Science at Sea

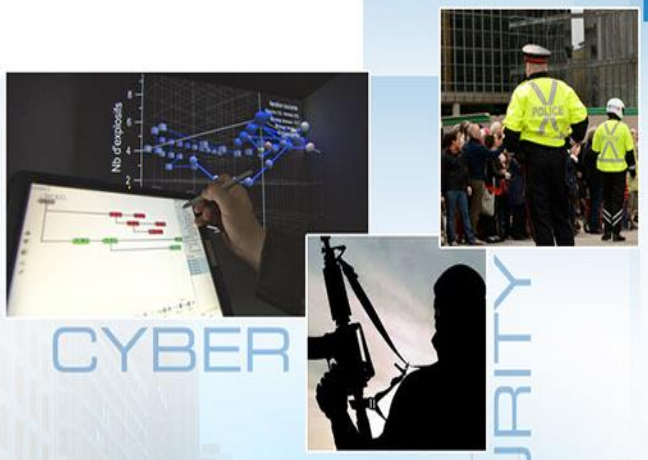
The evolving role of DRDC in delivering Science and Technology to the RCN

David Hazen, Director, DRDC Atlantic Research Centre
13 May 2015

DRDC

- Provides a knowledge and technology advantage to support defence and security operations at home and abroad
- National Leader in Defence and Security Science and Technology (S&T)
- Agency of Department of National Defence (DND)

Context



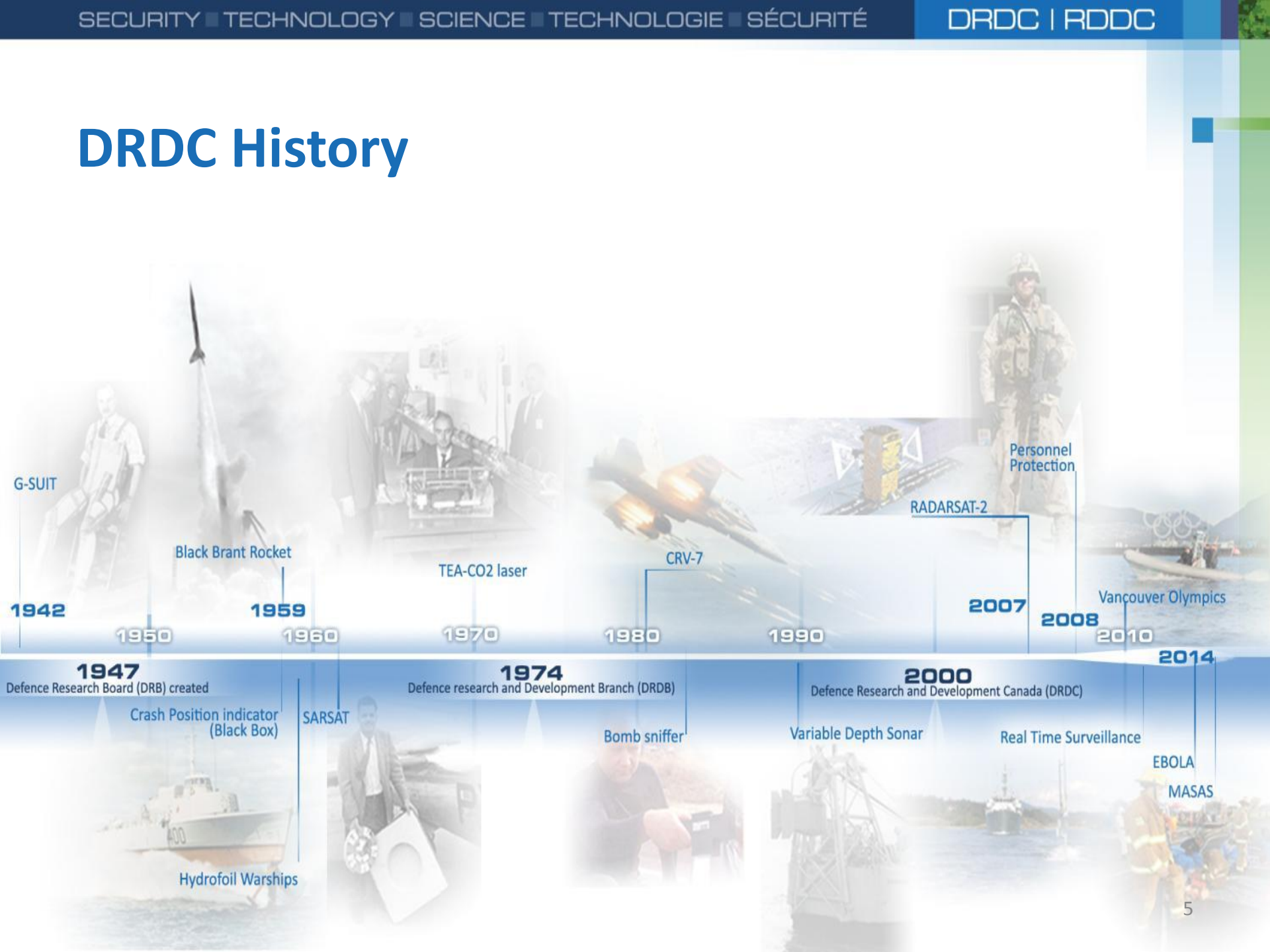
- Complex spectrum of conflict in the air, land, maritime, space and cyber domains
- Potential threats from a variety of sources:
  - Space, cyberspace, disease, unstable states
  - Asymmetric warfare
  - Terrorism, use of technology
  - Natural disasters, major accidents, crime
- New threats are emerging faster and in a less predictable fashion (e.g. ISIL)

What is Defence Science?




- Applied science that addresses defence and public security problems
- Includes basic research, applied research, technology demonstration, exploratory development, and advanced development.
- Draws from a diverse array of science including
  - Natural and social sciences
  - Humanities
  - Computer science and Mathematics
  - Engineering

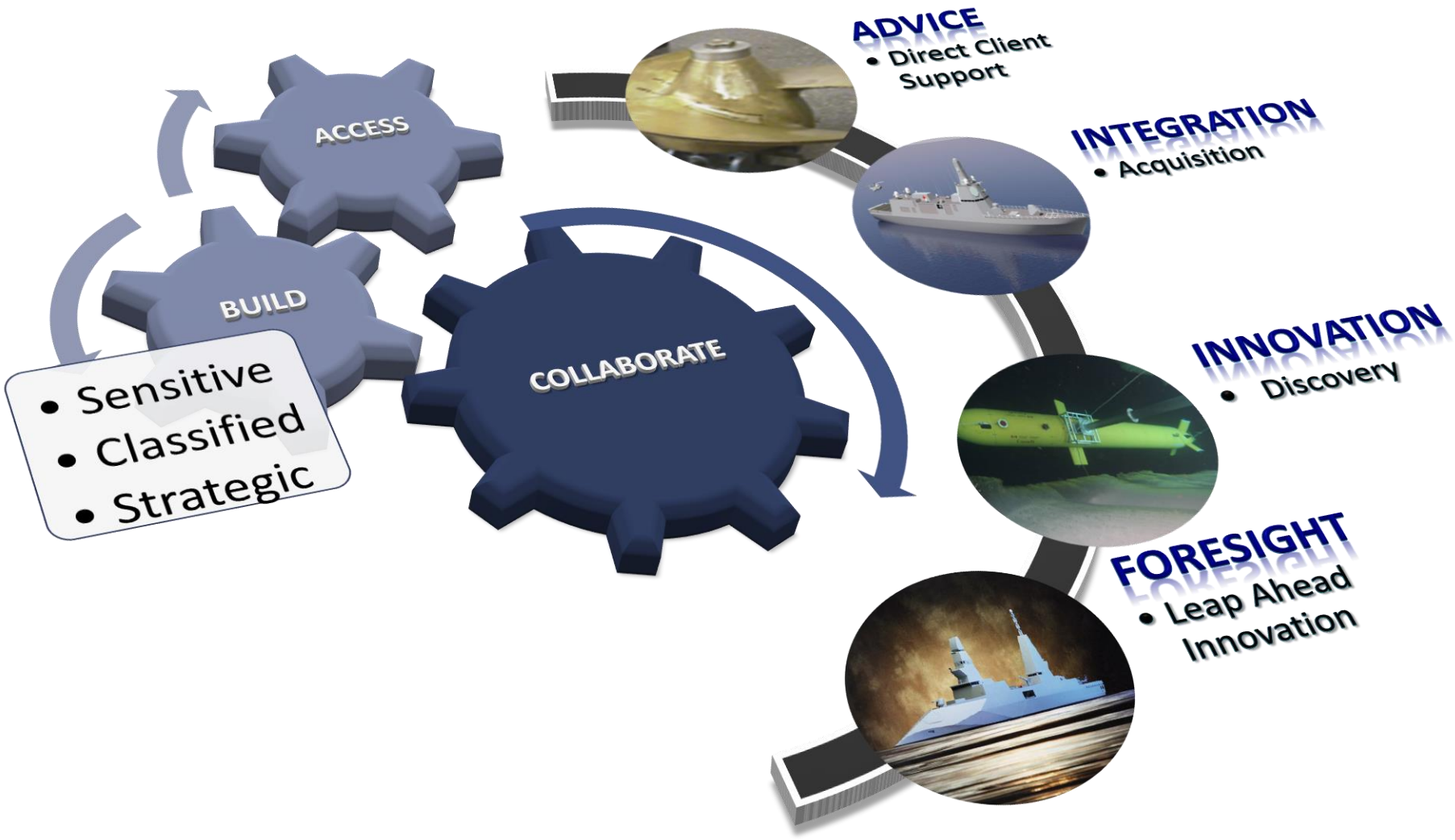
DRDC History



S&T Strategy

- Science and Technology in Action: Delivering Results for Canada's Defence and Security (2013)
- A comprehensive, long-term blueprint to help ensure DND, the CAF and its public safety and security partners have the tools and capabilities to defend Canada and carry out their core missions and activities.
- Based on three key approaches: Build, Collaborate, Access

Defence S&T Framework



S&T Portfolios

STRATEGIC DECISION SUPPORT - 00

NAVY - 01

ARMY - 02

AIR FORCE - 03

PERSONNEL - 05

JOINT FORCE DEVELOPMENT - 05

PUBLIC SAFETY AND SECURITY - 05

FORCE EMPLOYMENT - 06

DRDC Key Facts

- 8 research centres located in 4 provinces
- 1,400 employees
- $275 million operating budget

Delivering our S&T Program

- **Centre Operations ensure capability to deliver the S&T program**
- **A strong Corporate Services team enables DRDC's S&T**
- **Chief of Staff provides corporate leadership (e.g. S&T policy, intellectual property)**

International Partnerships

- **Bi-lateral and multi-lateral collaboration with various nations**
  - E.g. US Department of Homeland Security S&T Directorate
- **Robust international collaboration with Allied S&T Organizations, including**
  - NATO Science and Technology Organization (STO)
  - The Technical Cooperation Program (TTCP):
    - Canada, USA, United Kingdom, Australia and New Zealand
- **International partnerships strengthened with DRDC offices in Washington, D.C. and London, United Kingdom**

Industry

- Key component of Canadian innovation system
- Important partner for DND, CAF and public safety and security communities
- Translates concepts into reality
- Move solutions through to commercialization
- Opportunities for Canadian industry
- Work with small and medium enterprises, as well as large defence industrial partners

Academia

- Partnerships with universities to access knowledge
- Contracts for specific projects, staff exchanges, etc.
- Canada-funded research
- Leveraging national networks
- Identifying lines of research meeting the client's needs

Navy Strategic Issues and Priorities

Commander's Guidance and Direction to the Royal Canadian Navy (Executive Plan – 2013 to 2017)

- **Ensure Excellence at Sea**
  - Operational successes and challenges (Domestic, Forward Deployed, Contingencies)
    - Joint and integrated operations (interoperability)
    - Arctic and littoral operations
- **Evolving the Business of our Business**
  - Strategic Environment
- **Energize the Institution**
  - Engagement with industry and defence partners
- **Enable the Transition to the Future Fleet**
  - (Halifax Class) Frigate Modernization (HCM)
  - (Victoria Class) Submarine Capacity Life Extension (SCLE)
  - (Harry DeWolf Class) Arctic Offshore Patrol Ships (AOPS)
  - (Queenston Class) Joint Support Ship (JSS)
  - Canadian Surface Combatant (CSC)

Modernized Halifax Class Frigates

Victoria Class Submarine

FACT SHEET

HARRY DEWOLF-CLASS ARCTIC/OFFSHORE PATROL SHIP

The Arctic/Offshore Patrol Ship (AOPS) project will deliver six ice-capable ships, designated as the Harry DeWolf Class, after Canadian wartime naval hero Vice-Admiral Harry DeWolf. The AOPS will be capable of:

- armed sea-borne surveillance of Canada's waters, including the Arctic
- providing government situational awareness of activities and events in these regions
- cooperating with other partners in the Canadian Armed Forces and other government departments to assert and enforce Canadian sovereignty, when and where necessary.

Construction of the first AOPS will begin in September 2015, with HMCS *Harry DeWolf* scheduled for delivery in 2018.

AOPS SPECIFICATIONS:

Length:	103 metres
Beam:	19 metres
Complement:	65

To scale

Halifax-class Canadian Patrol Frigate
Displacement: 4,770 tonnes

Harry DeWolf-class Arctic/ Offshore Patrol Ship
Displacement: 6,440 tonnes

Kingston-class Maritime Coastal Defence Vessel
Displacement: 970 tonnes

INTEGRATED BRIDGE NAVIGATION SYSTEM

Modern integrated bridge, from which control of navigation, machinery, and damage control systems can be performed.

MULTI-PURPOSE OPERATIONAL SPACE

Where operational planning and mission execution will be coordinated.

HELICOPTER CAPABILITY

Depending on the mission, the embarked helicopter could range from a small utility aircraft right up to the new CH-148 maritime helicopter.

BAE MK 38 GUN

Remote controlled 25 mm gun to support domestic constabulary role.

CARGO/PAYLOADS

Multiple payload options such as shipping containers, underwater survey equipment, or a landing craft. Ship has a 20-tonne crane to self-load/unload.

ENCLOSED FOCSLE/ CABLE DECK

Protects foredeck machinery and workspace from harsh Arctic environment.

VEHICLE BAY

For rapid mobility over land or ice, the ship can carry vehicles such as pickup trucks, ATVs, and snowmobiles.

BOW THRUSTER

To enable manoeuvring or berthing without tug assistance.

DIESEL/ELECTRIC PROPULSION

Propulsion: Two 4.5 megawatt main propulsion engines, four 3.6 megawatt generators.

MULTI-ROLE RESCUE BOATS

Top speed of 35+ knots, 8.5 metres long. Will support rescues, personnel transfers, or boarding operations.

RETRACTABLE ACTIVE FIN STABILIZERS

Deployed to reduce ship roll for open ocean operations, retracted for operations in ice.

Royal Canadian Navy
Public Affairs – January 2015
www.forces.gc.ca

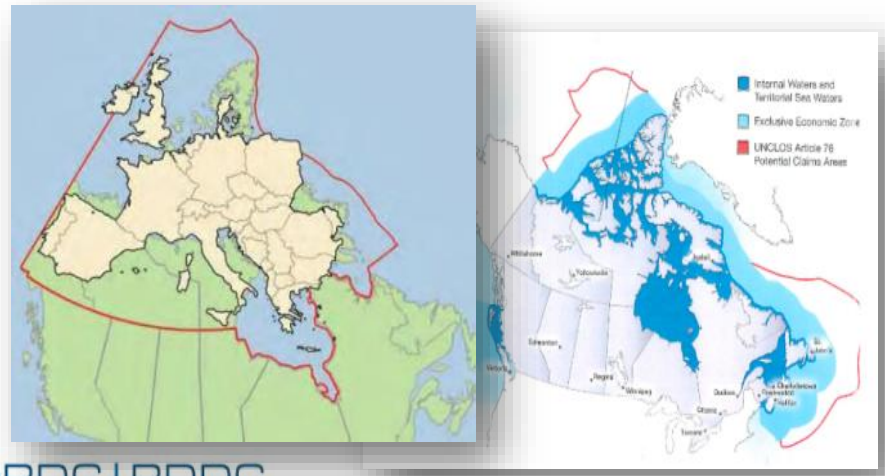
Canada

Queenston Class Supply Ship

Canadian Surface Combatant

Arctic / Maritime Domain Awareness (MDA) Challenges

- MDA is an essential component of our overall national security strategy. Without effective surveillance of events within Canadian territorial waters, and in the ocean approaches to the country, national security is undermined.
  - Land Area: 9,093,510 KM2 SQKM
  - Coastline: ~244,000 KM
  - Exclusive Economic Zone ~7.1 MSQKM



- *"The geopolitical importance of the Arctic and Canada's interests in it have never been greater."*
  - Prime Minister Stephen Harper, August 28, 2008, Inuvik, Northwest Territories
- *"The RCN is well on its way to becoming an Arctic navy rather than just a northern navy, with capabilities and skills to operate persistently in the High Arctic."*
  - VAdm Mark Norman, Commander Royal Canadian Navy, to Standing Committee on Defence, Nov 2014.

International / Expeditionary Challenges

The RCN's role is to defend the global system at sea and from the sea

- 90% of global trade, by volume, travels by sea
- 95% passes through just nine oceanic chokepoints
- The worlds fleets exceed 53,000 ships, with a combined tonnage over 590M tons
- World seaborne trade has more than quadruples in the last four decade

- Middle power challenges:
  - Affordability
  - Interoperability
  - Readiness
  - Sustainability
  - Global Situational Awareness

Why is Maritime S&T Important?

- *"The nature of maritime warfare has always led navies to be focussed on technology. In many respects, the key ages of navies have been defined by changes in technology, and its exploitation."*
  - Commodore Art MacDonald, Director General Navy Force Development, Maritime S&T Programme Guidance (2014)

The Role of Maritime S&T

- The Royal Canadian Navy [RCN] maintains a close relationship with the Science and Technology Group [Defence Research & Development Canada] of the Department of National Defence, leveraging its expertise across three broad areas of effort:
  - Development of future maritime capabilities and platforms;
  - Generation of maritime forces; and,
  - Support to deployed operations.

Navy Science and Technology Projects

- **N1 – Force Structure**
  - Composition of the future fleet
  - Crewing and human factors
- **N2 – Above Water Warfare**
  - Anti-ship missile defence
- **N3 – Underwater Warfare**
  - Force anti-submarine warfare
  - Torpedoes and torpedo defence
  - Mine countermeasures
- **N4 – Maritime Information Warfare**
  - Next generation naval command and control systems
- **N5 – Naval Platforms**
  - Fleet transformation
  - Ships systems readiness
  - Signature management

New Investments

- **Virtual Seas**
  - Enabling a cohesive, efficient, and effective approach to the use of modelling and simulation in the Navy's decision-making processes, integrated with related activities across the Canadian Armed Forces
- **Integration of Command Decision Support**
  - Investigating the integration and management required to provide "Information Warfare" planning support for shipboard command teams
- **Defence Applications of Agile Manufacturing**
  - Exploiting the benefits offered by agile manufacturing, including increased operational agility & readiness, cost savings in logistics support, and increased innovation with the prospect of adaptive and customizable systems designed to meet the requirements of their application rather than their manufacturability

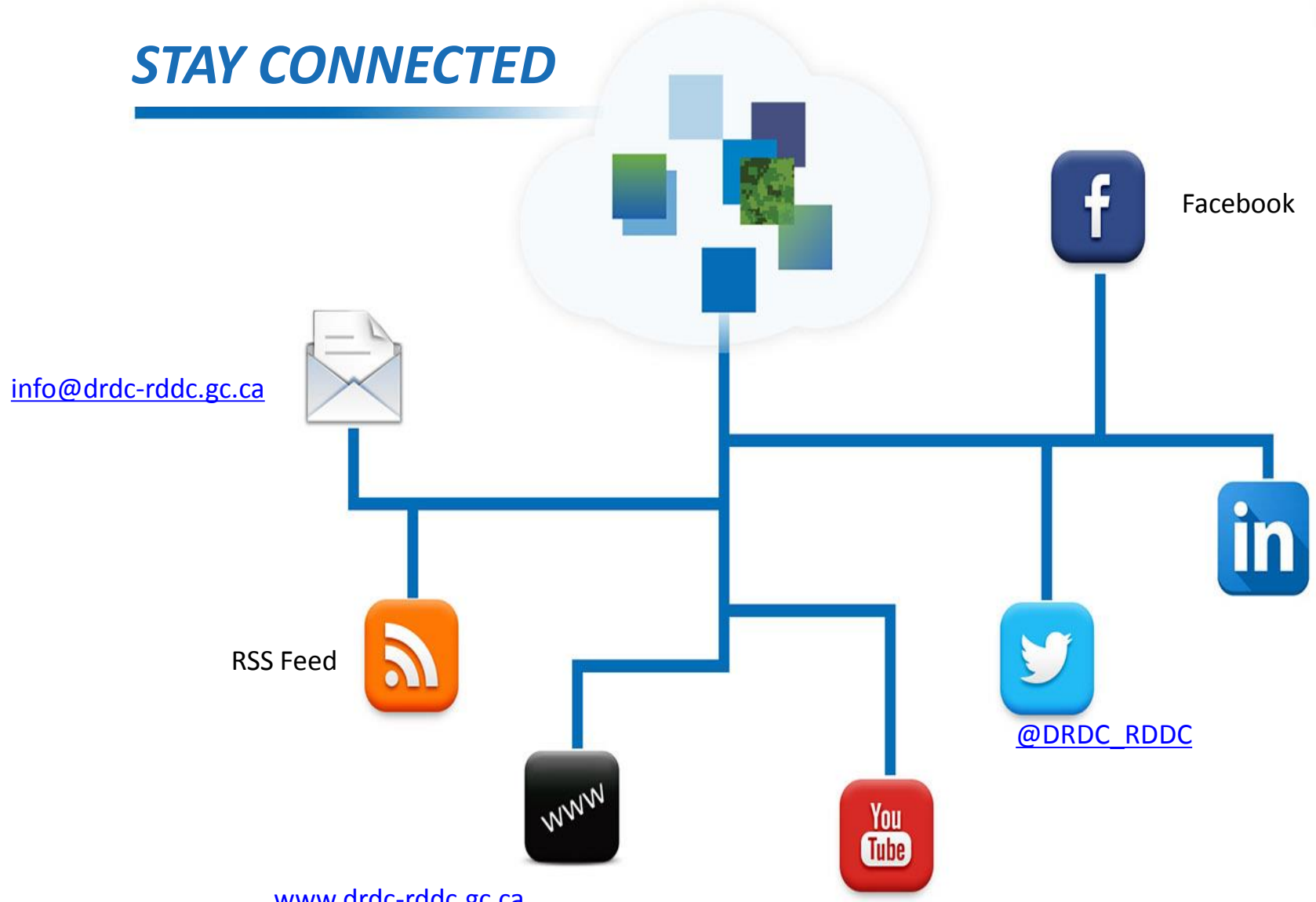
New Investments

- **Platform-deployed Autonomous Systems for Tactical Anti-submarine Warfare**
  - Investigating the potential of employing Maritime Remote Autonomous Systems for tactical ASW operations
- **Canadian Arctic Underwater Sentinel Experimentation**
  - Investigating the options for conducting strategic underwater surveillance in the Arctic Ocean
- **Long Endurance Autonomous Under-Ice Vehicle**
  - Investigating the options for a long-endurance, autonomous, underwater, under-ice vehicle for strategic underwater surveillance in the Arctic Ocean

Defence S&T and the Future Maritime Security Environment

- S&T will continue to **advance** and **impact** navies in ways that will be **difficult to predict.**
- The role of defence S&T is to provide **advice, innovation, integration and foresight** to assist naval operators and planners in understanding the **strengths, weaknesses, opportunities** and **threats** presented by technological and scientific innovation.
  - Success will come to those who know how to exploit technological change, not necessarily those with the best technology.

STAY CONNECTED



Acknowledgements

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- **DGSTAN Staff**

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SCIENCE, TECHNOLOGY AND KNOWLEDGE FOR CANADA'S DEFENCE AND SECURITY

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