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VARD™

a Fincantieri company

Design of the Chilean Antarctic Vessel

Arctic Passion Seminar, Mar 2018

By Dan McGreer, Vard Marine

Overview

- Vard Marine
- Chilean Navy Requirements
- Design Development
 - Hull Form & Structure
 - Ship Arrangements
 - Machinery
 - Winterization

Vard Marine

- Naval architecture and marine engineering company, established in Vancouver, Canada in 1983
- Subsidiary of VARD Group AS in Norway, part of Fincantieri



Vancouver, BC



Houston, TX



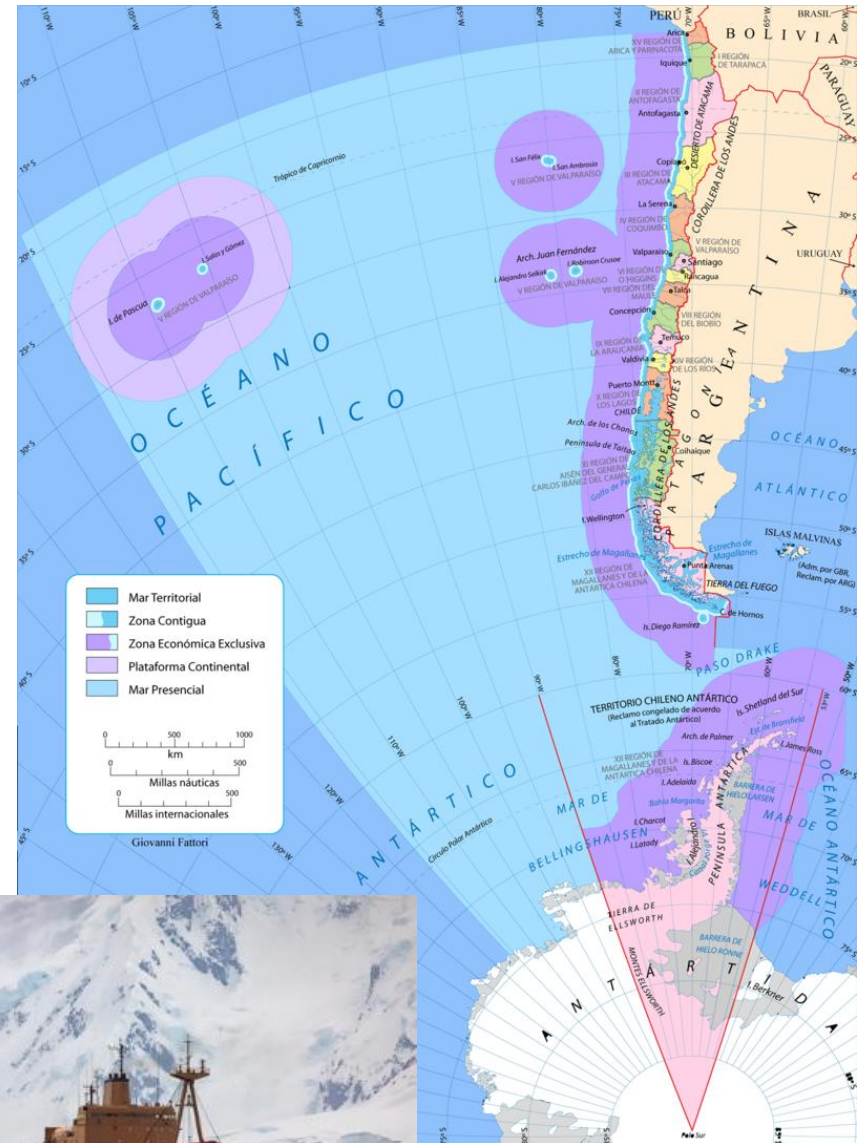
Ottawa, ON

Vard Marine

- Vard Marine (VARD) has a long history working with Aker Arctic as we were part of the same shipbuilding group for over 30 years.
- VARD designs icebreakers and ice-capable ships for government and commercial clients worldwide.
- Our design work is supported by research and development into many aspects of ice operations and operability.
- VARD staff have provided input into the IMO Polar Code, the IACS Unified Requirements for Polar Class, and Arctic Council initiatives.

Chilean Requirements

- Replace and enhance the capabilities of the *Contraalmirante Oscar Viel Toro* (ex-CCGS *Norman Mcleod Rogers*)
- Undertake logistic support, science, SAR and other missions in the Antarctic and Southern Ocean
- Operation for at least 8 months/year around Alejandro 1 Island



Project Responsibility

ASMAR shipyard has responsibility for delivery of the project.

ASMAR is a state owned company, and builds and repairs government and other vessels for domestic and export clients.

The yard developed the initial ship performance and technical specifications as basis for design competition.



Design Development

Contract awarded to VARD
February 2016

Chile re-baselining of
performance requirements led to
an initial phase of concept
redefinition, slight increase in
contract duration

Announcement of the project by
the President of Chile and steel
cutting 2017

Design work essentially complete
by October 2017

VARD is continuing to assist
ASMAR with project
implementation



Hull Form and Structure

Requirements based on area and season of operation

VARD developed operability plots based on ice chart data and IMO POLARIS system to confirm:

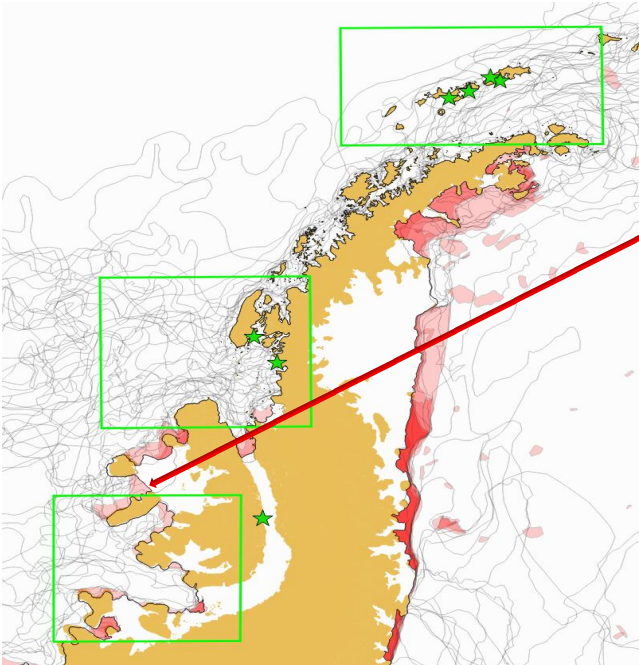
- Icebreaking performance requirement
- Ice class (ice strengthening)
- Temperatures (PST) also checked against environmental data

Operability Analysis

Late June

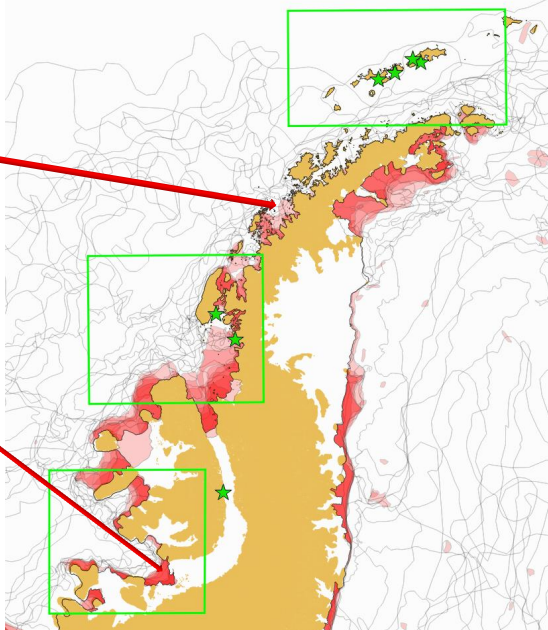
Early November

areas with access risk highlighted



1 year (12.5%)

8 years (100%)

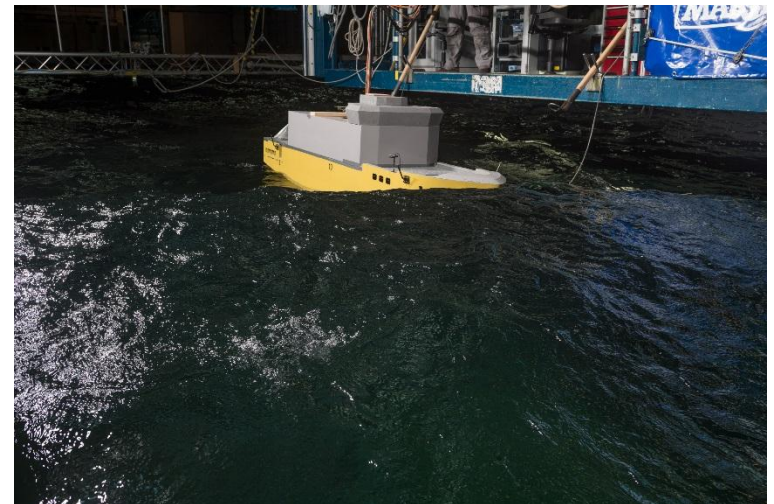
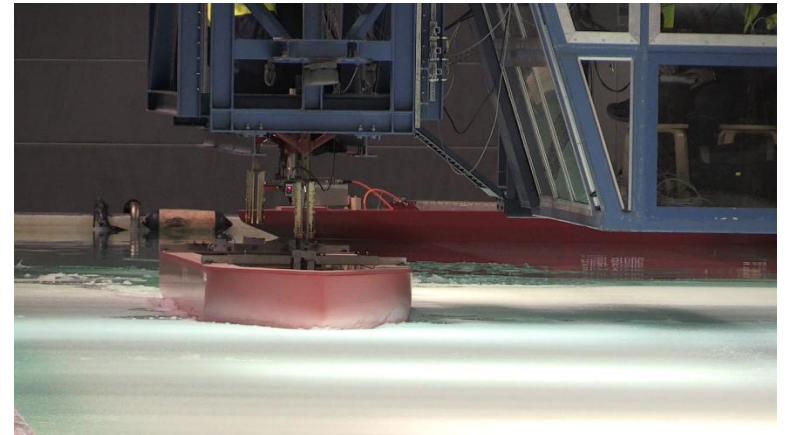


Hull Form

Aker Arctic supported VARD in the design of the hull form, model tests and some specific ice class design solutions.

The hull form development included:

- Twin screw & rudder
- Balanced icebreaking and open water performance
- CFD analysis
- Model testing in ice (Aker Arctic), open water (SSPA) and severe seakeeping (MARIN)

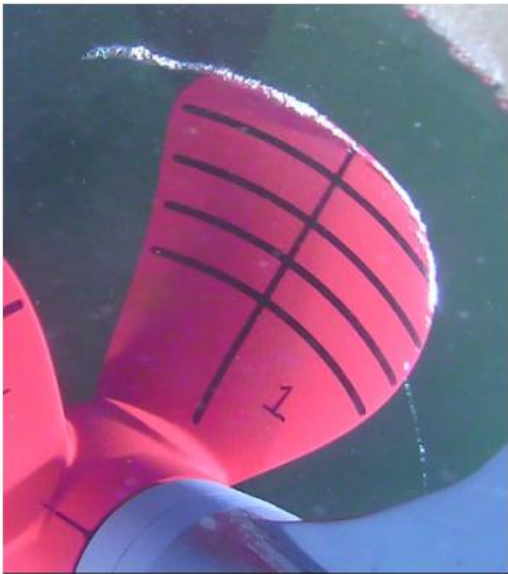
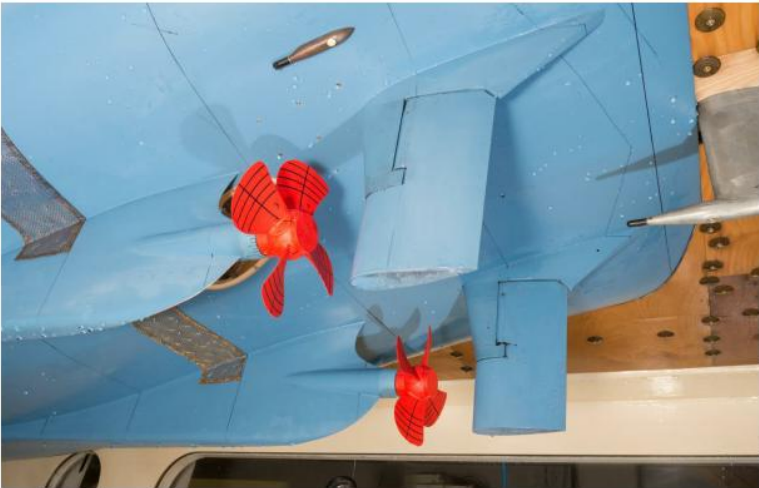


Radiated Noise Requirements



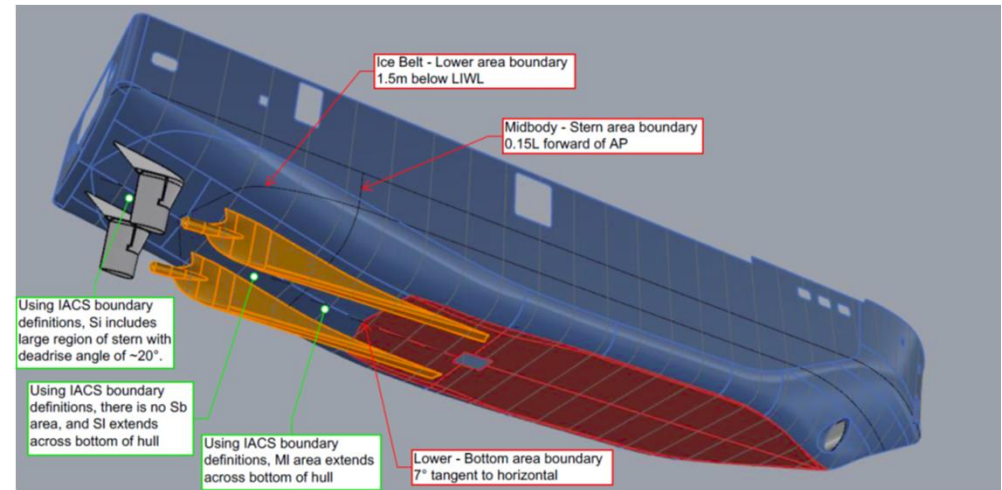
Designed to meet DNV Silent – A

Cavitation and Noise Tests at SSPA in their Cavitation Tunnel

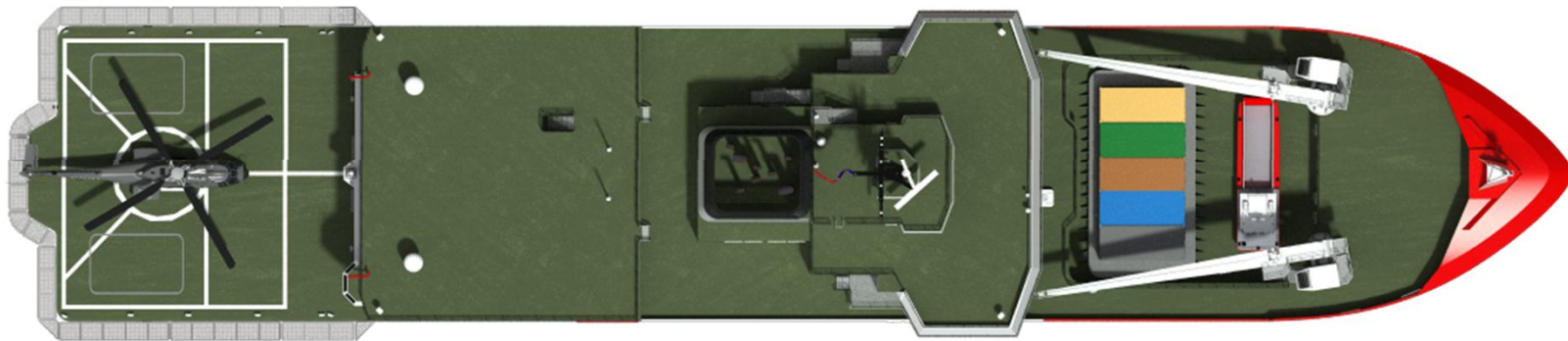


Structure

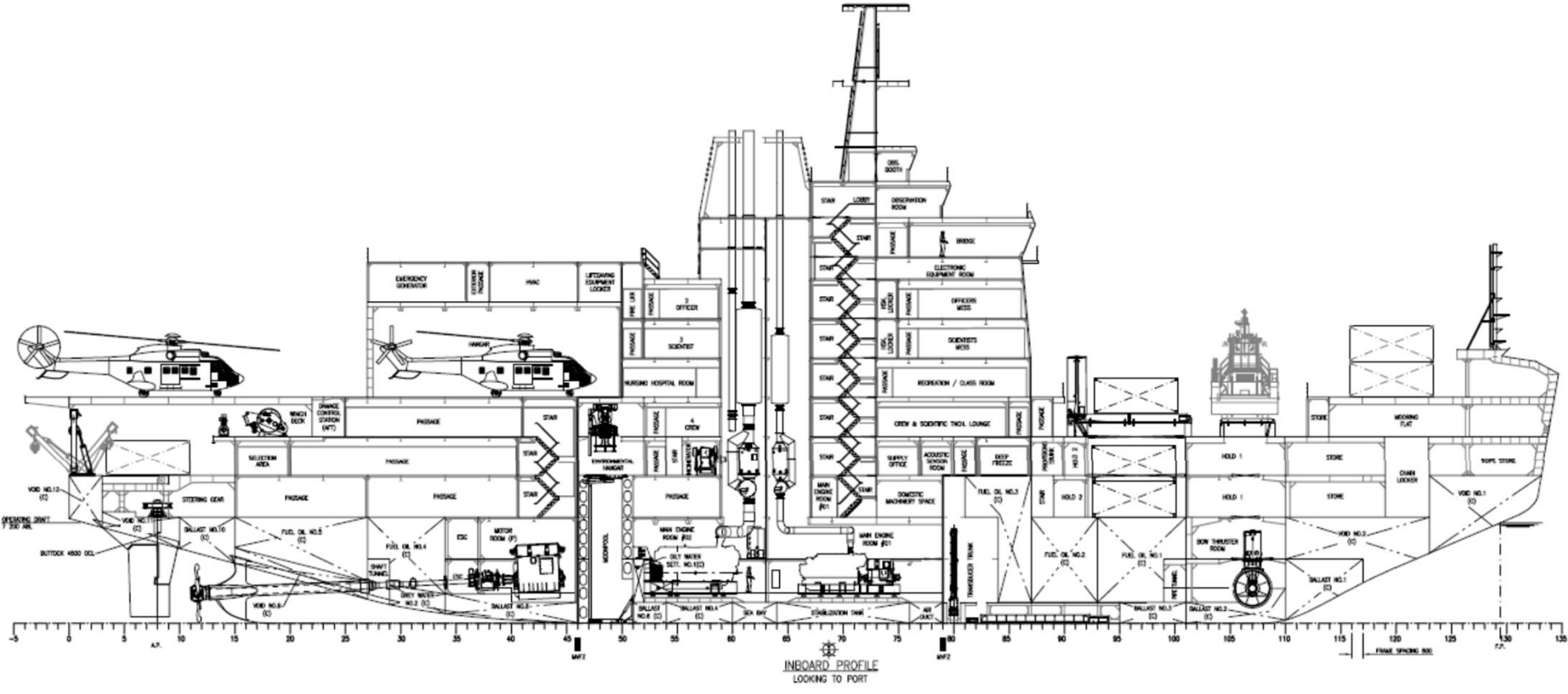
- PC 5 ice class; issues of interpretations for LR/IACS requirements
- EH 36 steel in ice belt
- Fincantieri provided advice on producibility issues, based on recent experience with Norwegian Kronprins Haakon



Ship Arrangement



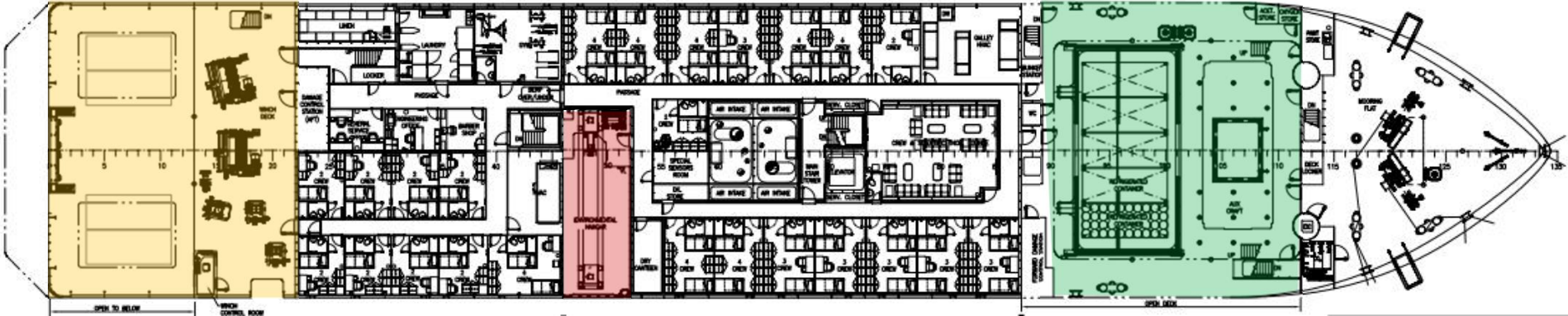
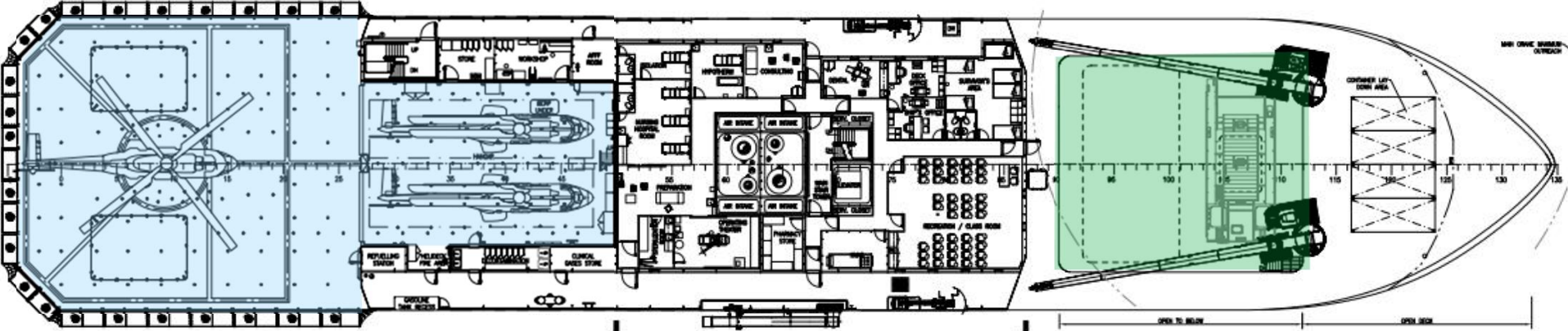
Ship Arrangement



Ship Arrangement

Flight Deck and Hanger

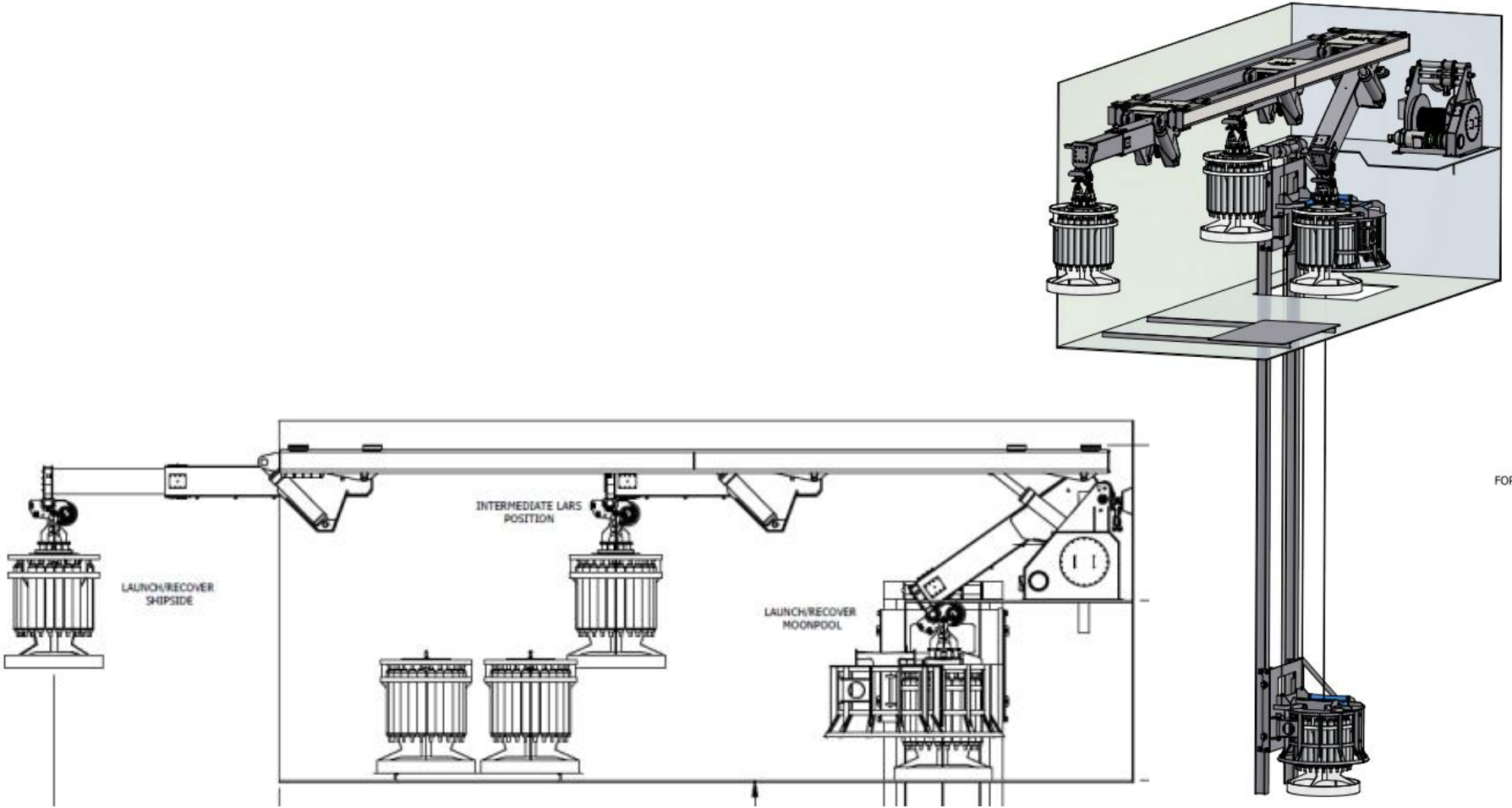
Fwd. Cargo Hold



Aft Working Deck

Environmental Hanger

Environmental Hanger and Moon Pool

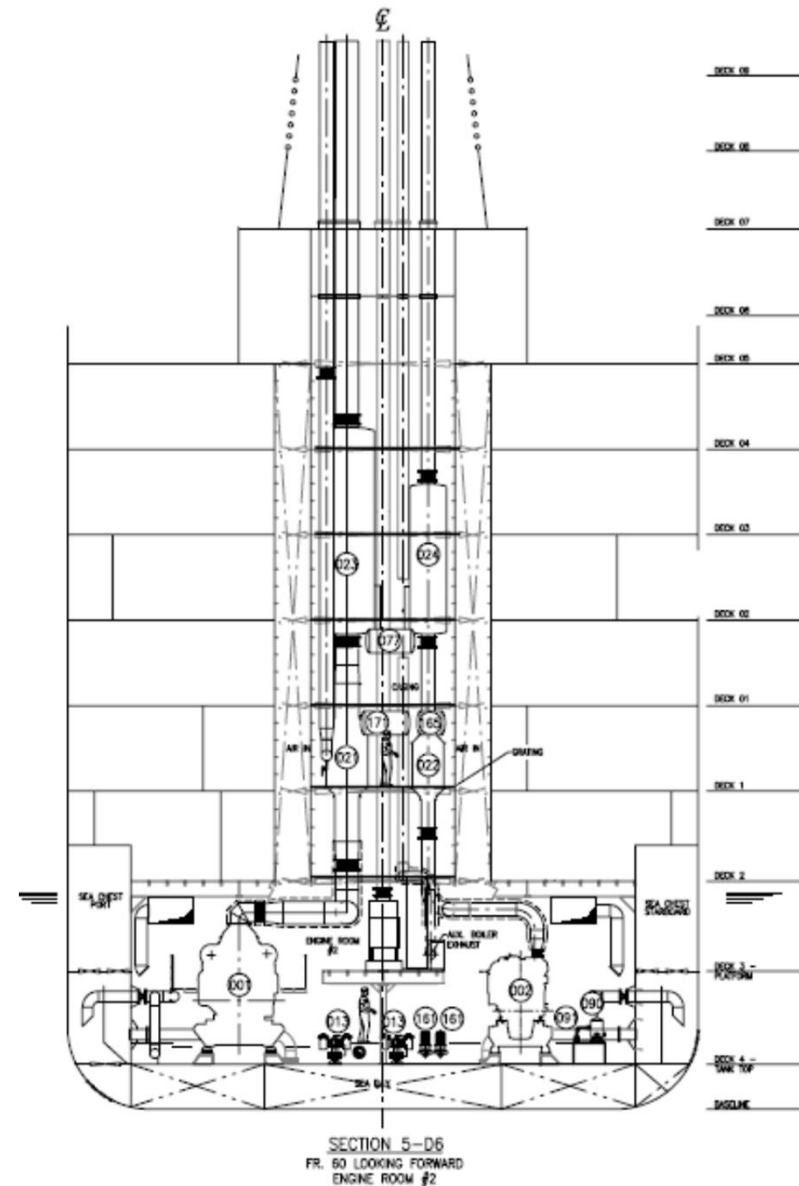


Main Machinery


- Complex set of operational requirements including:
 - Icebreaking
 - Open water transit and missions
 - Dynamic positioning for science, etc
 - Periods alongside/at anchor for logistics
- Environmental performance very important in sensitive areas – TIER III compliance
- Reliability/redundancy for remote operations

Power Plant

- Diesel electric, GE system – 690 VAC
- 2 x large, 2 x smaller GE Diesels for IEP, plus emergency generator
- Extensive fit for heat recovery
- 2 x 4.5 MW propulsion motors
- 2MW Bow thruster



Winterization

- Additional input from Aker Arctic.
- Extensive “structural” winterization – equipment below deck or sheltered; not like this 
- Careful design of seabay and sea chests.
- Tank heating for tanks exposed to low temp; vent protection.
- Particular care in critical aspects for escape, evacuation and rescue
- Pragmatic use of deck heating and trace heating.
- Steam and manual systems for de-icing of other areas.



The Ship



MAIN PARTICULARS

Length overall	111.0 m	364'-2"
Length waterline	102.4 m	335'-11"
Breadth moulded	21.0 m	68'-11"
Depth main deck	10.6 m	34'-9"
Design draft	7.2 m	23'-7"

PERFORMANCE

Propulsion power	2 x 4,500 kW	2 x 6,034 hp
Max Speed	3.0 knots, 1.0m ice, 16.0 knots, Open Water	
Range	14,000 nm	
Endurance	60 days	

Thank you for your attention