Sonardyne
SOUND IN DEPTH
SUBSEA TECHNOLOGY

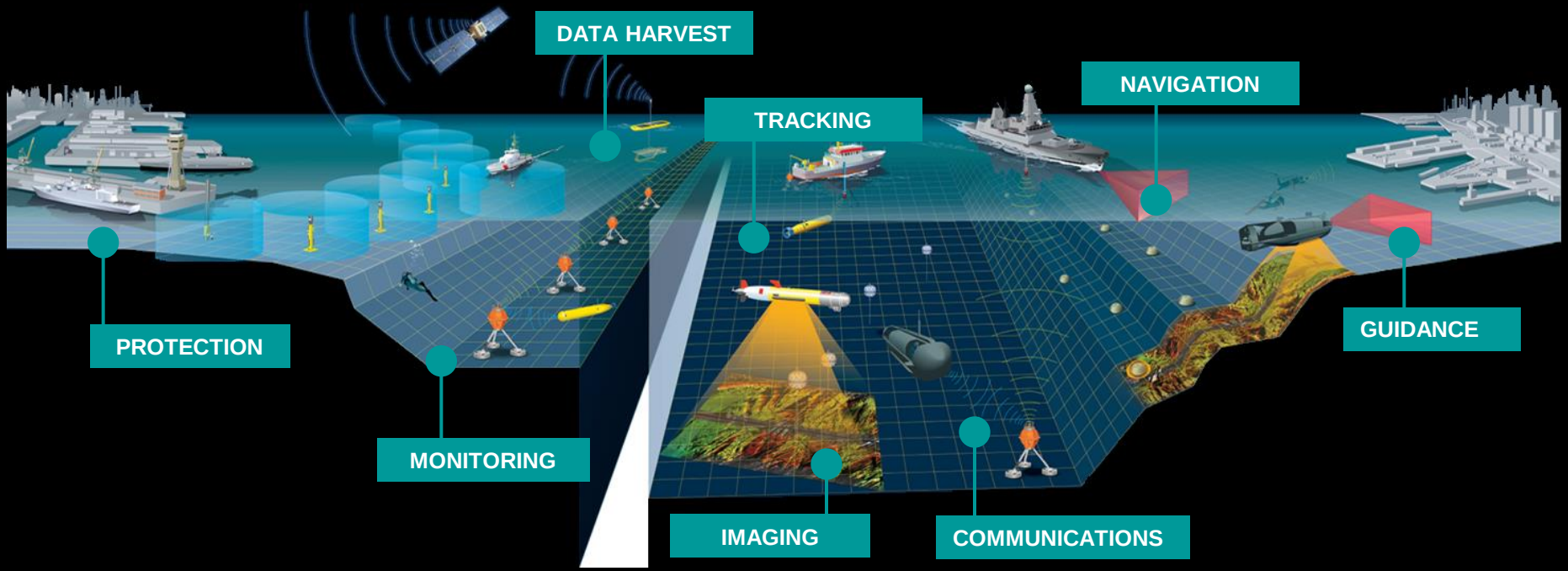
Fusing sensor data for improved MCM performance using AUVs

UDT 2018

Ioseba Tena
Global Business Manager (Marine Robotic Systems)

POSITIONING
NAVIGATION
COMMUNICATION
MONITORING
IMAGING

Overview


DATA HARVEST
NAVIGATION
TRACKING
PROTECTION
GUIDANCE
MONITORING
IMAGING
COMMUNICATIONS

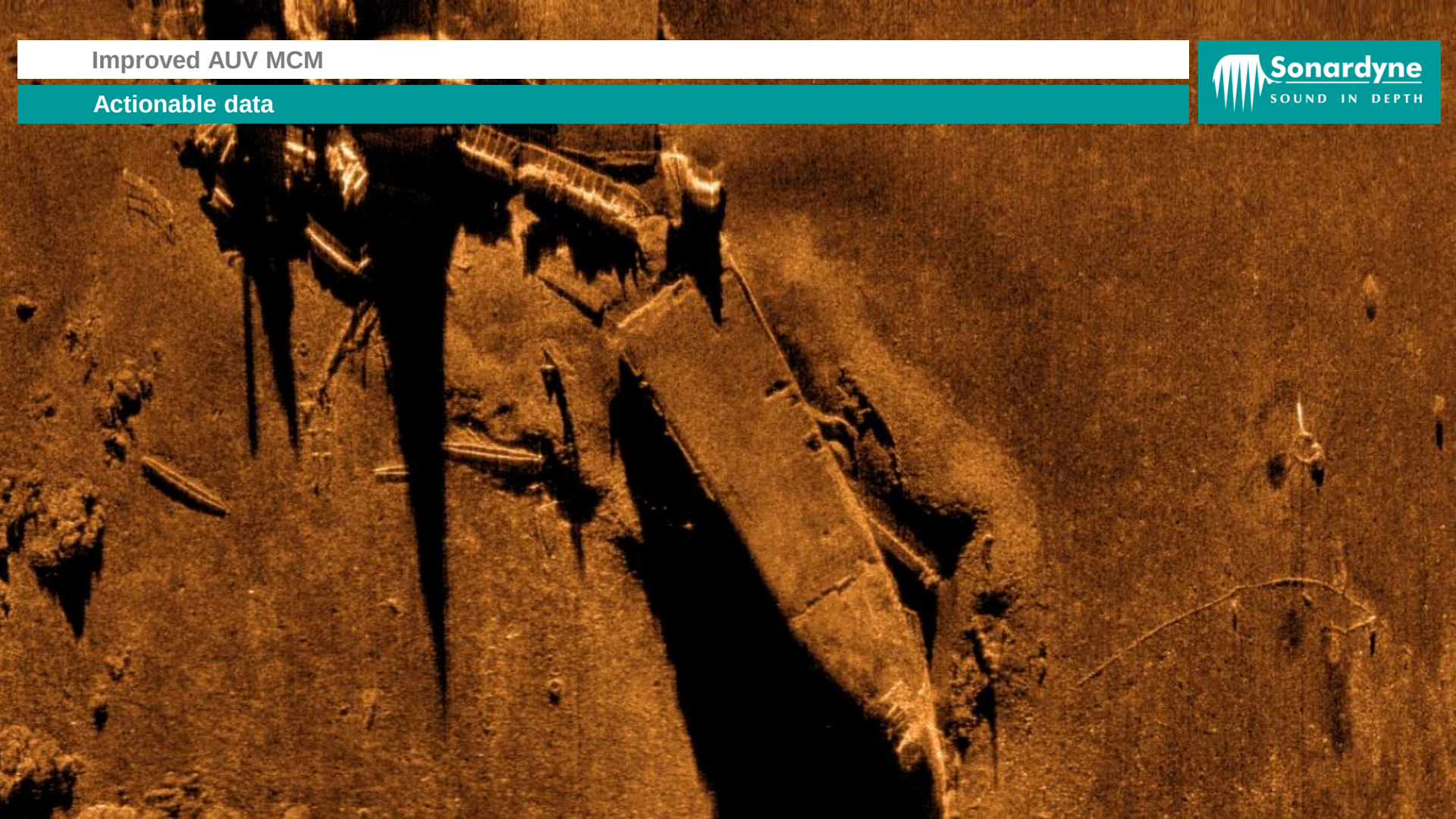
Goals

- Increase Search Classify Map (SCM) Survey Area.
- Increase Mission Quality and Tempo.
- Improve Percentage Clearance.

Requirements

- Improve Probability of Detection (PD).
- Decrease Probability of False Alarms (PFA).
- Improve Accuracy of Survey.
- Coverage Rate.

Actionable data



AUV Navigation

“Today we can navigate with centimetre accuracy”

Image: Reach Subsea

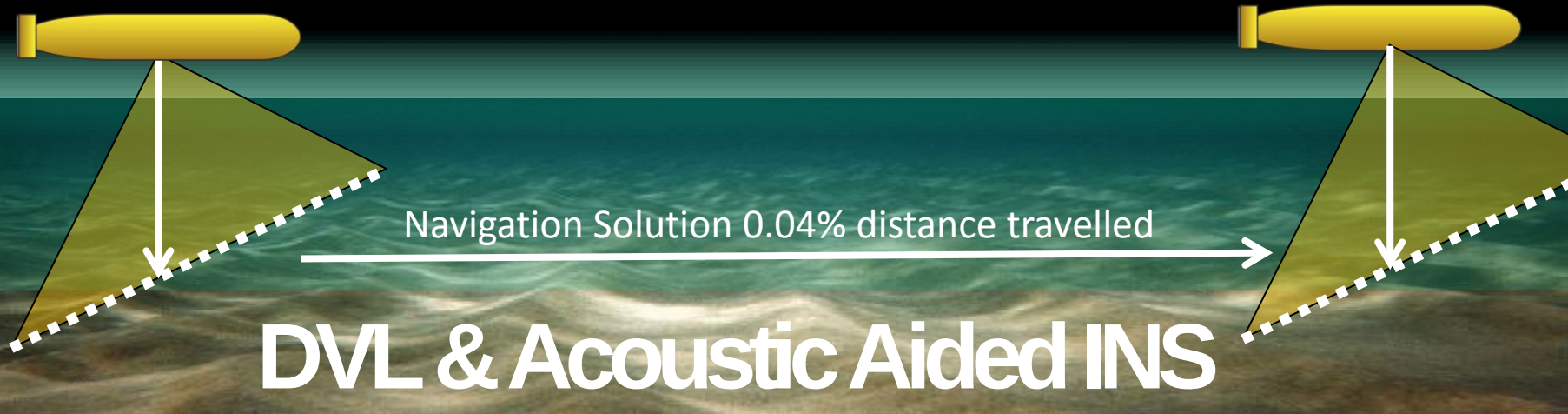
AUV Navigation

Gravity

Rotation

Image created by Reto Stöckli, Nazmi El Saleous, and Marit Jentoft-Nilsen, NASA GSFC

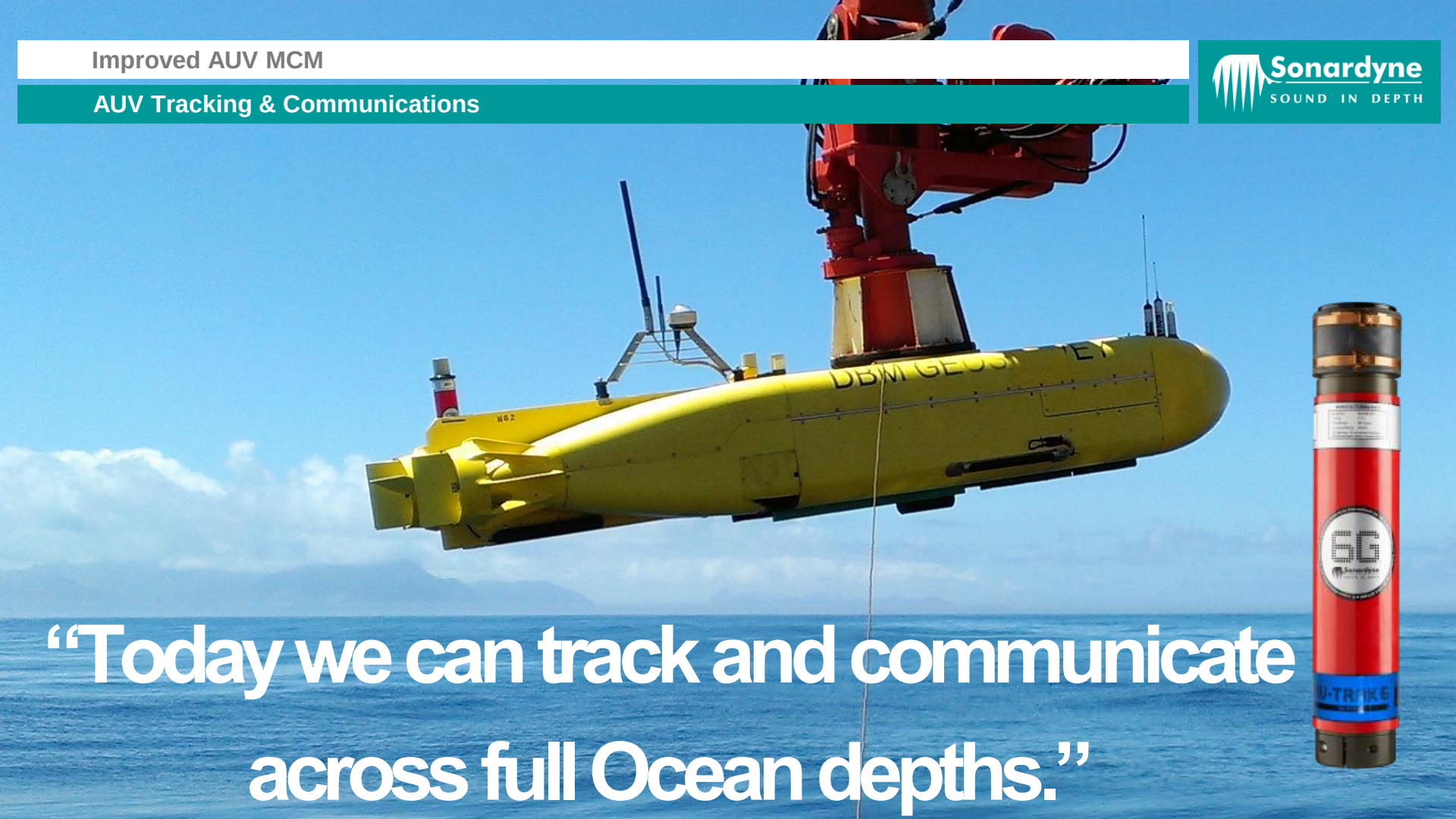
AUV Navigation



DVL & Acoustic Aided INS

AUV Tracking & Communications

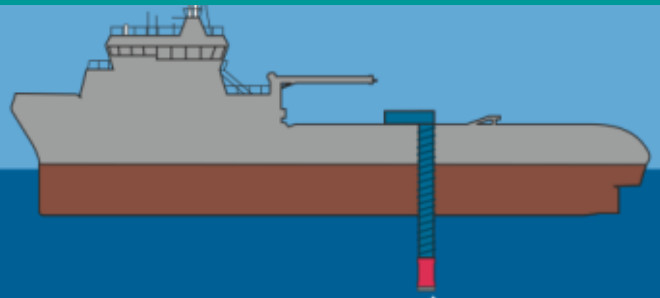
Sonardyne
SOUND IN DEPTH



"Today we can track and communicate across full Ocean depths."

AUV Tracking & Communications

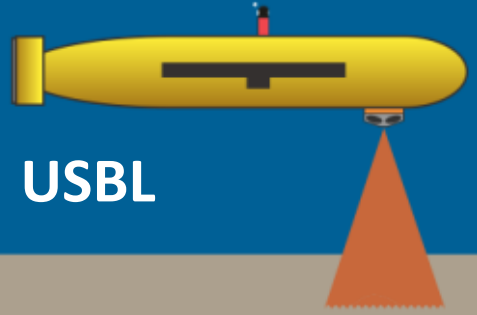
Sonardyne
SOUND IN DEPTH



Sonardyne Wideband® 2

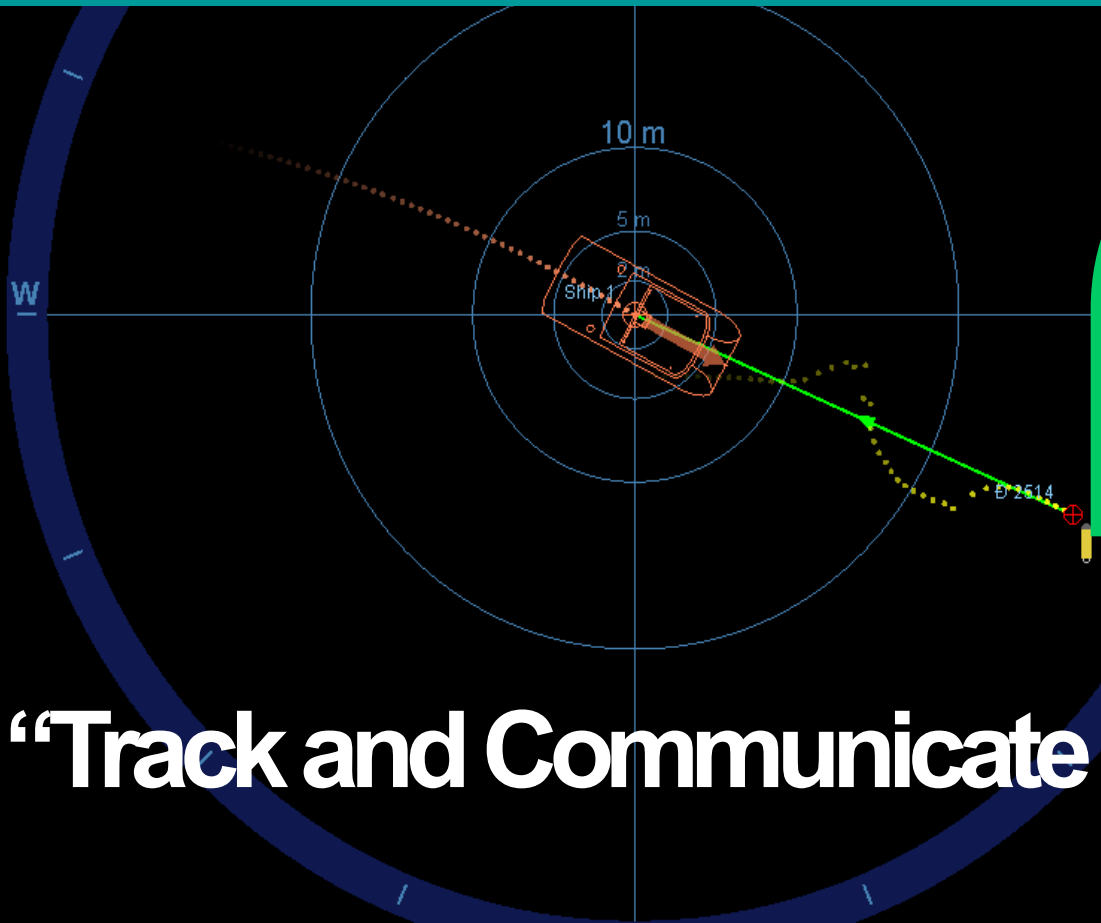
Track

Exchange Data



USBL

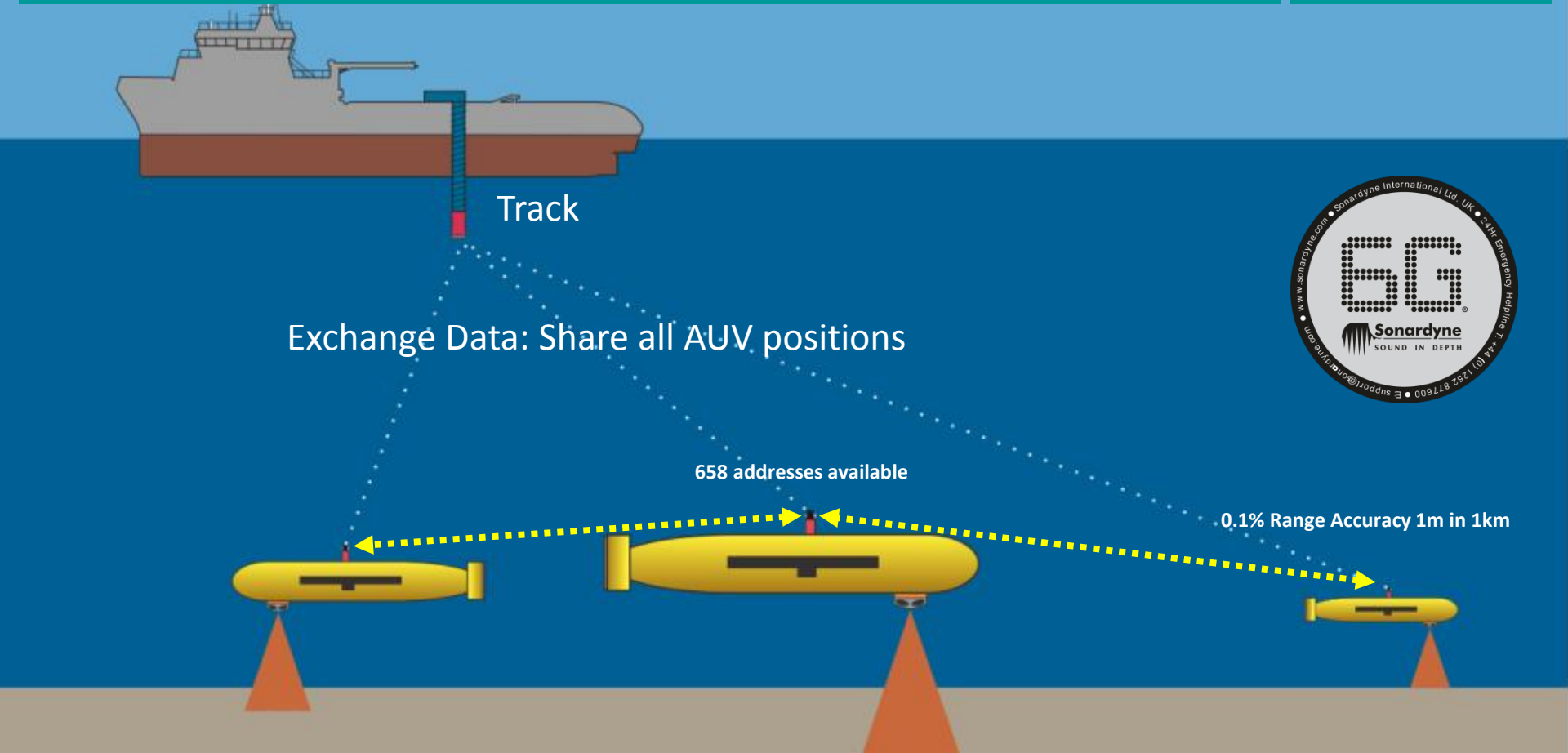
AUV Tracking & Communications



Battery: 95%
Status: Green
Mission: W4
Lat: 50.33503°
Long: -4.160042°

“Track and Communicate with AUV”

AUV Tracking & Communications

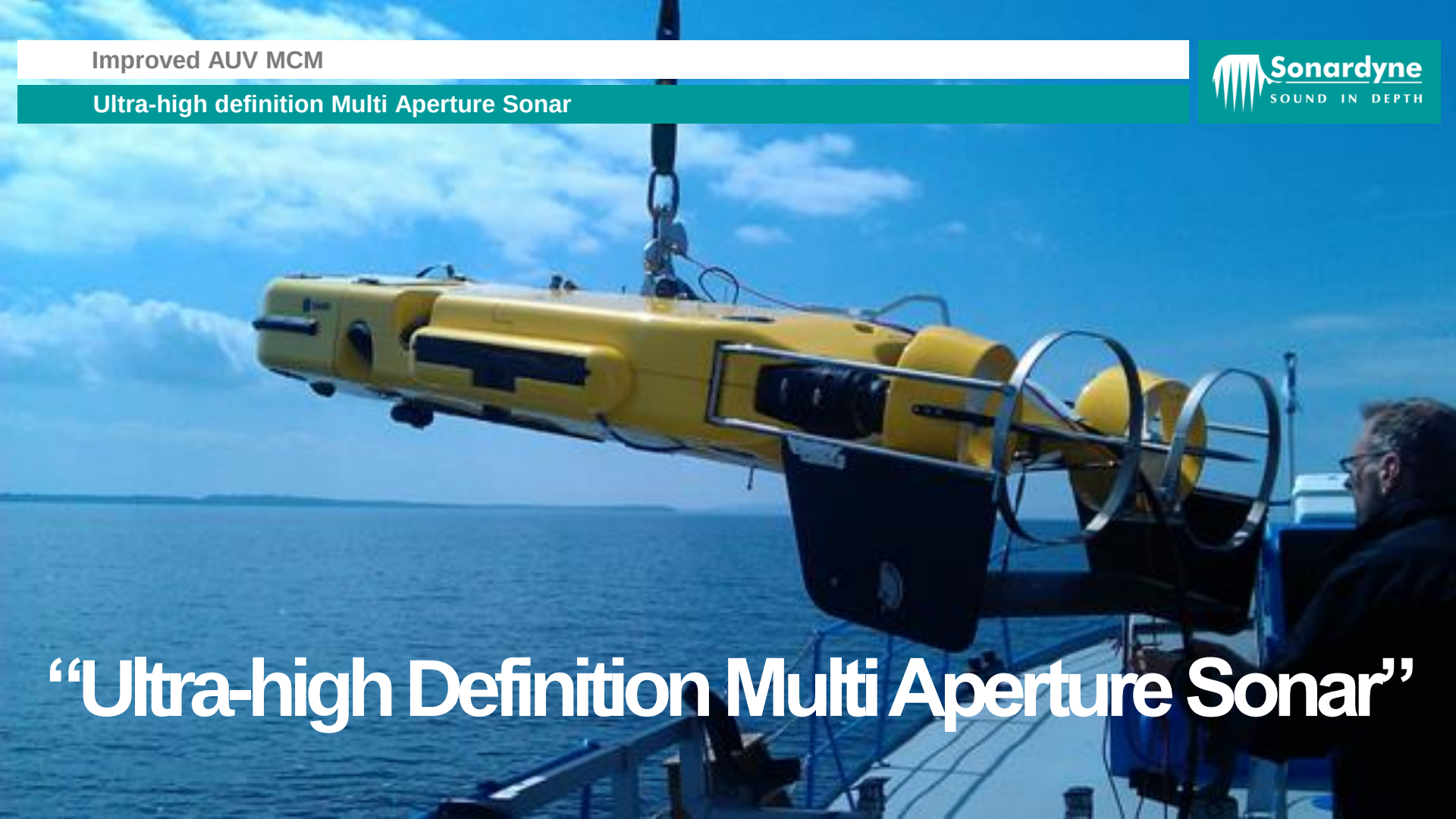


AUV Navigation

Relative navigation cm scale

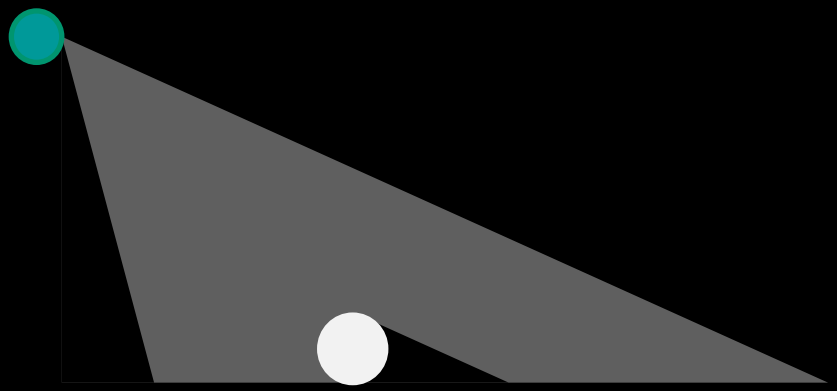
DVL & Acoustic Aided INS

Sonardyne
SOUND IN DEPTH



“Ultra-high Definition Multi Aperture Sonar”

Ultra-high definition Multi Aperture Sonar

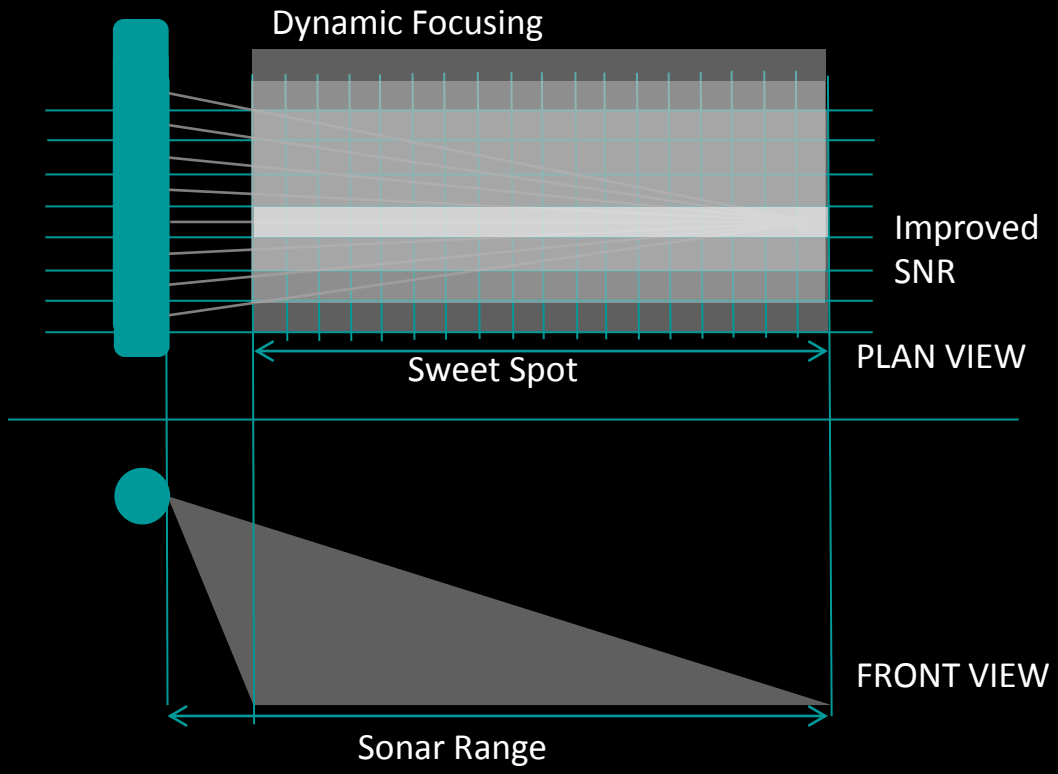


Shadow length holds height information

Shape of highlight and size of shadow is used improve PD and to limit PFA

(U.S. Navy photo by Mass Communication Specialist 1st Class Peter D. Blair/Released)

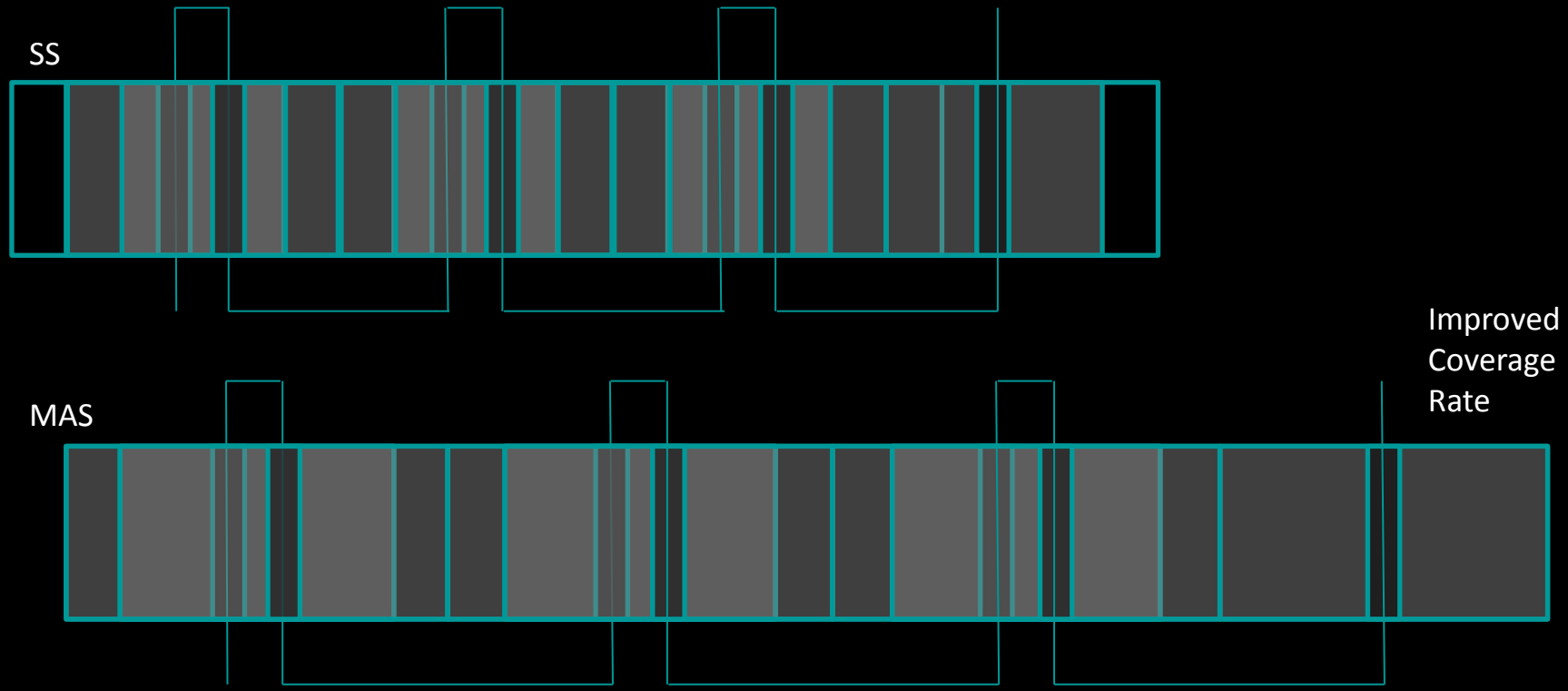
Ultra-high definition Multi Aperture Sonar



Sonar Range

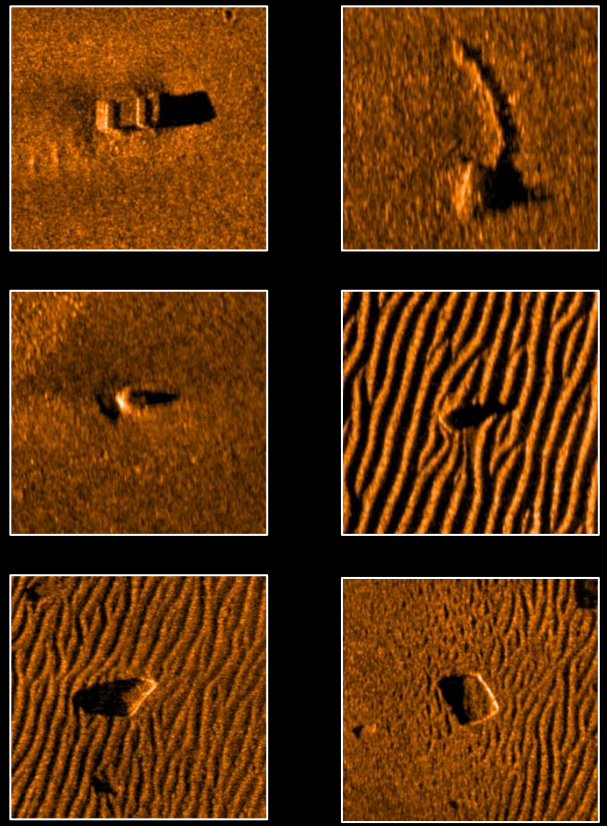
Best in Class Along Track Resolution 0.15°

Ultra-high definition Multi Aperture Sonar



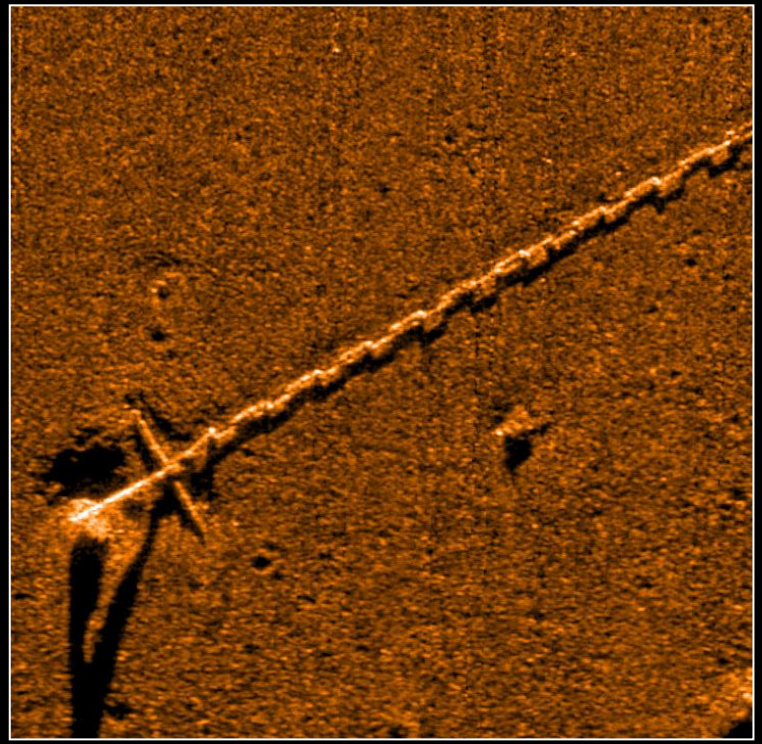
Ultra-high definition Multi Aperture Sonar

- Increased contrast and ultra-high definition:
  - Better estimates of highlight and shadow pairs
  - Better operator decisions
  - Better ATR performance
- Dynamic Focusing:
  - Improved PD and PFA across the whole swath
- Multiple Apertures:
  - Improves SNR reducing “speckle”
- MAS:
  - Improves Percentage Clearance and effectiveness of mission

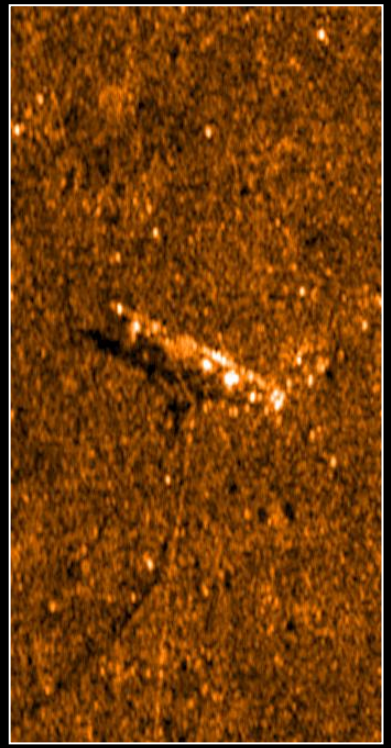


Ultra-high definition Multi Aperture Sonar

20 m



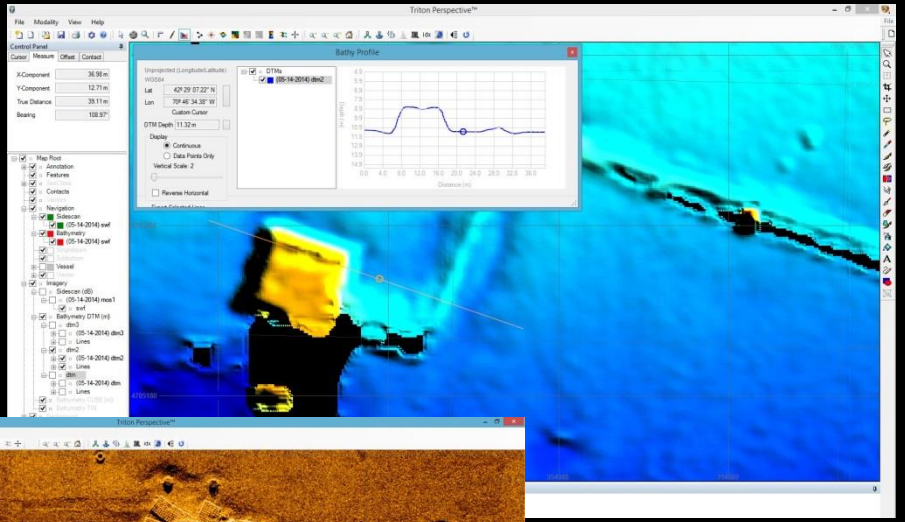
40 m

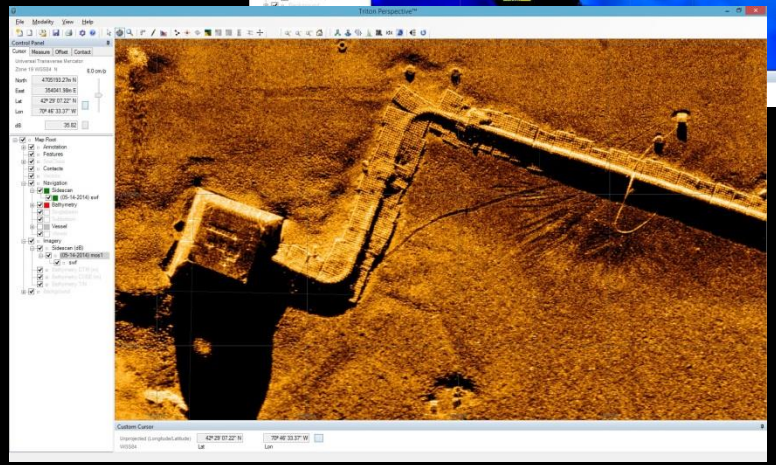


50 m

Ultra-high definition Multi Aperture Sonar

- Open interfaces .SWF8
- Real-time ATR Interface
- PMA integration into 3rd Party Software
- Compatible with leading PMA software:
  - Triton Imaging
  - HYPACK
  - Cheasapeake
  - SeeTrack
  - CARIS
- Many in development
- Simpler integration to AUV

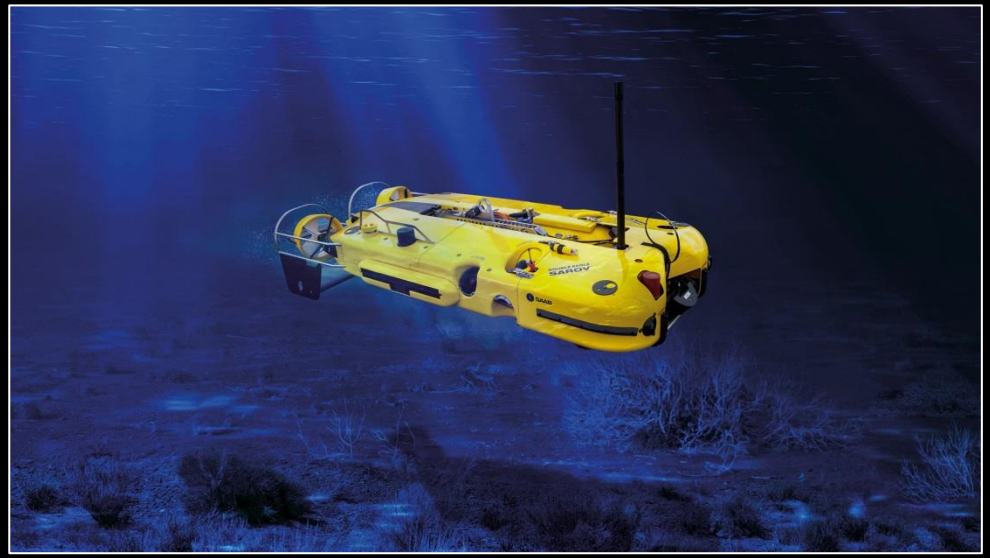




Multiple Aperture Sonar Made for Low-Logistics

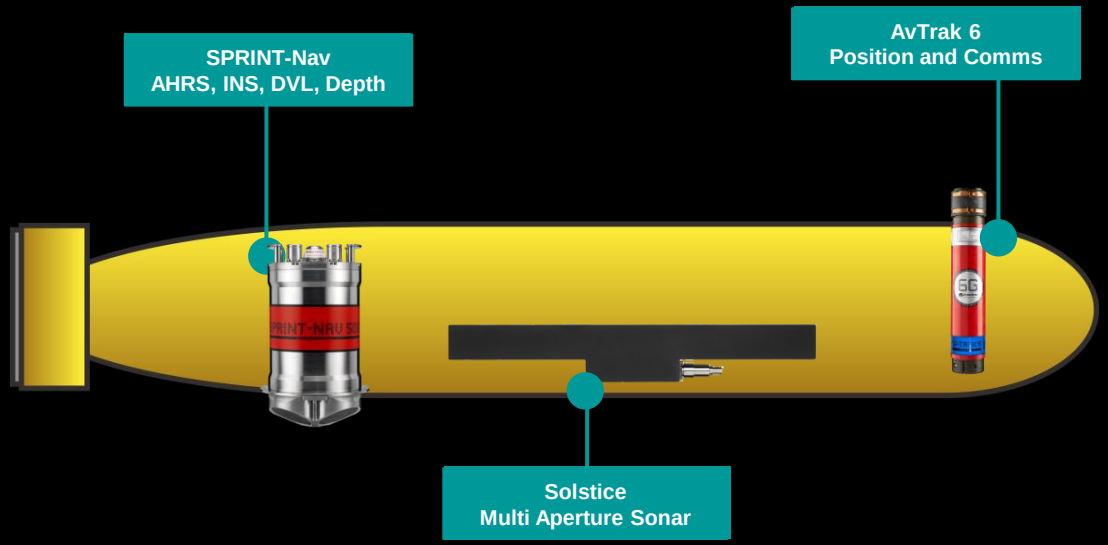
Multi Aperture Sonar for Low-logistic AUVs

- Hydrophone Array Length 672mm
- Frequency Band 725 to 775 kHz
- Bandwidth 20 kHz
- Swath 200m
- Depth Rate 200m
- Operating Power 18W



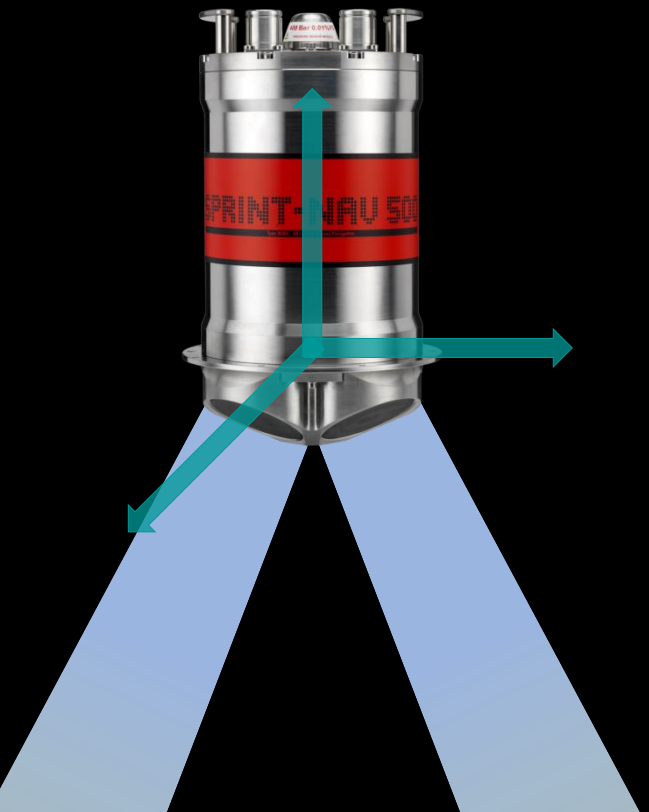
- Already integrated with leading suppliers
- Low-logistic platforms
- Ultra-high resolution sonar

Integrated AUV Navigation and MAS



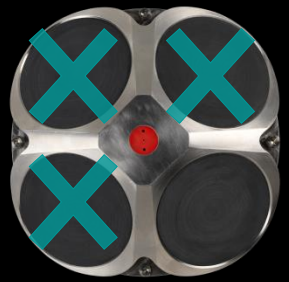
AUV

Integrated AUV Navigation and MAS



- AHRS alignment for instant INS initialisation
- Mechanically aligned and tightly coupled for improved performance and flexible deployment options
- Access each instrument or simply interface to INS
- Sparse LBL aiding with 6G beacons
- Battery for continued INS function even during power failures
- In built storage for Post-Processing and QA
- Water blocks to keep electronics safe

- Beam level aiding for better performance and robustness even in difficult seabed conditions



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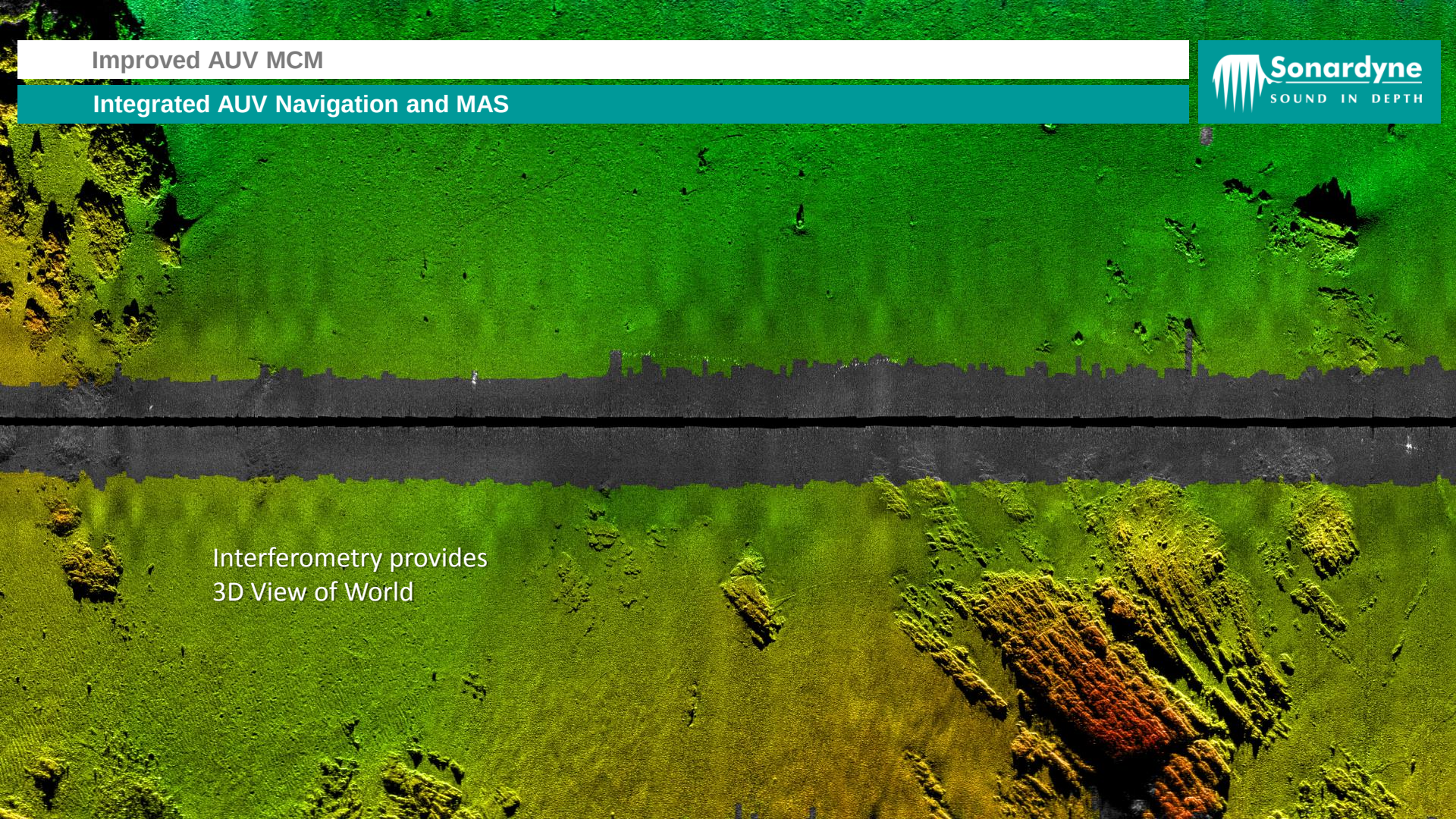

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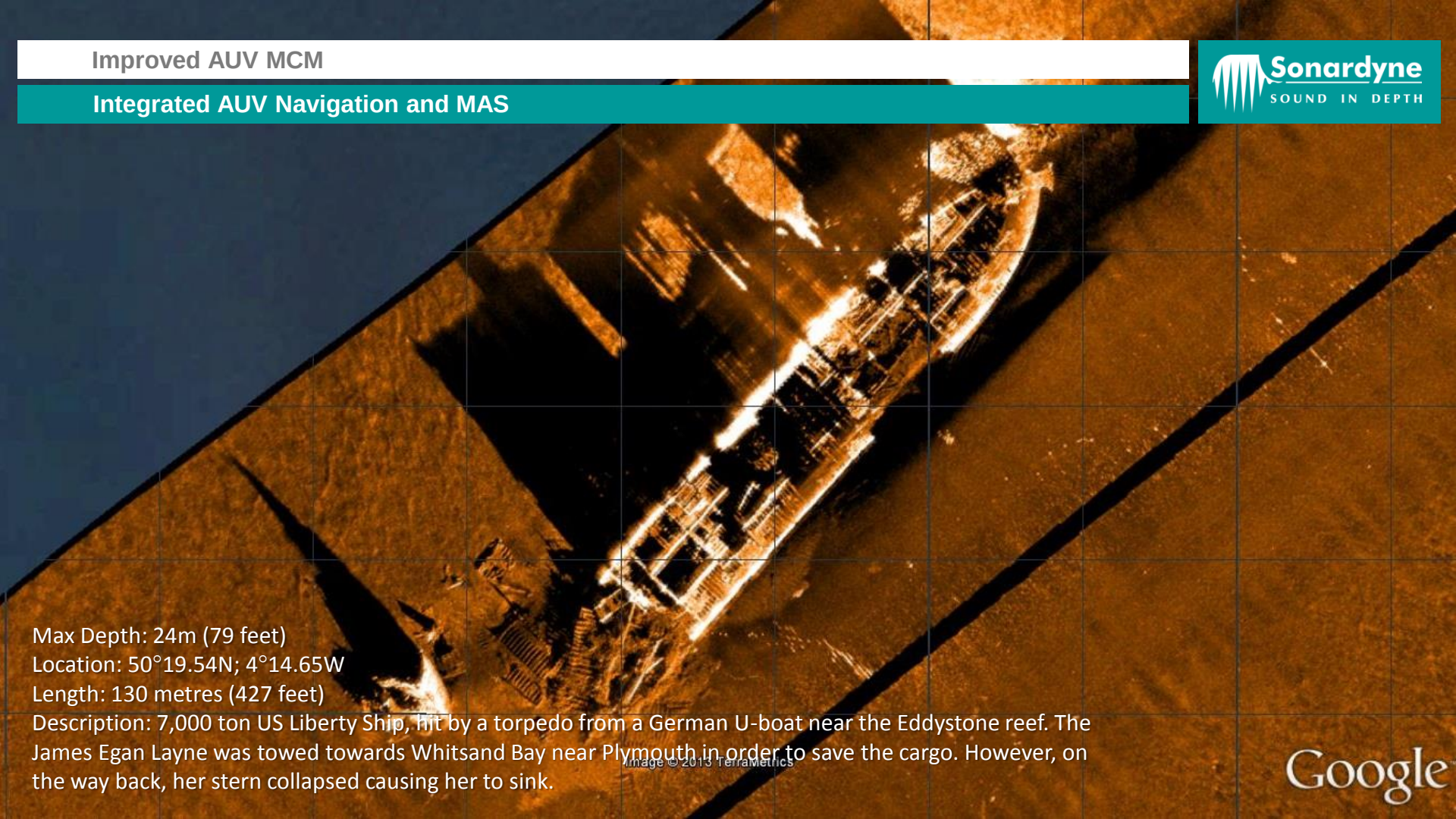


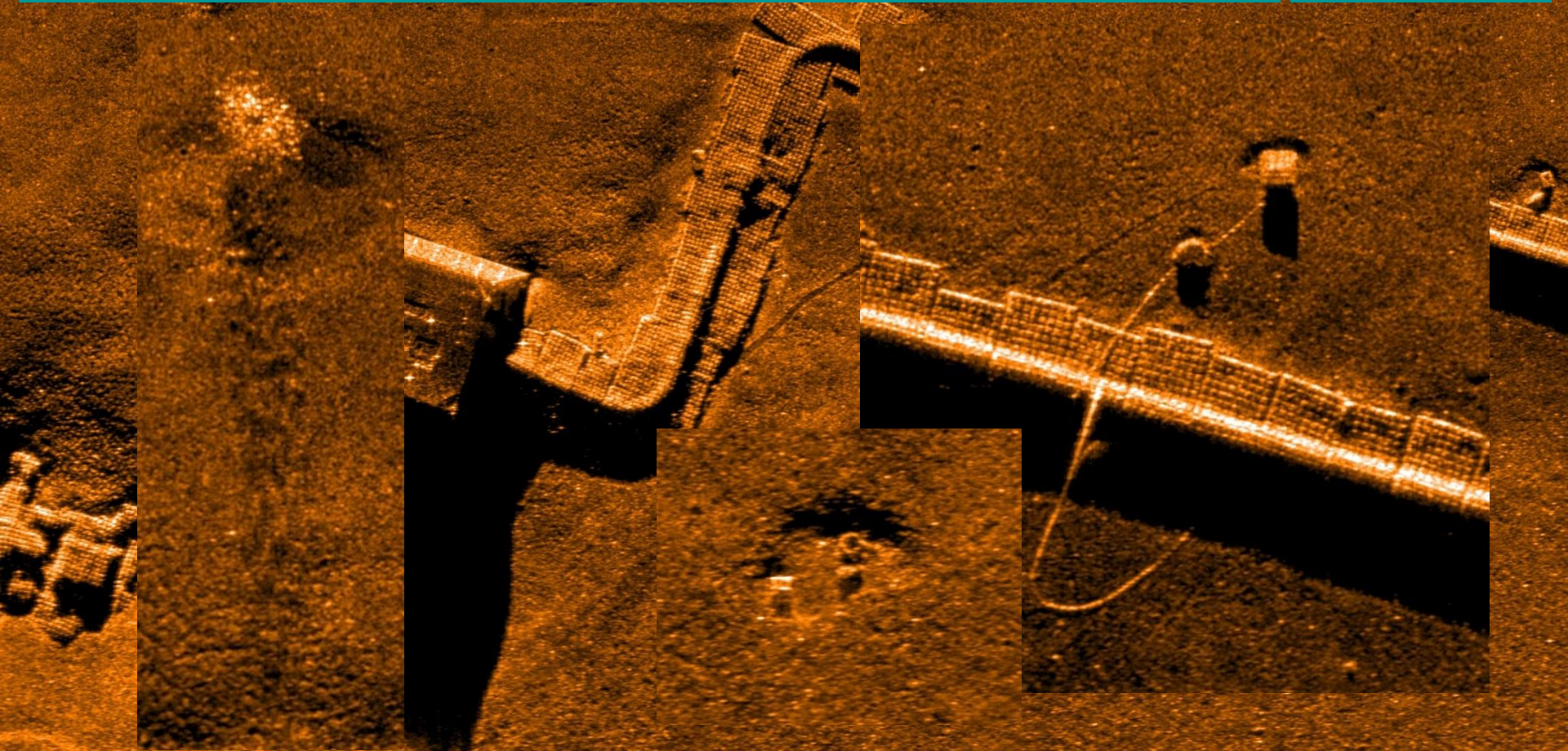
Max Depth: 24m (79 feet)
Location: 50°19.54N; 4°14.65W
Length: 130 metres (427 feet)
Description: 7,000 ton US Liberty Ship, hit by a torpedo from a German U-boat near the Eddystone reef. The James Egan Layne was towed towards Whitsand Bay near Plymouth in order to save the cargo. However, on the way back, her stern collapsed causing her to sink.

Ultra-high definition Multi Aperture Sonar

- May 2014 – PLEM inspection
- Bluefin-12 AUV
- Pipeline End Manifold used to import LNG
- Large Template 12 x 12 m, pipe and mattress protectors
- The individual elements of the mattresses 0.25m by 0.25m

Improved AUV MCM

Ultra-high definition Multi Aperture Sonar



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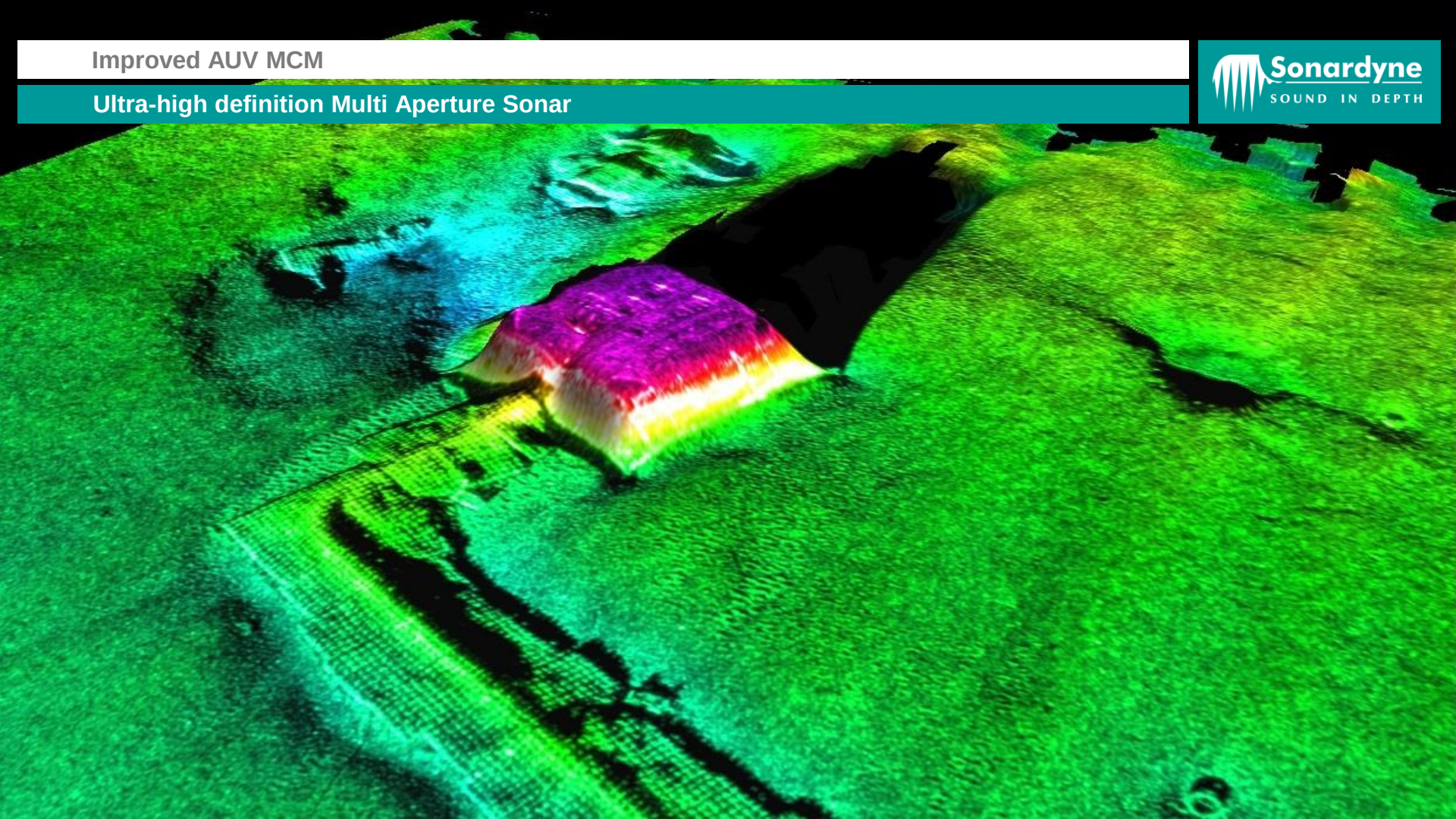

Goals

- Increase Search Classify Map (SCM) Survey Area.
- Increase Mission Quality and Tempo.
- Improve Percentage Clearance.
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Thank you for your time today
Any questions?

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