L3HARRIS™

OCEANSERVER:
IVER3 AND IVER4 UNMANNED UNDERSEA VEHICLES

2019 WHOI Marine Robotics Entrepreneurs Forum: Flash Talks

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L3Harris OceanServer, Fall River, MA

L3Harris OceanServer

Who we are:
- Originally OceanServer Technology, Inc., Fall River, MA, with business started in 2003
- Acquired by L3 Technologies (March 2017)
  - L3 merged with Harris Corporations (July 2019)
- 14 Original employees, Now 50+ employees in two locations (Fall River, MA and San Diego, CA)

We provide:
- IVER family of unmanned undersea vehicles (UUVs): Iver3 and Iver4

Our Markets and Customers are:
- US Department of Defense Communities
- International and Domestic (Non-Defense)
- Commercial Survey
- Universities and Research Facilities
- Law Enforcement/First Responders
- Environmental

We distinguish ourselves by:
- Innovation from internal investment – we own all IP
- Providing a "COTS" UUV that is highly customizable
- Truly open system
- Exceptional customer support & product performance
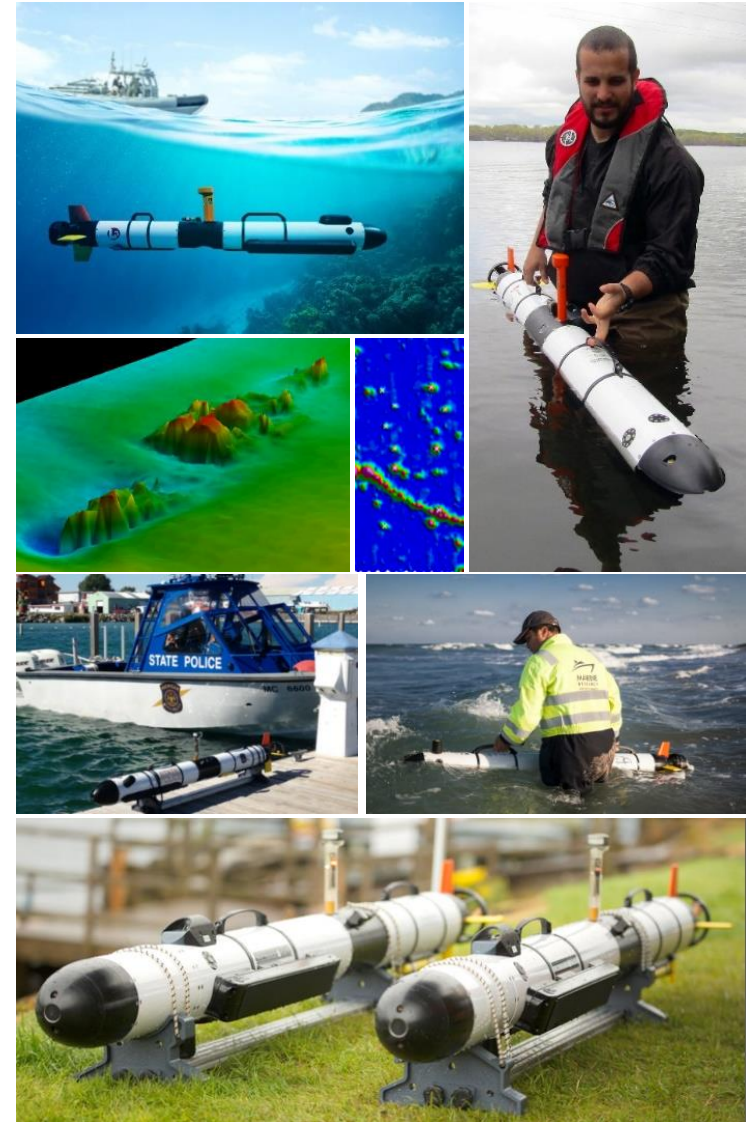
L3Harris Integrated Mission Systems
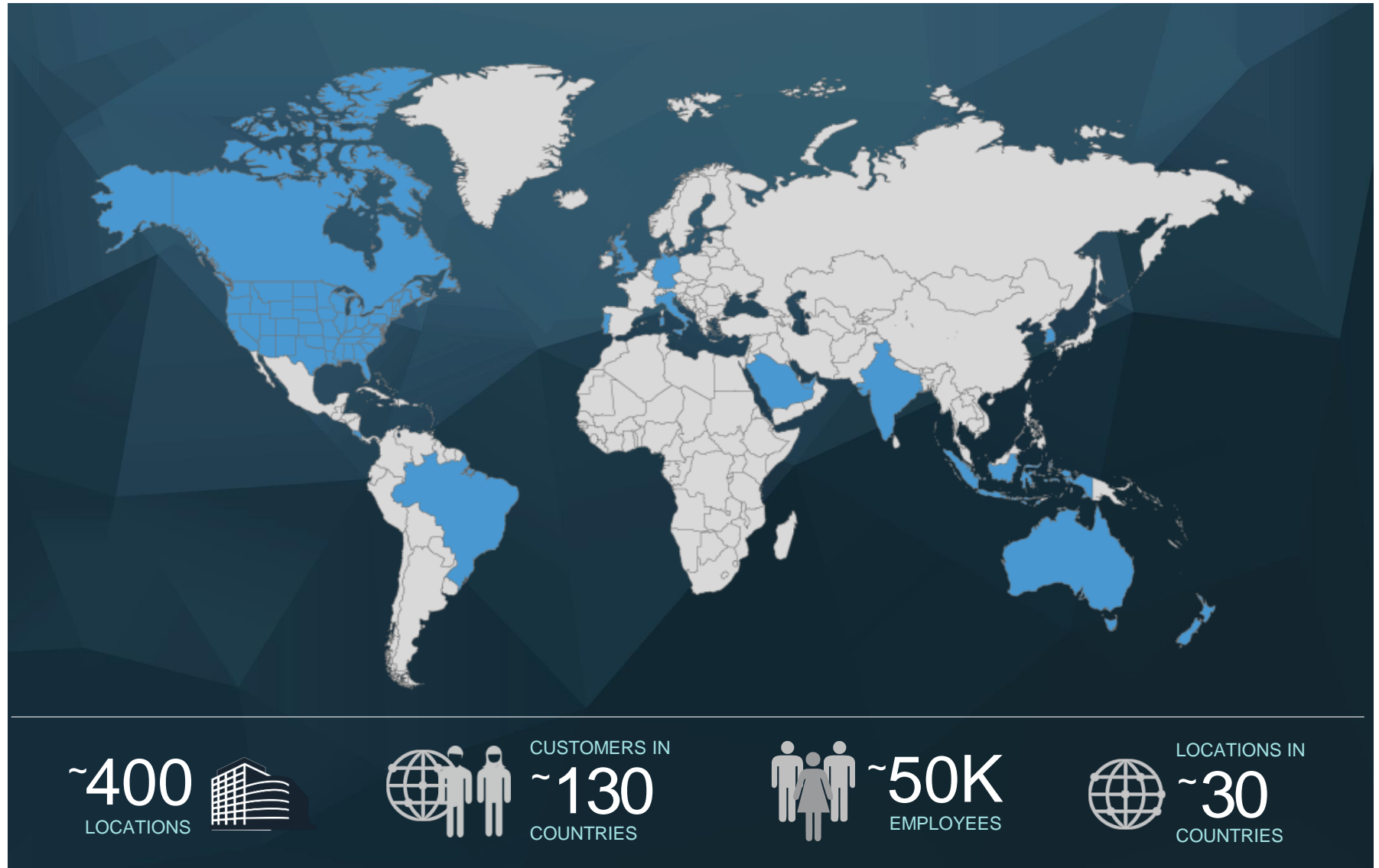
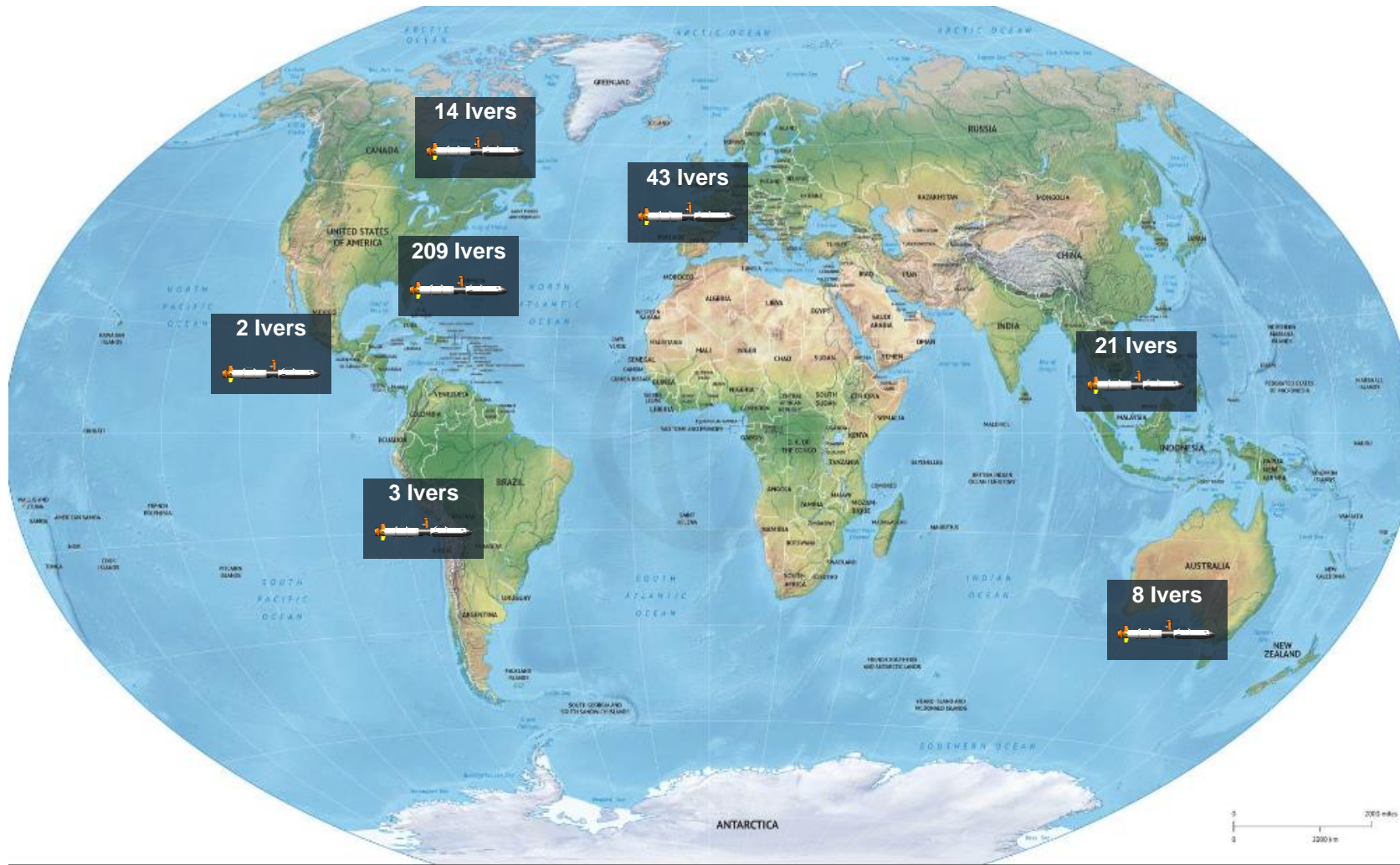## Integrated Mission Systems

$4.9B

Sean Stackley
President,
Integrated Mission
Systems

Leading technology integrator to U.S. and international militaries for Intelligence, Surveillance and Reconnaissance, airborne and maritime platforms

Headquarters
Palm Bay, Florida

~400 LOCATIONS

CUSTOMERS IN ~130 COUNTRIES

~50K EMPLOYEES

LOCATIONS IN ~30 COUNTRIES

14 Ivers

43 Ivers

209 Ivers

2 Ivers

21 Ivers

3 Ivers

8 Ivers

- 300+ Vehicles Manufactured
- 250,000+ operational hours
- Iver evolution driven by guidance of demanding customers
- US DoD = 88
- US Non-DoD = 125
- International = 87 (29 Countries)

L3Harris

OceanServer ➕ L3Harris ＝ ⭐

From OceanServer

– Base Technology
– Skilled Employees
– Industry Relationships

From L3Harris

– Financial Wherewithal and Transparencies
– Operational Expertise (Manufacturing, Quality, etc.)
– Program Management Expertise
– Broad Technological Depth
– Broad Geographical Resources
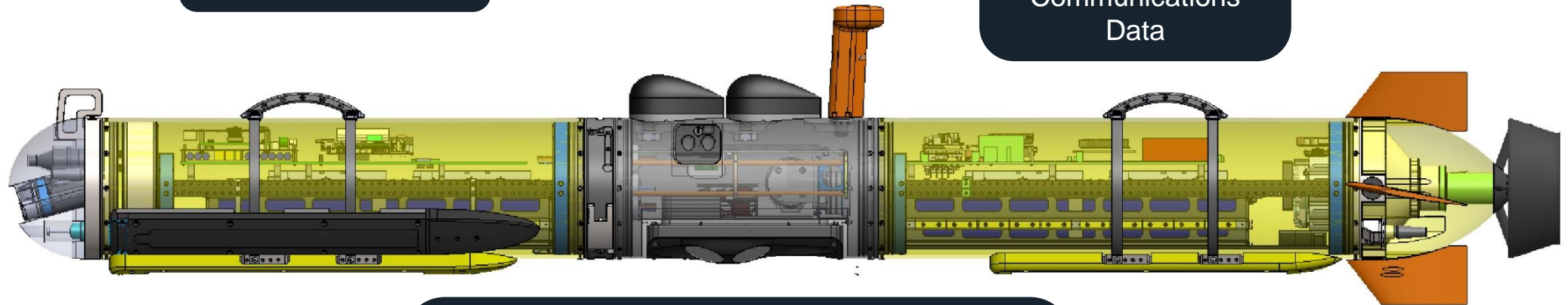
New R&D Efforts

– Power
– Communications
– Imaging
– Navigation
– UUV Size Options

IVER4 UUV SYSTEM OVERVIEW

FWD SECTION
Payload

AFT SECTION
Power
Navigation
Communications
Data

IVER4 SPECIFICATIONS
99" Length
9" Diameter
<240 lb Weight
1000 ft. Depth Rating
Titanium & Carbon Fiber Construction
18+ Hour Endurance

INNOVATED
DESIGNED
MANUFACTURED   in the   **USA**
TESTED

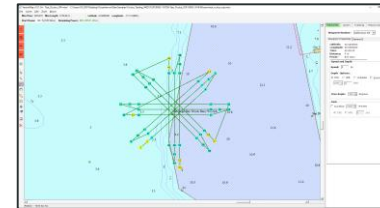# EASE AND SPEED OF DEPLOYMENT: FULL LOGISTICS FOOTPRINT

Deployment steps:

1. Mate FWD and AFT sections with tool-less clamp
2. Plan mission using VectorMap and upload
   - Can be completed in 5 to 30 minutes (depending on complexity of mission)
3. Hand deploy Iver4
4. Drive Iver4 away from the vessel using the handheld remote and start mission

Handheld Remote

Rugged Operator Console
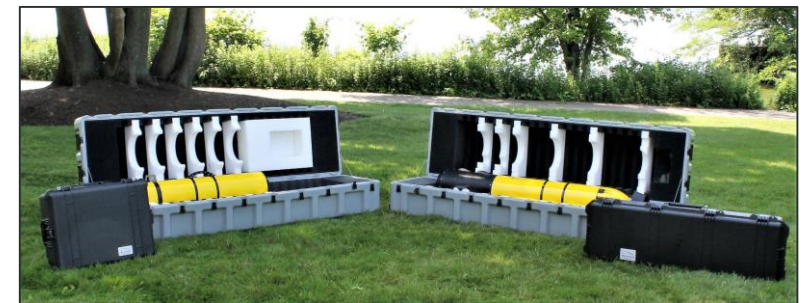
Everything required to operate the vehicle can be deployed in 4 cases

ABILITY TO INTEGRATE THIRD-PARTY SENSORS AND AUTONOMY SOFTWARE

- Comprehensive **Open** Interface Control Document **(ICD)** and Application Programming Interface **(API)**
  - L3Harris uses the same interface(s) to rapidly field prototypes.

- **Minimized Electromagnetic Interference (EMI) and open interface** reduces integration time and increase performance

Unique, flexible framework designed to ease integration and maximize functionality

Open Architecture for Software and Sensor Integration
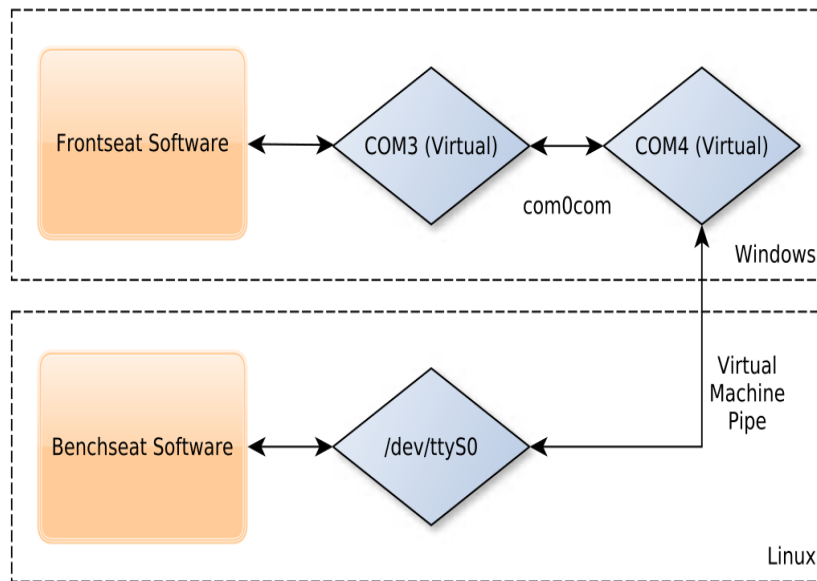
Payload CPU hosts 3rd party software for interface with remote helm API

- Frontseat Driver software is the primary L3Harris UUV control software

- The backseat, or benchseat, drivers are dedicated to the third party sensor or autonomy software and have access to frontseat functions through the L3Harris API

- The backseat stores software on a separate CPU from the frontseat

- The benchseat stores software on 2 cores of a single partitioned quad core CPU producing size, weight, and power benefits over a two CPU system
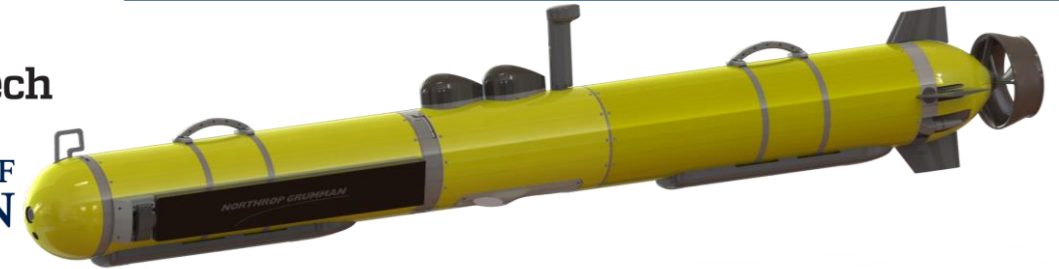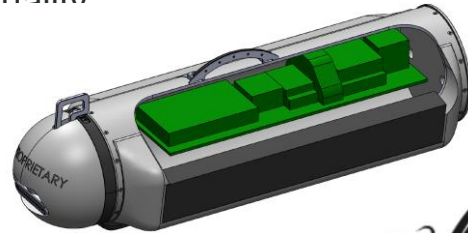
THIRD PARTY SENSOR INTEGRATION

- **15 yr. history** of close partnerships with 3rd party sensor & SW providers
  - optimized vehicle and sensor performance through iterative testing and design modifications
  - EMI shielding, frequency mapping and other important drivers
- Sonar, Communications, Camera & strobe, Water quality, Magnetometer, & other custom payloads
  - Single and Dual Frequency Side Scan & Bathymetry
  - Synthetic aperture Sonar
  - Control and Communications: DDL, 2.4 GHz, 900 MHz
  - Acoustic: BluePrint, Benthos, WHOI micro modem
  - Camera and Strobe
  - AML sound speed and CT, Neil Brown CT
  - YSI multi-parameter water quality

Iver platform supports **over 30 different sensors**

Iver3 with Northrop Grumman microSAS interfaces using the remote helm. **Demonstrated at ANTX 2018.**

Northrop Grumman microSAS rendering on Iver4

Kraken SAS rendering on Iver4 payload section

Michigan Tech

UNIVERSITY OF MICHIGAN

SHARK MARINE TECHNOLOGIES INC.

NUWC — NAVAL UNDERSEA WARFARE CENTER DIVISION NEWPORT, RI

EdgeTech — The Leader in Underwater Technology

NORTHROP GRUMMAN

KLEIN MARINE SYSTEMS, INC.

KRAKEN

ARL — APPLIED RESEARCH LABORATORIES THE UNIVERSITY OF TEXAS AT AUSTIN

xylem

leidos

Raytheon

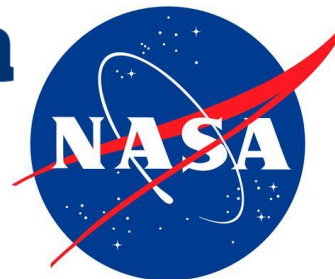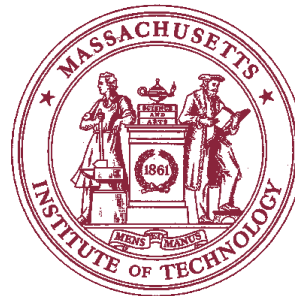HERIOT WATT UNIVERSITY

THIRD PARTY AUTONOMY SOFTWARE INTEGRATIONS

- Multiple operating systems
- Architectures/Middleware
  – ROS (Dr. Carl Kaiser, WHOI)
  – MOOS-IvP Helm
  – LCM
  – MOAA
  – JAUS
  – NASA
  – ARL: UT
- Behaviors
  – SeeByte
  – ARL: UT

Rich API proven through multiple integrations with partners across many industries

Thanks, Next!

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