

Defence R&D Canada (DRDC)

Mission: To provide a science, technology and knowledge advantage for Canada's defence and security

- 8 research centers located in 4 provinces
- 1,400 employees



S&T Portfolios



STRATEGIC DECISION SUPPORT - 00



NAVY - 01



ARMY - 02



AIR FORCE - 03



PERSONNEL - 04



JOINT FORCE DEVELOPMENT - 05

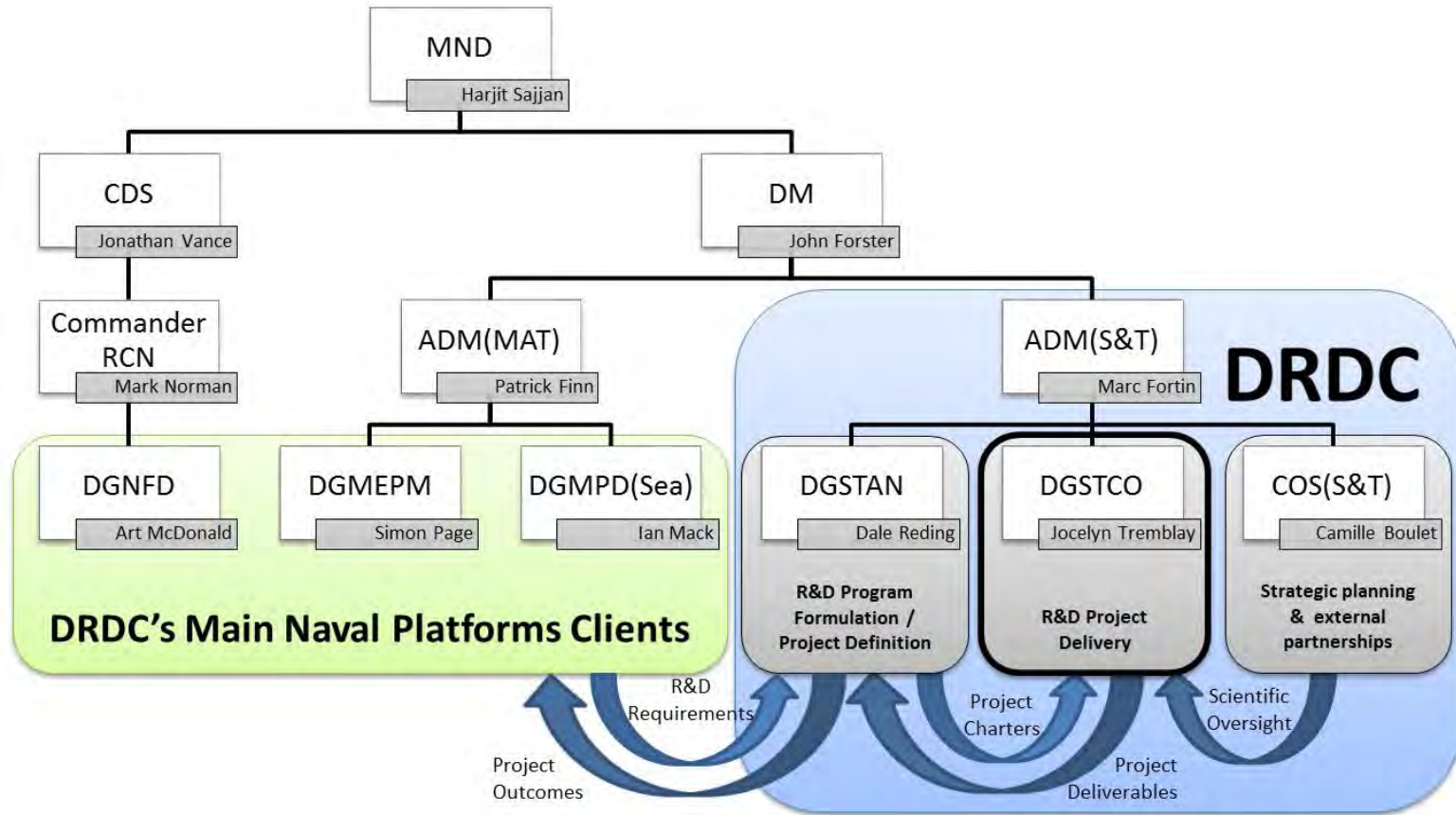


FORCE EMPLOYMENT - 06



PUBLIC SAFETY AND SECURITY - 07

DRDC within the Department of National Defence



Navy Portfolio Overview

DGSTAN: Dale Reding (Director General S&T Air and Navy)

- **N1 – Force Structure**
 - Composition of the future fleet and crewing factors
- **N2 – Above Water Warfare**
 - Anti-ship missile defence
- **N3 – Underwater Warfare**
 - Anti-submarine warfare in the littorals & torpedo defence
 - Naval mine countermeasures & CF diving
- **N4 – Maritime Information Warfare**
 - Tactical and navy-operational information management and situational awareness
- **N5 – Naval Platforms**
 - Effectiveness and safety of existing and future naval platforms



Naval Platforms Projects

- 01ea Fleet Transformation
- 01eb Ship Systems Readiness
- 01ec Ship Signature Management
- 01ez Direct Client Support
- DRDC liaison to PMO CSC, JSS and AOPS

Fleet Transformation Project

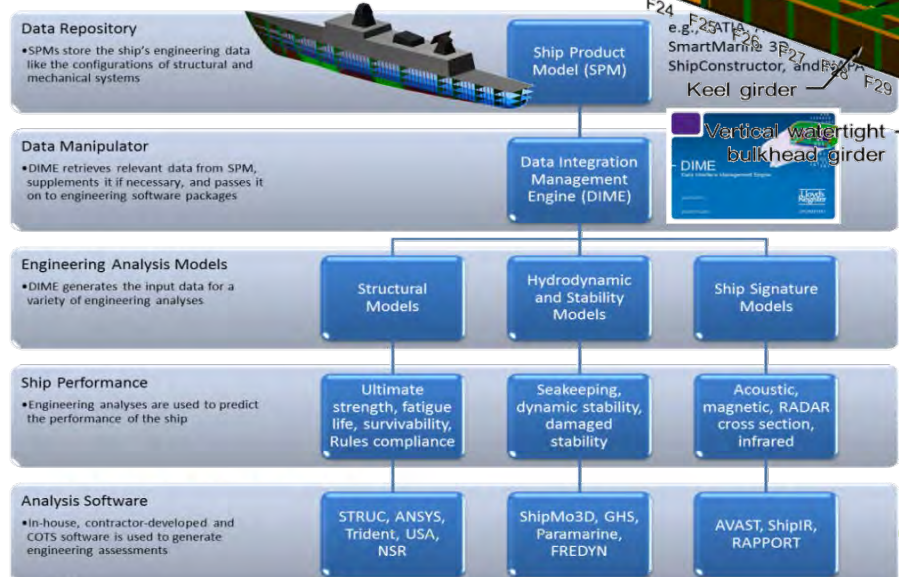
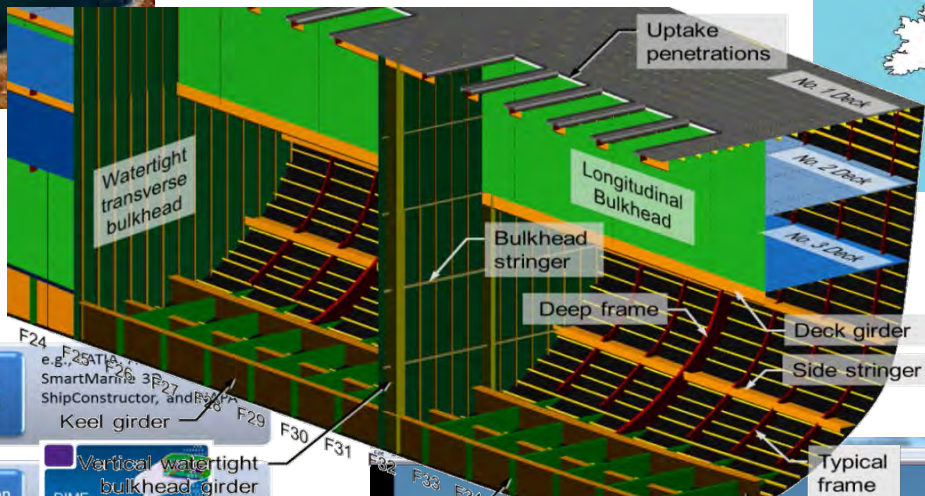
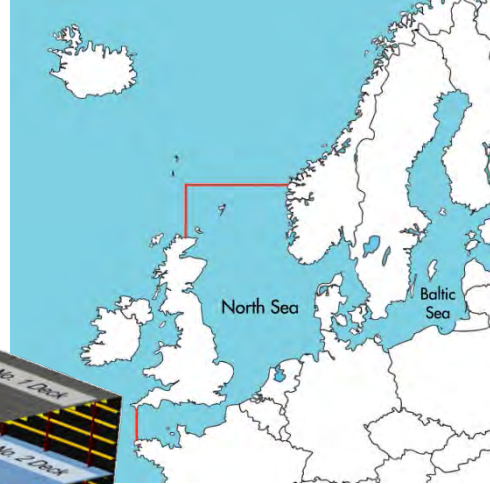
■ Objectives

- Mitigate the risks associated with the delivery of CSC, JSS and AOPS
- Develop capabilities for future Navy MCPs (e.g., amphibious vessel, submarines, UUVs, etc.)

■ Work Elements

- Integrated Platform Systems Evaluation
- Evaluation of Future Operations through Simulation
- Damaged Ship Survivability and Resilience
- Energy and Propulsion Efficiency
- Advanced Platform Concepts for the Fleet After Next
- Environmental Compliance





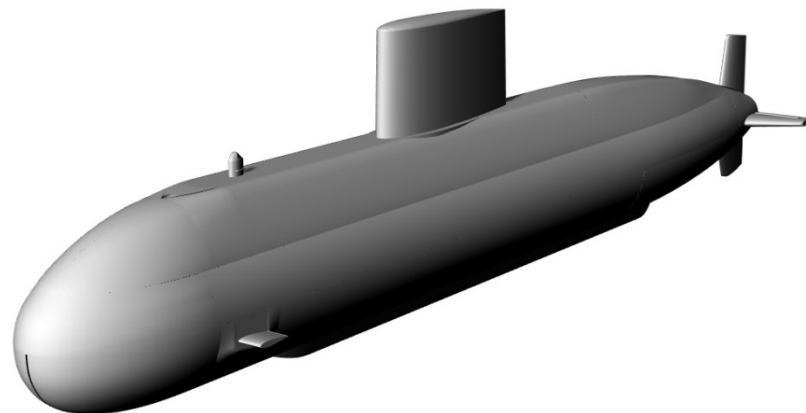
Ship Systems Readiness Project

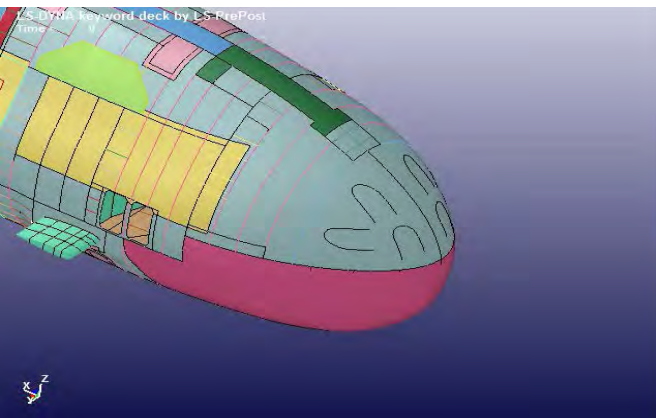
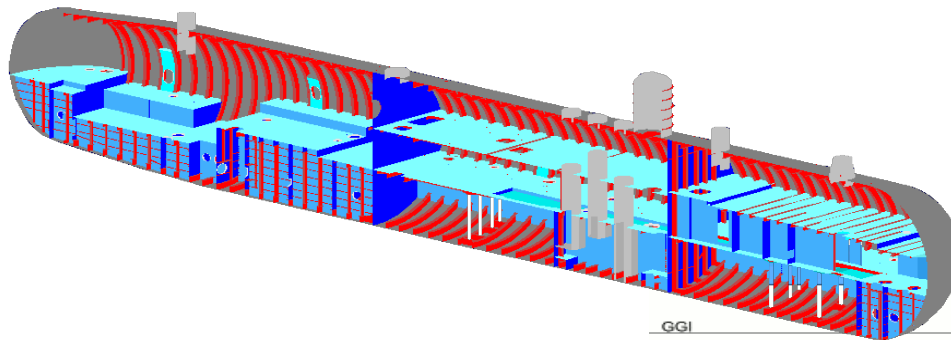
■ Objectives

- Support fleet operability
- Enable the Navy to exercise due diligence in operational safety

■ Work Elements

- Operator Guidance Systems
- Extreme Ship and Submarine Maneuvers
- Ship and Submarine Survivability
- Cost-Effective Through Life Maintenance (Including Additive Manufacturing)
- Current Fleet Support

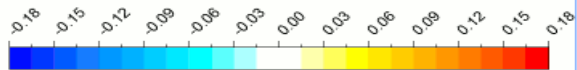




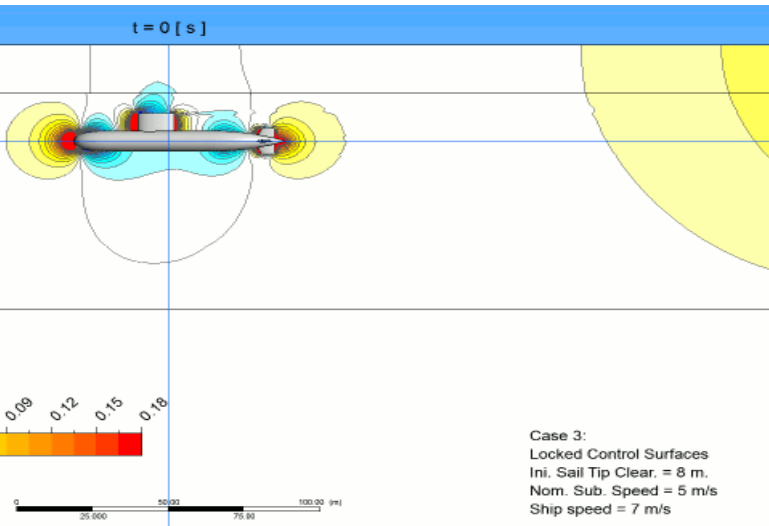
GGI

Initial Depth = 37.8 m.

Depth = 100 m.



$$C_p = \frac{P}{(0.5 \cdot \rho \cdot V^2) \text{ [m/s]}^2}$$



Case 3:
 Locked Control Surfaces
 Ini. Sail Tip Clear. = 8 m.
 Nom. Sub. Speed = 5 m/s
 Ship speed = 7 m/s



Ship Signature Management Project

■ Objective

- Prediction of acoustic, infrared, electro-magnetic, pressure, etc, signatures

■ Work Elements

- Onboard signature management system
- Composite propellers
- Propeller noise and cavitation
- Target echo strength prediction tools and materials

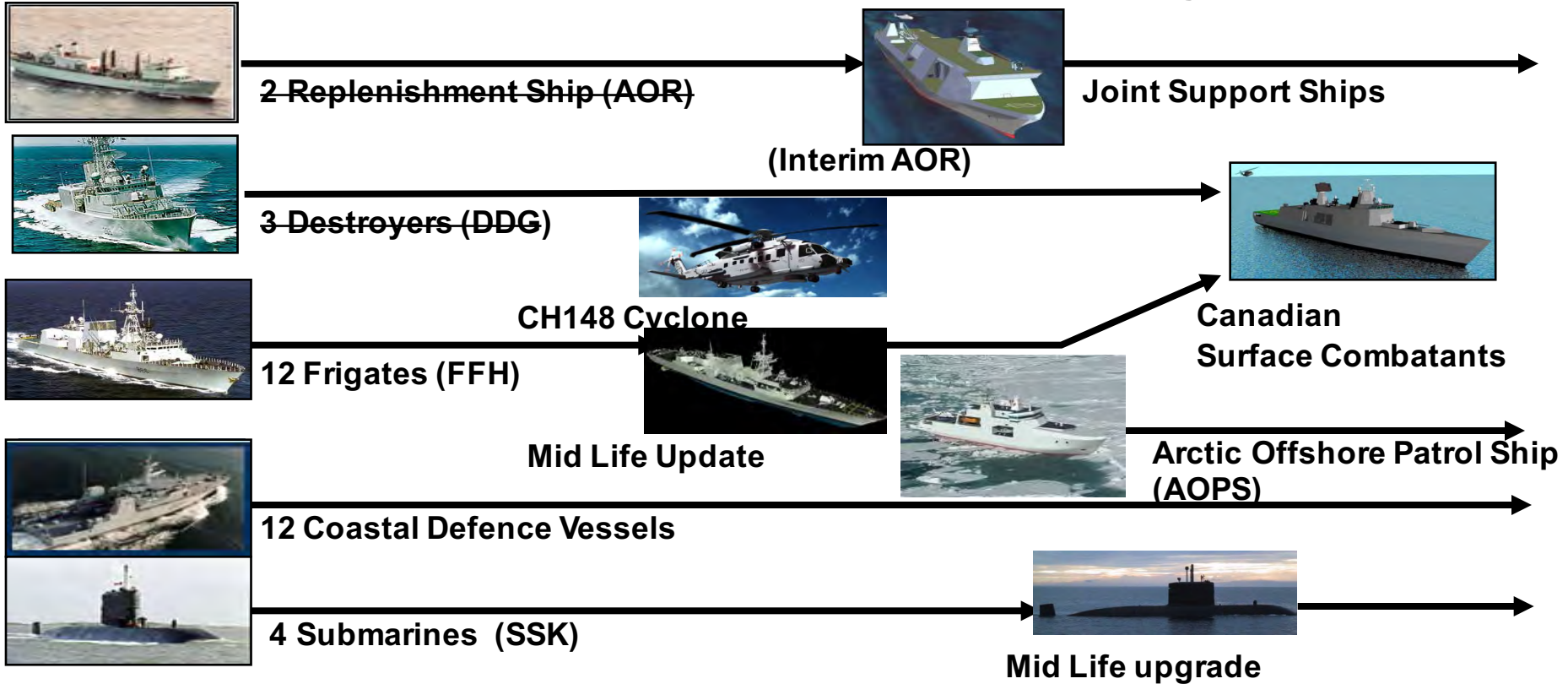


DRDC 'Risk Mitigation' Role to Navy and Maritime Air MCPs

- Undertaking studies to provide alternatives in project definition
- Developing 'achievable, measurable and affordable' requirements
- Providing means to 'measure' deliverables
- Assistance in 'acceptance' of deliverables
- Gateway to International and National Partners
- MCPs
 - Canadian Surface Combatant – CSC
 - Arctic Offshore Patrol Ship – AOPS
 - Joint Support Ship – JSS
 - Maritime Helicopter Project – MHP (Cyclone)
 - HALIFAX Class Modernization – HCM

Note that all work to date has been to support the Navy Project Management Offices, not the designers and builders directly

Canada's Current and Next Navy



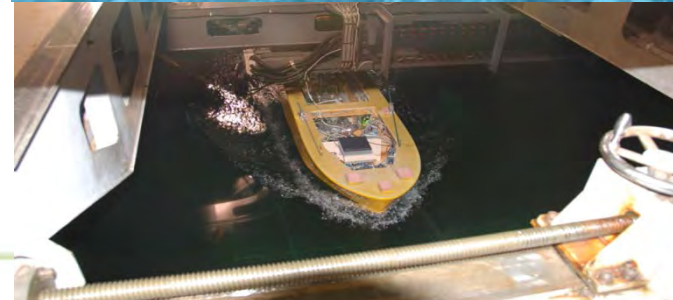
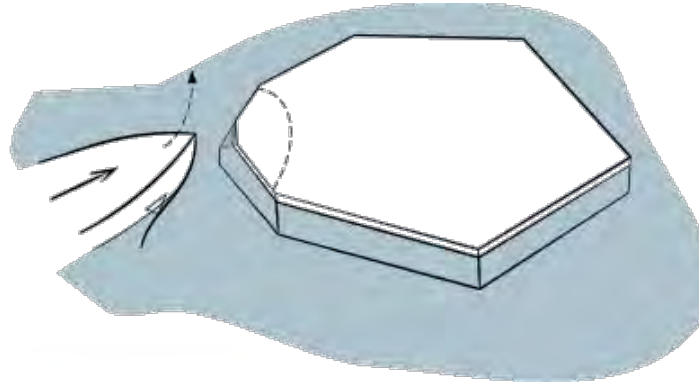
Joint Support Ship (Queenston Class)

- Assessment of Canadian Designs
- S&T Advice to Decision Point (2013)
 - Damage Control
 - Structures
 - Seakeeping
 - Airwake
 - Member of Decision Team
- Airwake Assessment of German TKMS Design
- Seakeeping Assessment of German TKMS Design



Arctic Offshore Patrol Ship (Harry deWolf)

- Seakeeping Model Tests at NRC and seakeeping simulation
 - resulted in addition of fin stabilizers
- Study and Advice on Propeller Design and Location
- Beginning work on Simulation of Arctic Operations – with MUN



Maritime Helicopter Project - Cyclone

- Development of Flight Deck Motion System (FDMS)
- Participants in Cyclone Acceptance Trials (2012-)
- Airwake Trials on HALIFAX Class post HCM

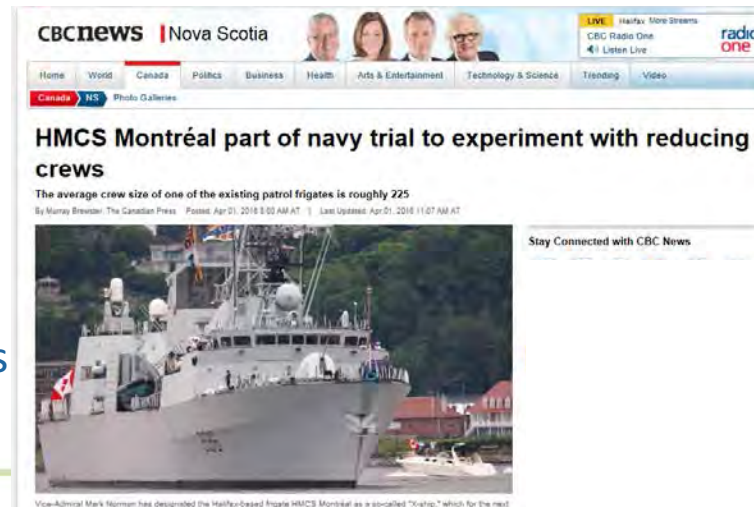
Other Acquisition Support

- Halifax Class Modernization (HCM)
 - Maneuvering Trials
 - Acoustic noise assessment
 - Sea King Helicopter Operational Certification
 - Computational Fluid Dynamics for Stern Flap
- Analysis to support Special Forces acquisitions
- DNR New RIB Launch and Recovery Simulation



Xship – use of deployed HFX Class to validate CSC requirements

- HMCS Montreal during normal deployment 2016-2021
- Some of the planned experiments related to Platform Performance
 - Crew size validation
 - Layout of critical spaces
 - Effects of automation on crew size
 - Propeller coating
 - Ship Noise Management System demonstration
 - SHOLAS – airflow
 - Wave Data Fusion
 - Structural Health Monitoring
 - Heavy Seas – motions
 - Mission Modularity – containerization of systems



The screenshot shows a news article from CBC News Nova Scotia. The article title is "HMCS Montréal part of navy trial to experiment with reducing crews". The sub-headline reads: "The average crew size of one of the existing patrol frigates is roughly 225". The byline is "By Murray Brewster, The Canadian Press" and the date is "Posted: Apr 01, 2018 9:02 AM AT | Last Updated: Apr 01, 2018 11:07 AM AT". The main image shows the HMCS Montreal, a grey patrol frigate, docked at a pier. The article text is partially visible, mentioning that Vice-Admiral Mark Norman has designated the frigate as a so-called "Xship".

Key DRDC International Programs

- MARIN Cooperative Research Ships – CRS
- Cooperative Research Navies - CRN
- TTCP MAR TP4 Naval Platforms
- ABCANZ (Structures) and ABCA (Hydro)
- Centre for Ship Signature Management (CSSM)
- Submarine Hydrodynamics Working Group
- NATO Ship Design Capability Group (SDCG)
- NATO STO AVT-ET-166 "High Latitude Extreme Environment Ship Operations".
- Ca/Neth IEP on Ship Design
- Ca/Neth/Swe UNDEX
- Ca/Neth/Swe TES
- Ca/Neth/UK/AUS on Submarine Structures
- USCG VALID JIP

iSMART Thoughts

■ Governance Models

- Naval Ship Research Program
- NSERC National Centers of Excellence
- Cooperative Research Ships
- Ship Structures Committee
- Joint Industry Projects

■ Topics

- Really up to Shipyards/Designers
- Ship data management for build and engineering evaluation (including warfighting)
- Quality control

■ Issues

- Funding
- Controlled Goods and Security Classification
- Contract Management

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FOR CANADA'S DEFENCE AND SECURITY

SCIENCE, TECHNOLOGIE ET SAVOIR
POUR LA DÉFENSE ET LA SÉCURITÉ DU CANADA

