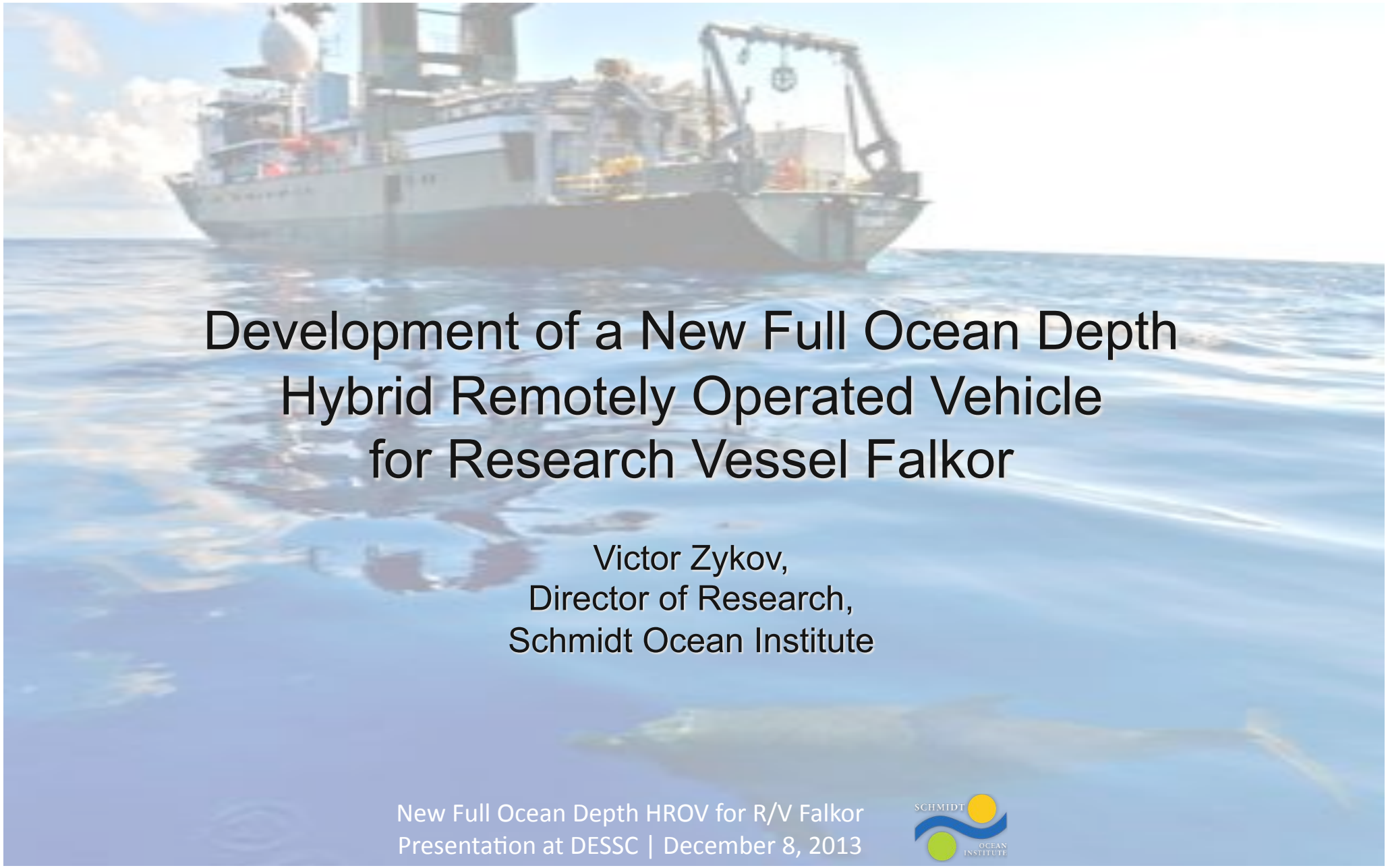

Development of a New Full Ocean Depth Hybrid Remotely Operated Vehicle for Research Vessel Falkor

Victor Zykov,
Director of Research,
Schmidt Ocean Institute


SOI Founders Eric and Wendy Schmidt
at R/V Falkor delivery to SOI, March 6, 2012
New Full Ocean Depth HROV for R/V Falkor
Presentation at DESSC | December 8, 2013
SCHMIDT
OCEAN
INSTITUTE

R/V Falkor

Accommodation: science party 20 pers., incl. marine techs

Length: 82.90 m (272 ft)
Breadth: 13.00 m (42.7 ft)
Freeboard: 2.275 m (7.5 ft)
Draft: 5.80 m (19 ft)
Gross Tonnage: 2088 GRT
Cruising Speed: 12 knots

Propulsion Power: 5,882 kW (7,888 hp)
Range Estimate: 8,000 nautical miles
Endurance Estimate: 36 days

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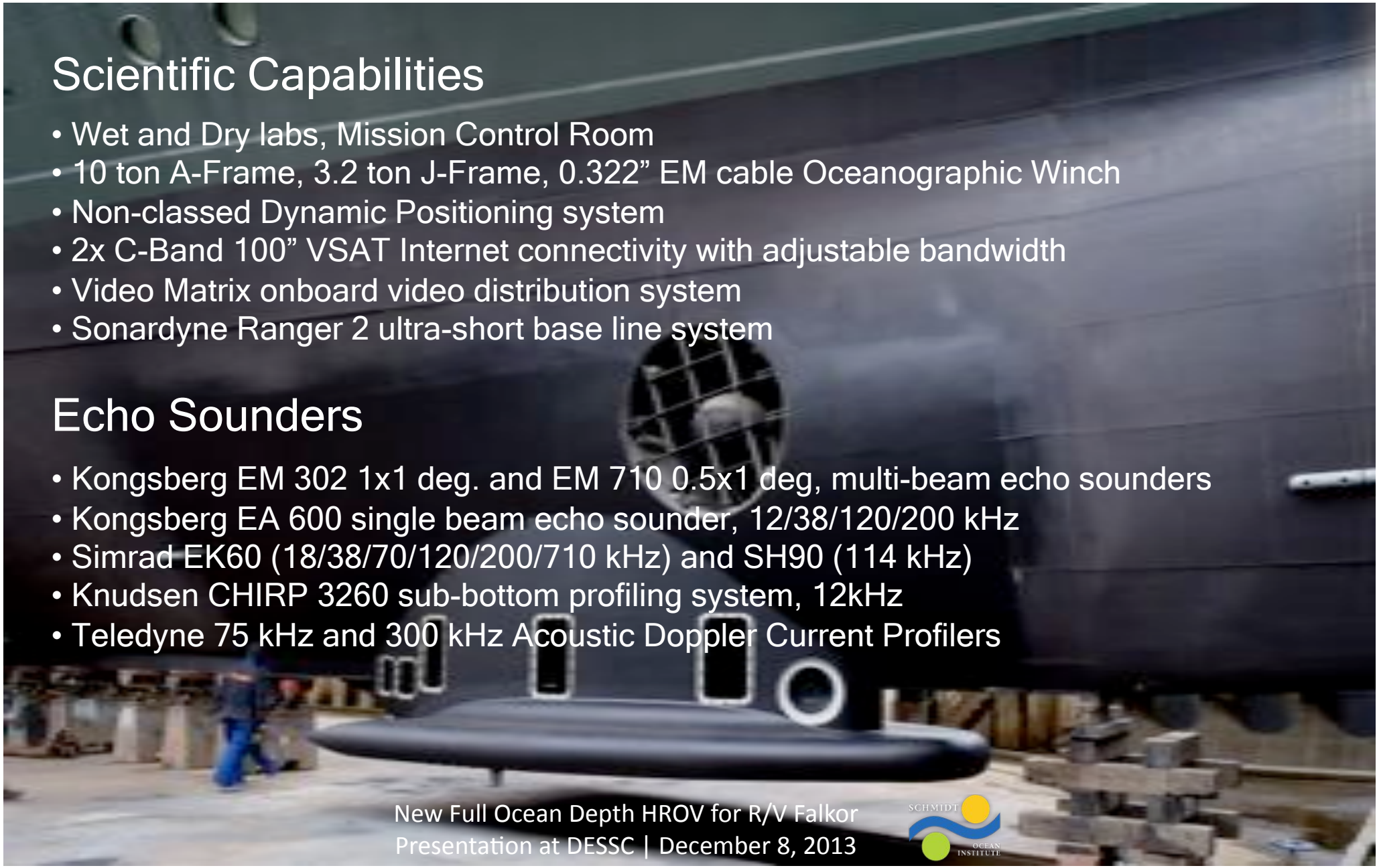


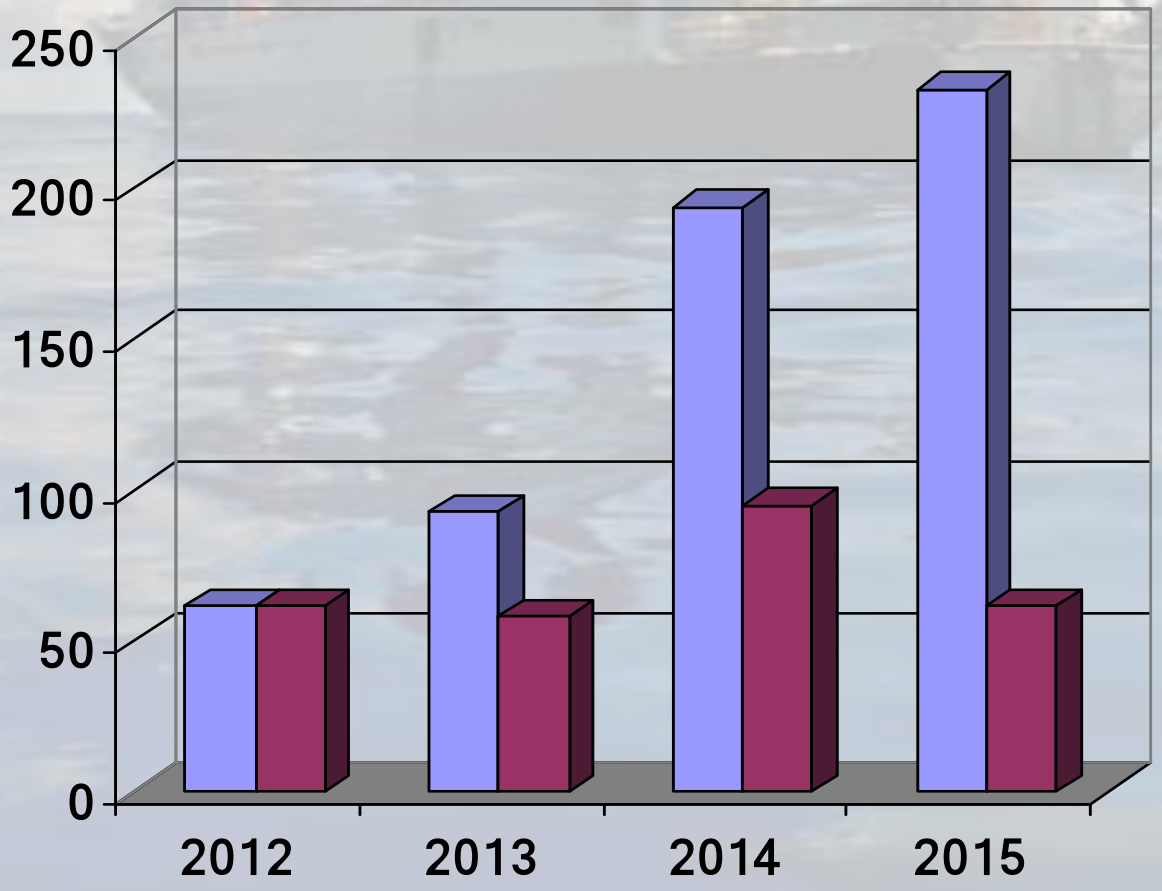
Scientific Capabilities

- Wet and Dry labs, Mission Control Room
- 10 ton A-Frame, 3.2 ton J-Frame, 0.322” EM cable Oceanographic Winch
- Non-classed Dynamic Positioning system
- 2x C-Band 100” VSAT Internet connectivity with adjustable bandwidth
- Video Matrix onboard video distribution system
- Sonardyne Ranger 2 ultra-short base line system

Echo Sounders

- Kongsberg EM 302 1x1 deg. and EM 710 0.5x1 deg, multi-beam echo sounders
- Kongsberg EA 600 single beam echo sounder, 12/38/120/200 kHz
- Simrad EK60 (18/38/70/120/200/710 kHz) and SH90 (114 kHz)
- Knudsen CHIRP 3260 sub-bottom profiling system, 12kHz
- Teledyne 75 kHz and 300 kHz Acoustic Doppler Current Profilers

R/V Falkor and Vehicle Utilization 2012-2015



Ship science days at sea

Vehicle science days at sea at depths 2.5-11 km

SOI partners with WHOI to develop HROV

- Systematic access to abyssal and hadal zones is in high demand by the international scientific community
- Own vehicle will allow SOI to:
  - address the scheduling and availability constraints
  - leverage the latest technological innovations
- Through the collaboration with WHOI NDSF and DeepSea Challenger, we are in a unique position to contribute to the global oceanographic community.

SOI HROV Top Level Capabilities

- Full Ocean Depth Rating
- Supports Operation in both ROV and AUV modes
- Supports diverse ocean research activities, e.g.:
  - scientific sample collection, object manipulation
  - chemical and thermal data collection
  - seafloor mapping, photomosaicing
  - collection and deployment of equipment
  - acquisition of high quality underwater video, etc.
- Optimized for the prevalence of ROV operations, expected range of autonomous transit is at least 20 km

SOI HROV Top Level Capabilities

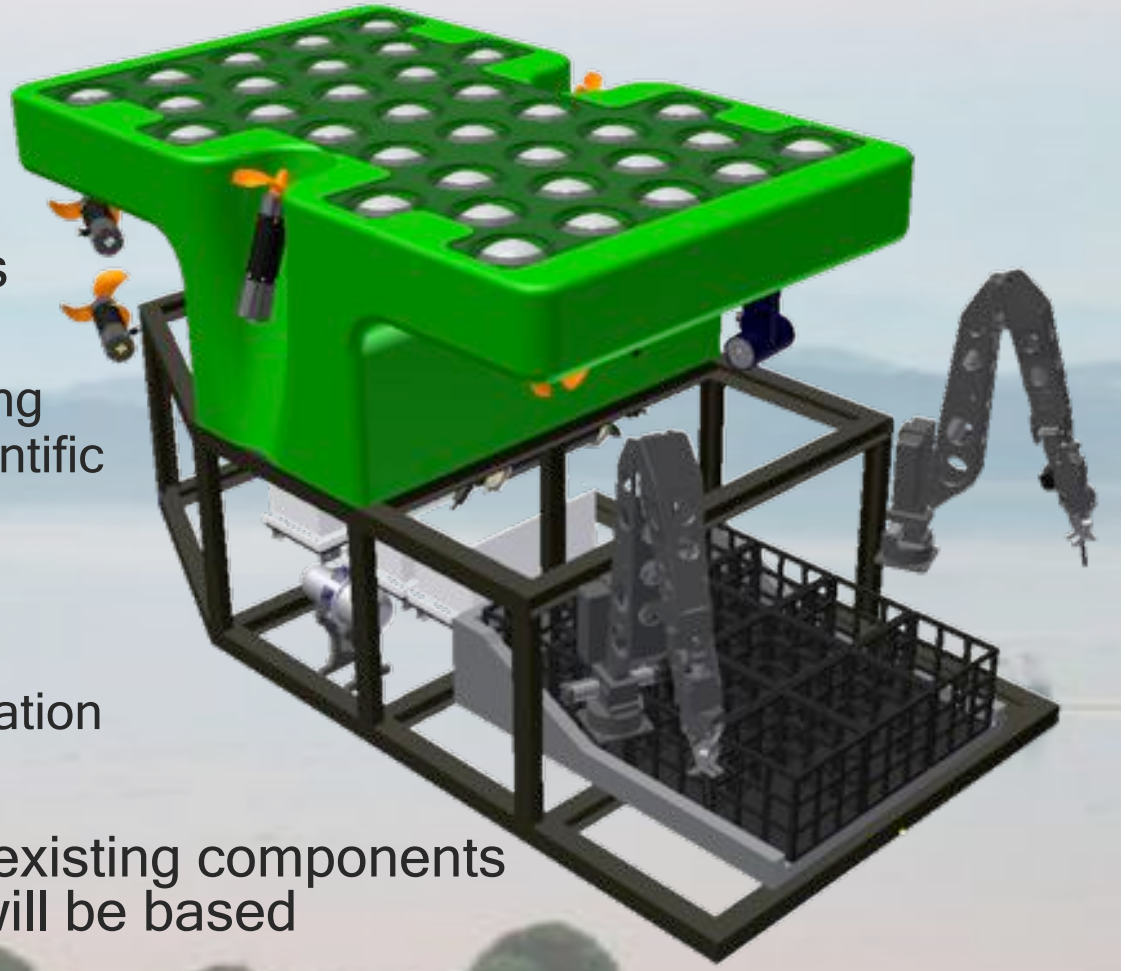
- Telemetry and communications provided via:
  - expendable fiber to 11 km (ROV mode);
  - free space optical communications to 6 km (ROV mode);
  - light tether to 6 km (ROV mode);
  - untethered for all depths (AUV mode);
- Change between modes will be quick and seamless
- Visually immersive remote operations experience:
  - 3x wide HD panoramic video
  - 3DHD contextual video
  - UHD PZT camera for scientific video acquisition
  - Compatible with emerging telepresence operations

SOI HROV Top Level Capabilities

- Scientific data generation will be consistent with NDSF practices and standards for best data interoperability
- HROV will be designed for the following dive profile:
  - up to 30 dives per year to the depth of 3,000 m,
  - up to 30 dives per year to 6,000 m,
  - up to 60 dives per year to 11,000 m
- Delivery schedule:
  - systems delivery to RV Falkor expected in January 2015
  - sea trials and integration expected in Q1 and Q2 of 2015
  - initial research deployments anticipated in Q3 and Q4 of 2015

Early conceptual HROV design study

- **The actual vehicle will look very different**
- This concept study reflects the following projected features of the new SOI HROV:
  - Design mass distribution among flotation, batteries, frame, scientific instruments, payload
  - Workspace allocation
  - Manipulation capability
  - Lights and camera mass allocation
  - Flotation structure
- This design study is using pre-existing components upon which the actual design will be based



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Scientific Advisory Group for SOI HROV Design

- SOI is establishing Scientific Advisory Group to collect input on the vehicle design capabilities, including:
  - Scope and prioritization of the scientific functions
  - Operational duty cycle (deployment cycle) and other logistics
  - Payload capacity and interoperability with auxiliary systems
  - Compatibility with telepresence operations, etc.
- First Scientific Advisory Group meeting anticipated in early January 2014.
- All interested researchers please contact SOI at victor@schmidtocean.org

Questions?

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