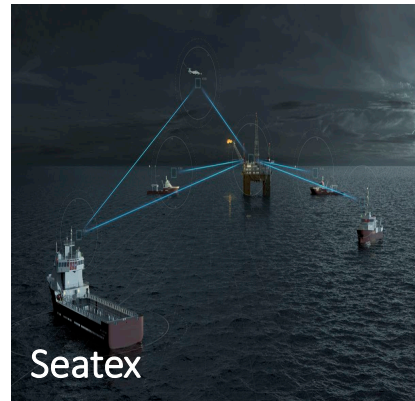
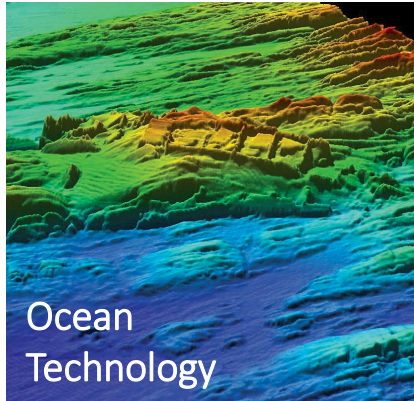
# Kongsberg Gruppen





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# Kongsberg Discovery



Technologies for Secure and Sustainable Ocean



~1000 employees



~4 BNOK order intake



Strong technology backbone

# Kongsberg Discovery

## Global presence

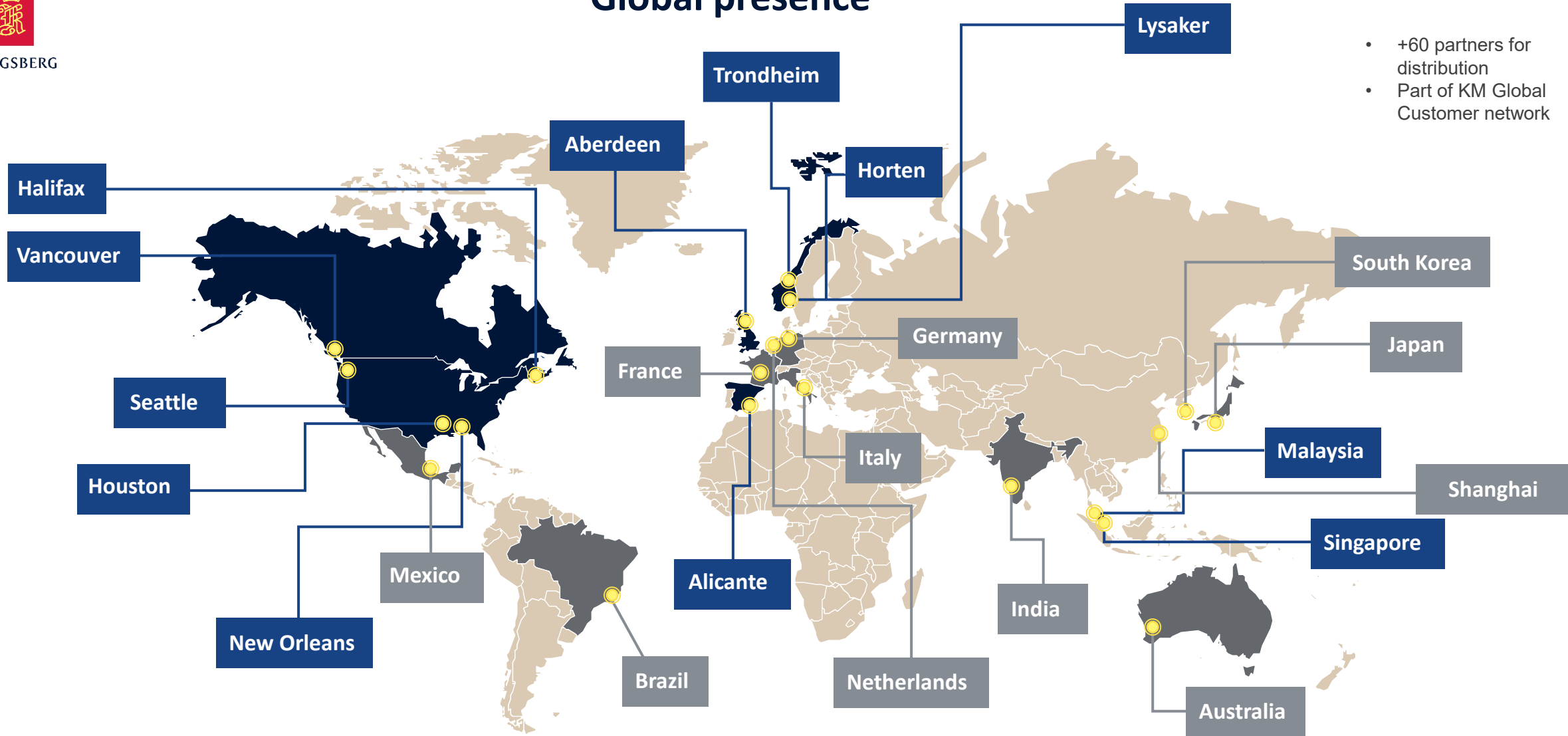


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 KD entity

 KD presence

- +60 partners for distribution
- Part of KM Global Customer network





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**2021**  
**2030** United Nations Decade  
of Ocean Science  
for Sustainable Development





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How do we  
contribute?



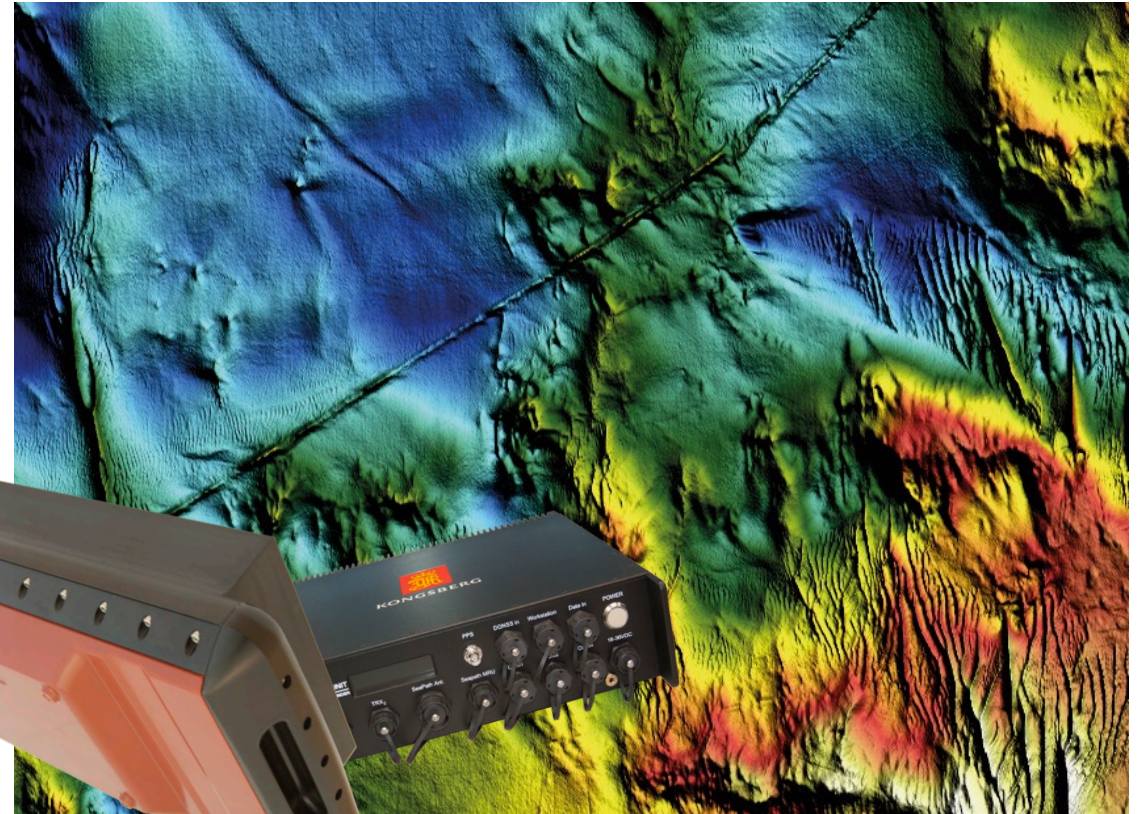
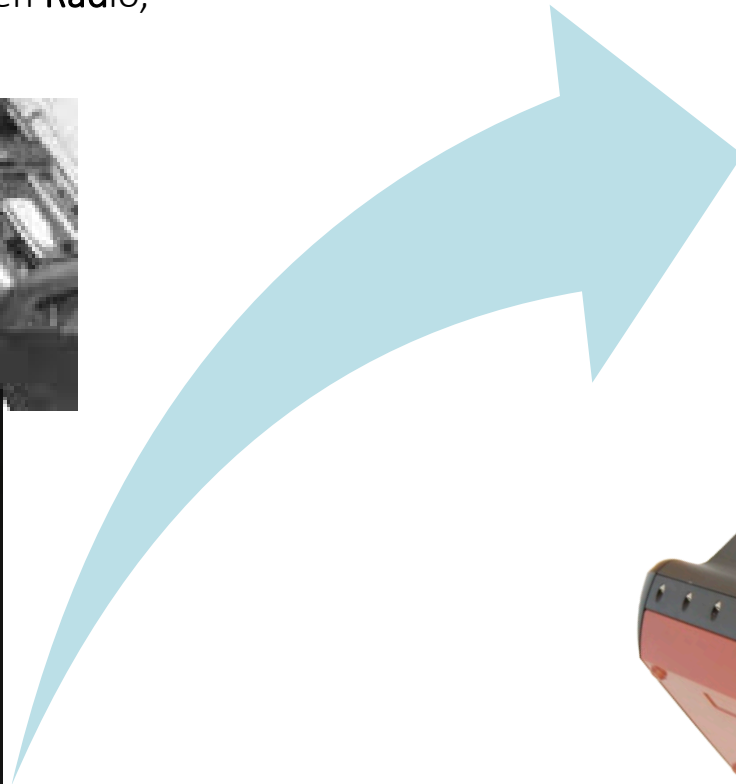


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Willy Simonsen founded **Simonsen Radio**,  
**Simrad**, in 1947



# Better sensors Better data

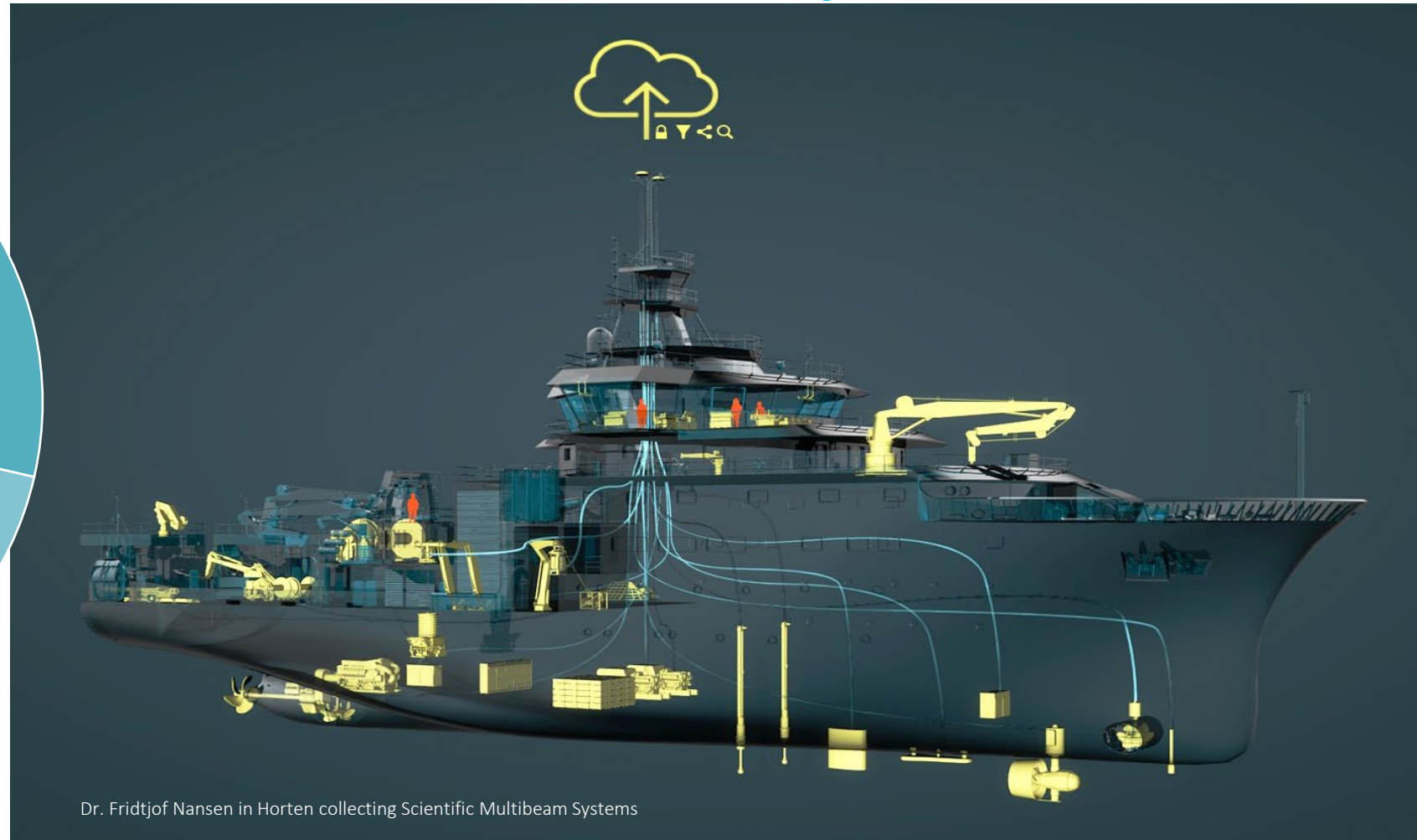
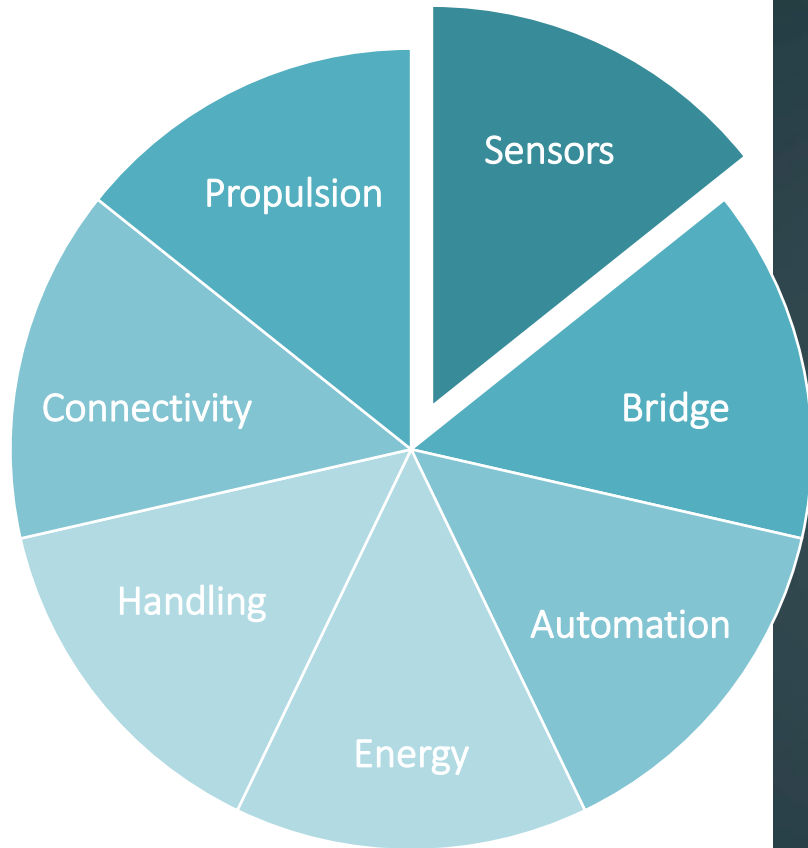




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# Integration = Efficiency

## Safe and Efficient Marine Operations



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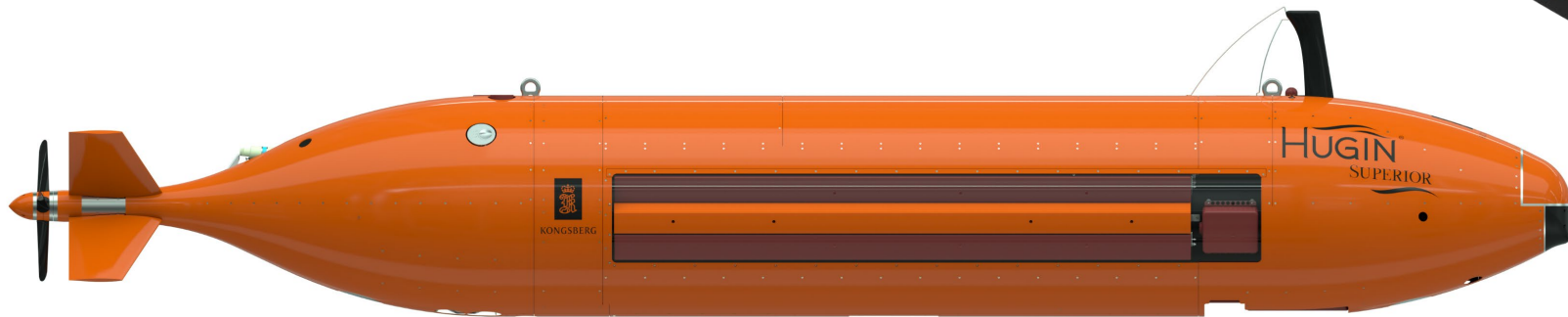
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# Autonomy - Marine Robotics

## data quality – efficiency - force multipliers



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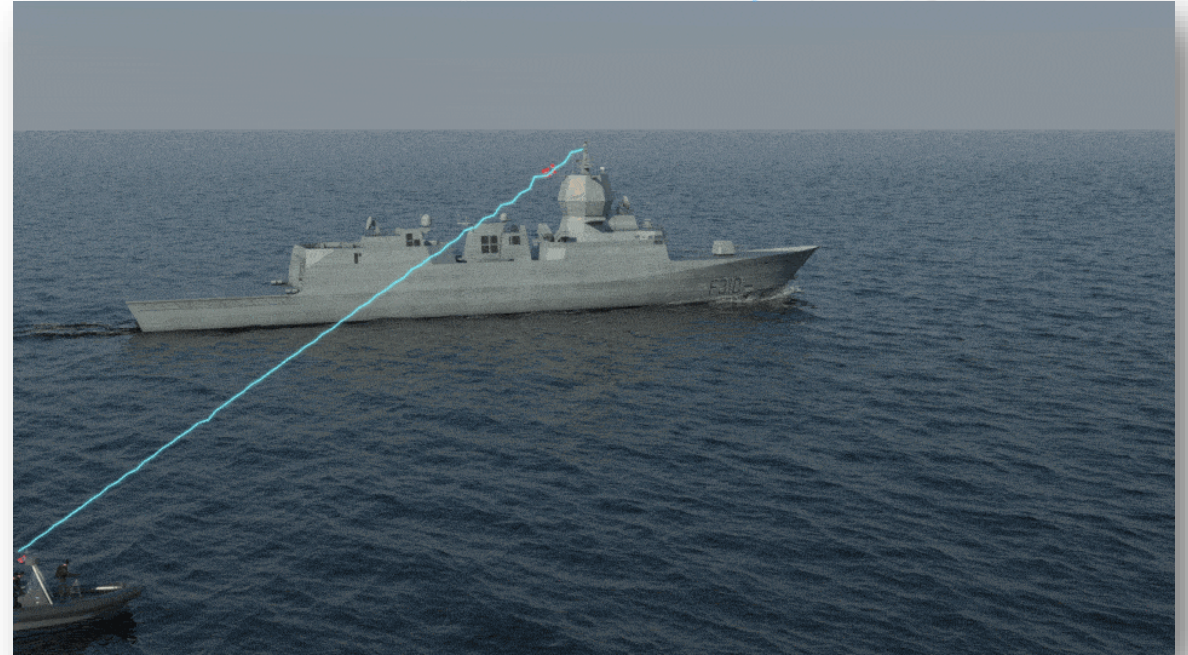


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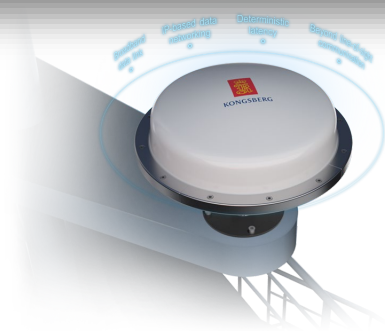
# Interconnectivity data transmission – remote operations



Conventional radio systems



Marine Broadband Radio - MBR



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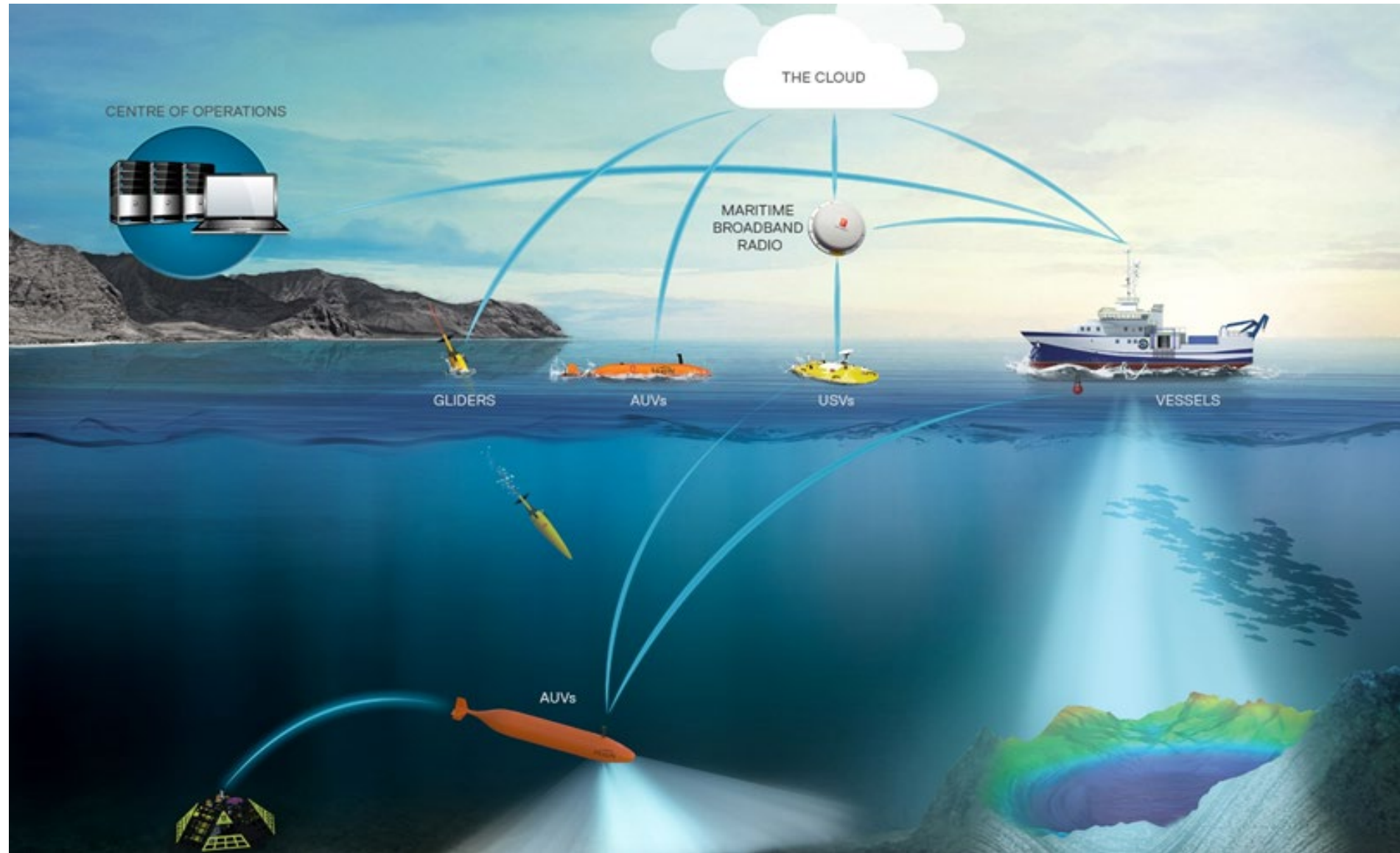
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# Digitalization Bringing it into the cloud

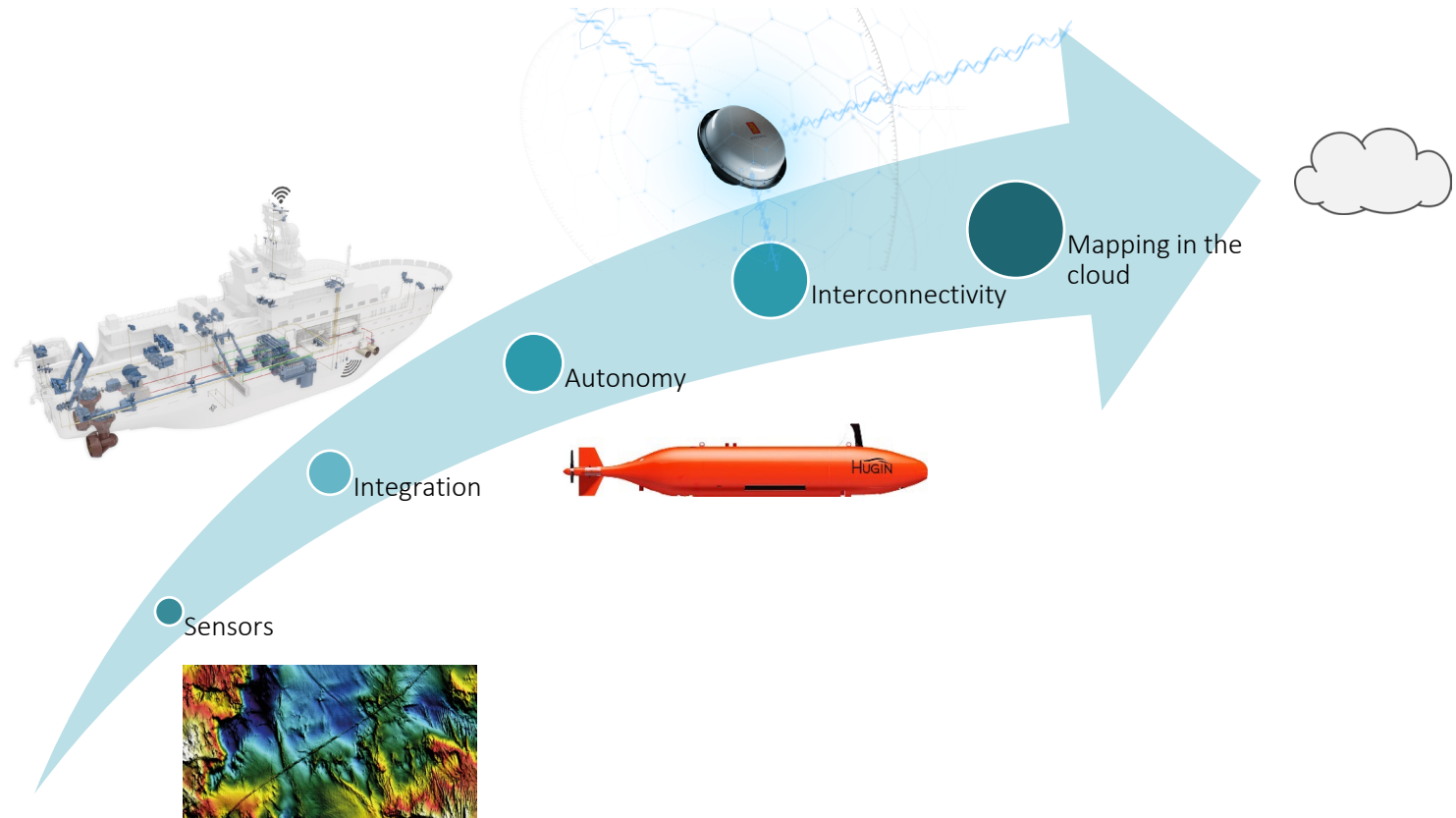
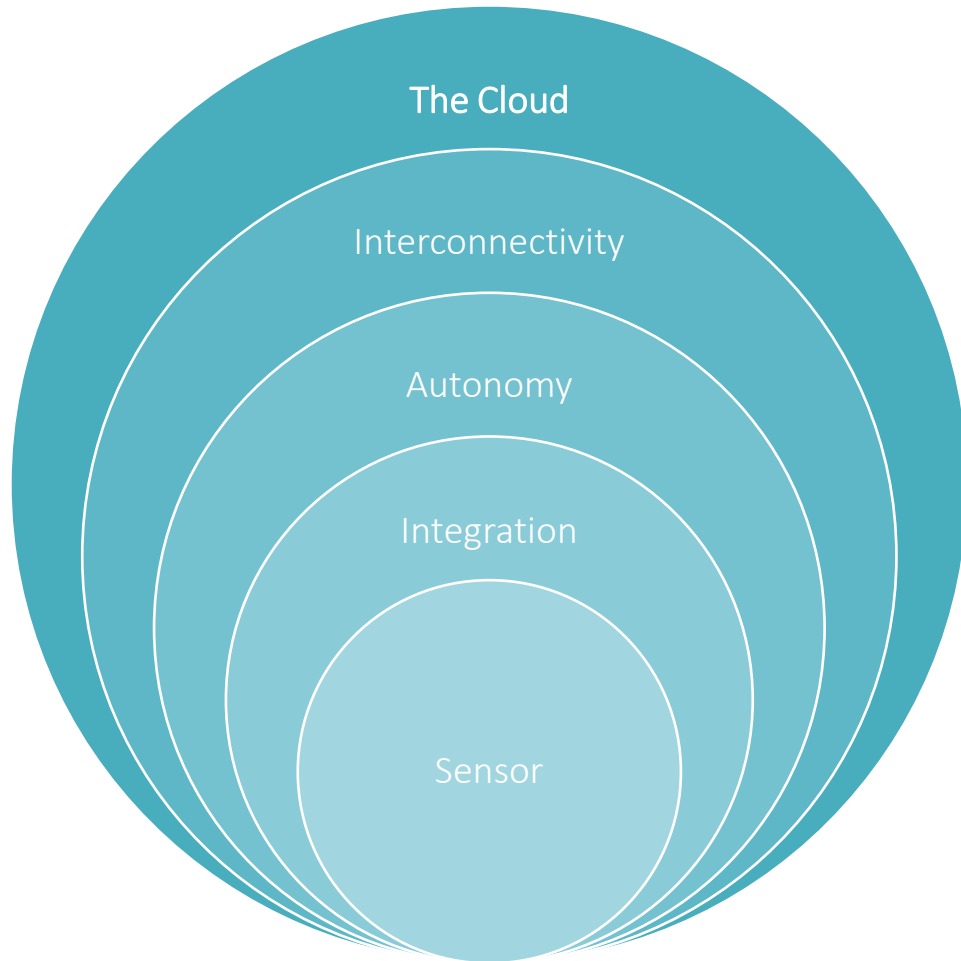
Data availability  
and remote  
operations





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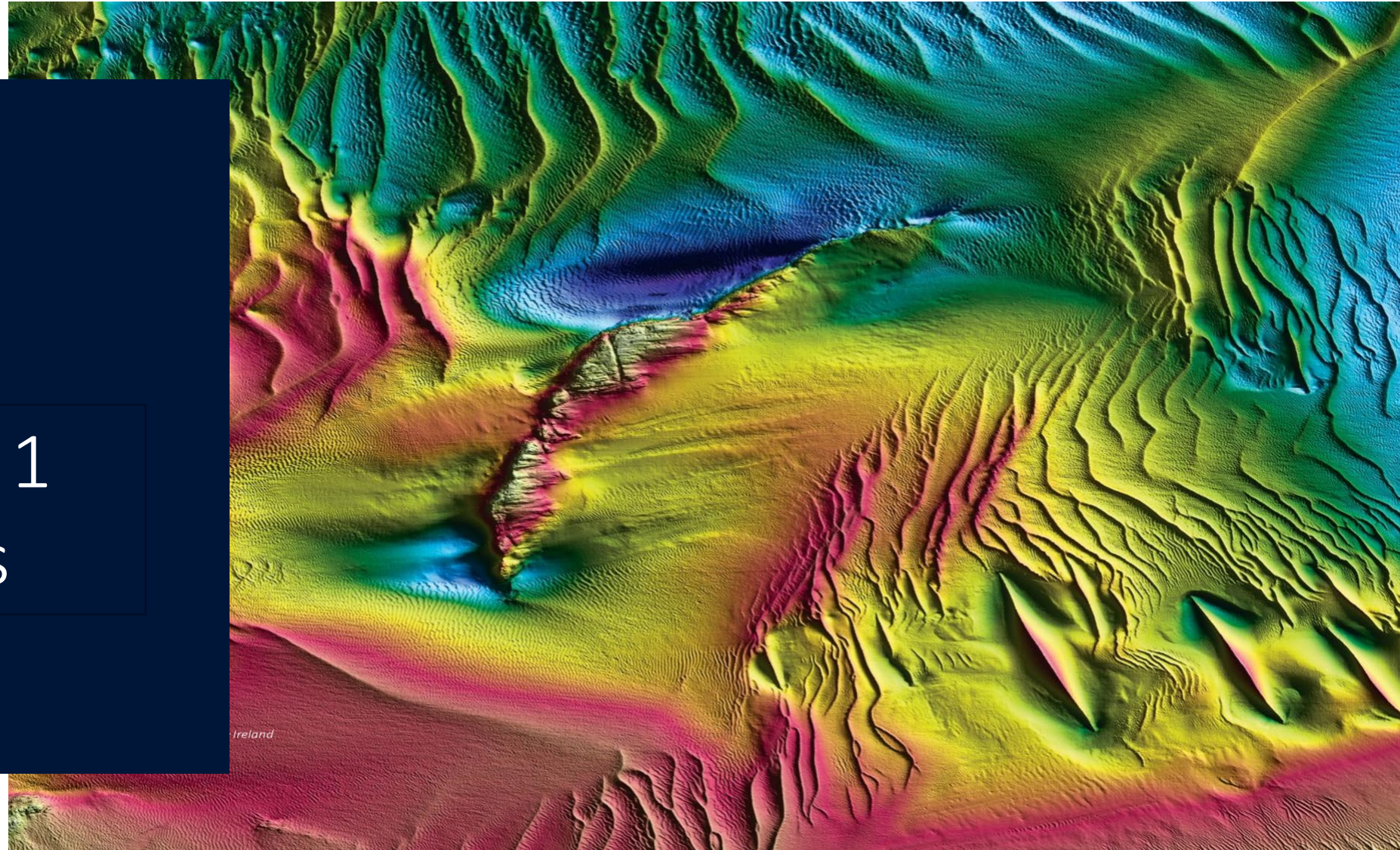
# Bringing it together Effective operations





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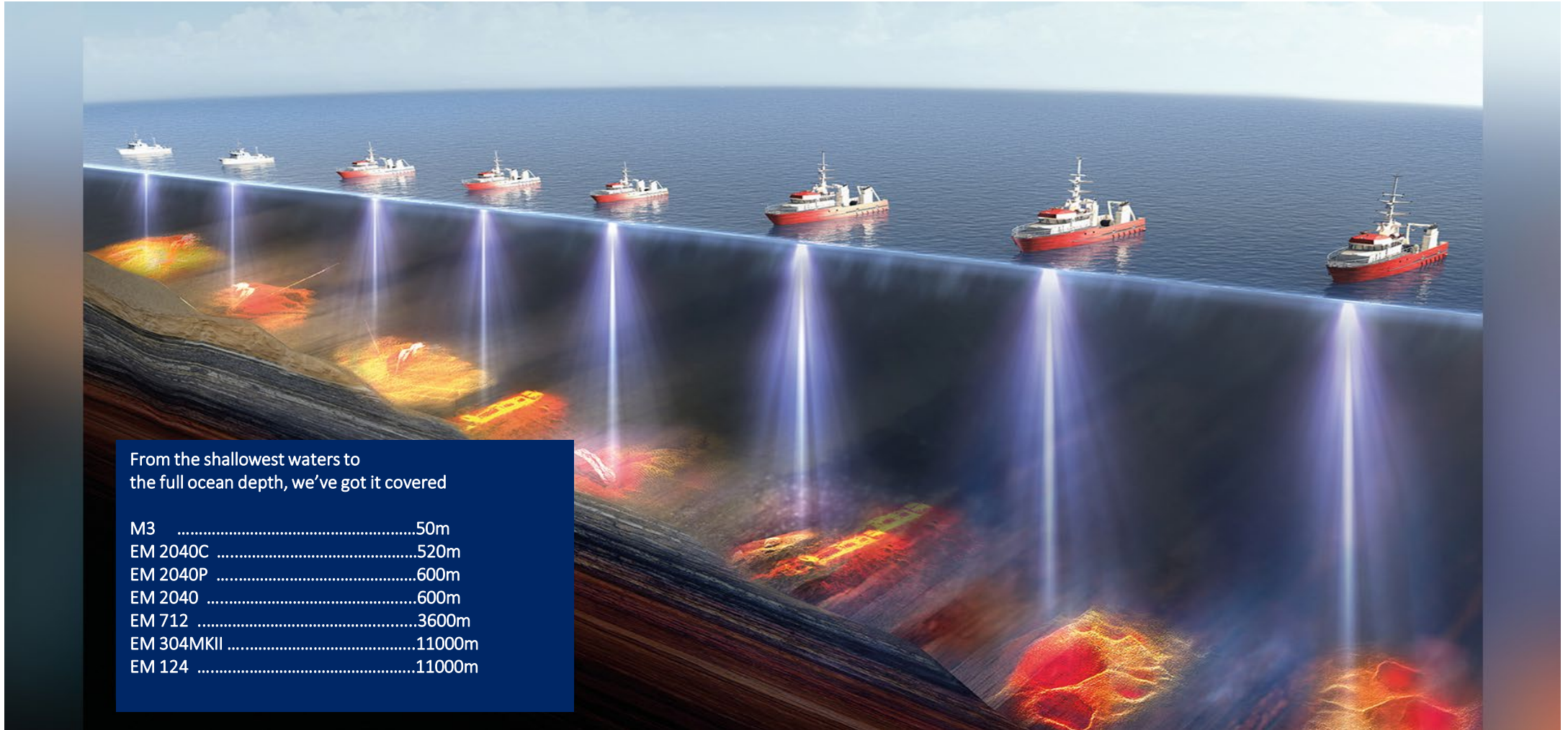
# Example 1 Sensors





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# Multibeam Sensors



From the shallowest waters to the full ocean depth, we've got it covered

M3	.....	50m
EM 2040C	.....	520m
EM 2040P	.....	600m
EM 2040	.....	600m
EM 712	.....	3600m
EM 304MKII	.....	11000m
EM 124	.....	11000m



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# EM<sup>®</sup> 2042

## Very high-resolution shallow water MBES

### Advantages over EM 2040

- Complete new design
- 50m depth rated, no export license
- >60% weight reduction
- Less power consumption
- Up to 4096 beams per ping
- Embedded (option):
  - ✓ miniMRU
  - ✓ SVT
- Ready for (option):
  - ✓ QuadSwath™
  - ✓ PredictivePitch™
- One cable to the topside (SRX w/embedded miniMRU/SVT)



EM<sup>®</sup> 2042

**FEATURING**

- Next generation of multi-transmitter MBES
- True 3-sector real-time stabilization
- High resolution multi-frequency bathymetry and seabed backscatter
- Engineered to surpass DHD Exclusive Order / LINZ Special Standard
- Seamless integration with SIS- and 3rd party software

**OPTIONS**

- Water column data logging
- Embedded miniMRU in the receiver
- Embedded SV sensor in the receiver
- EM HighFrequency mode
- Enhanced EM Multi-Frequency Backscatter mode
- Extra detections
- QuadSwath™
- PredictivePitch™
- Portable mount for over the board installations
- Easy upgrade from EM 2040



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MULTIBEAM ECHO SOUNDER FOR SHALLOW WATERS

**EM<sup>®</sup> 2042**

Introducing the EM 2042, the next generation of EM multibeam echo sounder that takes seabed mapping to new depths, by delivering unparalleled accuracy and resolution to your surveys. In the field of hydrography, offshore industry, dredging and marine science, the EM 2042 is the perfect tool for your underwater mapping needs. The ease of use and advanced features make it a must-have for professionals who demand the best data quality, reliability, and flexibility.

**Components**

The EM 2042 can be delivered with a 0.4 or 0.7 beam width (@400kHz) transmitter, with a single or dual 0.7 receiver optionally embedding a KONGSBERG miniMRU and an AML sound velocity sensor. The transmitter and receiver are connected to the topside processing unit through a single subsea cable, making it easy to set up and operate. Only EM<sup>®</sup> has the unrivaled dual RX variation, requiring only one TX array, generating up to 1024 beams per swath. The unique EM 2042 transmitter combines three transmit sectors to enable dynamic focusing on both transmission and reception, as well as roll, pitch and real 3-sector yaw stabilization. The EM 2042 transducers are 60% lighter than the previous generation and have reduced the total power consumption. A custom-made portable bracket for over-the-board installations can accommodate integration, in a fixed location with known offsets, for the most used INS sensors in hydrography, allowing a quick and easy setup.

**Improved frequency range**

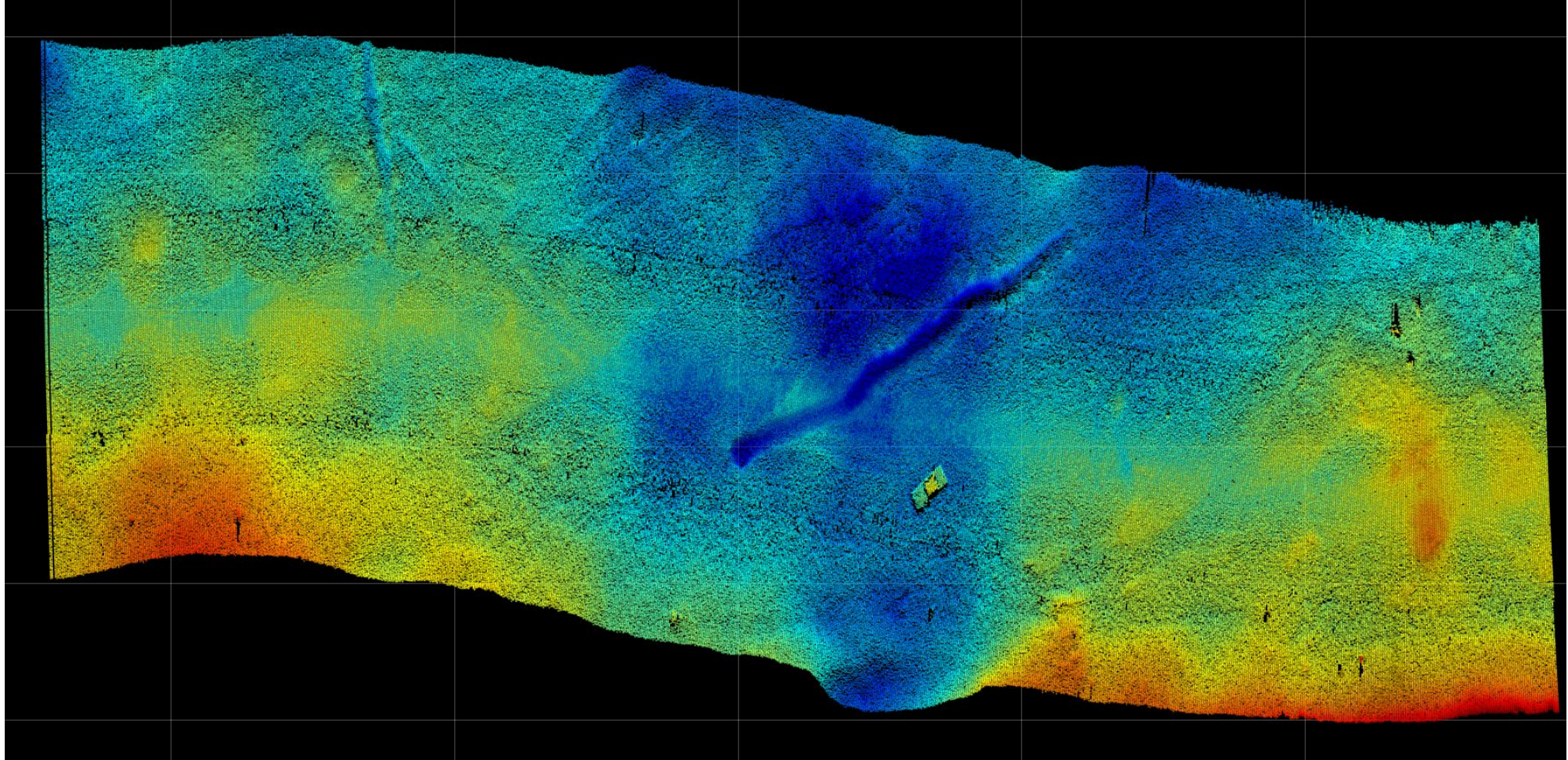
EM 2042 features a wideband frequency range from 150 kHz to 700 kHz, offering different modes for various applications:

- 300 kHz: Ideal for most mapping tasks, balancing range and resolution
- 400 kHz: Optimized for inspection work
- 600 kHz and 700 kHz: Enhance small object detection and 3D mapping
- 200 kHz: Extends the range down to 600 meters
- A new 150 kHz band complements EM<sup>®</sup> MultiFrequency mode, improving seabed classification in a single pass



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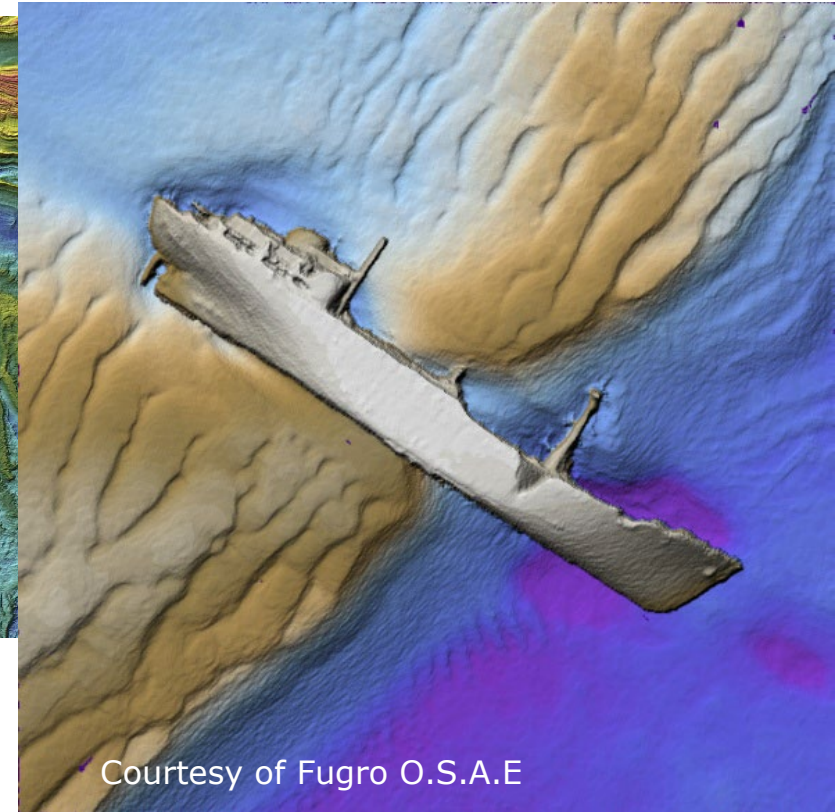
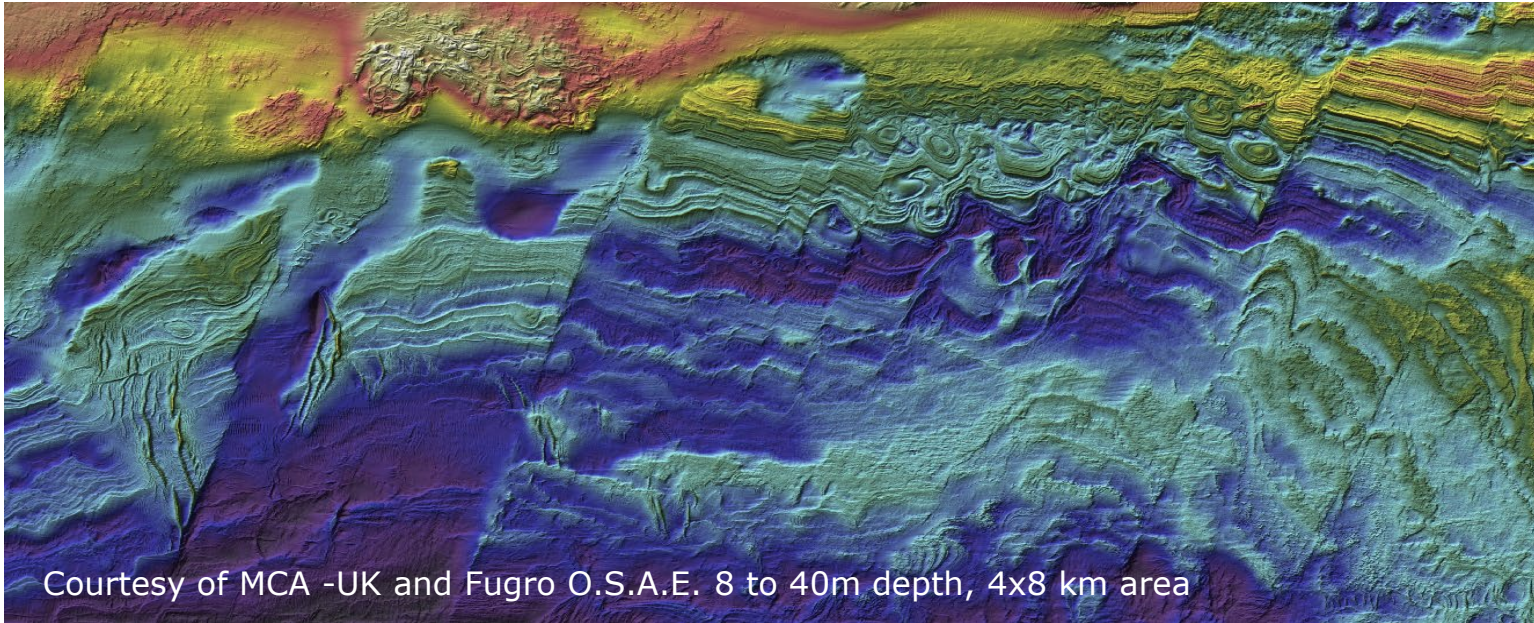
# EM 2042





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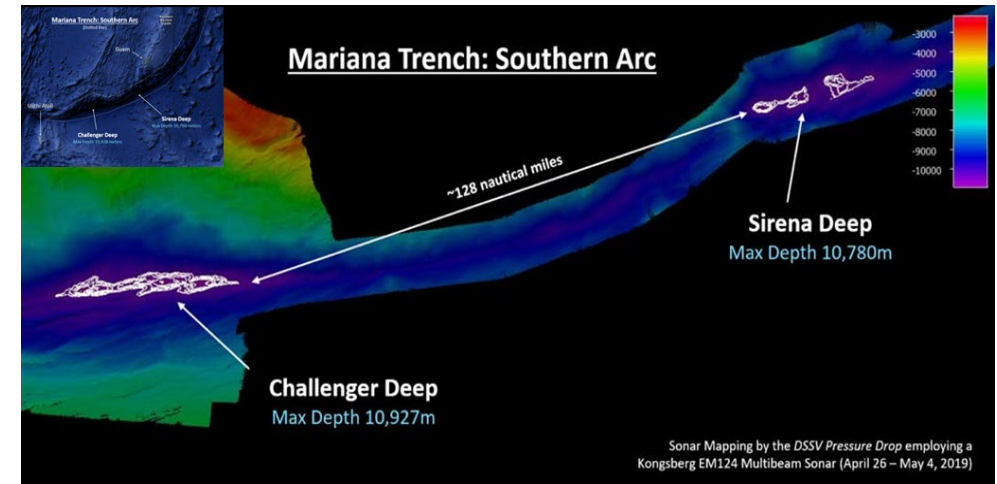
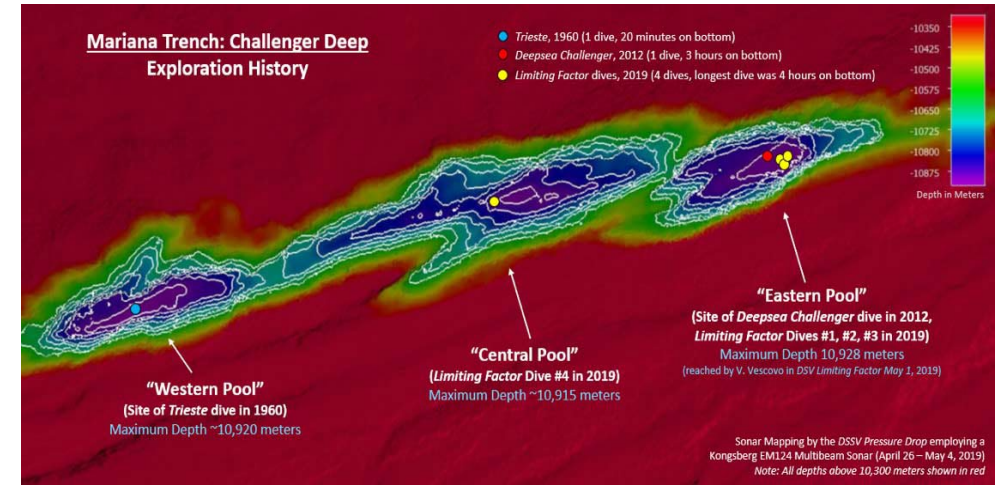
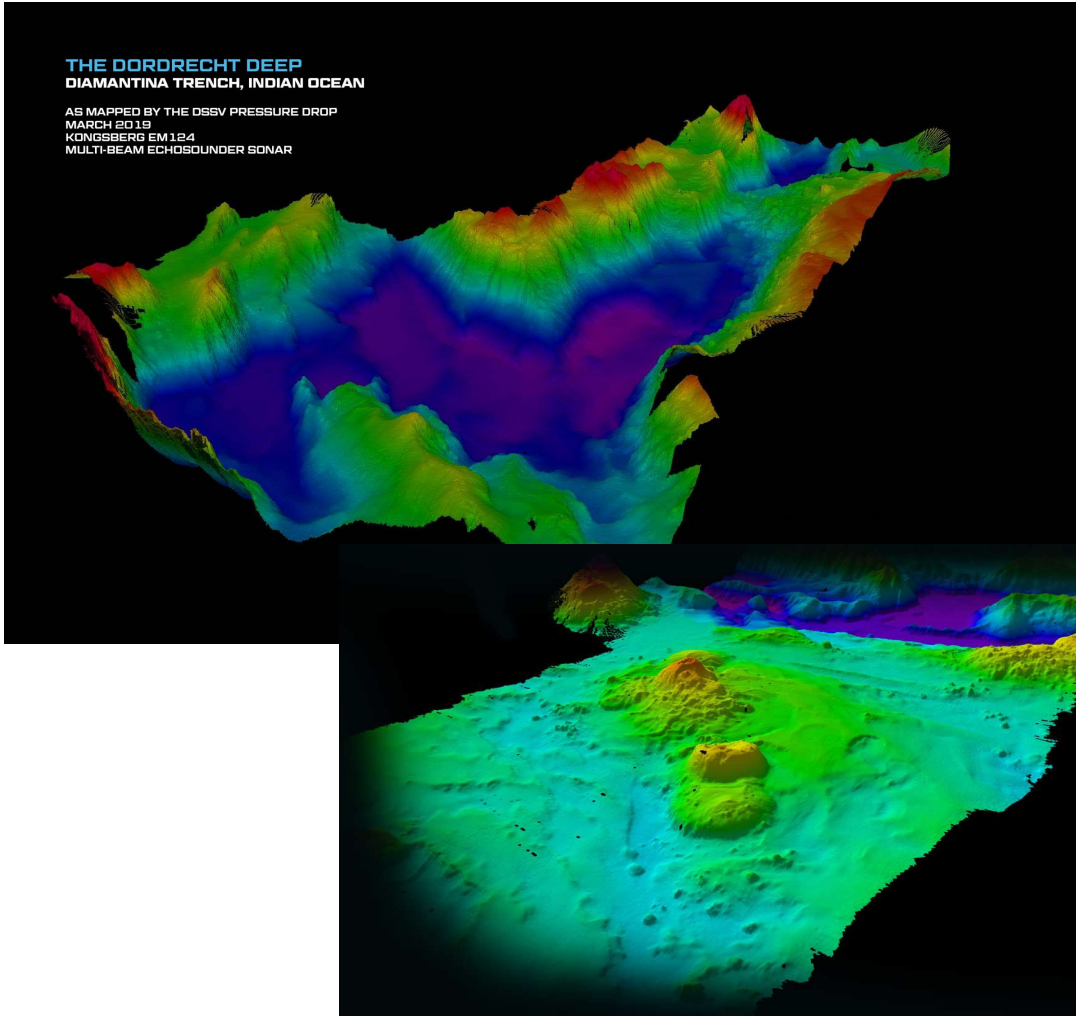
# EM 712





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# EM 124



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# Ocean Science – Continuous Mapping and Monitoring



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Platforms / Instrument Carriers  
Mooring, vessels, gliders, autonomous and uncrewed vehicles

Biomass:  
i.e. Fish, plankton, jellies

Non-Biological Targets:  
i.e. oceanographic layers, currents  
sediment, seabed classification,  
gas bubbles, marine hazards

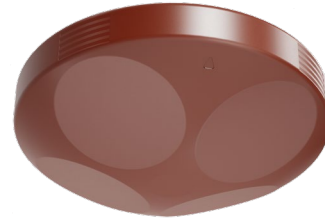
# Ocean Science Acoustic products



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Transducers



▪ CP300



EC150

Unique ADCP performance

- Extreme resolution
- High ping to ping accuracy
- High ping rate
- High performance in dynamic environments and moving platforms



ME70/MS70 Scientific MBES:

- Calibrated Backscatter
- Individual Split Beams
- Extremely low side lobes
- 70 to 120 kHz frequency range

Transceivers



EK80 Family

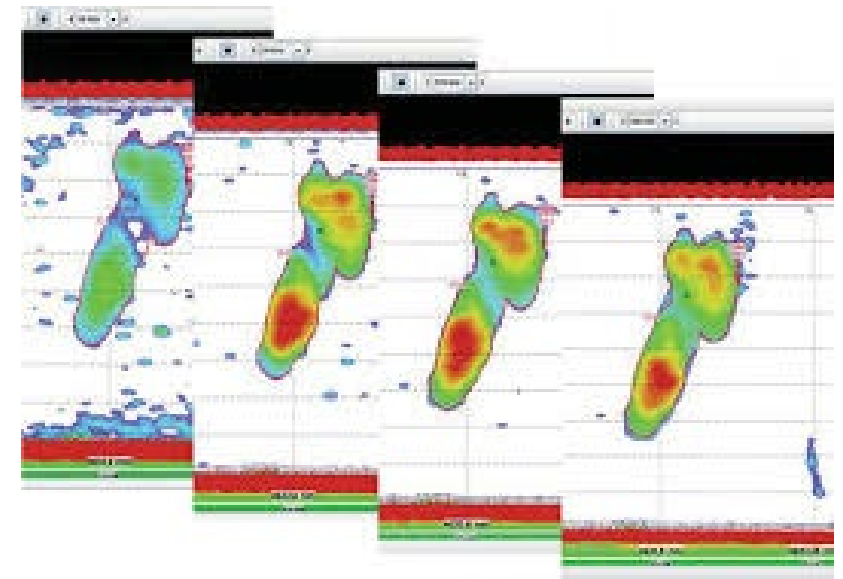
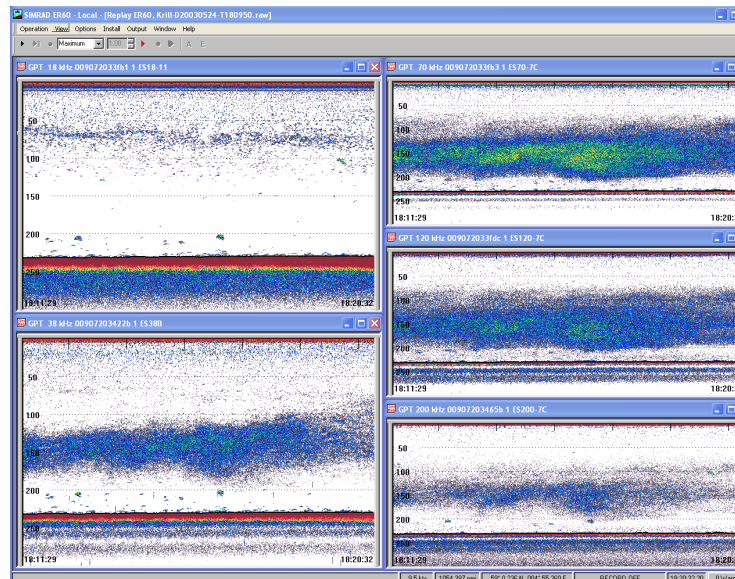
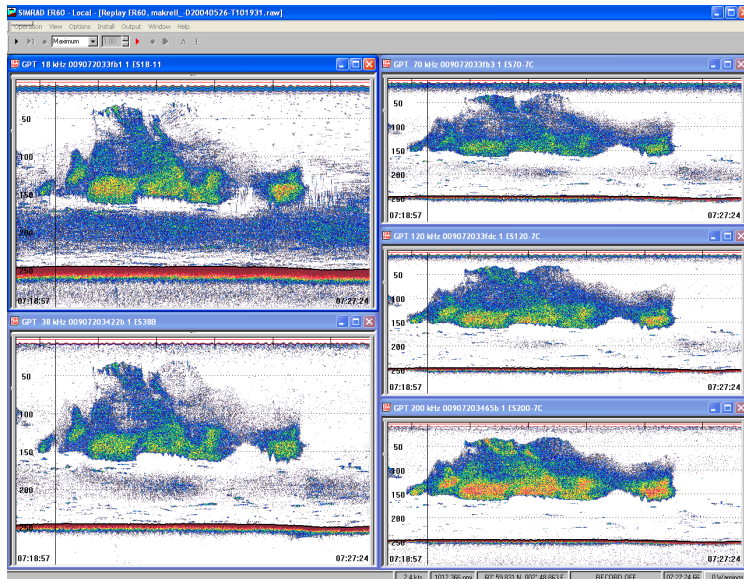
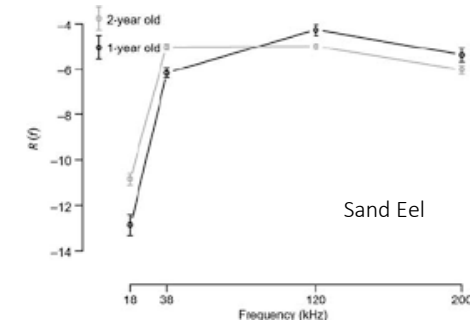
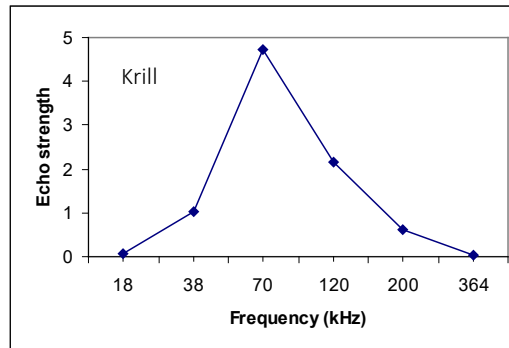
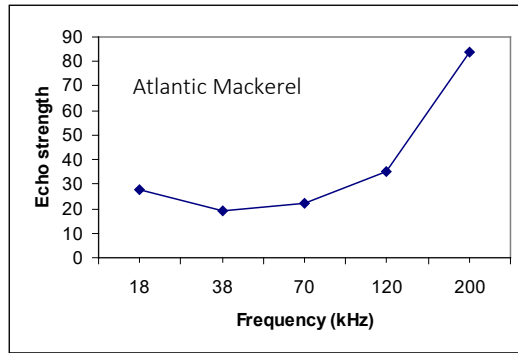
- Broadband Split-Beam echosounder & ADCP system
  - Multiple Platform Systems:
    - Shipboard, Underwater Vehicle, Mooring and Portable Systems



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# Multifrequency & EK80

## Multifrequency, species ID



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## Example 2 Autonomy



From shallow to deep water



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# HUGIN Family



## HUGIN® EDGE

1000m depth rating  
24 hours endurance  
2.7 km<sup>2</sup> per hr coverage rate  
4 m (L) x 0.4 m (diameter)  
350 kg

## HUGIN®

3000m or 6000m depth rating  
30 to 60 hours endurance  
2.7 km<sup>2</sup> per hr coverage rate  
6.2 m (L) x 0.875 m (diameter)  
1900 kg

## HUGIN® SUPERIOR

6000m depth rating  
72 hours endurance  
4.6 km<sup>2</sup> per hr coverage rate  
6.6 m (L) x 0.875 m (diameter)  
2200 kg

## HUGIN® ENDURANCE

6000m depth rating  
15 day endurance  
4.6 km<sup>2</sup> per hr coverage rate  
11.2 m (L) x 1.2m (diameter)  
7000 kg

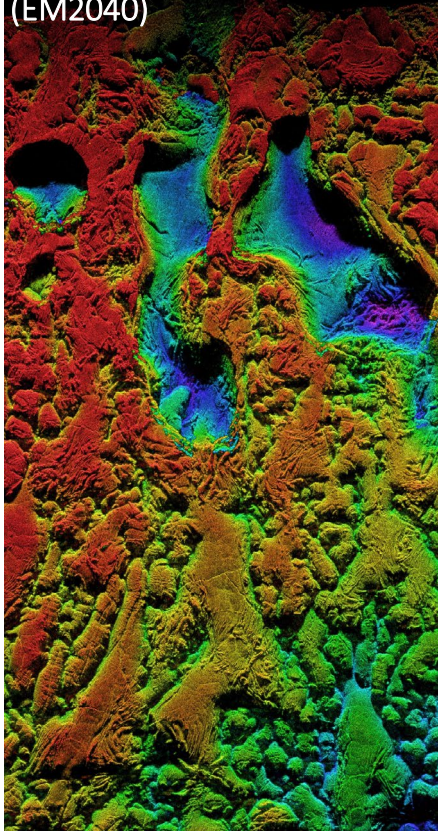
Background



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# Proven Payloads

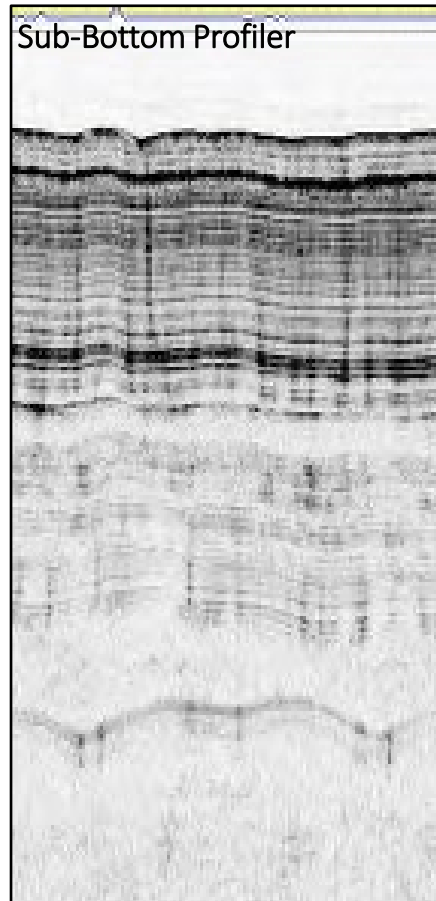
Multibeam Echosounder  
(EM2040)



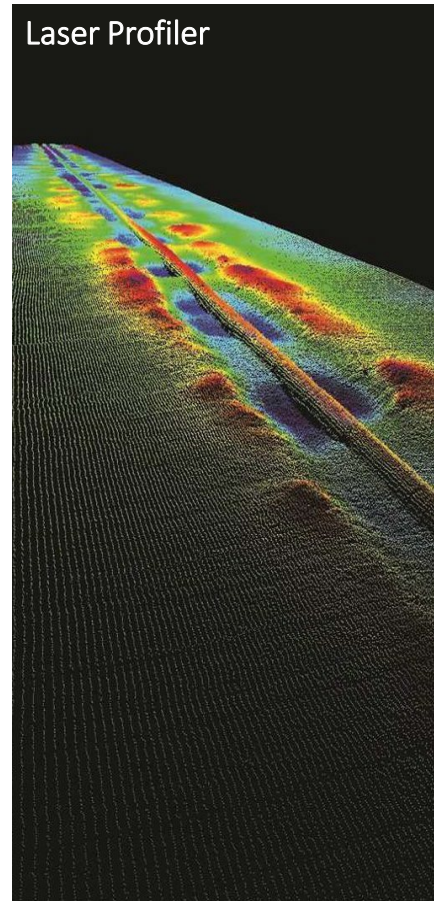
Synthetic Aperture Sonar  
(HISAS 1032)



Sub-Bottom Profiler



Laser Profiler



Digital Stills



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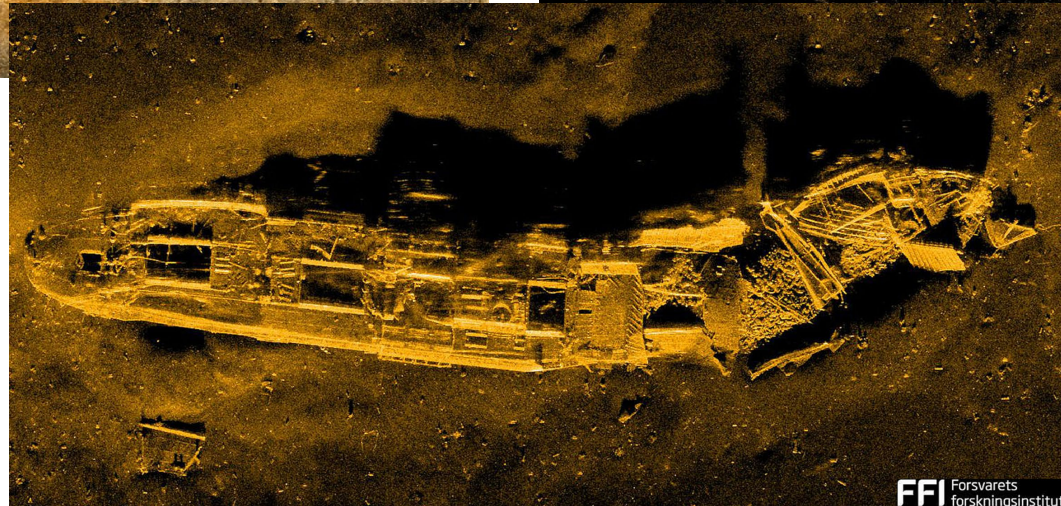
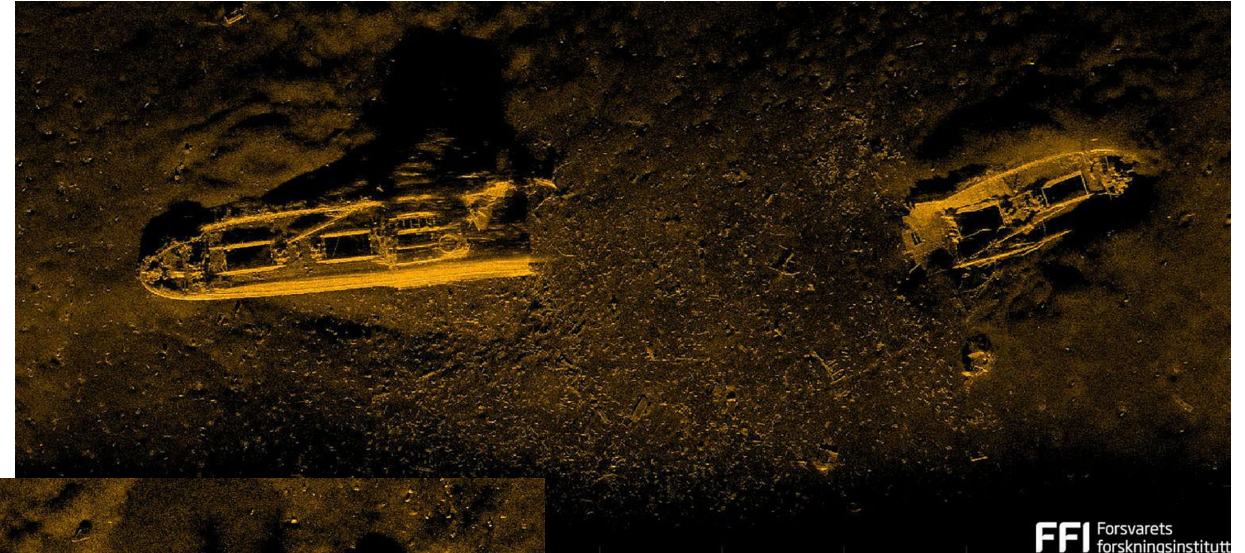
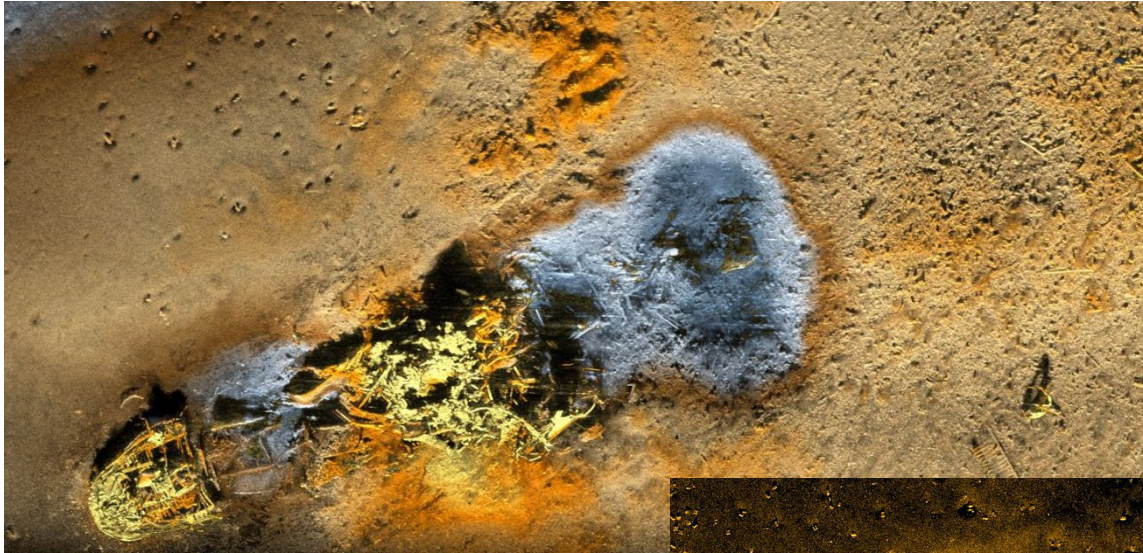
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Background



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# Proven Payload - Synthetic Aperture Sonar (HISAS 1032)

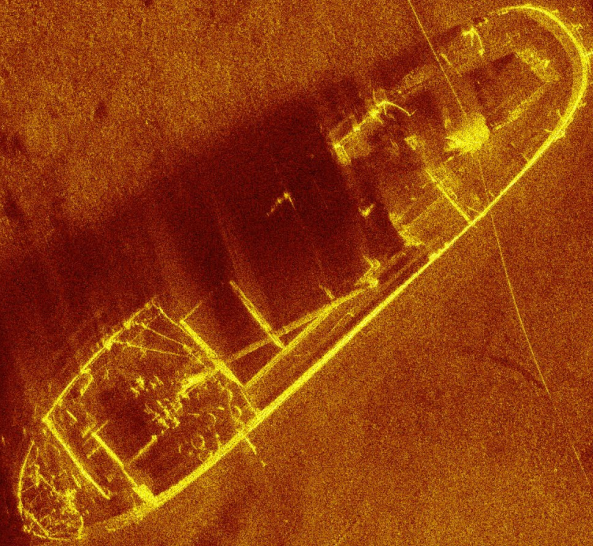


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**It's All About the Data**

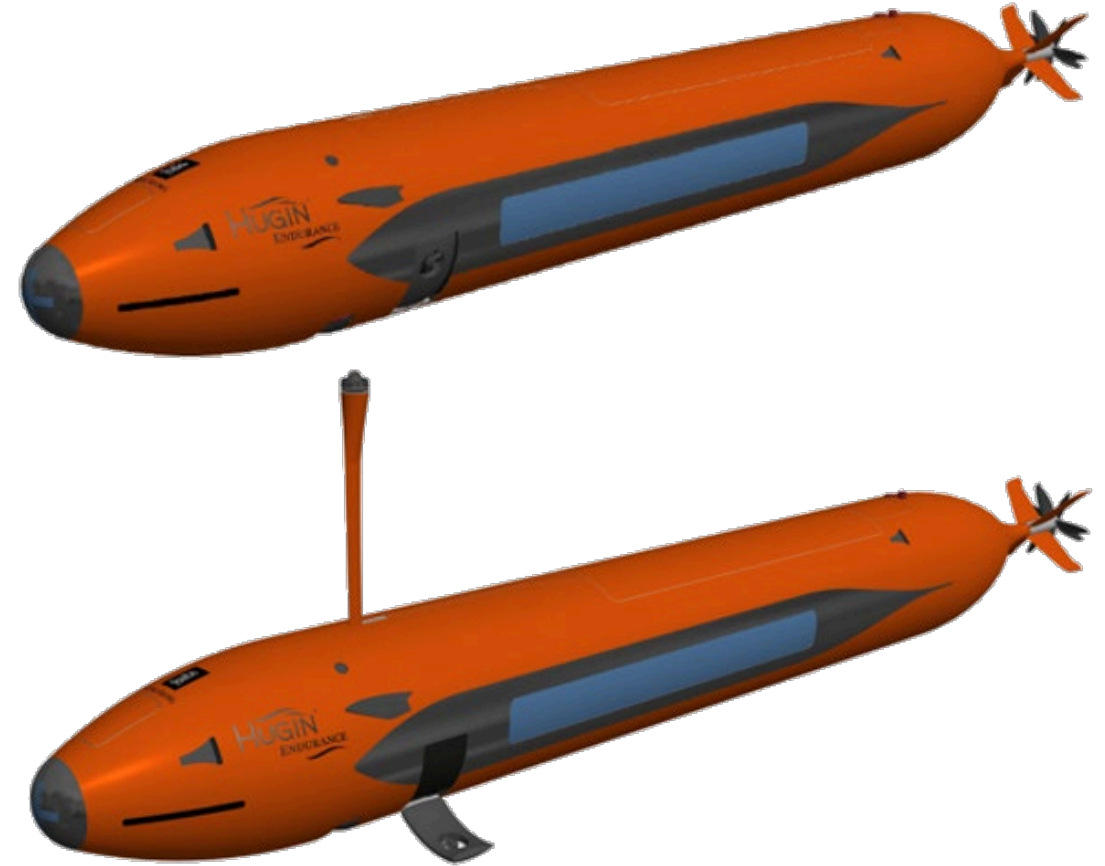


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System Concept

# Initial Design

- Long endurance/range, 15+ days, 1200 nm depending on payload configuration and speed
- **18 months timeline**
- Depth rating of 6000 meters
- Primary focus on shore-to-shore operations
- Capable of carrying our existing sensors and wide range of potential new sensors or payloads
- Increased focus on operational robustness
- Increased in-mission situational awareness
- In commercial market it will help reduce carbon footprint of our traditional customers
- In defense market immediately useful for certain mission types, and expandable into additional mission types including payload delivery



# Challenges

Breaking barriers in long range UUV operations



## Challenges



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# Major challenges to success

- To increase endurance and payload capacity, the vehicle envelop had to grow significantly
- Vehicle concept calls for long range missions without support vessel
- More complex mission plans are required
- Set ourselves a tight development window of only 18 months



# Solution

Breaking barriers in long range UUV operations



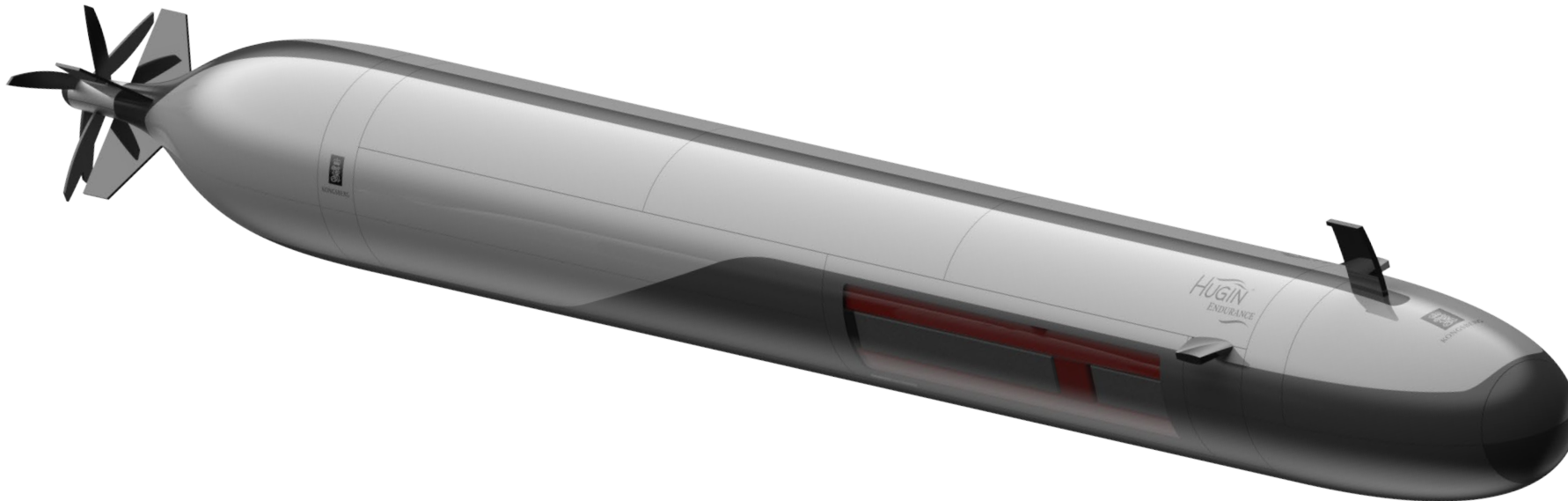
Solution



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## What's the same

- Free flooded architecture
- Powered by li-ion batteries
- Multiple processors
- Similar antenna
- Same payload processor
- Same INS architecture
- Reuse existing pressure housings
- Similar recovery mechanism
- Same sensor options as HUGIN Superior



See Statement of Prop...

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## Solution

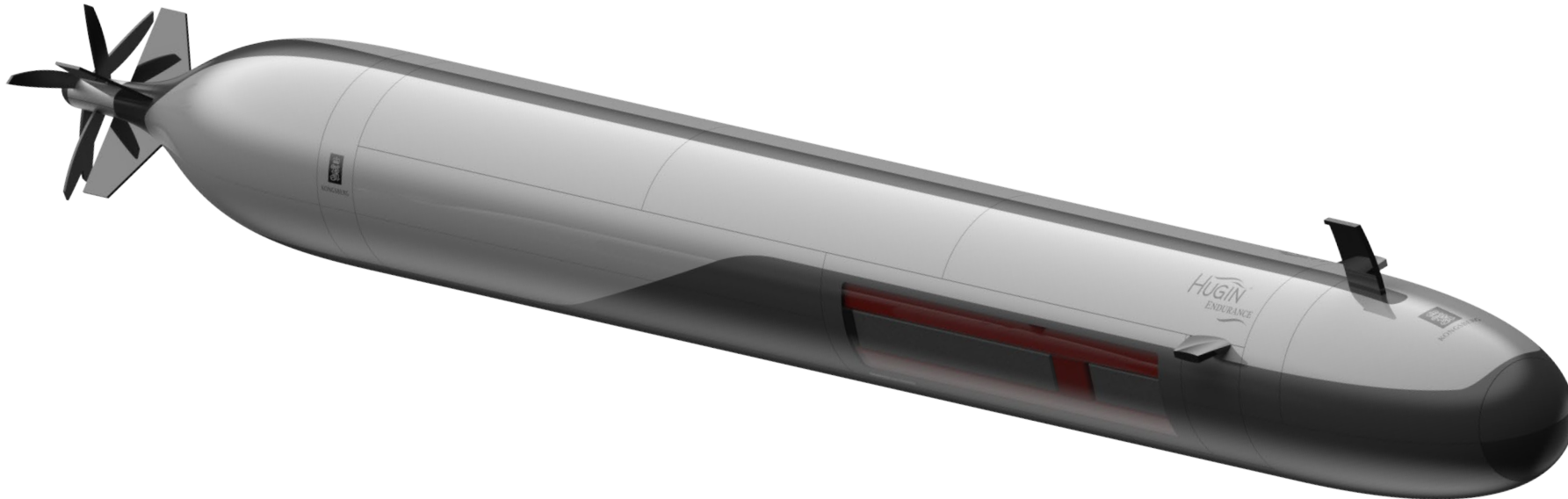


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- Battery and payload capability
- Redundancy
- Control system architecture
- Increased fault detection/handling

## What's different

- Active forward control planes
- Dual contra-rotating propellers
- Lateral thrusters
- Integrated towing capability
- Active ballasting system
- Increased situational awareness
- More flexible safety behaviors



See Statement of Prop...

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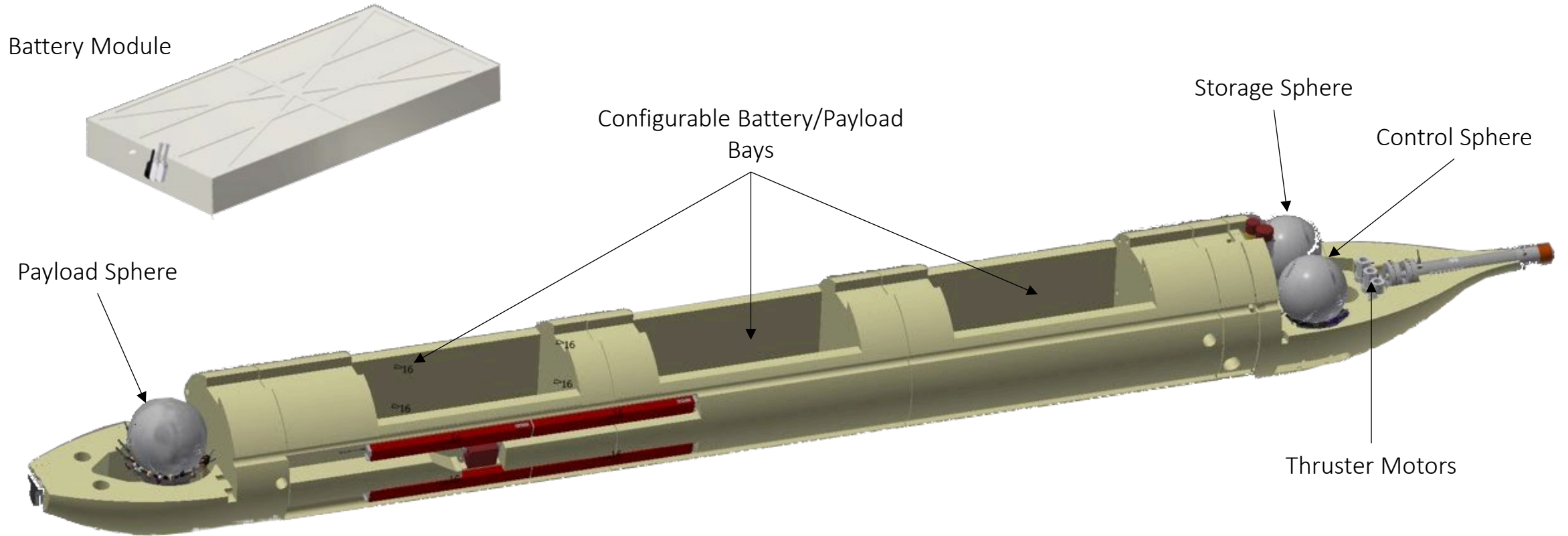
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Solution



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# Accommodating more power and payload



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Solution



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# Active ballasting

- Changes displacement in-mission to account for water density variation
  - Increases efficiency and endurance
  - Ensures highest quality data
- Enables greater range of safety behaviors
- Enables payload delivery capabilities



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# Specifications

Attribute	Specification
Length	11.8 m
Diameter	1.2m
Weight	8000 kg
Depth Rating	6000 m
Endurance	380 hr
Speed range	2 – 5 kts
Range (@ 3 knots)	2400 km
Navigation	<0.04% DT
Configurable Payload Vol.	0.9 m3 per bay
Configurable Payload Cap.	1,496 kg (in air weight)





# Latest Updates – September 2024

- 16.5 days fully autonomous (no position / mission updates provided to the vehicle)
- Water depths 50m to 3400m
- Distance covered > 2,200km
- Final position error 0.02% of distance travelled (~440m)
- Datasets included synthetic aperture sonar (HISAS 1032 dual Rx), bathymetry, camera imagery and laser data

## HUGIN Endurance AUV Smashes Records in Multi-week Fully Autonomous Mission

Kongsberg Discovery is reporting a major achievement in the field of autonomous underwater technology with its latest milestone for the HUGIN Endurance. The company has successfully completed a multi-week autonomous mission, setting new records and showcasing the advanced capabilities of their 8-ton, 40-foot autonomous underwater vehicle (AUV).

During the mission, HUGIN Endurance operated without human intervention or external navigation aids for the entire duration. After receiving a final navigation update from a pre-deployed transponder 10 hours into the dive, the AUV maintained its autonomy while navigating depths ranging from 50 meters to 3,400 meters. The vehicle met its advertised range of 1,200 nautical miles and returned with an impressive position error of just 0.02% of the total distance traveled.

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(Photo: Kongsberg Discovery)

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Hugin Endurance is undergoing sea trials (source: Kongsberg Discovery)

### AUV completes multi-week, fully autonomous mission

16 Sep 2024 by Riviera News

Marine drone technology continues to make progress, with news of an autonomous underwater vehicle (AUV) successfully completing a multi-week mission





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**Thank you**

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