CCG Vessel Procurement – Engineering Support

New Vessel Design and Build Update




Canada

Outline

- Shipbuilding in Canada (NSS)
- Offshore Oceanographic Research Vessel
- Polar Icebreaker
- Arctic Offshore Patrol Vessel (AOPS)
- Near Shore Fisheries Research Vessel (NSFRV)
- Greening of Vessels
- Modularity

National Shipbuilding Strategy (NSS)

- Long term project to renew Canada's fleet of combat and non-combat vessels
- In partnerships with 3 Canadian Shipyards
  - Irving Shipyard – Halifax, NS
  - Seaspan Shipyard – Vancouver, BC
  - Davie Shipyard - Levis, QC
- Objective:
  - is to restore Canada's shipyards and rebuild our marine industry along with job creation and ensuring sovereignty and protecting interests at home and abroad

seaspan SHIPYARDS

IRVING
Irving Shipbuilding, Inc.

DAVIE

Delivered Vessels

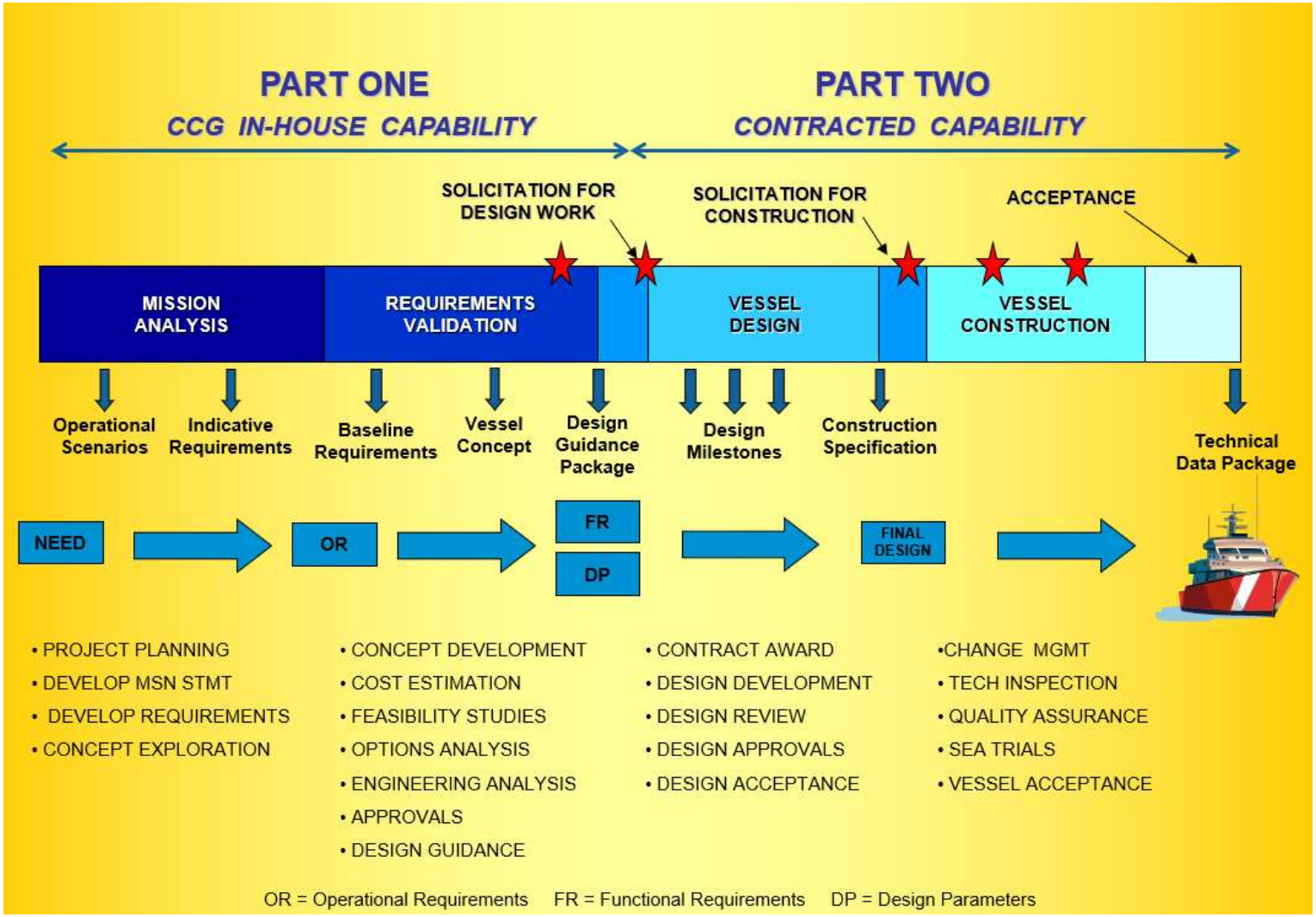
- VSY has Delivered 3 vessels under the NSS

Sir John Franklin - Pacific

Cpt. Jacques Cartier - Atlantic

John Cabot - Atlantic

CCG Vessel Procurement Process

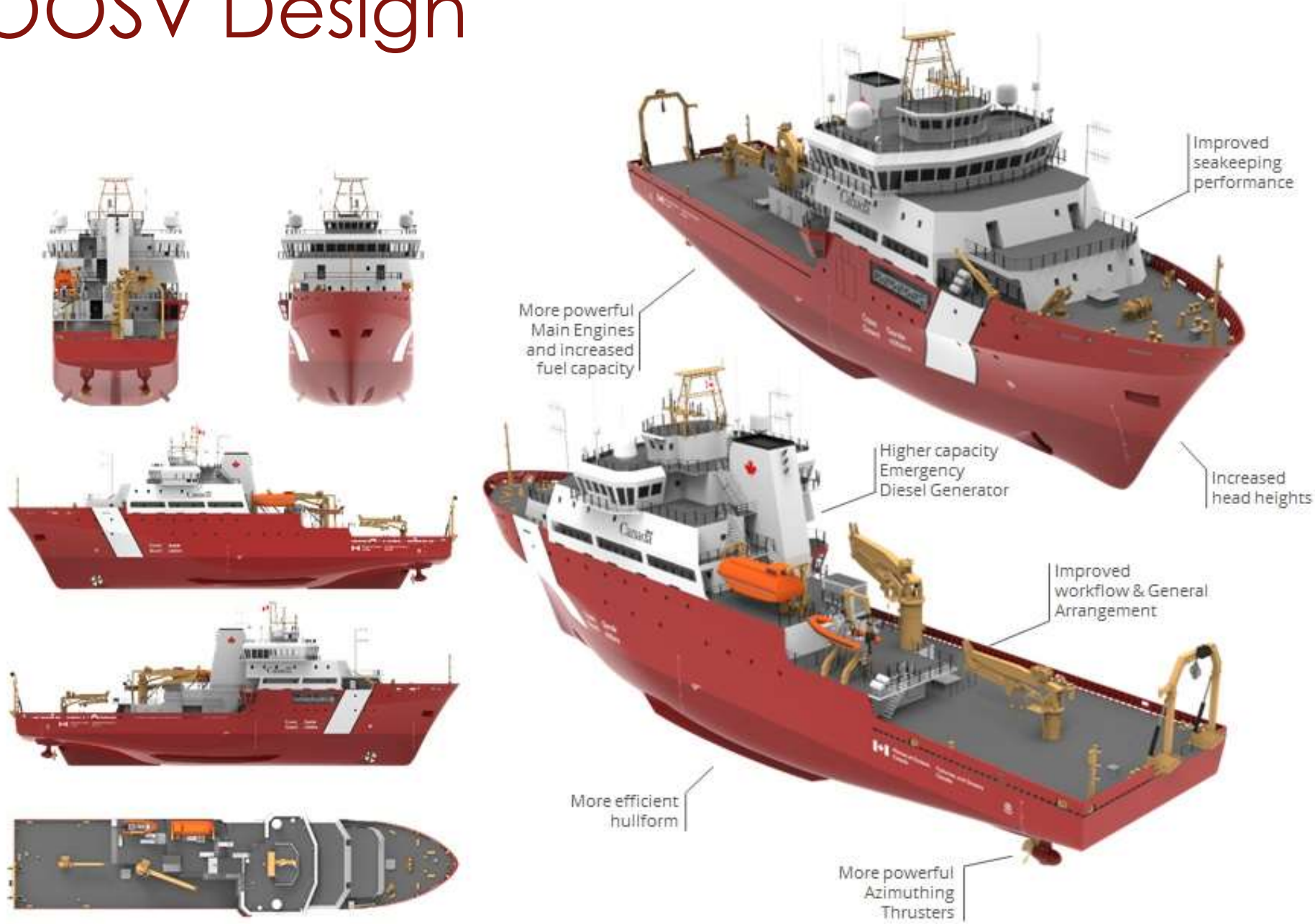


Offshore Oceanographic Science Vessel (OOSV)

- Particulars:
  - Length: 87.9m
  - Breadth : 17.6m
  - Displacement: 5058t
  - Cruising Speed: 12 kts
  - Max Speed: 13.4 kts
  - Range: 12719Nm
  - Complement: 60
    - Science: 26 Berths
    - Ice Class: PC6

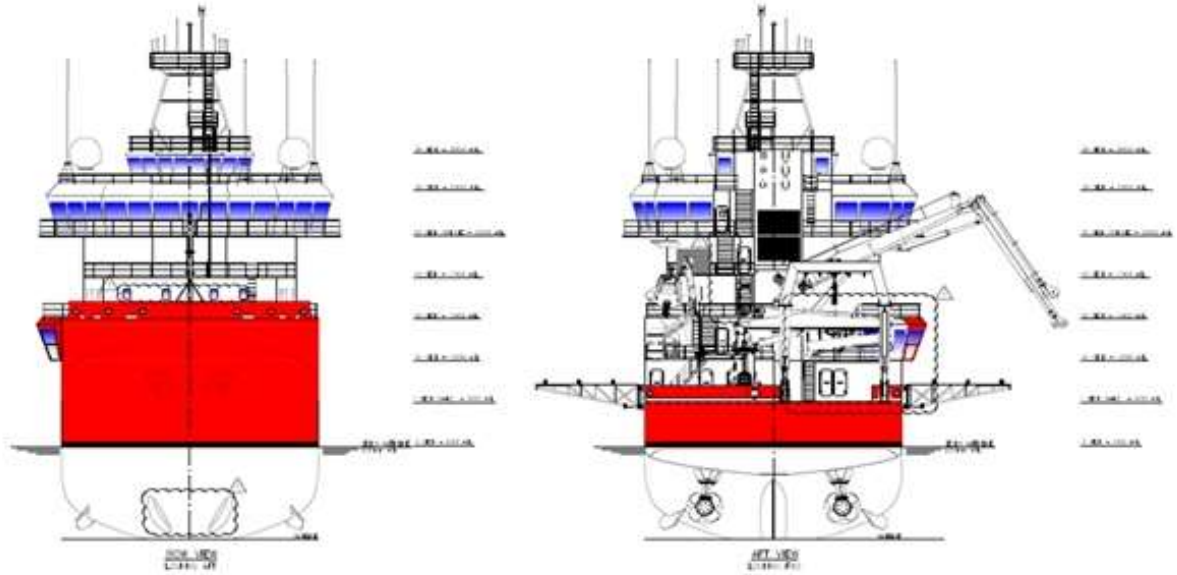
Replacement for the CCGS Hudson. Hudson was decommissioned in 2022

OOSV Design

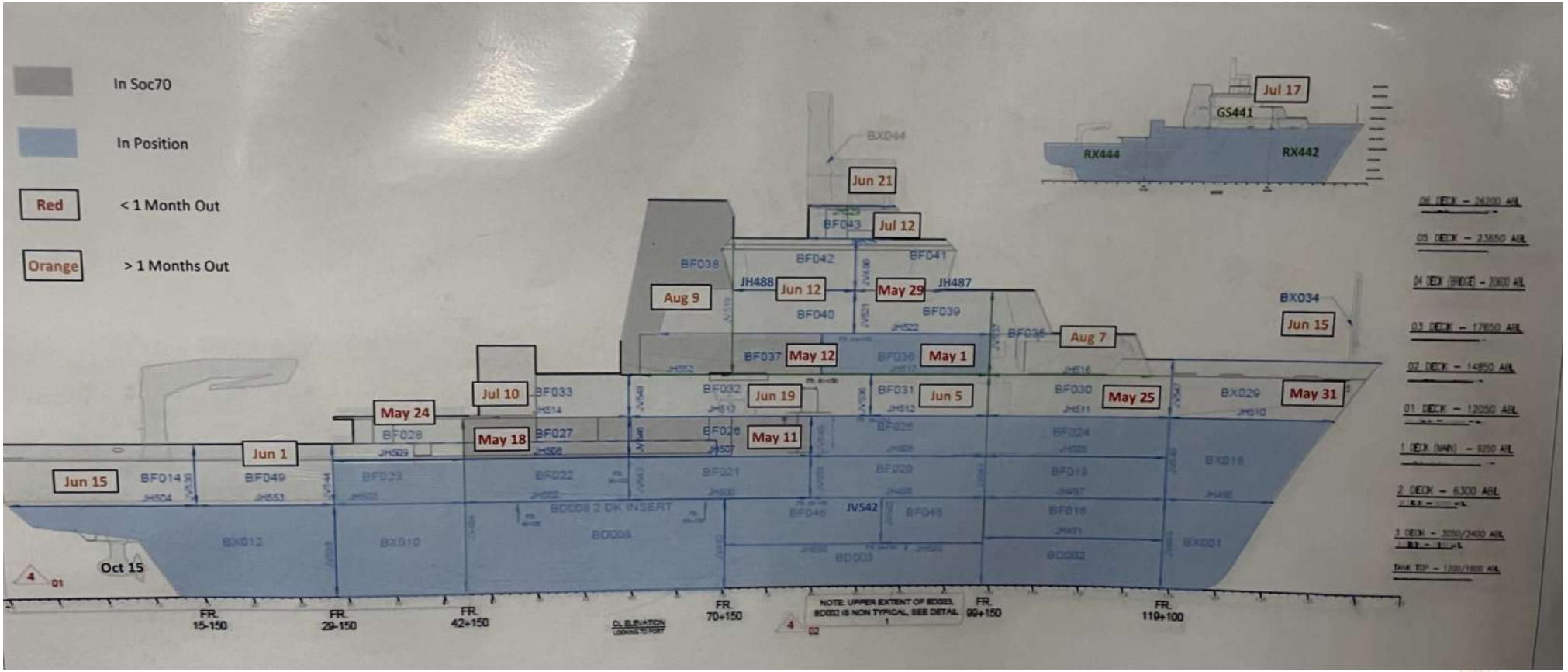

Improved seakeeping performance
More powerful Main Engines and increased fuel capacity
Higher capacity Emergency Diesel Generator
Increased head heights
Improved workflow & General Arrangement
More efficient hullform
More powerful Azimuthing Thrusters

OOSV Project Status

- Build contract awarded in January 2021 with first steel cut on 26 March 2021.
- OOSV has cleared block construction and hot work (SOC 40).
- OOSV is scheduled to complete Blast & Paint (SOC 55) and Cold Outfitting (SOC 50) with the next 2-months.
- Ship consolidation is scheduled for completion Q3 2023.
- Launch is scheduled for August 2024.
- Delivery scheduled for March-May 2025.
- Planned 9–12-month transition into service upon to commence on vessel delivery



OOSV Build Progress



Science Spaces

- Vessel will have 4 main lab spaces:
  - General Purpose Lab
  - Chemistry Lab
  - Acoustics Lab
  - Computer Lab
  - Salinity/Climate Control Lab
  - Marine Mammal Observation Station
- Total in-situ lab space is ~446m²
- Outside of the Lab Space there will be a 2 deck Ocean Sampling Room (~62m²)
  - CTD Rosette casts up to 6000m depth
  - 2 LARS systems (one for CTD 322 wire and one for Hydro Wire)
  - Winch control room will feature a chair for equipment operation (known as the Captain Kirk Chair)

OOSV Handling Systems

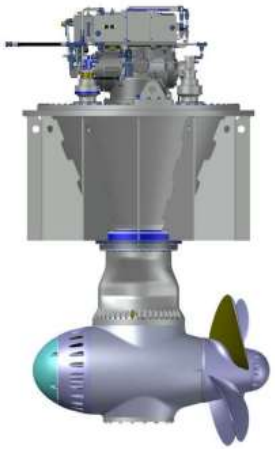
- Main crane – 5T @ 19.5m
- Secondary Crane – 4.5T @ 13.5m
- A-Frame – 20T – 5m – 120s to full extension
- Oceanographic Winch
  - 20T bare drum
  - 6000m depth capability

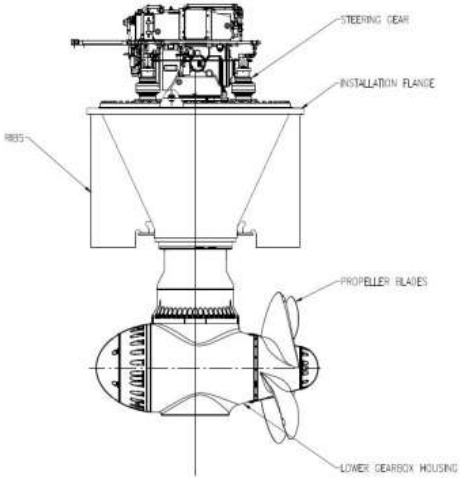
- CTD LARS – 5T @ 3.7m – 60s to full ext.
- Hydro Wire LARS – 4T @ 3.7m – 60s to full ext.
- Seismic Towing booms port and starboard

*All deck gear is designed to work at SS-6

Ship Propulsion

- Dual Azmuthing Thrusters – Schottel SRP 510 – 1600kW each
  - Fixed pitch propellors
- Single Tunnel Bow Thruster
  - Schottel StTT4





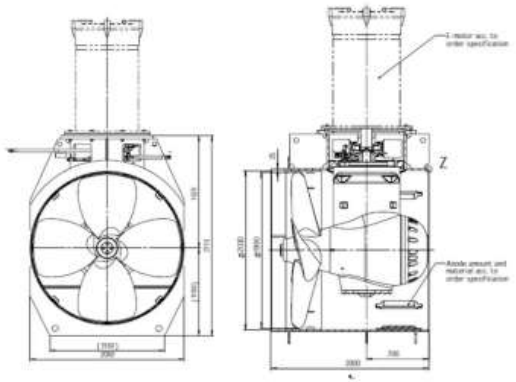
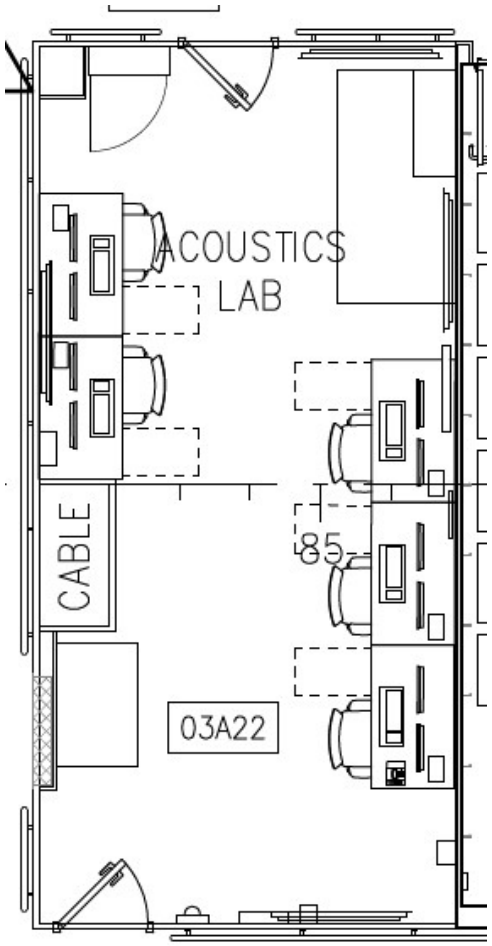


Figure 11: Bow Thruster General Arrangement

Acoustics Lab

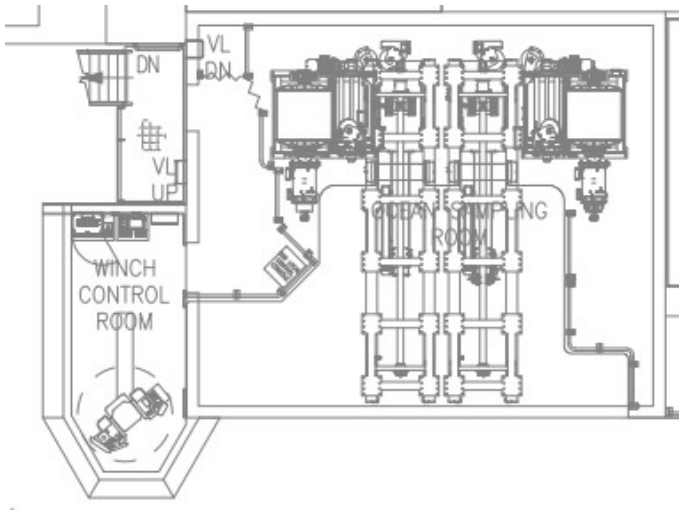
- Control for all hull and drop keel mounted sonars
- **Drop Keel Sonars – 3m below Hull**
  - EK80 – 18, 38, 70, 120, 200kHz
  - AR and DAT
  - EM2040
  - Sounding and Pinging 12kHz
  - ADCP 75 and 300Khz
- **Hull Mounted Sonars**
  - EM304
  - Sub Bottom Profiler
  - Sounding and Pinging 12kHz
  - EA 600



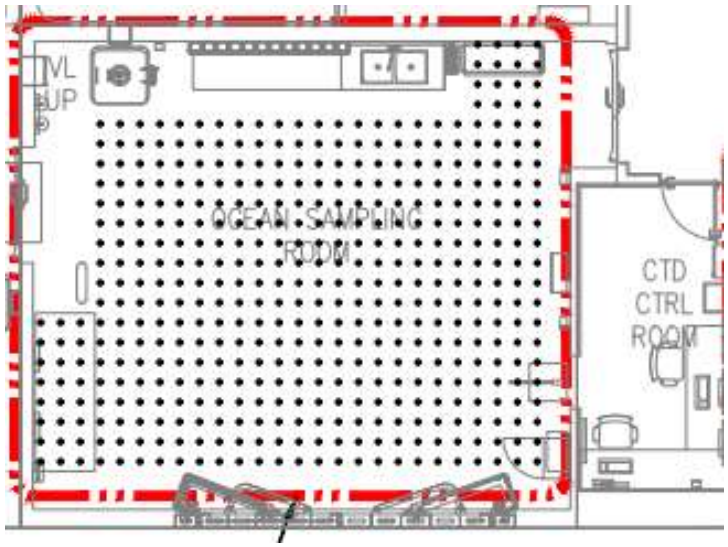
KONGSBERG

Ocean Sampling Room

- Dual LARS removing block changeover requirement
- Both LARS have luffing capability for package control
- Deck socket pattern (600mm X 600mm) for easy securing of equipment
- CTD Control Room located next to OSR



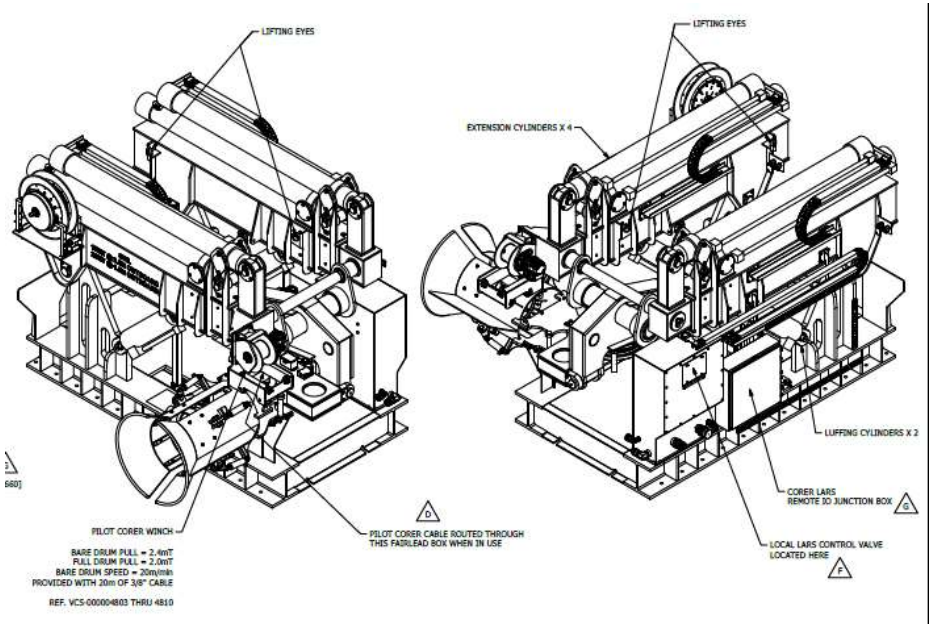
Upper

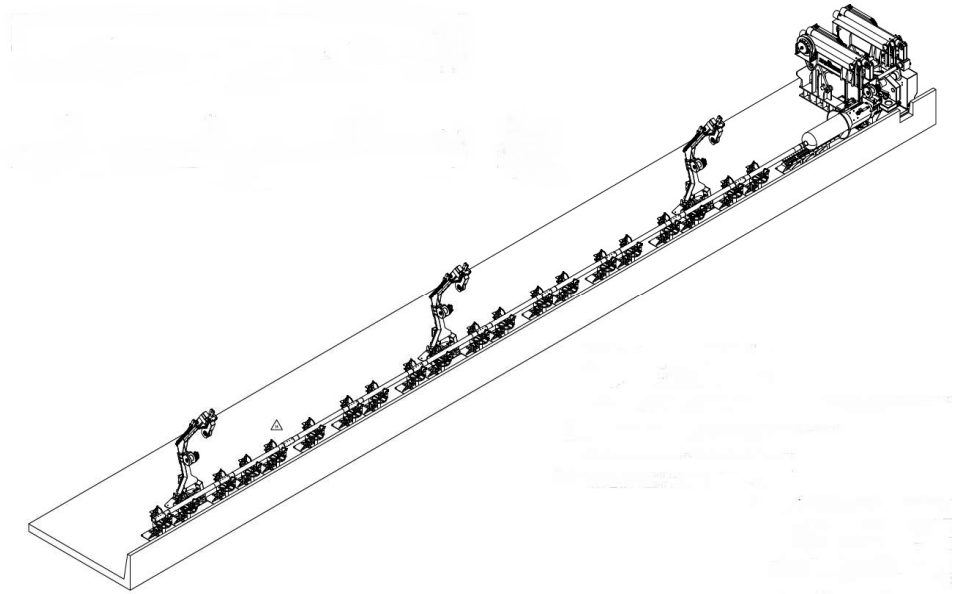


Lower

Piston Coring System

- 30m max core capability
- Modular Coring LARS
- Modular Coring Davits and stands





HAWBOLDT INDUSTRIES
Custom-Engineered Marine Equipment

OOSV Production Progress – SOC 50 – BF014

Aft Working Deck and Secondary Crane Pedestal

OOSV Build Update

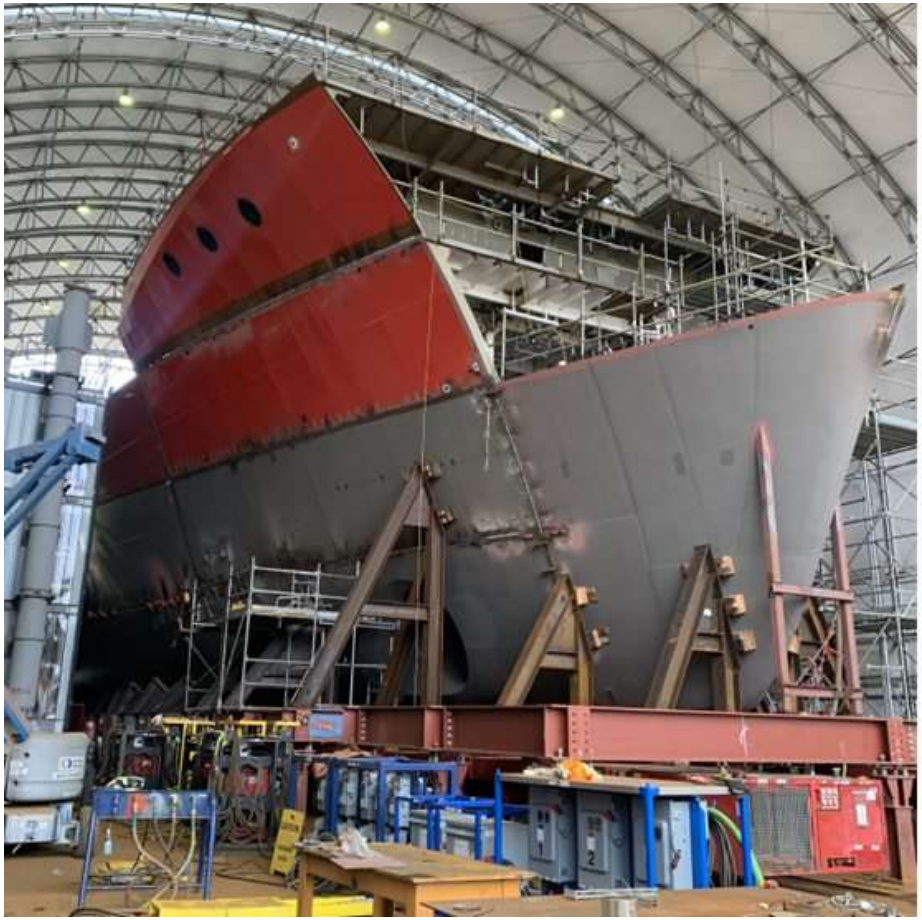
OOSV Bridge Layout

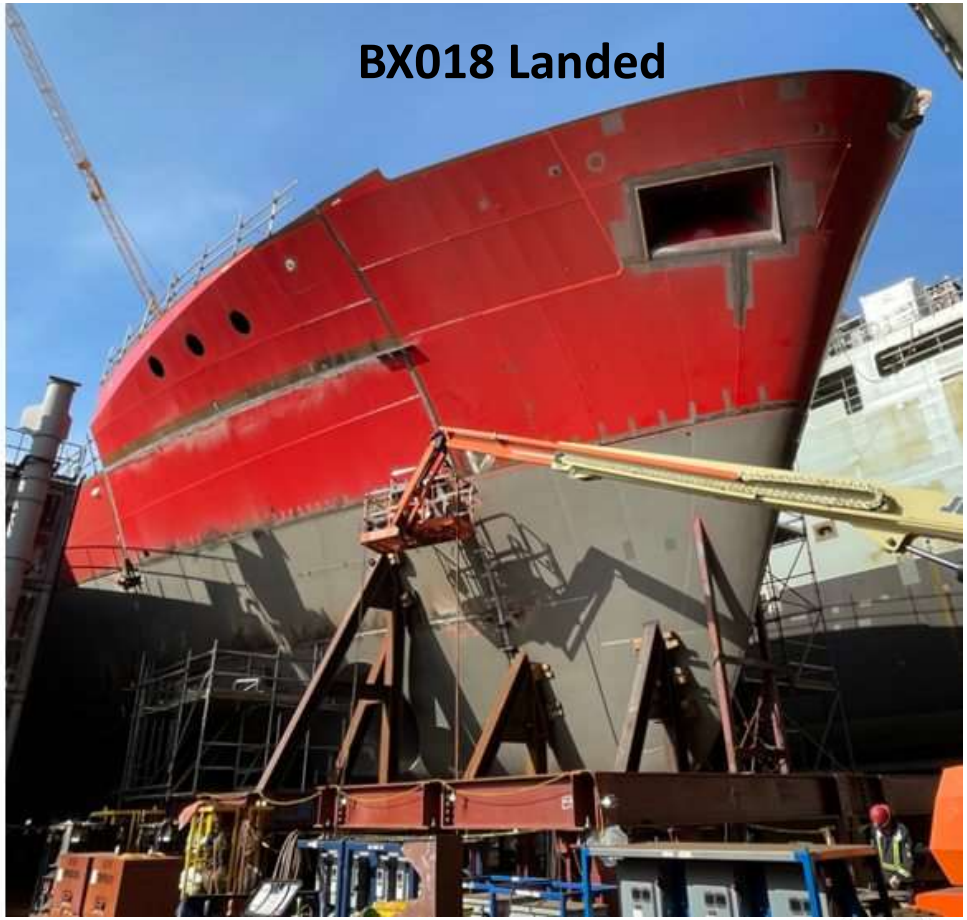
OOSV Production Progress – SOC 75 Outfitting

Port Section of Main Switchboard

OOSV Production Progress – SOC 70 Load Out

OOSV Production Progress – SOC 70 – RX442



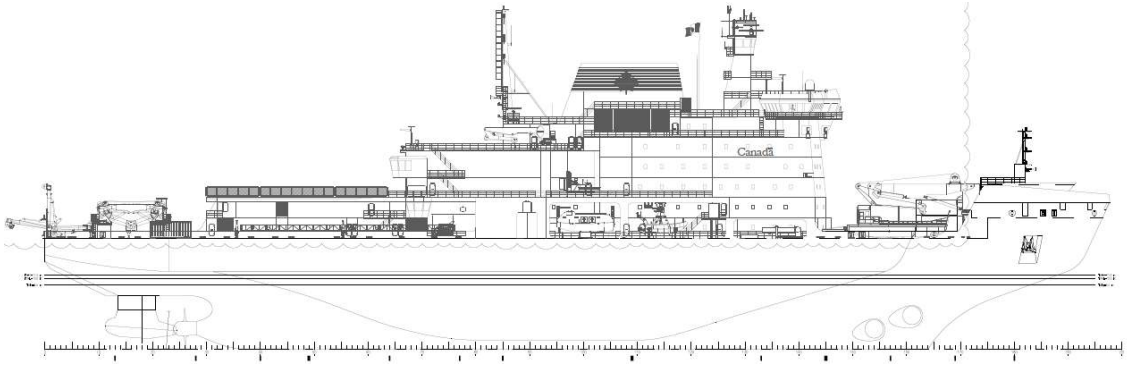


OOSV Production Progress – BF039 & BF041

Pre- and Post- Blast & Paint

Polar Icebreaker – 2 Vessels

- Vessel Specifications
  - Length: 158.2m
  - Breadth: 28.0m
  - Displacement: 25,850t
  - Cruising Speed: 18 kts
  - Endurance: 270 days – full compliment
  - Complement: 100 Persons
  - Science: 40 Berths
  - Ice Class: PC2 (planned)



Replacement for the Louis St Laurent

Polar Icebreaker Update

The Polar Icebreaker design is currently being finalized by Vancouver Shipyards

Milestone	Date
Functional Design Complete	Spring 2024
Full Rate Construction	Spring 2025
Production Design Complete	Fall 2025
Vessel Launch	Spring 2029
Vessel Delivery	Winter 2030

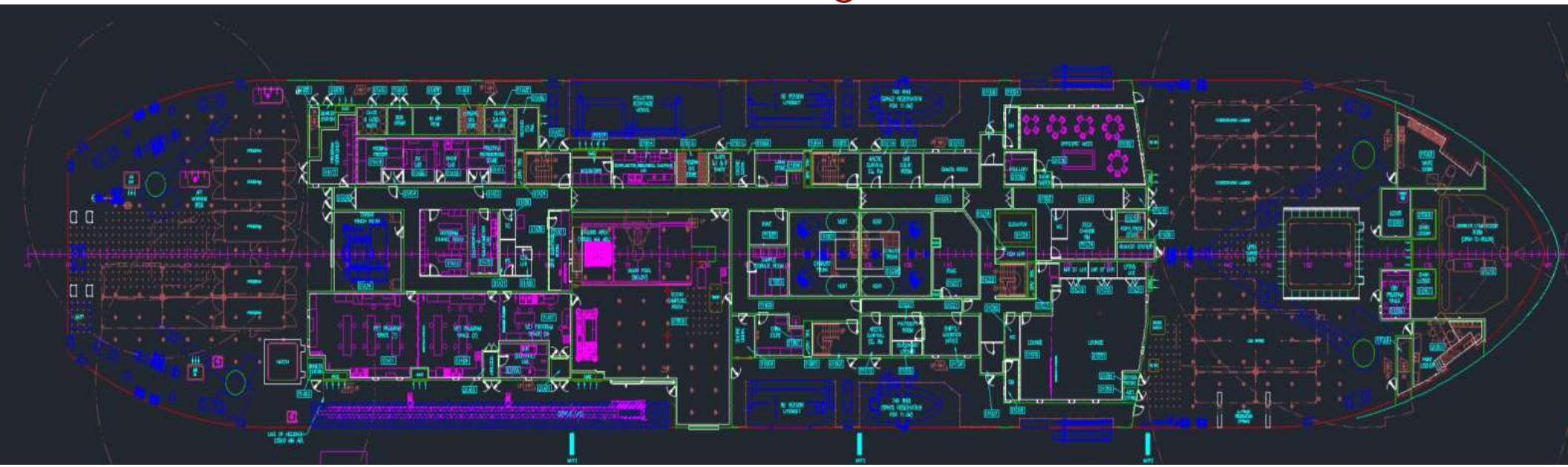
Polar Schedule

- Vessel Inherent Systems
  - Moon Pool – 4.4m X 4.4m
  - 2 Winch Rooms:
    - 2 O-Winches
    - 3 EM Cable Winches
    - 1 Hydro Wire Winch
    - 1 CTD Winch
  - Large Ocean Sampling Room
    - With an Inherent ROV Winch
  - ~850m² of Lab Space
  - 30m Piston Core Capability
  - Primary Program Store - ~189m²
  - Stern A-Frame
  - Forward Deck Side A-Frame
  - Port and Starboard Cranes on Forward and Aft Decks
  - Can Carry 2 Cyclone Helios

Current Working Design

Profile

Main Working Deck



Arctic Offshore Patrol Ship – (AOPS)

Particulars

- Length: 103.6m
- Breadth: 19m
- Displacement: 6615t
- Speed: 17 kts
- Range: ~6800nm
- Compliment: 57
  - Science: 25
- Ice Class: PC5

AOPS Labs and Equipment

- Vessel will have ~298m² of In situ Lab Space consisting of:
  1. General Purpose Lab
  2. Acoustics Lab
  3. Chemical Lab
  4. Ocean Sampling Room
  5. Ocean Sampling Computer Lab
  6. Sea Water Sampling Lab

Deck Equipment

- 25mt Main Crane with 3 Winches
- Oceanographic Winch
- A-Frame – 20mT (Same as OOSV)
- Single Boom CTS LARS in OSR
  - Will still operate with CTD 322 wire and Hydro wire

* Work deck is small on the vessel so it will limit some Science ops like coring

Near Shore Fisheries Research Vessel – (NSFRV)

Particulars:

- Length: 28m
- Beam: 9.3m
- Installed Power: 1505kW

Primary Programs:

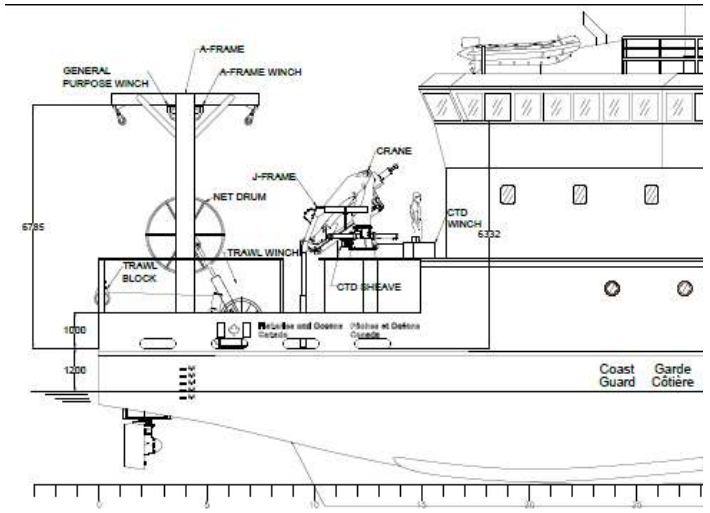
- Fisheries Research
- Ocean Science
- Habitat Management & Environmental
- Hydrography (potential mission)

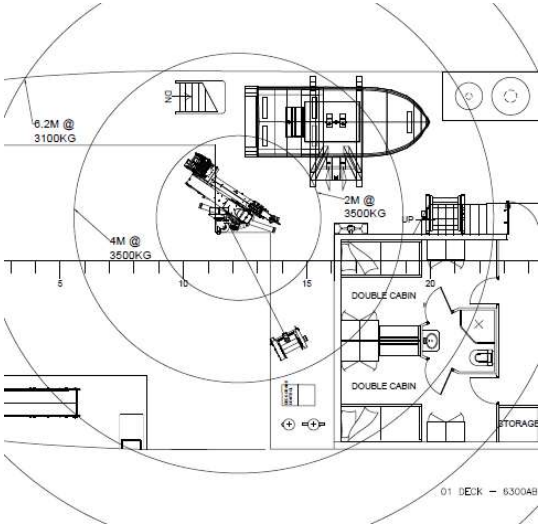
Main Design Goals

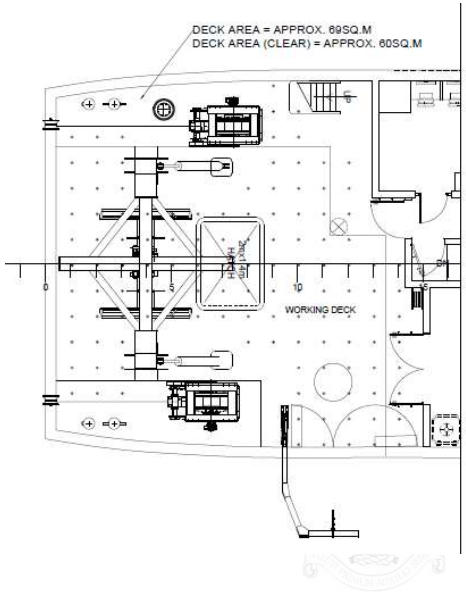
- Improve seakindliness of vessel.
- Improve on wheelhouse arrangement.
- Improve on accommodations
- Highly functional and integrated working deck and equipment
- Green vessel

Working Deck

- 69m² of deck space with deck sockets
- Stbd J-Frame – 1T SWL
- CTD Winch – 1.5 tonne mid drum
- A-Frame with net drum – 5 tonne SWL
- 2 trawl winches – 15 tonne mid drum
- Crane – 1740kg @ 10m

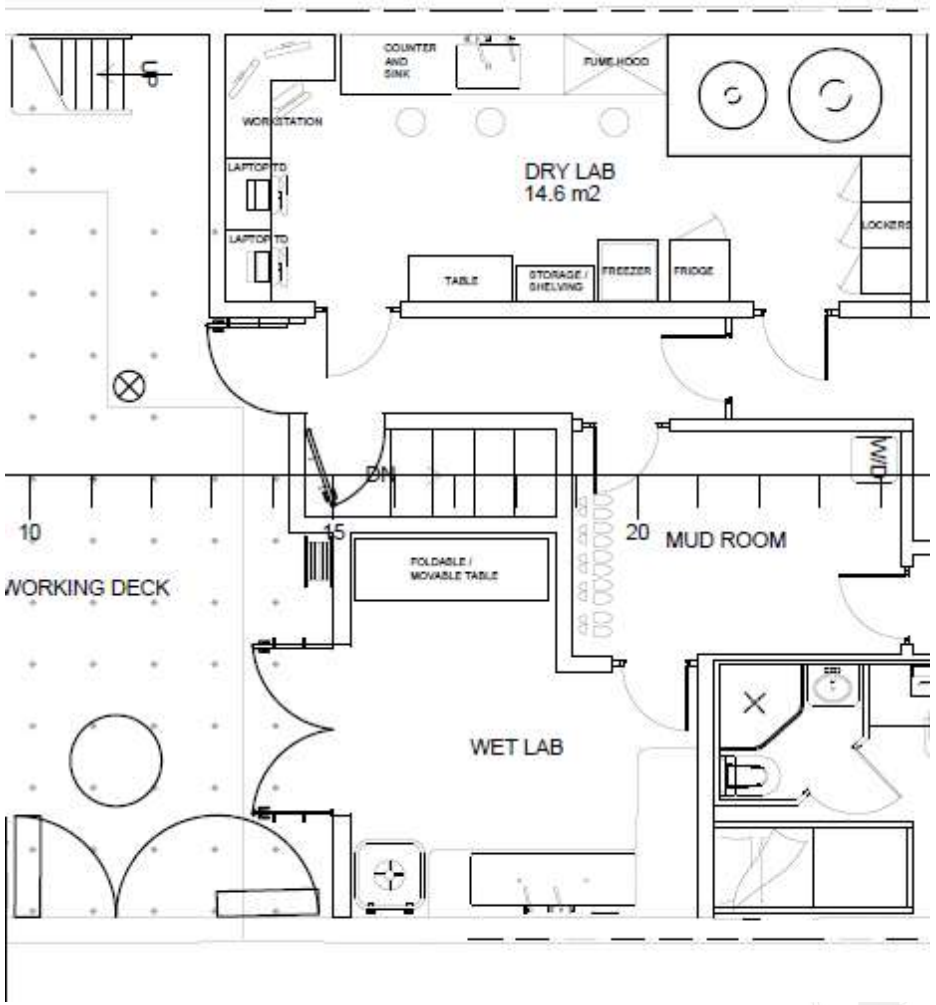






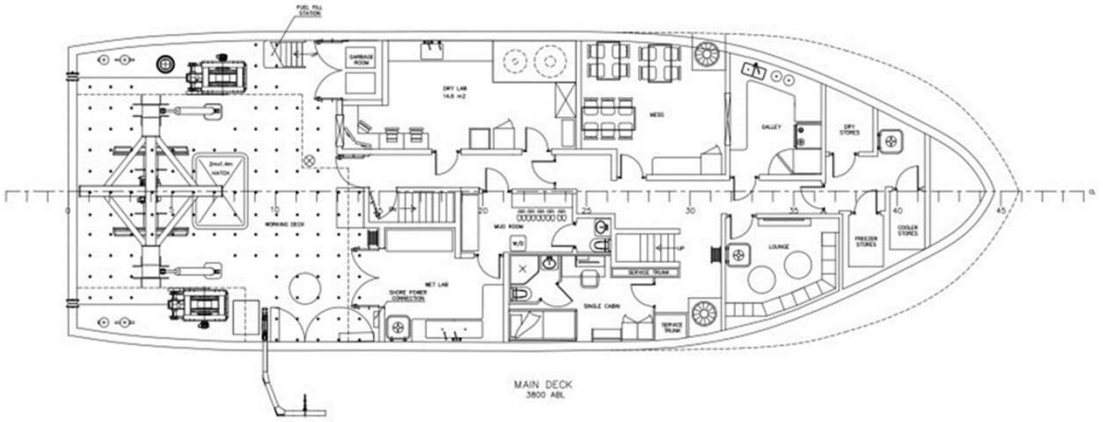
Lab Spaces

- ~25m² of Lab Space
- Fume hood in Dry Lab
- Live catch system
- Science seawater system
- Built in workstation for sampling systems
- Located adjacent to the work deck

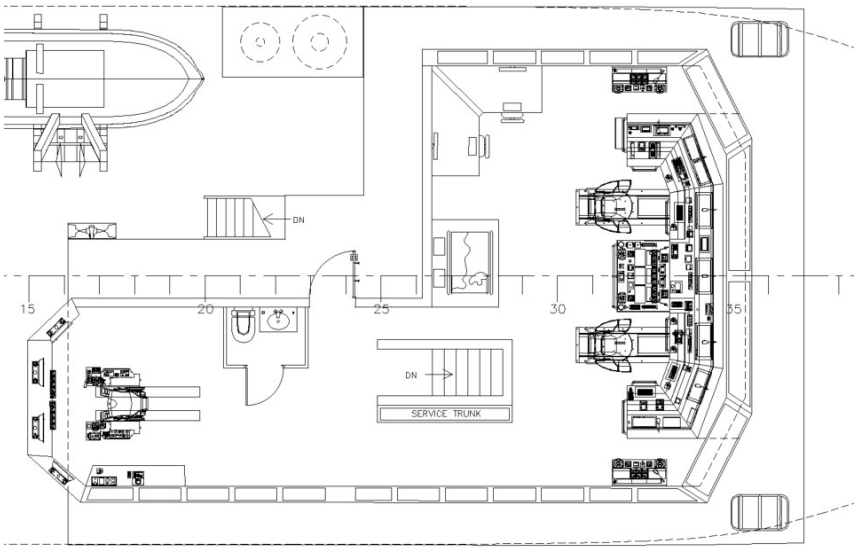


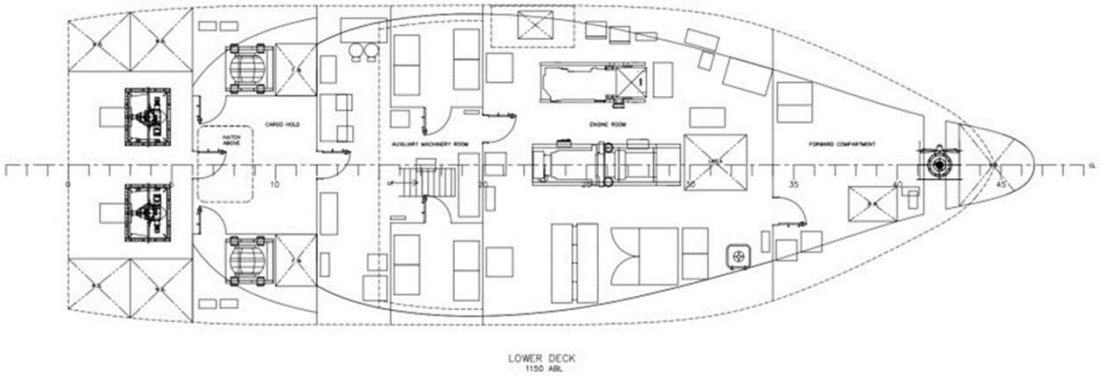
In-house Design

- Compliment: 11
  - Science: 6
- Cruising Speed: 9 knots
- Endurance: 14 days



Improved Bridge Layout





Green Technology

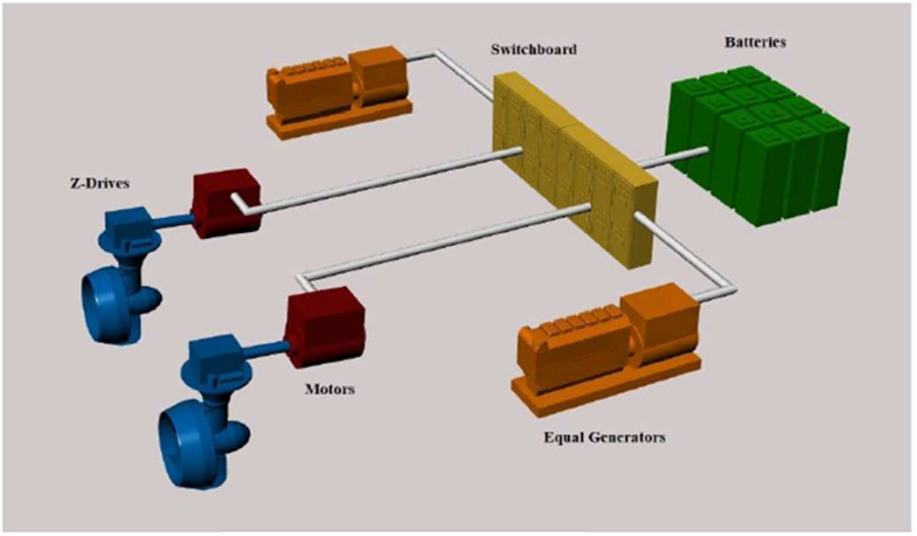
- Highly efficient hullform but always other requirements (open water vs icebreaking vs sea kindliness vs maneuverability…)
- Rationalize power required keeping as low as possible.
- Maximum number of "quantums" of power, numerous small engines vs 1 large engine
- Look to for ways to capture "lost power" (braking, heat loss, running engines at inefficient power levels
- Focus is the reduction of CO2 emissions using alternative fuels
  - Currently testing the use of Biofuels on some vessels in current fleet

For green vessel, main metric is fuel usage.
Less fuel = less emissions

Green Tech - Continued

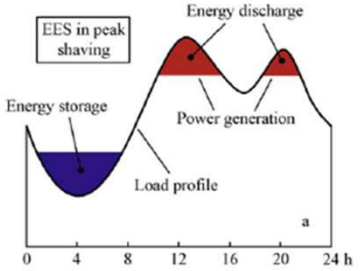
DESIGN OBJECTIVES & REQ.

- Operational Requirements
- Crew Comfort
  - Silent Overnighting (min. 8 hours)
- Government Directives
  - Emission Reduction and Net-Zero Transitions
    - Zero Emission Operations
      - Battery Electric Science Operations
      - Battery Electric Local Harbour Operations
      - Battery Electric Transit Operations



OPTIMIZING POWER PLANT

- Load Leveling
- Peak Shaving
- Spinning Reserve



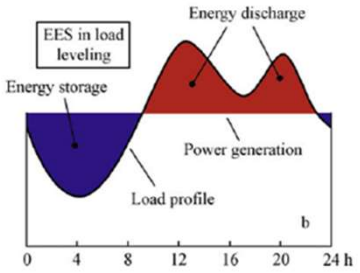


Figure 4: Peak Shaving vs. Load Leveling

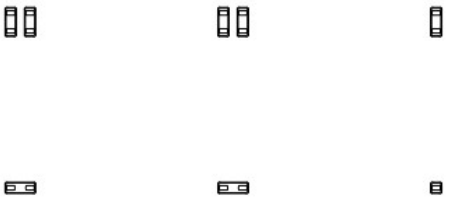
Modularity

- CCG as part of new vessel design, is including the ability to utilize the vessels for more programs through a modularity approach
  - **Standardize the ship and modify the payload**
  - This will allow non-primary science vessels to have the ability to cover off science missions when needed
  - Implement standard interfaces across projects

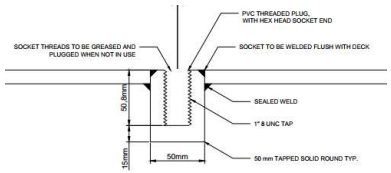
Standard Module Interfaces

- ISO 668 compliant Twist Lock Sockets in full and ½ TEU pattern on working deck
- Bolted Deck Sockets – Where the area is too constrained for twist locks or containerized approach is not desired
- Implementation of convertible Multipurpose Spaces inherent to the vessel and close to working deck
- Standard fittings for container services, ships systems, LAN connections, electrical services, etc.

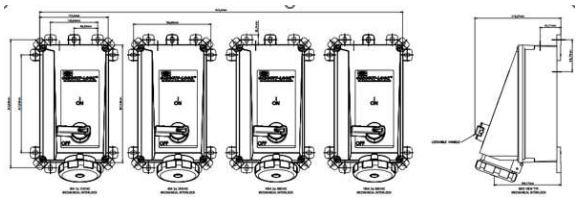
Twist Lock Pattern



Deck Sockets

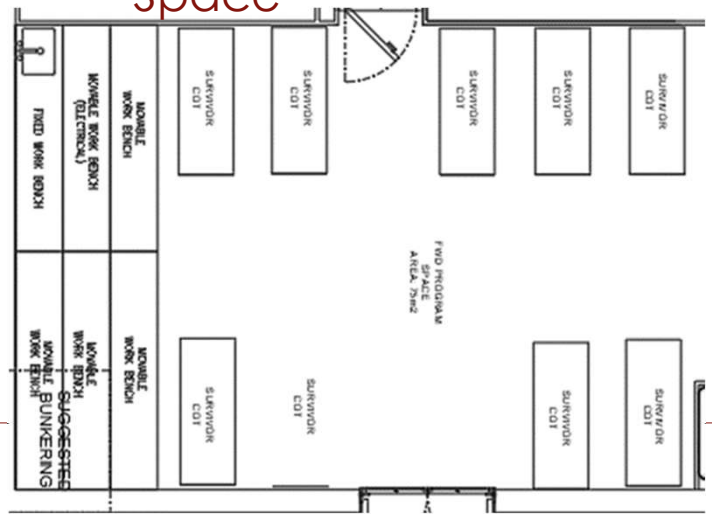


Power Supplied



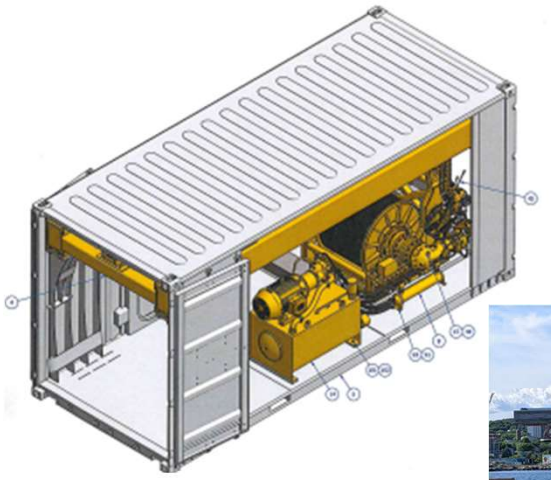
- Supplied Voltages and Currents
  - 120VAC / 30A / 1Ø
  - 120VAC / 60A /1Ø
  - 230VAC / 60A / 3Ø
  - 440VAC / 60A / 3Ø
  - 440VAC / 100A / 3Ø
  - 440VAC / 200A / 3Ø
  - 600 VAC / 100A / 3Ø

Converted Space

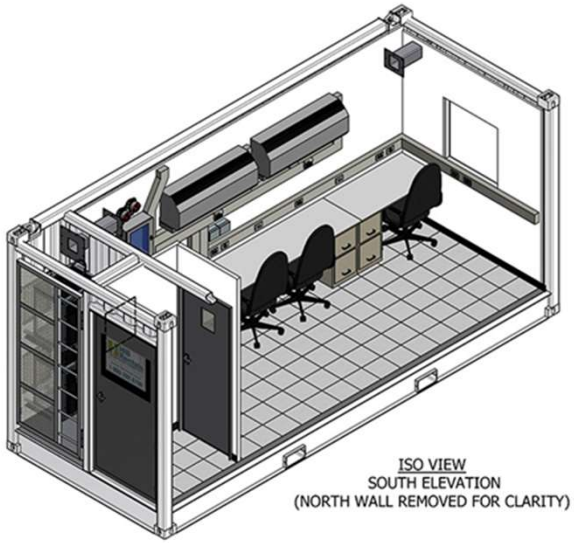


Containerized LARS Systems and Labs

- Would utilize containerized systems and Lab spaces to fulfill science missions



- The project will not be considering Portable Sleeping Accommodation Modules/Hoteling
  - Due to extensive risk to personnel and vessel systems design



Thank You

Questions


Canada