

Design and Testing of the Spartan USV Mine Warfare Module

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Acknowledgement

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Agenda

- **Spartan USV and MIW Module**
- **Requirements**
- **AQS-14/24 Payload**
- **L&R Design**
- **Testing and Operation**
- **Conclusions**



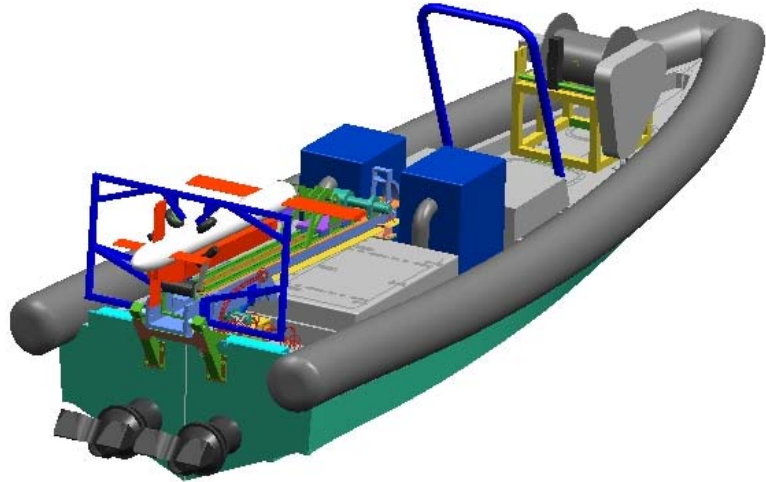
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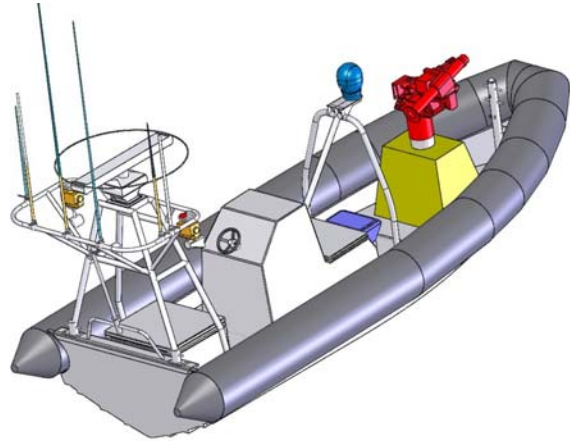


Spartan is Developing Three Modular Payloads

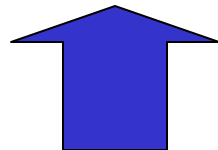
- 11 M RHIB



- 7 M RHIB



- MIW Module

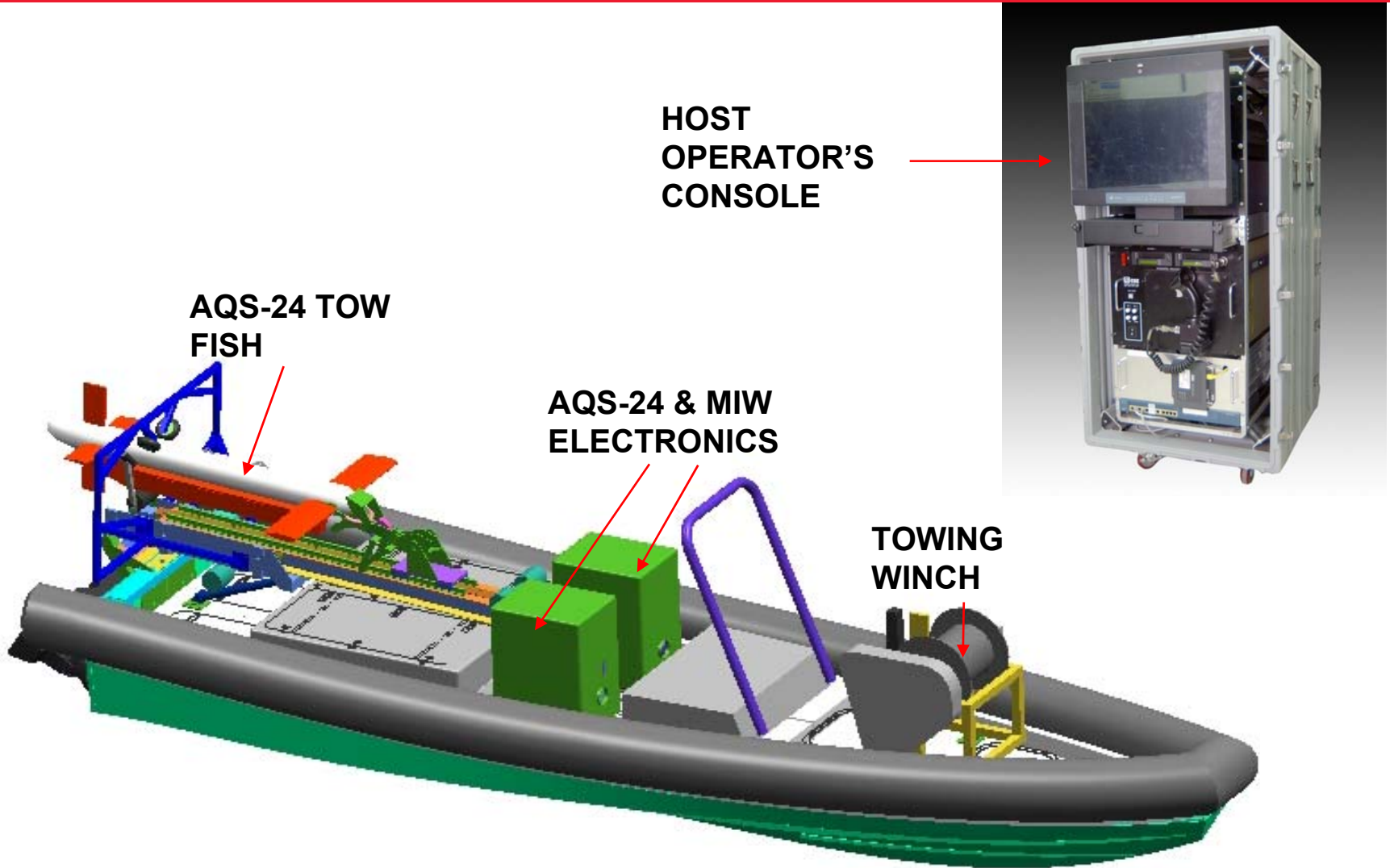


Subject of This Paper

- ISR & Force Protection

- ASW Module (French)

MIW Module Provides Capability for Remote Operation from USV



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Key Requirements for MIW Module

- **Modular design to facilitate interchangeability**
- **Positive restraint of towfish when stowed (for high speed transit)**
- **Semi-automated L&R control with future transition to “one button” and autonomous operation**
- **Weight limit of 3690 lbs**
- **Water Depths up to 200 Ft (170 Ft tow depth)**
- **Operate up to Sea State 3**
- **Maximize Area Coverage Rate (tow speed)**
- **Withstand wave slap load of 500 psf**



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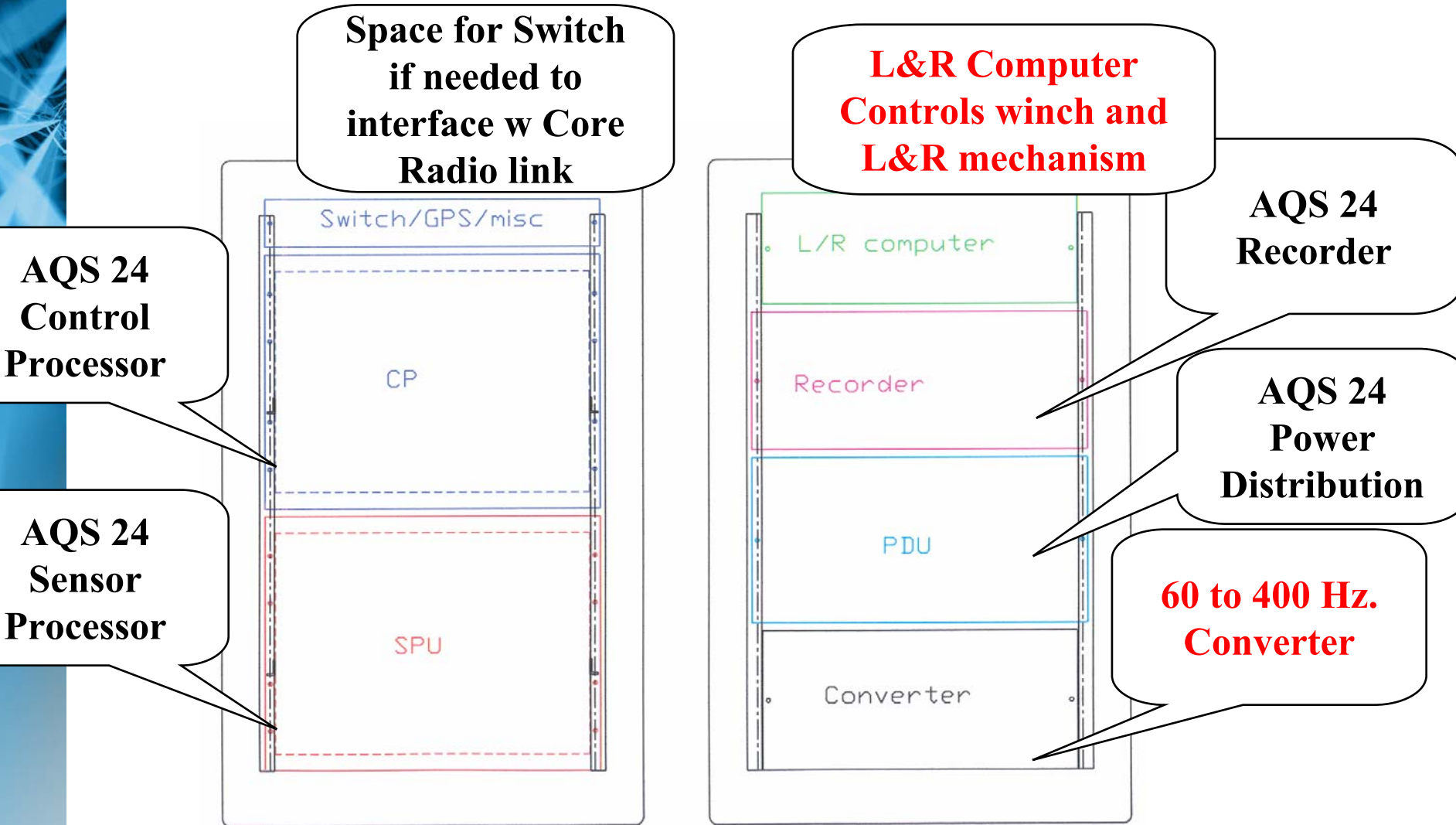


AQS-14/24 Tow Fish Is Suited To USV Operation

- High resolution SLS to detect & classify bottom mines
- 112 Inches L X 64 Inches W. Weight 550 Pounds
- Key features
 - Bottom tracking or constant depth modes.
 - Can operate at different SLS resolutions to accommodate radio link bandwidth.



On Board Electronics Are Mostly NDI



Black Type = NDI

Red Type = Custom

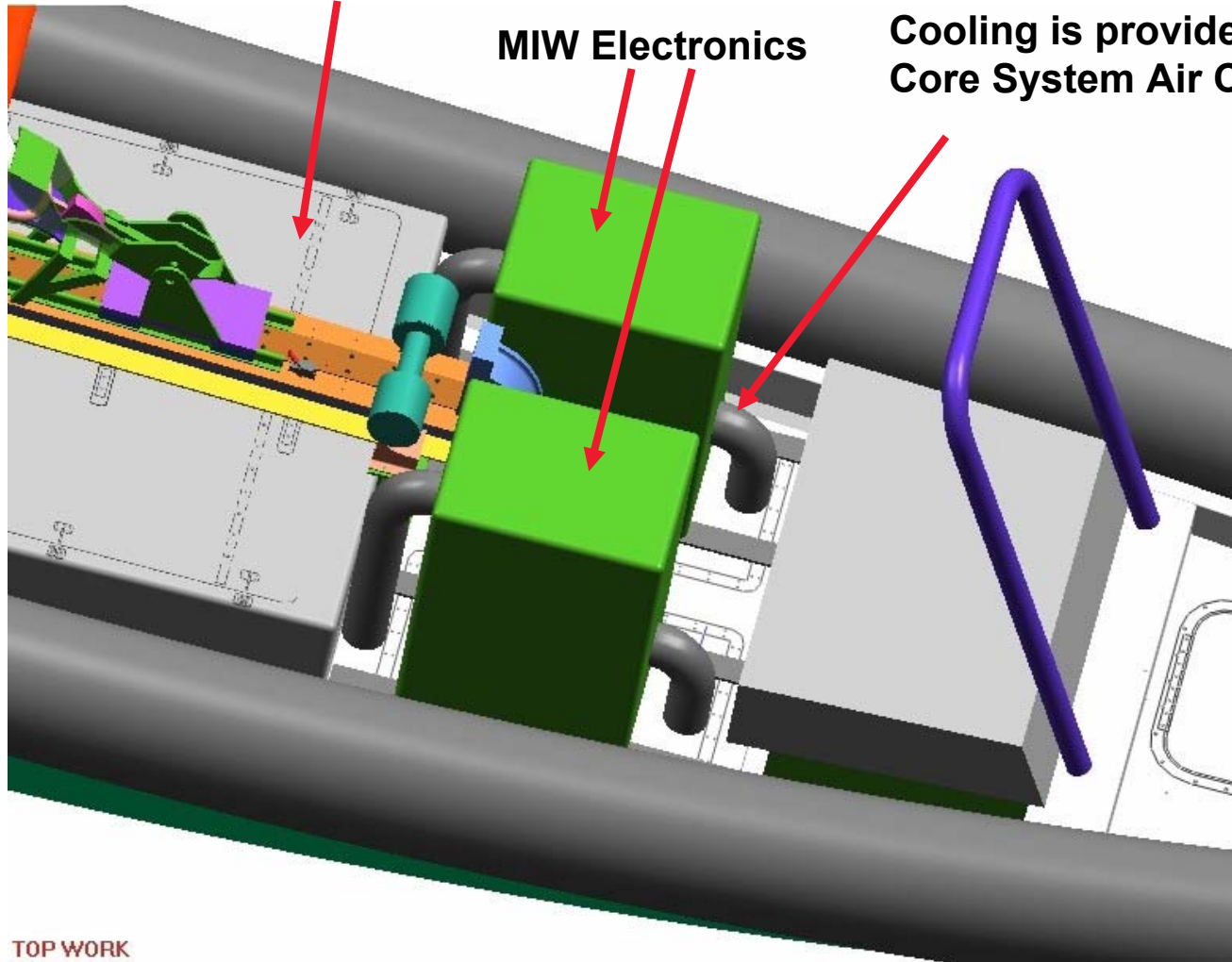


Electronics are Housed in Deck Mounted Ruggedized Cases

Engine driven generator provides 110V AC power

MIW Electronics

Cooling is provided via USV Core System Air Conditioner



Operators Console is Configured To Allow Location Flexibility

**OPERATORS SONAR
DISPLAY**



**L&R
CONTROL**

**CONTROL
PROCESSOR
CONTROL
JOYSTICK**

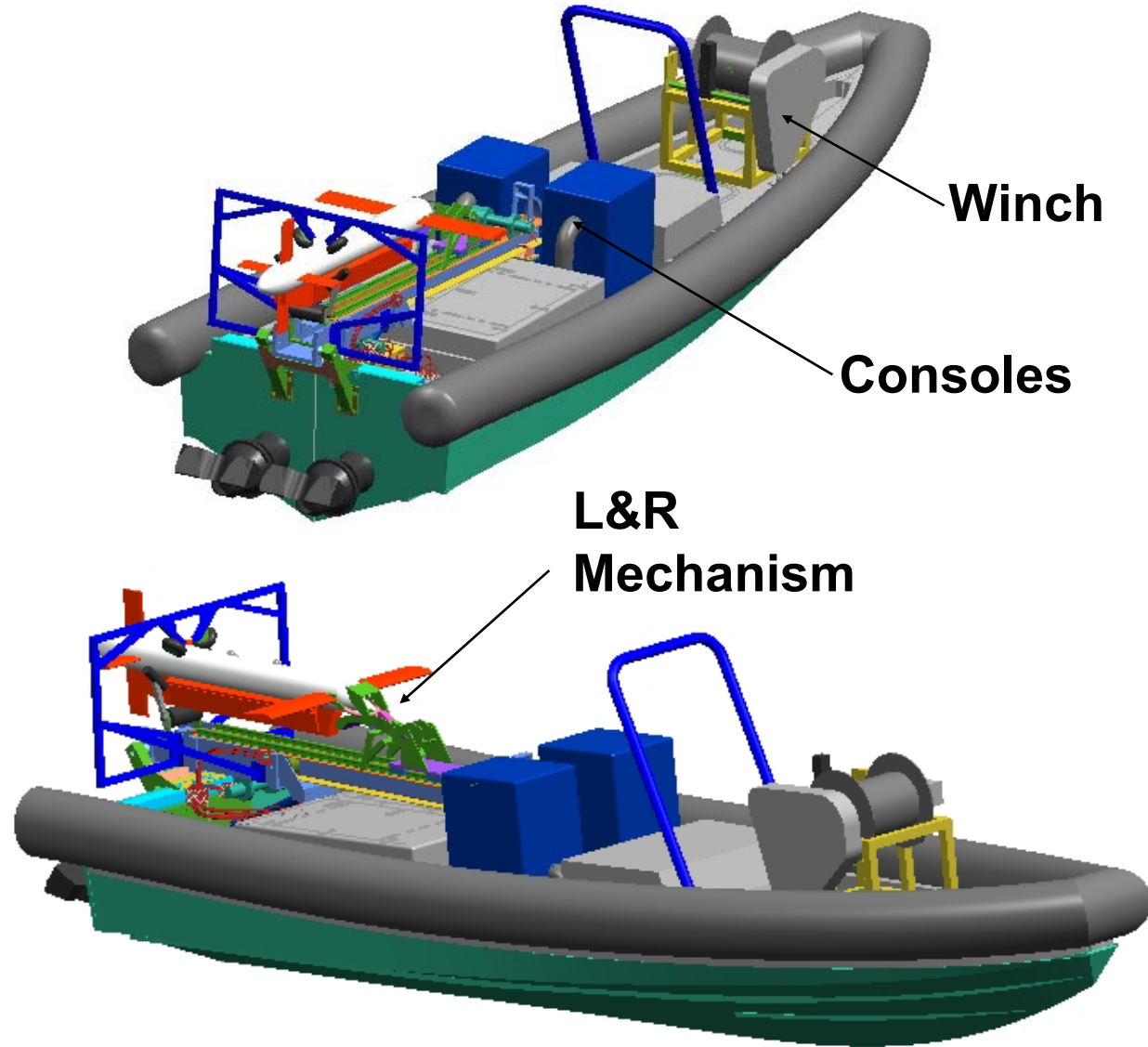


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General Arrangement

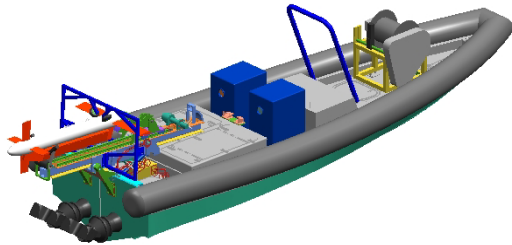


Key MIW – Craft Interfaces

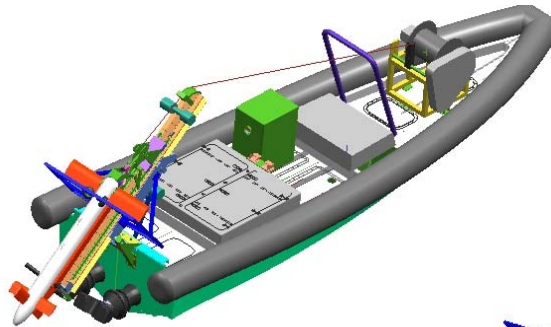
- **Primary Electrical Power from Core (117 VAC, 60 Hz At 6 KW**
- **Hydraulic Power for L&R and Winch from Core. 0 to 10 GPM at 3000 PSI \pm 10%**
- **Cooling Air for MIW Onboard Electronics from Core, 9000 BTU/hr and 400 CFM at $\Delta P = 1.3$ in. H₂O**
- **3 Mbit/sec Uplink Bandwidth for Data Transmission**
- **Ethernet switch port at USV and host for command and status**
- **Video cameras NTSC input to video processor**
- **Foundations for Winch, L&R, and Electronics**



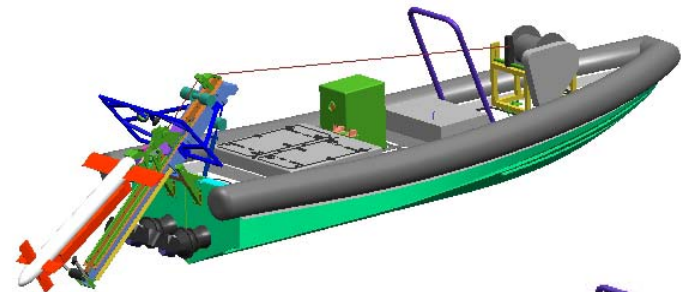
Major Steps in L&R Deployment



Extend Rail 1/2
Way



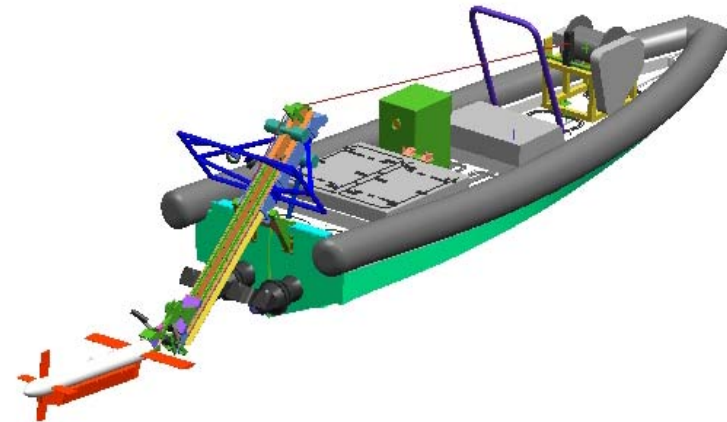
Tilt Rail



Recovery reverses
launch sequence

Finish Rail
Extension

Extend Docking
Carriage



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Spartan MIW Has Undergone Progressive Level Test Program

- **Builder's Trials March, 2005 in Chesapeake Bay**
 - Operation of L&R system
 - Software & GUI refinement
 - Craft manned
- **Government Trials April, 2005 in Narragansett Bay**
 - Conducted remote L&R operations
 - Data exfil via radio link
- **Operational Demonstration**
 - TBD – In planning



Video of System Operation



Spartan Mine Warfare Vehicle



Conclusions

- **MIW Module provides shallow water mine hunting capability from small unmanned surface craft**
 - Modular interfaces
 - Positive tow fish restraint
 - Within craft weight limit
 - Semi-autonomous operation
- **System is adaptable to variety of support craft**
- **Utility demonstrated in series of realistic operational tests**

