

Future Use of AOPS for Science

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The Navy's Role in Understanding our Oceans



CGS / HMCS Cartier



CSS / HMCS Acadia

The navies of the world - including the RCN - have always played a key role in advancing the understanding of our oceans



HMS Beagle



HMS Challenger

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Arctic Sovereignty is Important to Canadians

- Munk School of Global Affairs at the University of Toronto survey circa 2011:
 - Just over half of Canadians said that the Arctic region should be the most important element of Canada's foreign policy and that the country's military presence in the region should be beefed up, even if it means doing less elsewhere in the world



AOPS as an “All of Government” Asset

- Multiple roles – Military, Constabulary, Surveillance....***and science?***



Other Nations' Approaches

- Norway - KV Svalbard
- UK – HMS Protector
- US – USN GAPV Study



KV Svalbard



In September 2013 the Nansen Environmental and Remote Sensing Center (NERSC) coordinated and lead a scientific cruise with the Norwegian coast guard ship ***KV Svalbard***. Seven institutions from Norway, USA, Israel and France participated in the fourteen day long cruise.

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HMS Protector

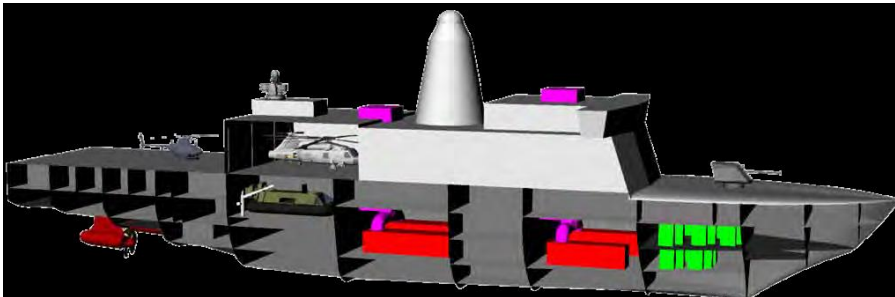
- MISSION:
 - To provide a UK sovereign presence in the British Antarctic Territory, South Georgia and the South Sandwich Islands and their surrounding maritime areas, to underpin their security and good governance; and meet the UK treaty obligations and exercise rights under the Antarctic Treaty System through inspections, *hydrographic charting and support to scientific research*



USN Green Arctic Patrol Vessel Design

“Further understanding of Arctic operating conditions and requirements will result from Arctic presence by the USN and support for ***scientific***, commercial and USCG operations.

“The most critical deficiencies identified by the USN include provision of ***environmental information***, safe maneuvering on the sea surface and the conduct of training, exercise and education in the Arctic”



NSWC Carderock, 2011

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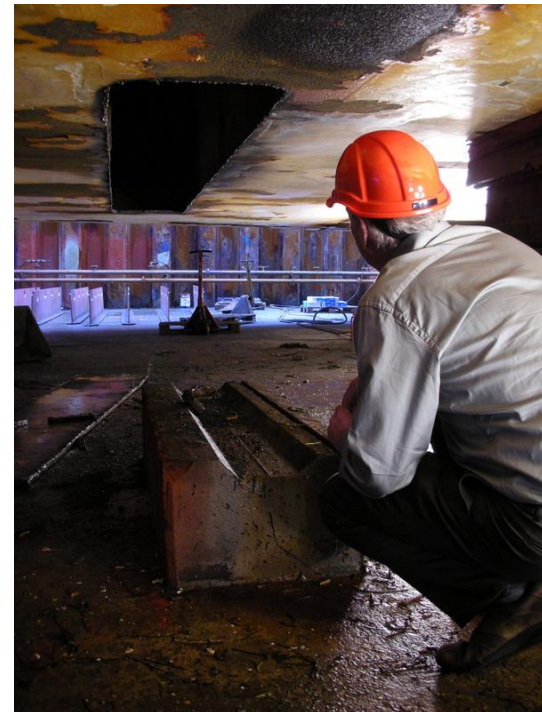
Potential AOPS Science Activities

- Hydrographic Survey – single beam vs. multibeam sonar
- Support for Autonomous Data Collection Platforms
- Met Data – Automatic Weather Observing System (AWAS)
- SST
- ADCP
- XBT / CTD / SV
- Ocean Light & Colour
- Water Sampling
 - Chemistry
 - Biology
- Wildlife Survey – MANOPS / Bird Radar / Geo-tagged photos

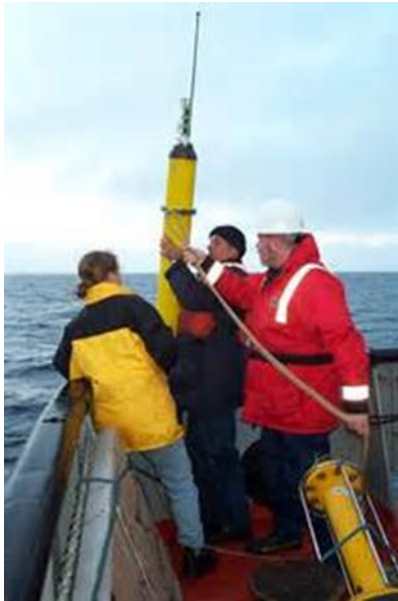


Kongsberg Multibeam Installation on Swedish Icebreaker Oden

8 m long x 1 m wide EM120 transmitting array mounted longitudinally on hull of Oden protected from ice by titanium / polyurethane window



Support for Autonomous Data Collection Platforms

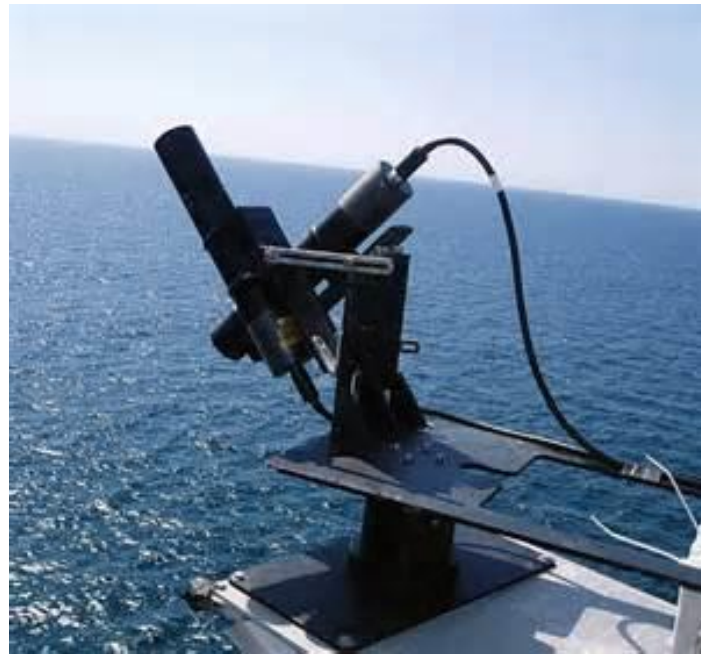


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Ocean Colour Sensor

- Modern day “Secchi Disk”
- Indicates biological health of the ocean



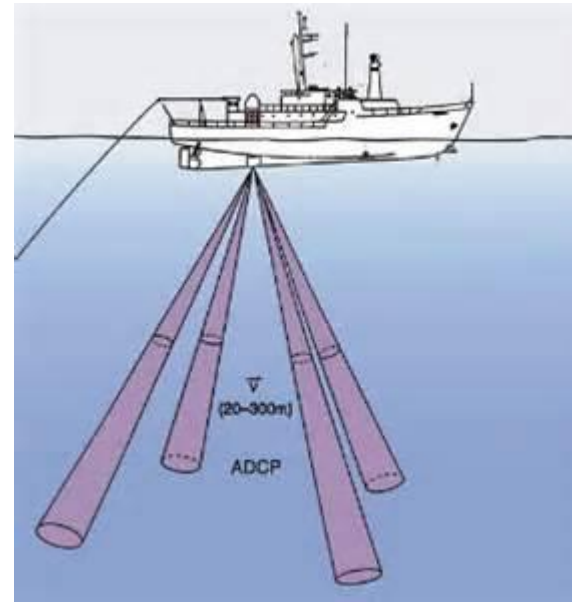
Shipboard Air Sampling

- Air Samples are automatically drawn into gas analysers and tagged with GPS time and location of sample
- Wind and ship steaming direction can impact quality of sample



Acoustic Doppler Current Profiler (ADCP)

- Needs through-hull installation
- Needs to be in a bubble free environment
- Needs protection from ice
- Provides 3-D water current information



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XBT / XSV

- Traditionally collected as part of Navy operations
- Manual versus automatic launch

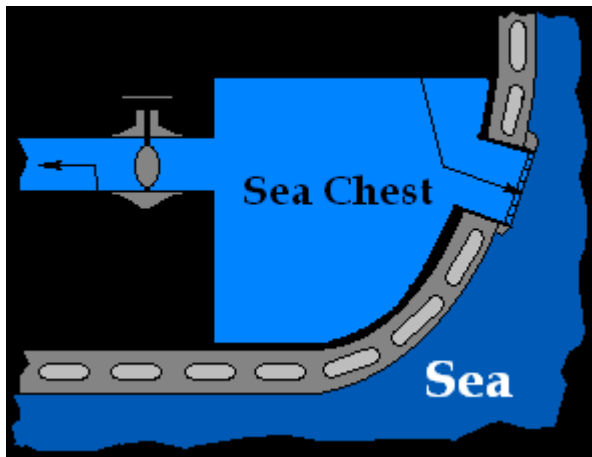


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Water Sampling and Analysis from Sea Chest

- Marine Chemistry and Biology Analysers automatically draw water from the ship's water intake
- Data is time and location tagged



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ISO Shipping Container Laboratory

- Trend in Ocean Science is to modular ocean science laboratories built into standard ISO Shipping Containers
- New CERC Ocean Science & Technology Lab at Dal Supports these.
- Complex experiments can be pre-staged prior to loading on ship



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The World's Most Cost Effective and Pervasive Data Collection Device

The Smart Phone!

Data Telemetry – Bluetooth, NFC, Cellular & WiFi!
GPS
3 Axes Accelerometer, Magnetometer, and Gyro
Sound sensor
Camera
Real Time Clock
Data Processing Computer
Removable Data Storage Device
Display Screen and Keyboard
Self Contained Power Supply

7 billion mobile subscriptions globally at end of 2013

2 billion mobile broadband subscriptions globally



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Issues & Mitigation

- Disclosure of ship location & Security Issues
 - Delay release of data
 - Cleanse source attribution
 - Keep data streams separate
- Compromising the Status of AOPS under Law of the Sea
 - Science data collection in EEZ only
- Incremental Costs / Interference with Primary Mission
 - Only take on low impact sensor systems
 - Ensure safety & battle over-rides on all systems
 - Keep data and power systems separate
 - Store data and forward when in port to eliminate data costs



Key Advantages

- Bolsters ongoing support for the AOPS program – new constituents
- Provides high-profile “charismatic” role for RCN
- Enhances career engagement for RCN personnel
- Collects valuable information about Canada’s EEZ



Thanks!

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