CCG Vessel Procurement – Engineering Support

New Vessel Design and Build Update
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 Shipyards – 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
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

PART ONE
CCG IN-HOUSE CAPABILITY

MISSION ANALYSIS
- Operational Scenarios
- Indicative Requirements

REQUIREMENTS VALIDATION
- Baseline Requirements
- Vessel Concept

SOLICITATION FOR DESIGN WORK

PART TWO
CONTRACTED CAPABILITY

VESSEL DESIGN
- Design Milestones

VESSEL CONSTRUCTION
- Construction Specification

ACCEPTANCE

Technical Data Package

OR = Operational Requirements
FR = Functional Requirements
DP = Design Parameters

- PROJECT PLANNING
- DEVELOP MSN STMT
- DEVELOP REQUIREMENTS
- CONCEPT EXPLORATION
- CONCEPT DEVELOPMENT
- COST ESTIMATION
- FEASIBILITY STUDIES
- OPTIONS ANALYSIS
- ENGINEERING ANALYSIS
- APPROVALS
- DESIGN GUIDANCE

- CONTRACT AWARD
- DESIGN DEVELOPMENT
- DESIGN REVIEW
- DESIGN APPROVALS
- DESIGN ACCEPTANCE
- CHANGE MGMT
- TECH INSPECTION
- QUALITY ASSURANCE
- SEA TRIALS
- VESSEL ACCEPTANCE
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 Azimuthing Thrusters – Schottel SRP 510 – 1600kW each
  - Fixed pitch propellors
- Single Tunnel Bow Thruster
  - Schottel StTT4
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
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
Piston Coring System

- 30m max core capability
- Modular Coring LARS
- Modular Coring Davits and stands
Aft Working Deck and Secondary Crane Pedestal
OOSV Bridge Layout
OOSV Production Progress – SOC
75 Outfitting

Port Section of Main Switchboard
OOSV Production Progress – SOC
70 Load Out

BF049 – Seismic Compressor Compartment
OOSV Production Progress – SOC 70 – RX442

BX018 Landed
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
The Polar Icebreaker design is currently being finalized by Vancouver Shipyards.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
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<tbody>
<tr>
<td>Functional Design Complete</td>
<td>Spring 2024</td>
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<tr>
<td>Full Rate Construction</td>
<td>Spring 2025</td>
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<tr>
<td>Production Design Complete</td>
<td>Fall 2025</td>
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<td>Vessel Launch</td>
<td>Spring 2029</td>
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<tr>
<td>Vessel Delivery</td>
<td>Winter 2030</td>
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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
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.
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