



An Autonomous Underwater Vehicle using Remote Piloting Technology via 4G Internet

Freedom Hybrid AUV/ROV

AUT 2019

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Agenda

1. **What is Freedom**
2. **Concept, Benefits and Specifications**
3. **Subsea Tool Changer**
4. **Freedom Applications**
5. **Connectivity**
6. **Mission Support Center**
7. **Environmental Footprint**
8. **Living Lab Setup**
9. **Technology Readiness Level (TRL)**
10. **Question and Answer**



Freedom

Based upon a “plug and play” operational philosophy, Freedom provides a low-maintenance, field-configurable vehicle optimized via interchangeable payload packages and sensor suites to meet work scopes.



WORK CLASS ROV

- TETHER
- HOVERING
- TOOLING



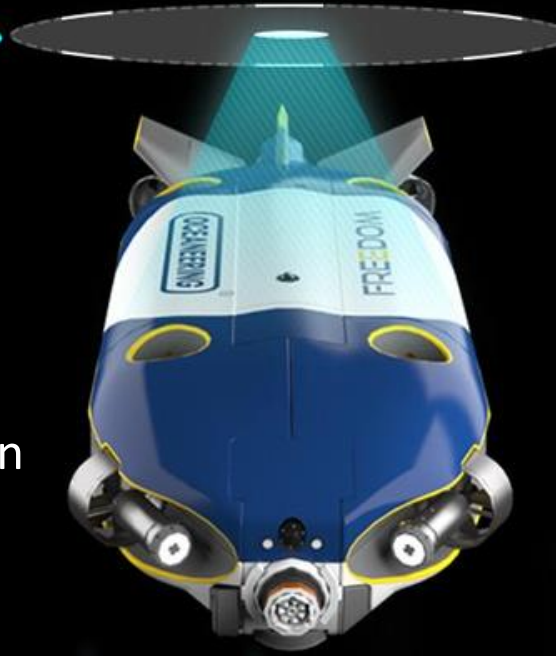
OBSERVATION ROV

- HOVERING
- CAMERAS
- TETHER



SURVEY AUV

- LONG RANGE
- SENSORS
- CAMERAS



FREEDOM ROV

Concept

- ROV and AUV whenever needed
- Subsea resident for long durations
- Tethered or untethered, depending on work scope
- Ability to pick up and use resident intervention tooling

- Autonomous or Real-Time Control
- Free Swimming or Tethered
- Long Range or Resident
- Inspection or Light Intervention

Freedom

ROV / AUV - Drone

Freedom

Plug and play..



Benefits

- Reduction in vessel days
- Improve service quality and decision making
- Reduce cost for IMR
- Potentially reduce insurance premiums
- Reduction in carbon footprint

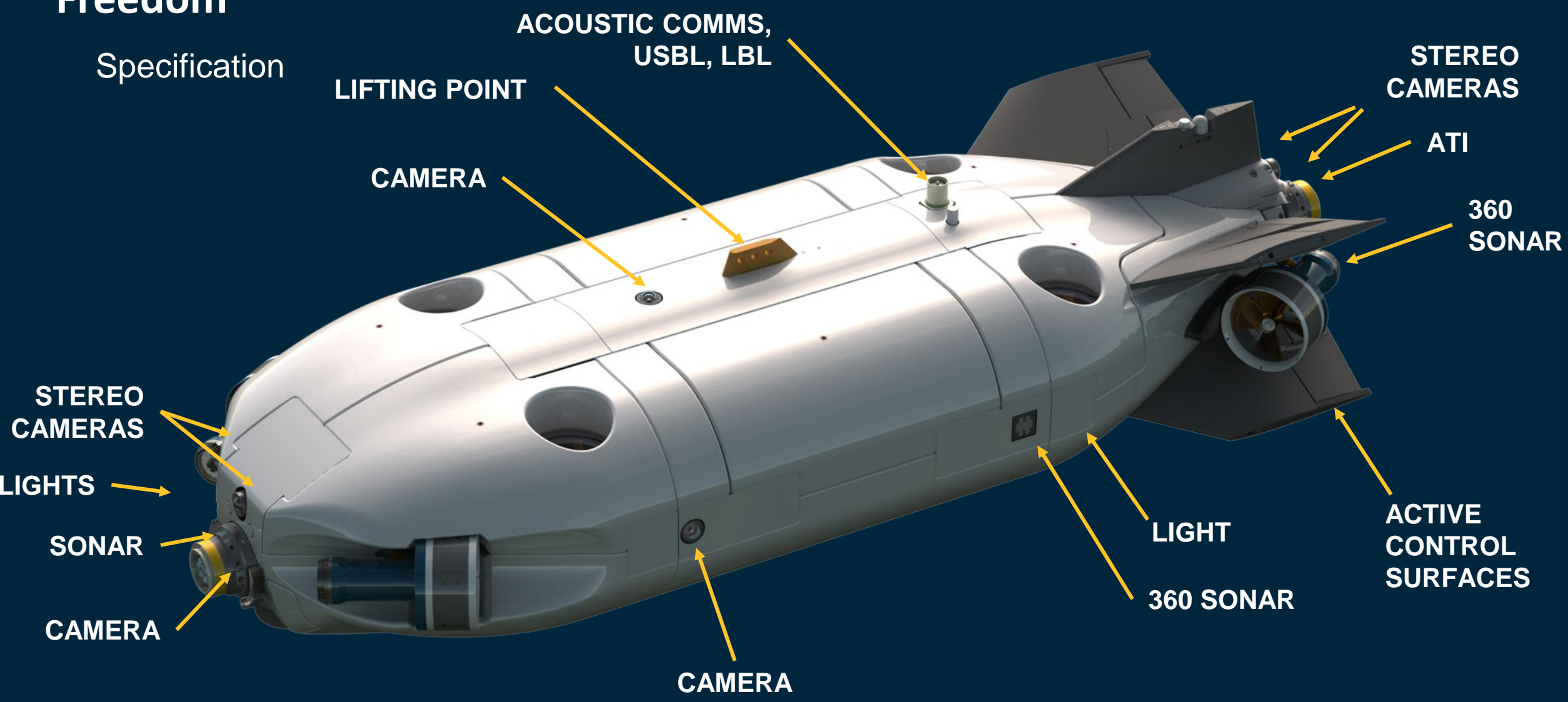
Specifications

- Speed: 0kts -6kts
- Water depth: 5m - 6,000m
- Range: 250 - 400km
- Tether length: 1,000m
- Dimensions: L:4,000mm, W:1,500mm, H:800mm
- Maintenance interval: > 6 months
- Compass Supervisory Control Software

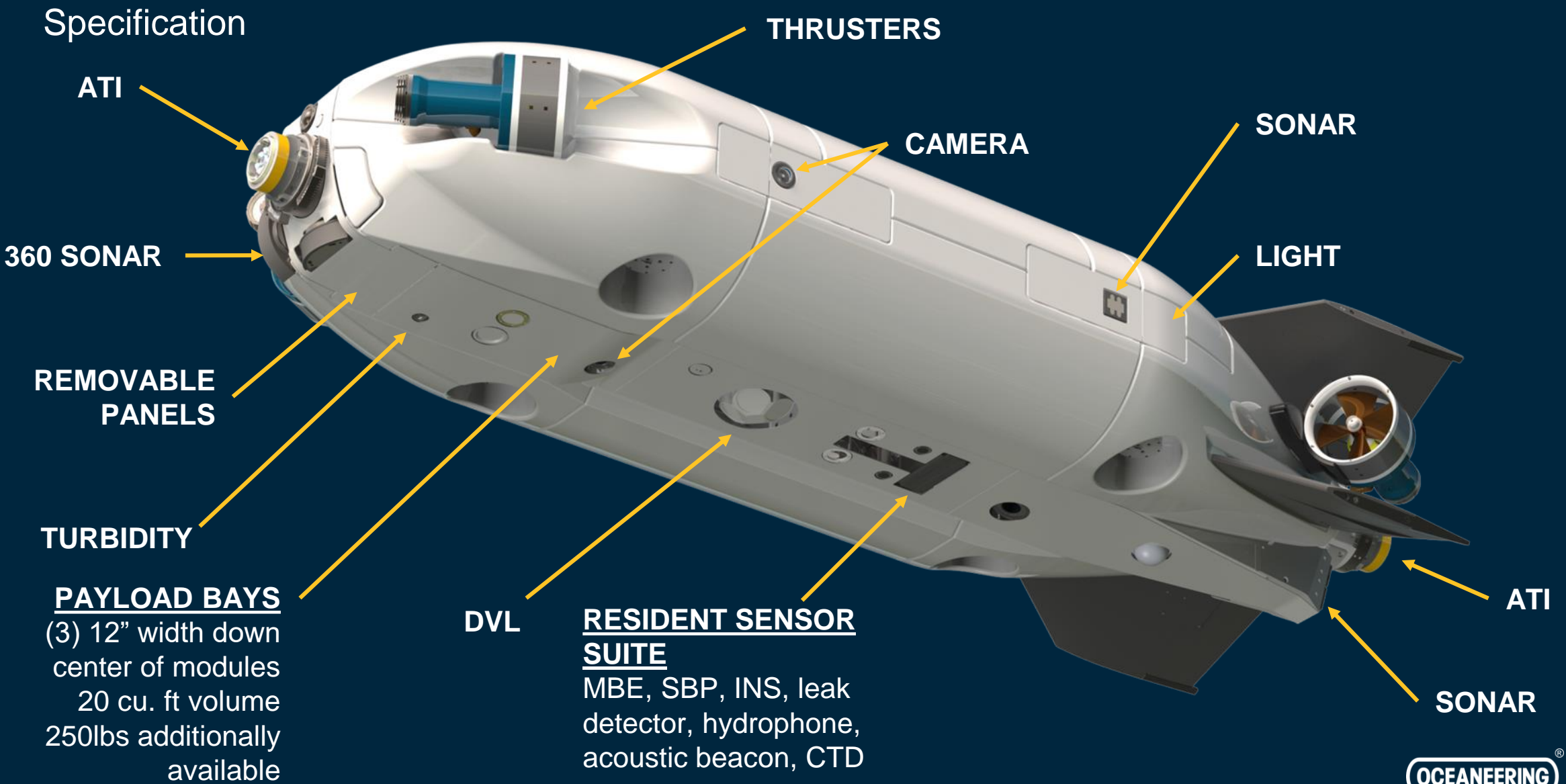


Freedom

Specification



Freedom

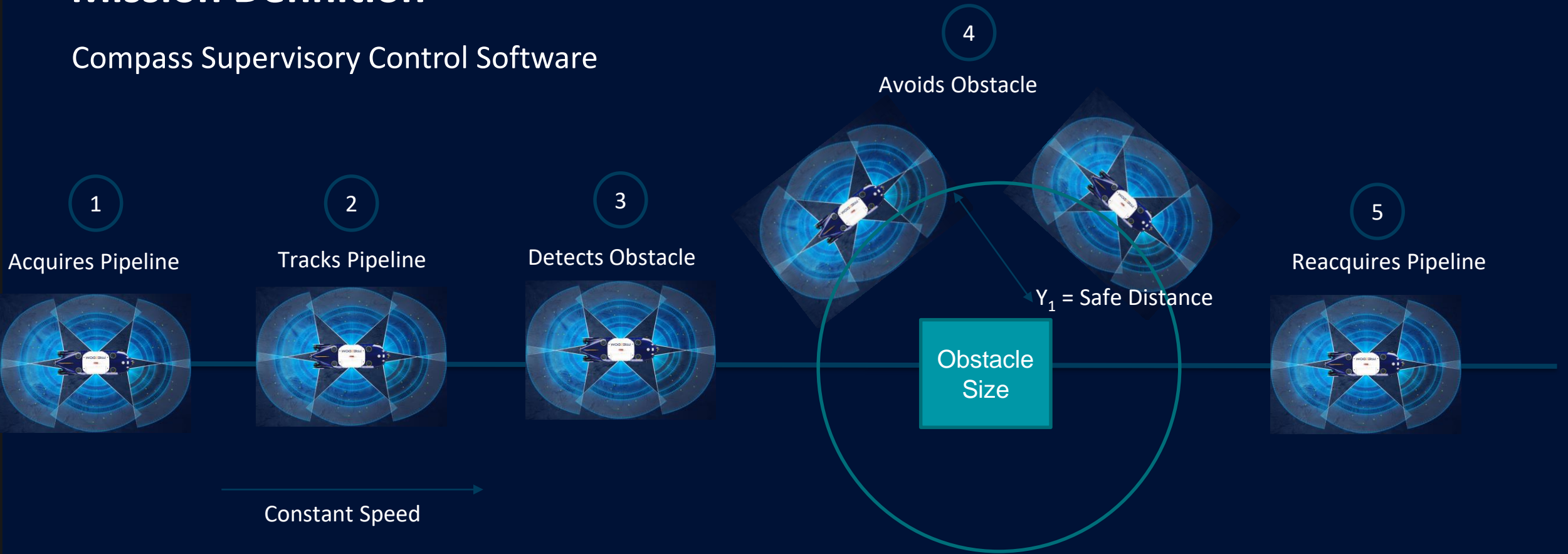


Freedom – Video

Freedom AUV/ ROV

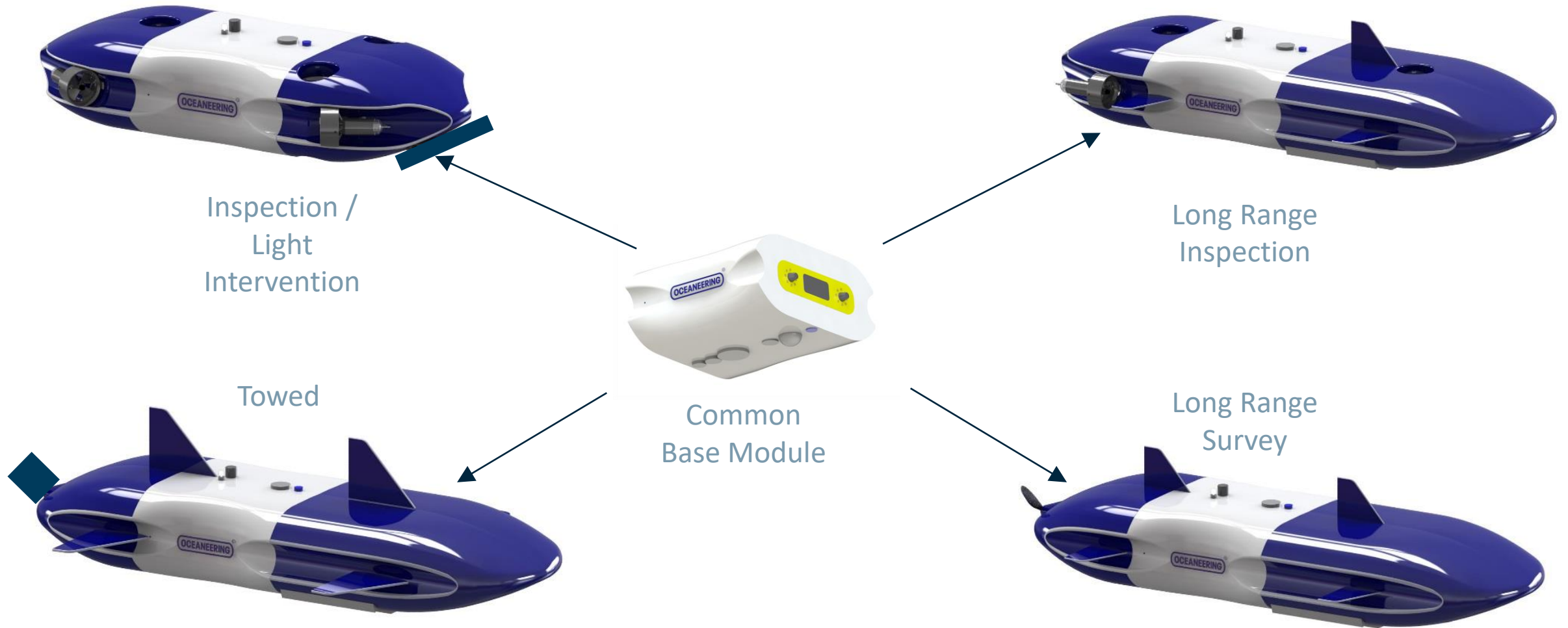
Mission Definition

Compass Supervisory Control Software

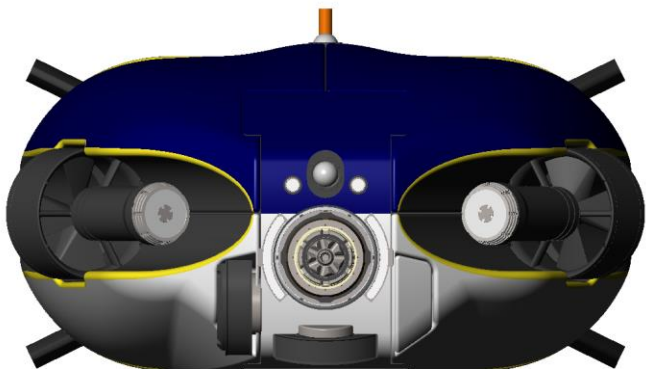


Freedom

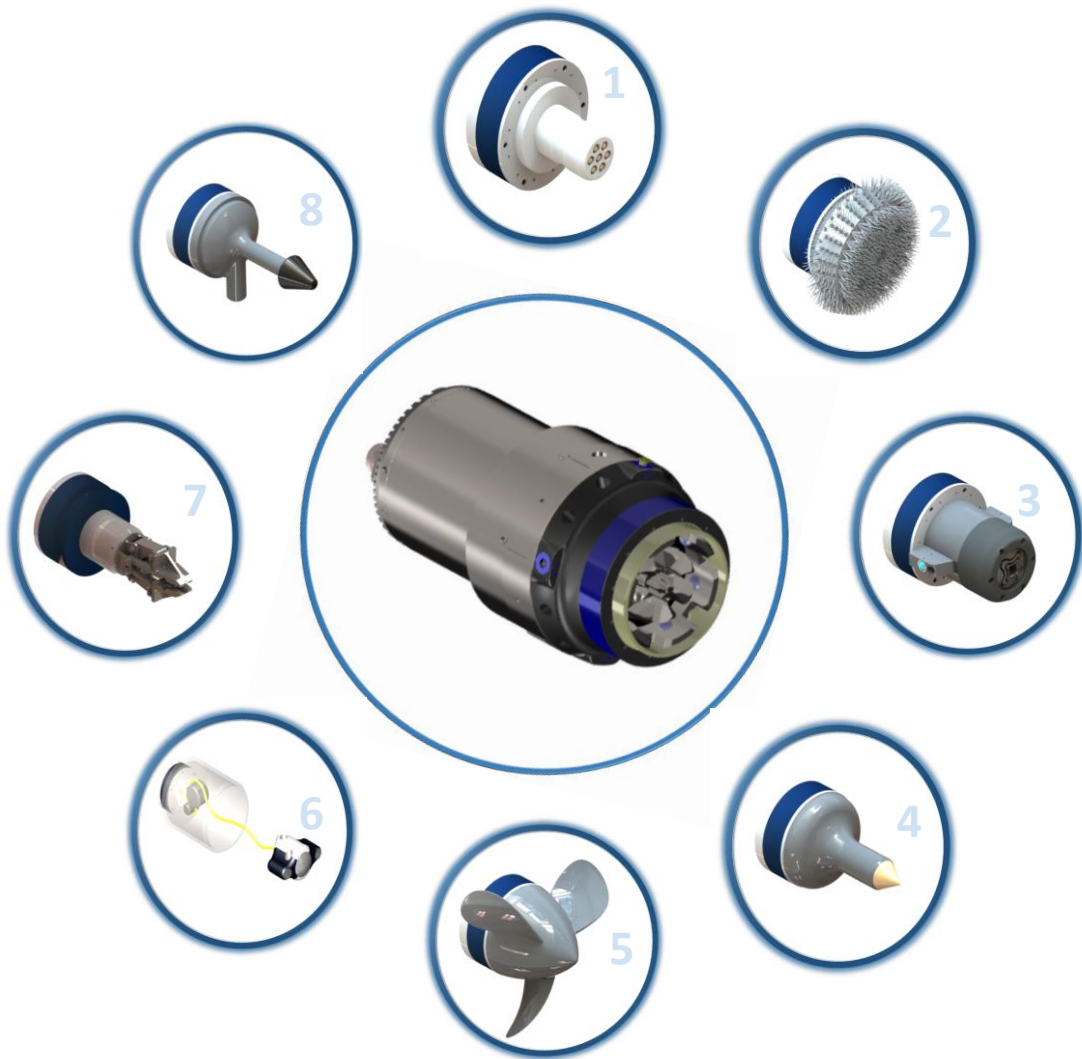
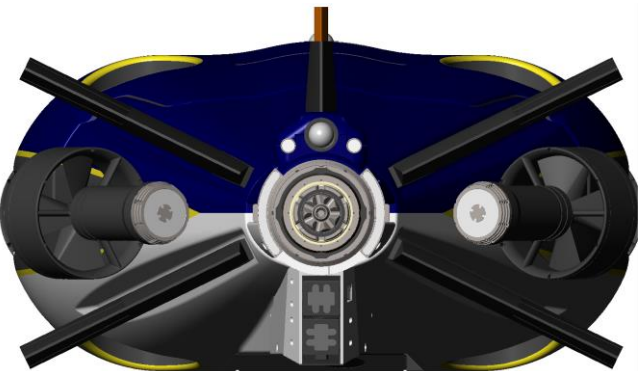
Modular Concept



Subsea Tool Changer



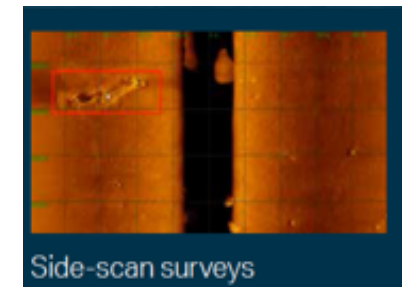
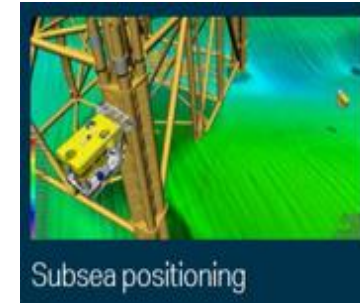
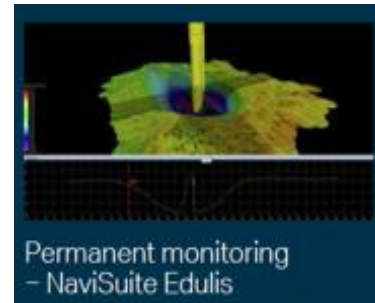
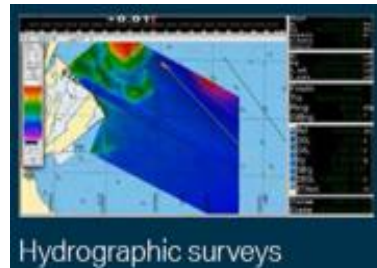
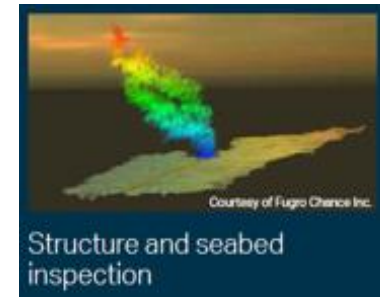
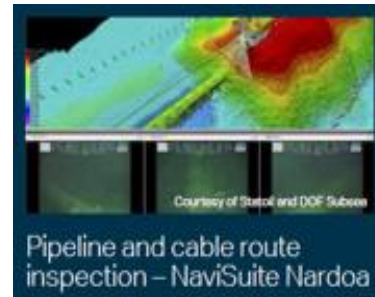
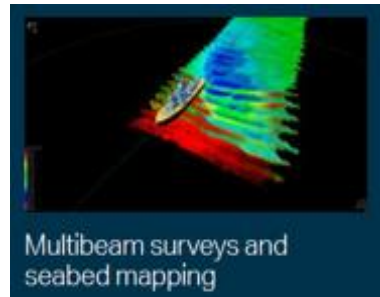
- 1. Generator
- 2. MP brush
- 3. CI. 4 TT
- 4. CP probe
- 5. Longe range thruster
- 6. Daughter ROV
- 7. Parallel gripper
- 8. High pressure jet



Freedom Application

Capabilities

- Leak Detection Monitoring
- Subsea Inspection and Intervention
- Pipeline Survey
- Offshore Windfarm Survey



Connectivity

Connecting the smarter way..

Wireless
4G / Internet



Onshore Mission
Support Center

4G Coms
Buoy

Buoy mooring with
video & data
communication



Resident Vehicle

Telecommunications Communication technology offshore evolution

			
Latency	200	250	700-1100 ms
Bandwidth	Unlimited	20 Mbit	5-7 Mbit

Mission Support Center

Redefining the “Remote” in Remotely Operated Vehicle

Task specialist

Tooling specialist

ROV co-pilot

ROV pilot

Client representative

Mission Support Center

- Stavanger (Norway), Houston (Texas), Morgan City (Louisiana)
- 24/7 operated onshore controls center
- Remote piloting of conventional ROVs as well as our new resident vehicles
- Communications via fiber, 4G and satellite

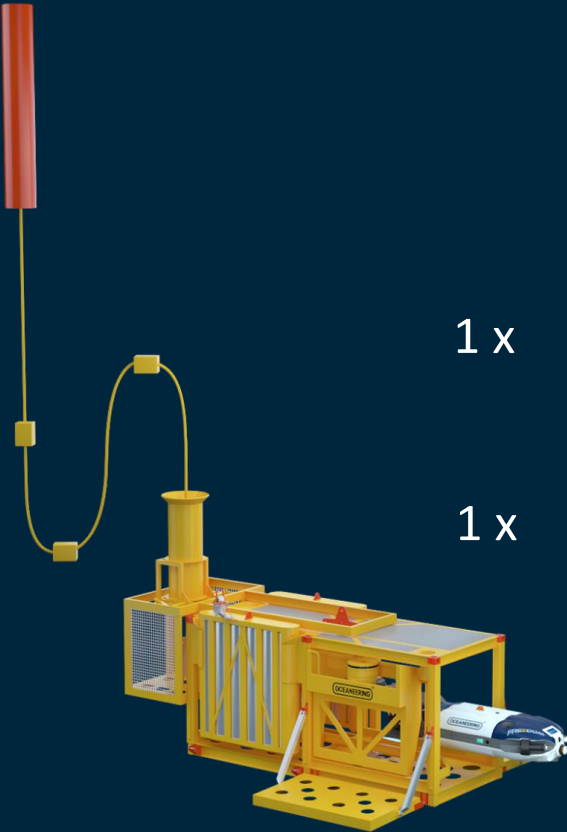
Environmental Footprint

One IMR vessel =
70MT CO₂ per day



=

7 000 cars per year



1 x



=

7 000 x



1 x



=

140 x

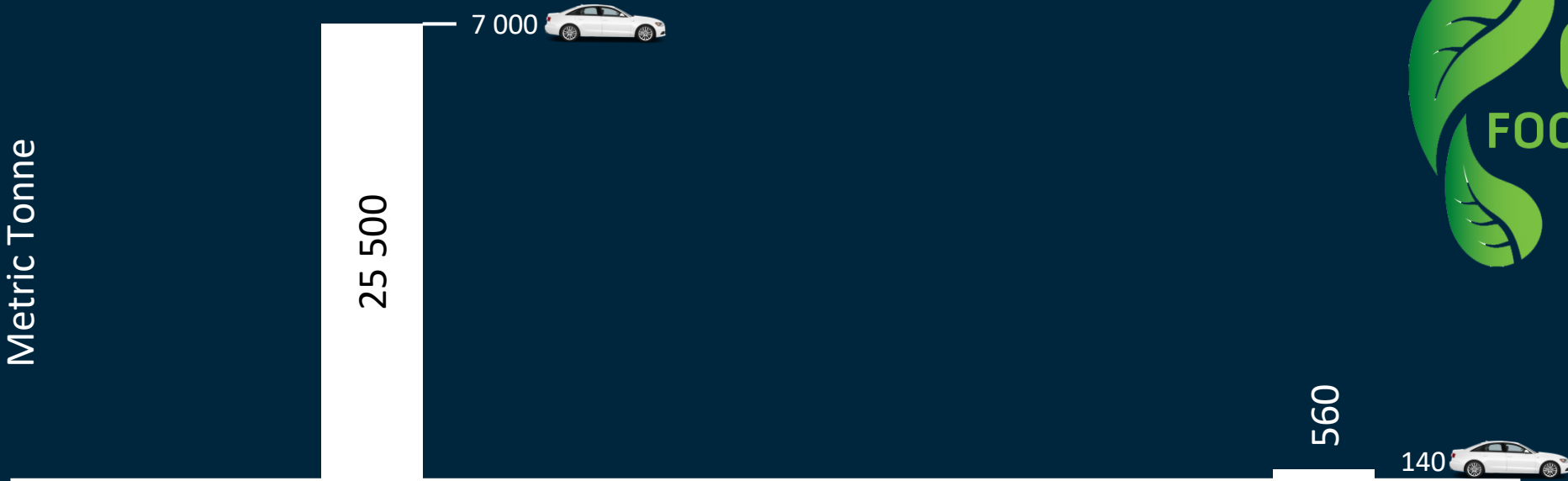


MT = Metric Tonne

Environmental Footprint

A greener and more efficient method of operating....

Yearly CO2 emissions
Metric Tonne



Freedom Enables Significant Reduction In Carbon Footprint



NOV Test site

Test Vehicle Launch
and Recovery Area

NOSEFO training
platform

NOSEFO indoor
training pool

Freedom Launch
and Recovery Area

Nosefo Training Facility

Location: Tau - 40min from Stavanger

Oceaneering Living Lab Setup

Freedom Qualification Program

Freedom planned schedule and progress..

TRL4

TRL5

TRL6

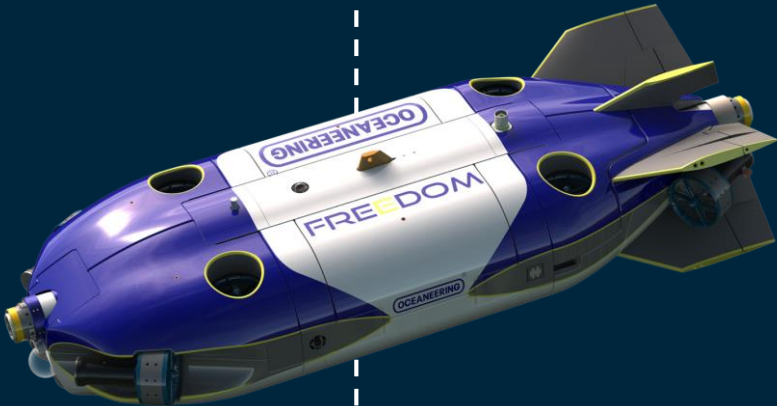
Living Lab Software
Qualification

FREEDOM Vehicle
Completion

FREEDOM Living
Lab Qualification

FREEDOM Living
Lab Customer Trials

FREEDOM in
Operation



Now

Aug
2019

Q1
2020

Q2
2020



Question & Answer Session



Thank you for your time..



Connecting What's Needed With What's Next™