Safety First, Service Always





Canadian Coast Guard Arctic Operations

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Canadian Coast Guard, Central & Arctic Region

Naval Association of Canada
Ottawa, ON
May 1, 2017

Canada

Canadian Coast Guard (CCG): Who We Are and What We Do

Operating as Canada's only national civilian fleet, we provide a wide variety of programs and services to the population and to the maritime industry on important levels:

Deliver programs and services to the population to ensure safe and accessible waterways and to facilitate maritime commerce;

Provide vessels and helicopters to enable fisheries enforcement activities, and the on-water science research for Fisheries and Oceans Canada and other science departments; and

Support maritime security activities.

Canadian Coast Guard: Regional Boundaries

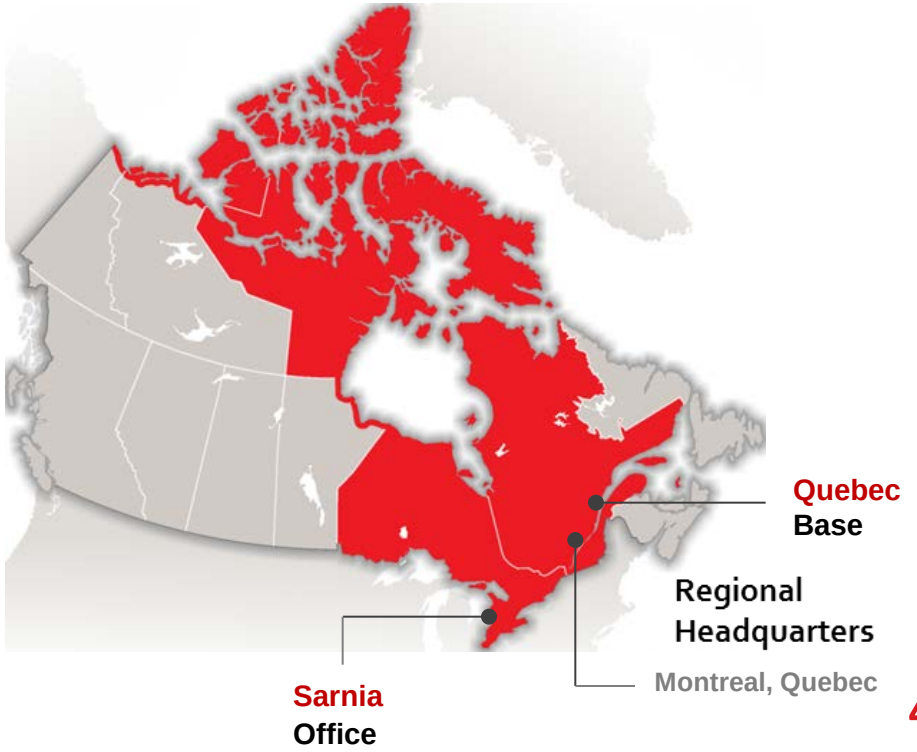
- **Western Region**: Pacific Ocean, Great Slave Lake, Mackenzie River and Lake Winnipeg
- **Central & Arctic Region**: Hudson Bay, Great Lakes, St. Lawrence River, Gulf of St. Lawrence (Northern Area), and Arctic Ocean
- **Atlantic Region** : Atlantic Ocean, Gulf of St. Lawrence (Southern Area), and Bay of Fundy

Central and Arctic Region: Fact Sheet

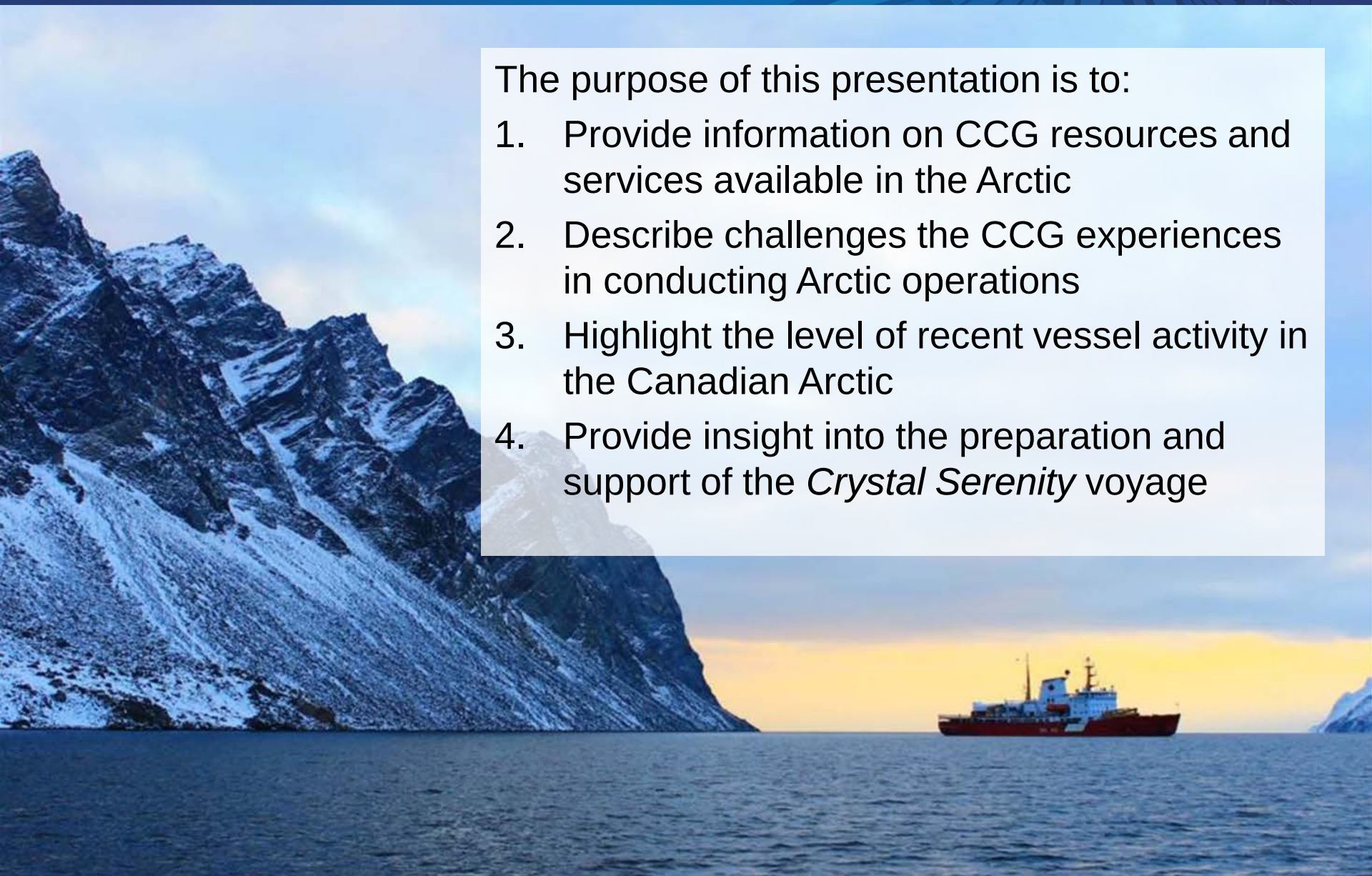
- A regional office and **10** operational bases
- **39** vessels
- **15** SAR lifeboat stations
- **12** inshore rescue stations
- **2** air cushion vehicles
- **8** helicopters
- **4,627** floating aids
- **2,191** fixed aids
- **5** MCTS centres

The Central and Arctic Region covers:

- St. Lawrence River, Gulf of St. Lawrence (Northern Area), Great Lakes, Hudson Bay and the Arctic coast up to Alaska
- Population of approx **21.5 million inhabitants**
- Nearly **3,000,000 km²** of water area



Presentation Overview



The purpose of this presentation is to:

1. Provide information on CCG resources and services available in the Arctic
2. Describe challenges the CCG experiences in conducting Arctic operations
3. Highlight the level of recent vessel activity in the Canadian Arctic
4. Provide insight into the preparation and support of the *Crystal Serenity* voyage

Background: CCG in the Arctic

- The CCG has operated in the Arctic for more than 50 years
- CCG often provides the only government presence in many areas of Canada's north

Photo: Greg Williams

- CCG icebreakers provide the furthest reach and most reliable capacity in Arctic waters
- CCG is part of Canada's multi-agency approach to Arctic safety, security, and environmental protection

Canadian Coast Guard: Programs and Services

Marine Aids to Navigation

Icebreaking Operations and Escort

Maritime Security

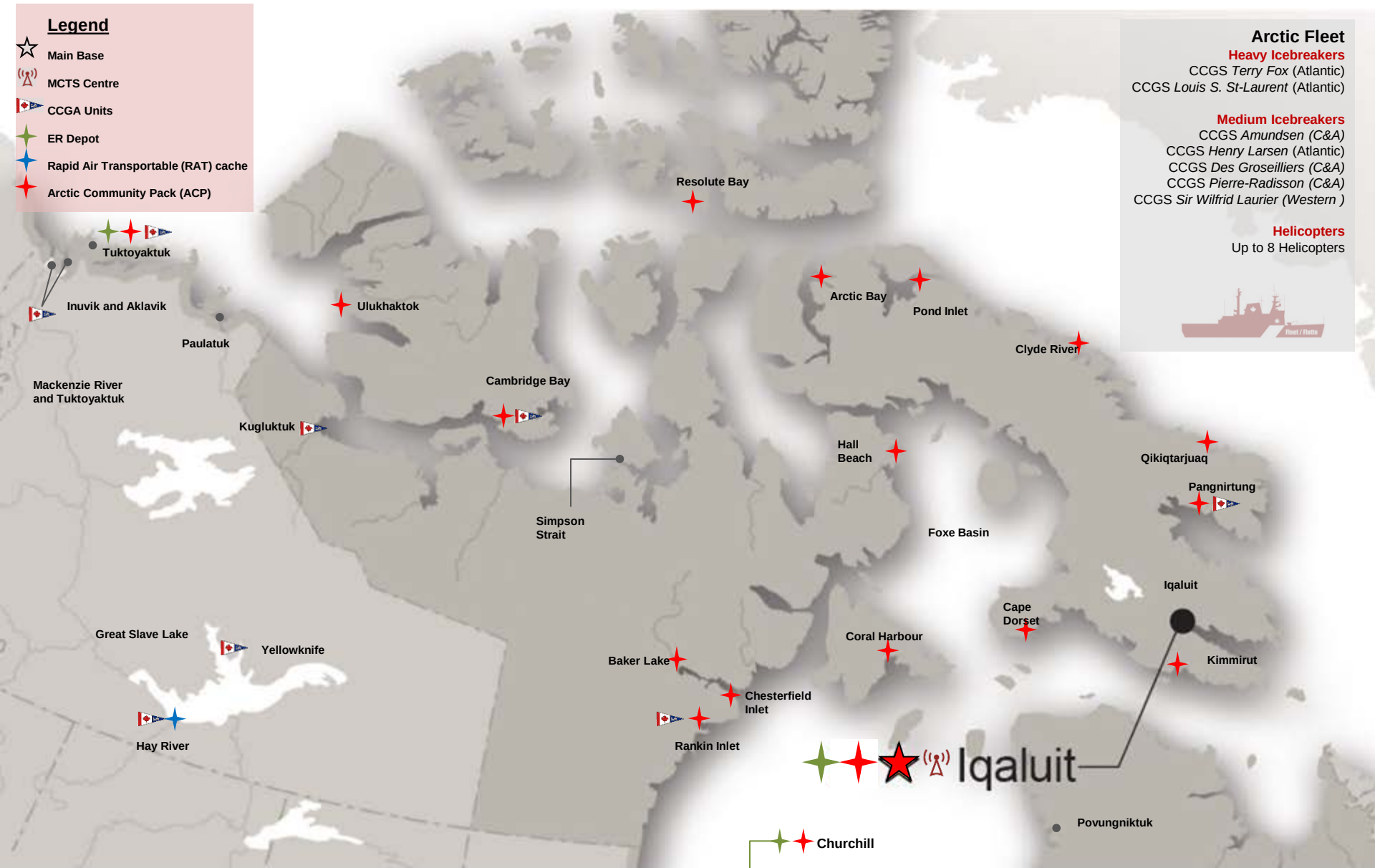
Marine Communications & Traffic Services

Environmental Response

Waterways Management

Marine Search & Rescue

Background:
CCG Arctic Resources



CCG Programs:
Marine Communications & Traffic Services

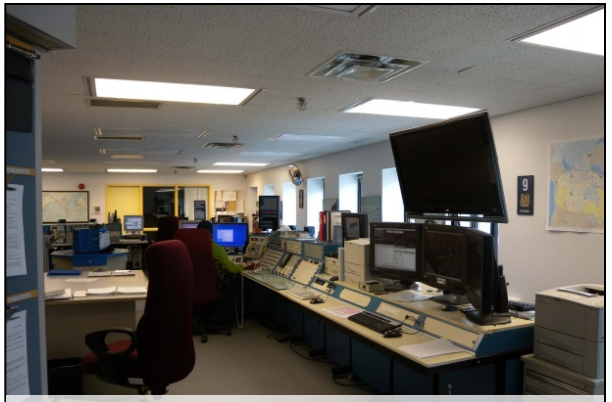
Marine Communications & Traffic Services (MCTS)

Iqaluit MCTS Centre

- Iqaluit MCTS centre operates from May – Dec.
- **Provides:**
  - Distress Monitoring and Vessel Traffic Services
  - Northern Canada Vessel Traffic Services Zone Regulations (NORDREG)
  - NAVAREAS: Navigation and weather warnings

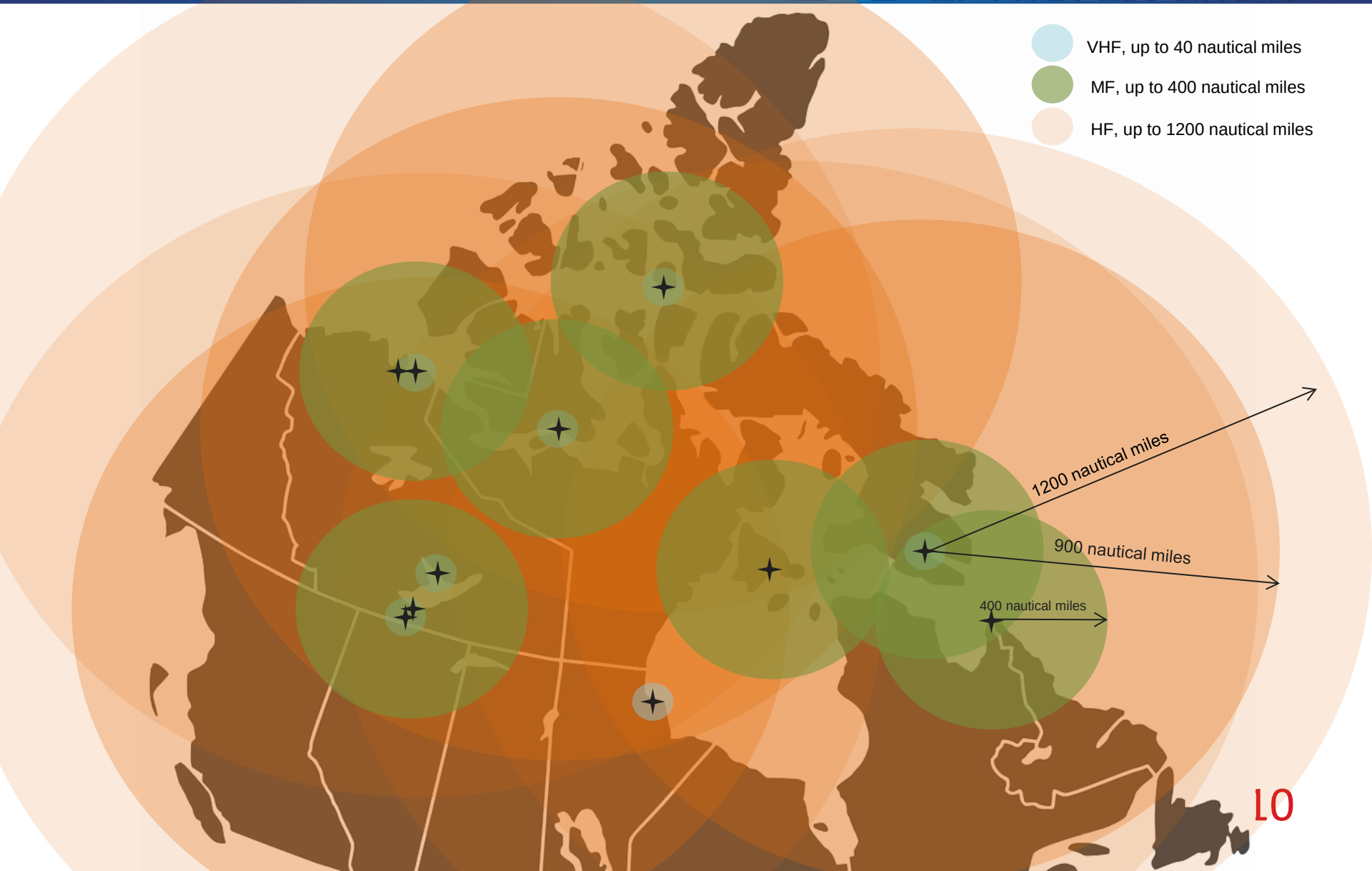
NORDREG

- Based on Shipping Safety Control Zones
- In all Arctic waters MCTS and NORDREG services are delivered from Iqaluit
- Back up and off-season services are provided from MCTS in Prescott, ON
- Reporting requirements apply to vessels greater than 300 GT



Console in Iqaluit MCTS Centre

Marine Communications & Traffic Services: Radio Coverage



CCG Programs: Icebreaking Services

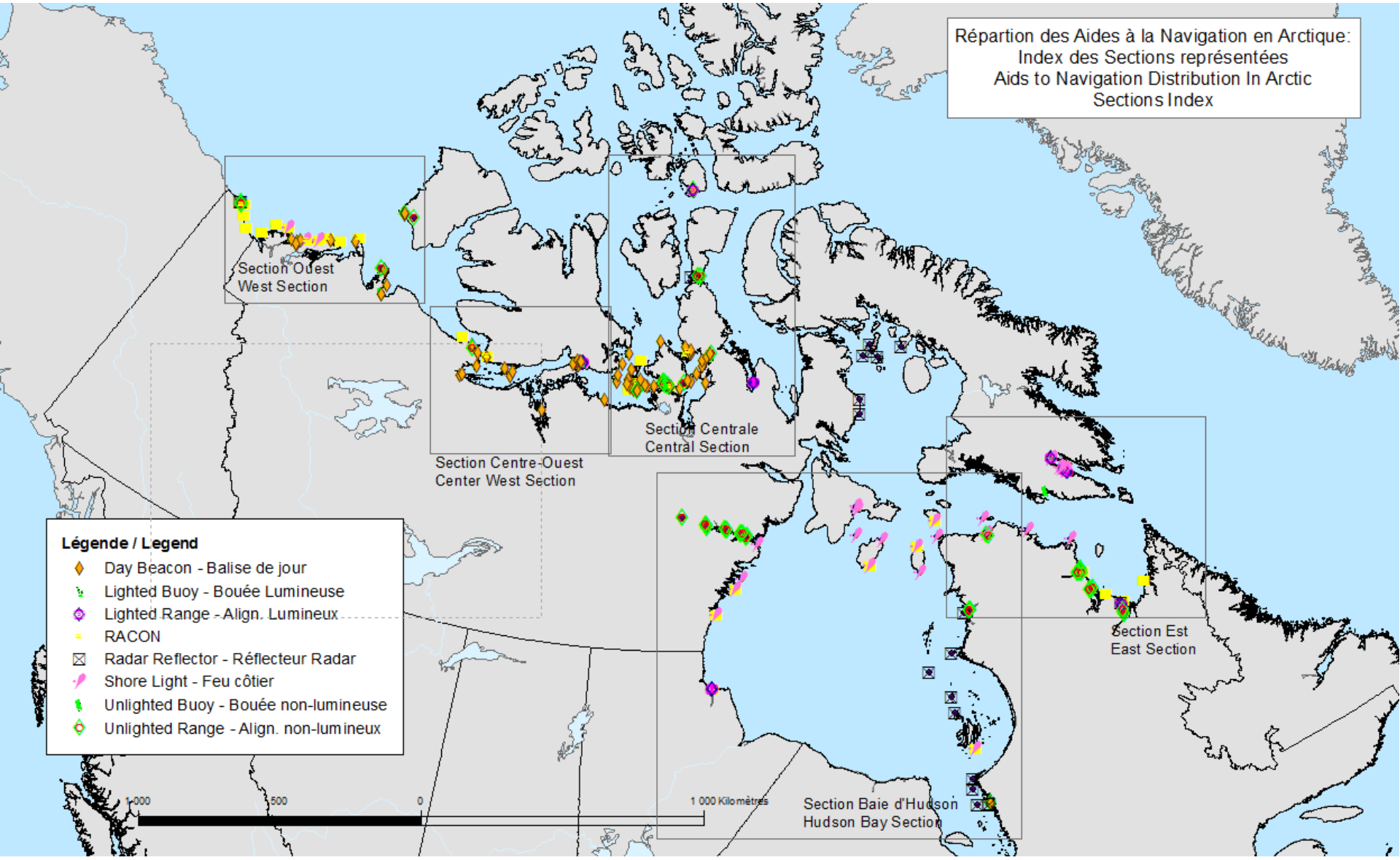
- Icebreakers are the main platform from which CCG programs are delivered in the Arctic including:
  - The resupply of Arctic communities
  - The escort of ships through ice-covered waters
  - Maintaining Canadian sovereignty in territorial and international waters
- CCG utilizes a pool of 7 Arctic-capable icebreakers (including Amundsen)
- The Icebreaking program is managed based on availability of vessels and client demand

CCG Programs:
Aids to Navigation and Waterways Management

- Aids to navigation (AtoN) are provided where the navigational risk is high, based on a reference vessel, waterway and environmental conditions

- AtoN services are mainly fixed visual and radar aids with a few lights and buoys
- CCG collaborates with the Canadian Hydrographic Service (CHS) who has the mandate to provide adequate marine charts

Aids to Navigation and Waterways Management: Arctic Aids



CCG Programs: Environmental Response

Canadian Law: The "Polluter Pay" Principle

- ✓ A rapid and well managed response will:
  1. Reduce damage to the environment
  2. Reduce costs to the vessel owner

Boom deployment exercises with CCG personnel and community members in Ulukhaktok

CCG is the Lead Agency for ship source spills

Beach Flush System

Why?

1. No commercial contractors in the Arctic
2. Response capacity aboard icebreakers is available for small spills
3. CCG Environmental Response program maintains equipment in multiple sites

Environmental Response: Cascading Response

- CCG has **23 equipment depots** in the Arctic. These are broken down into three types:
  1. Community Packs (x19)
  2. Rapid Air Transportable (x1)
  3. Major Environmental Response Depots (x3)

Typical Community Pack container

Boom deployment exercise with CCG personnel and community members in Ulukhaktok

1. Arctic Community Packs

- Designed for initial on-water containment and protection
- Tailored to community-specific objectives based on environmental priorities
- Beach flush systems in several of these communities

Environmental Response: Cascading Response

2. RAT (Rapid Air Transportable)

- Located in Hay River, NWT
- Approx. 120 pallets of equipment ready to be shipped
  - Configured to access to 39 of 47 communities, using common cargo aircraft (within 2 hours flight time)
  - Deployment standard: 48-96 hrs
- Equipment for recovery, storage, shoreline cleanup, and area decontamination suite

Rapid Air Transportable Depot

3. Major Environmental Responses Depots (Delta-1000)

- 3 large depots strategically placed North of 60° latitude
- Iqaluit, Churchill (Manitoba) and Tuktoyaktuk
- Contain larger caches of equipment for responding to more significant marine pollution incidents

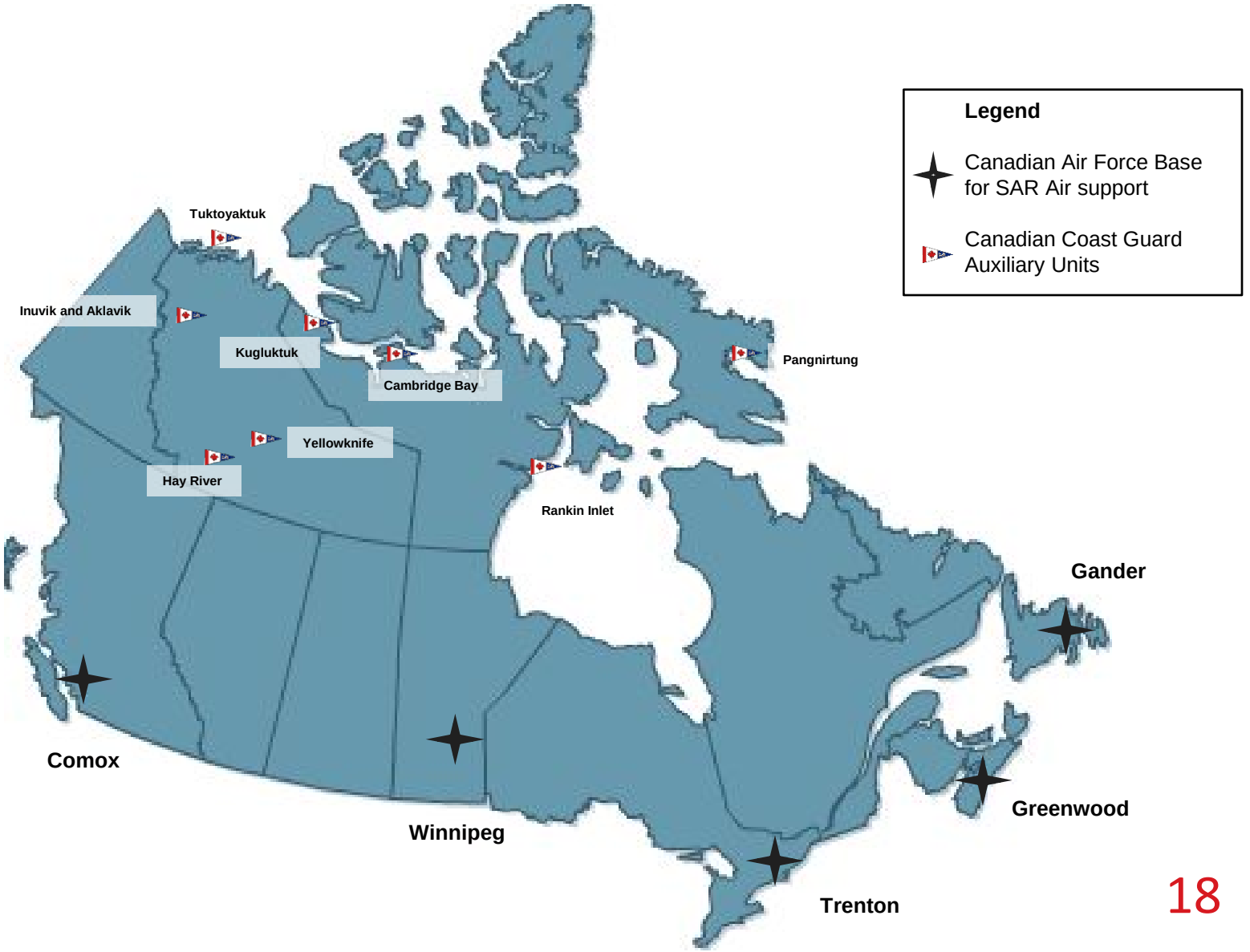
CCG Programs: Search and Rescue

Joint Rescue Coordination Center (JRCC) Halifax and JRCC Trenton coordinate SAR response in the Arctic using:

1. Canadian Coast Guard Auxiliary in 7 communities
   - Expansion in 2017
2. Royal Canadian Air Force (RCAF) provides air resources:
   - RCAF bases: Gander, Greenwood, Trenton, Winnipeg, Comox
3. Vessels of Opportunity - commercial, tourist or government vessels
4. Nunavut and Nunavik SAR groups provide local response for Ground search and rescue and limited marine search and rescue
5. CCG Icebreakers contribute - but are often a significant distance from the incident

RCAF Hercules and Cormorant

Search and Rescue: Resource Locations



Search and Rescue:
Aircraft Transit Infromation

Transit Times

C-130 7 Hours

Blue – Winnipeg

Red – Trenton

Green – Greenwood

Buffalo – 6 Hours

Orange – Comox

Cormorant – 6 Hours

Orange – Comox

Green – Greenwood

Purple - Gander

Search and Rescue: Arctic Challenges

1. **Size** – expansive and intricate geography
   - Navigation is complex
2. **Isolated, Small Communities** – large distances between communities
   - No deep water ports
   - Only limited capability airstrips
   - Minimal basic infrastructure
   - Few medical facilities
3. **A Growing Travel Trend –**
   - Typically hunters & fishers travel long distances by vessel to reach their area of harvesting
   - This is becoming more frequent with the reduction of multi-year ice -- thereby extending the “SAR season” in the Arctic

The contrails of a Royal Canadian Air Force CC-130 Hercules aircraft dispatched from Winnipeg were a welcome sight to worried ecotourists, who could do little but await rescue while floating on the Arctic sea. Here, tourist Joe Bunni of France watches after the Hercules dropped survival supplies to the trapped group.

Search and Rescue: Arctic Challenges

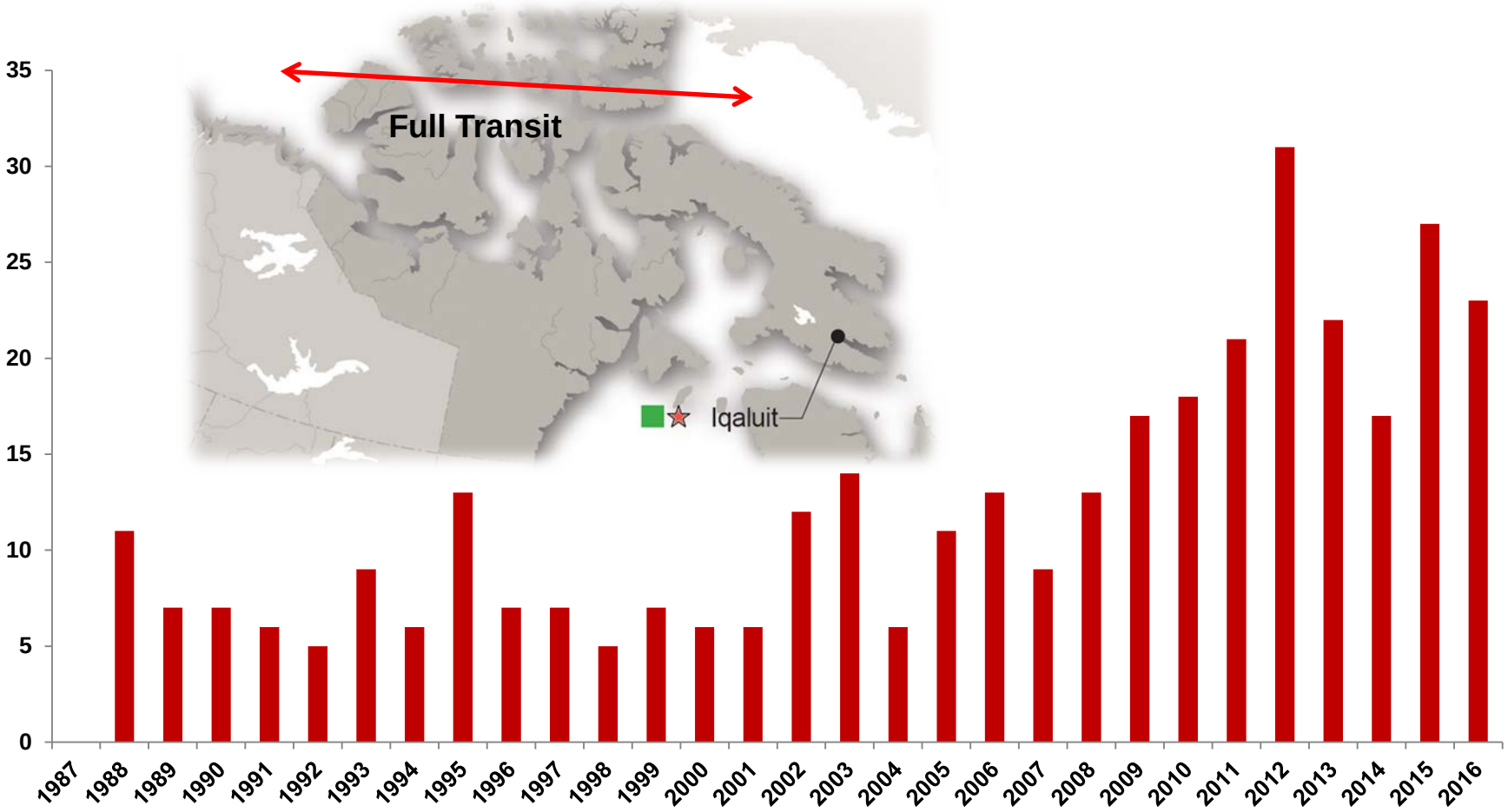
4. **Climate change** –
   - Winters are still very cold, leading to ice development on all Arctic waters
   - Ice coverage is not always “multi-year” it is sometimes “first-year”

BUT …

   - First-year ice melts in spring/summer resulting in a shifting ice pack or pieces
   - Ice packs and drifts can cut-off access to/from waterways
     - These changes can happen quickly – driven by varying winds
   - Ice pieces can damage vessels if moving in dynamic sea-state (waves) or if the vessel strikes an ice shelf

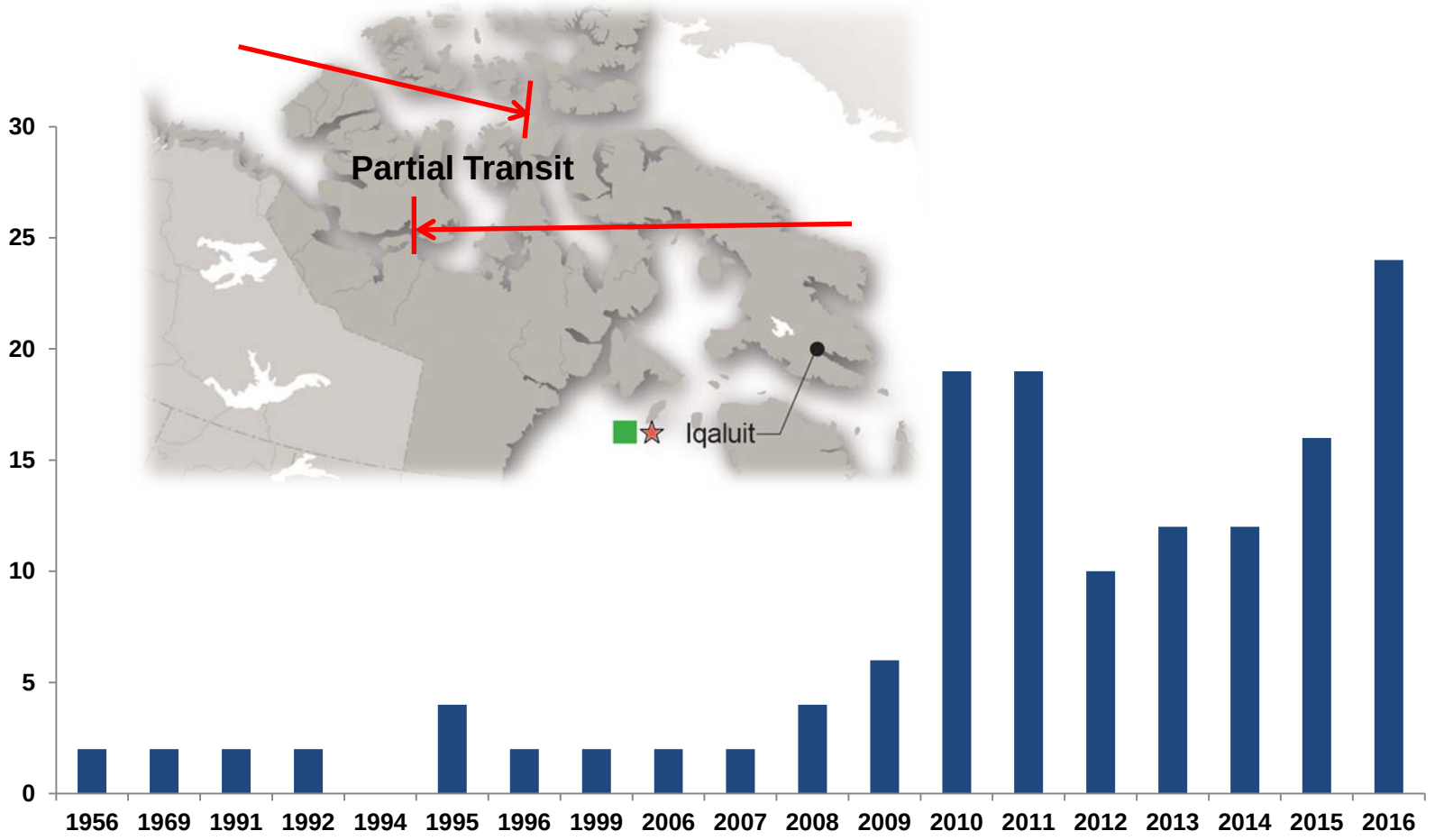
Ultimately: Open-water allows greater access resulting in increased vessel activity

Northwest Passage: Full Transits



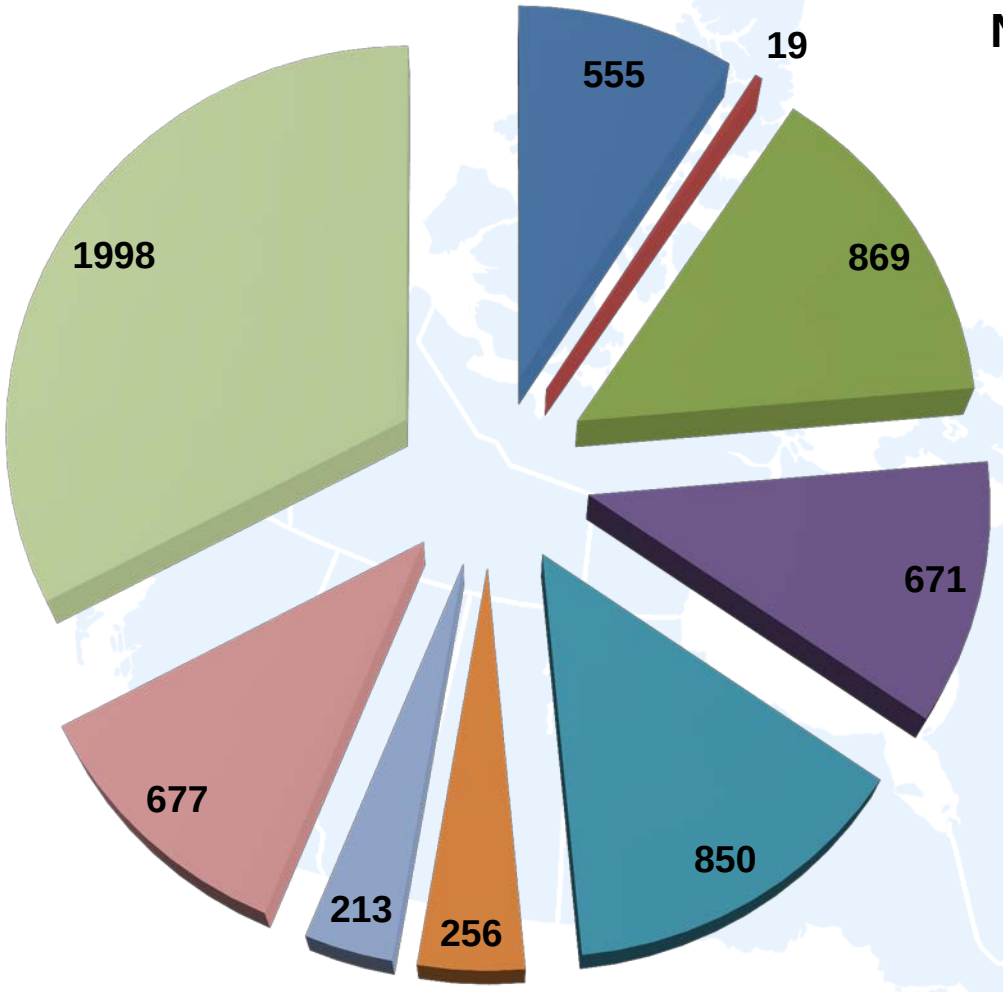
Note: *A full Northwest Passage transit is considered as being a transit between Baffin Bay and the Beaufort Sea in either direction*

Northwest Passage: Partial Transits



Note: *A partial transit westwards will be as considered as far west as Cambridge Bay and a partial transit eastwards will be considered as far east as Resolute Bay*

Who Was in the Arctic in 2016?

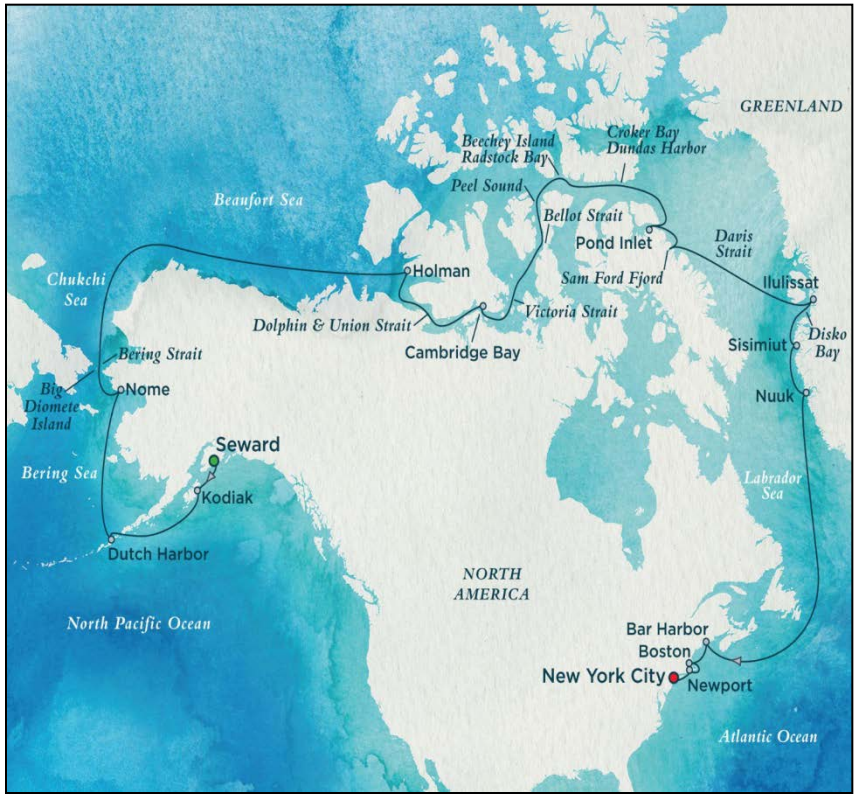


Total Days Spent in NORDREG Zone (2016)

- Canadian Coast Guard (11 vessels)
- Canadian Navy (2 vessels)
- General Cargo (14 vessels)
- Tankers (9 vessels)
- Tugs Barges (14 vessels)
- Passenger Vessels (11 vessels)
- Research Vessels (5 vessels)
- Bulk Carriers (21 vessels)
- Fishing Vessels (18 vessels)

Northwest Passage: Crystal Serenity Voyage

Crystal Serenity Cruise Itinerary: August 2016 Voyage



#	DATE	DAY	DESTINATION	ARRIVE	DEPART
0	08/16	TUE	SEWARD, U.S.A.		21:00
1	08/17	Wed	Kodiak AK, U.S.A.	9:00	18:00
2	08/18	Thu	Cruising the North Pacific Ocean		
3	08/19	Fri	Dutch Harbour, U.S.A.	8:00	18:00
4	08/20	Sat	Cruising the Bering Sea		
5	08/21	Sun	Nome, Alaska, U.S.A.	10:00	23:00
6	08/22	Mon	Cruising the Bering Sea		
7	08/23	Tue	Passing Big Diomete Island/Bering Strait		
8	08/24	Wed	Cruising the Chukchi Sea		
9	08/25	Thu	Cruising the Beaufort Sea		
10	08/26	Fri	Cruising the Beaufort Sea		
11	08/27	Sat	Holman, Canada	8:00	18:00
12	08/28	Sun	At Sea - Dolphin and Union Strait		
13	08/29	Mon	Cambridge bay, Canada	7:00	19:00
14	08/30	Tue	Cruising Victoria Strait		
15	08/31	Wed	Cruising Bellot Strait - Western Entranc	9:00	11:00
16	09/01	Thu	Ice Navigation - Peel Sound		
17	09/02	Fri	Cruising Beechey Island/Radstock Bay	6:00	18:00
18	09/03	Sat	Cruising Croker Bay/Dundas Harbor	8:00	18:00
19	09/04	Sun	Pond Inlet, Canada	6:00	18:00
20	09/05	Mon	Cruising Sam Ford Fjord	noon	22:00
21	09/06	Tue	Crossing Davis Strait		
22	09/07	Wed	Ilulissat, Greenland	7:00	18:00
			Cruising Disco Bay		
23	09/08	Thu	Sisimiut, Greenland	8:00	16:00
24	09/09	Fri	Nuuk, Greenland	7:00	16:00
25	09/10	Sat	Cruising the Labrador Sea		
26	09/11	Sun	Cruising the Labrador Sea		
27	09/12	Mon	Cruising the Atlantic Ocean		
28	09/13	Tue	Bar Harbor, U.S.A.	9:00	18:00
29	09/14	Wed	Boston, MA, U.S.A.	8:00	18:00
30	09/15	Thu	Newport, RI, U.S.A.	10:00	17:00
31	09/16	Fri	New York, U.S.A.	9:00	overnight
32	09/17	SAT	NEW YORK, U.S.A.	overnight	

Information Provided by Crystal Cruises

Crystal Serenity Voyage: Background Information

- Crystal Serenity transited the Northwest Passage in August 2016 with the RRS Ernest Shackleton as her escort vessel
  - First time for this type of voyage – both type and size of vessel and use of a dedicated escort vessel in the Arctic
- Largest passenger vessel to attempt transit
  - Approximately 1600 persons including crew
- CCG, Transport Canada, Canadian Ice Service initially met with company in 2014 to discuss regime and icebreaking services
- Canada and US jointly developed emergency response and tested with Crystal and partners via a table top exercise in April 2016

CCG - USCG Table Top Exercise: April 2016

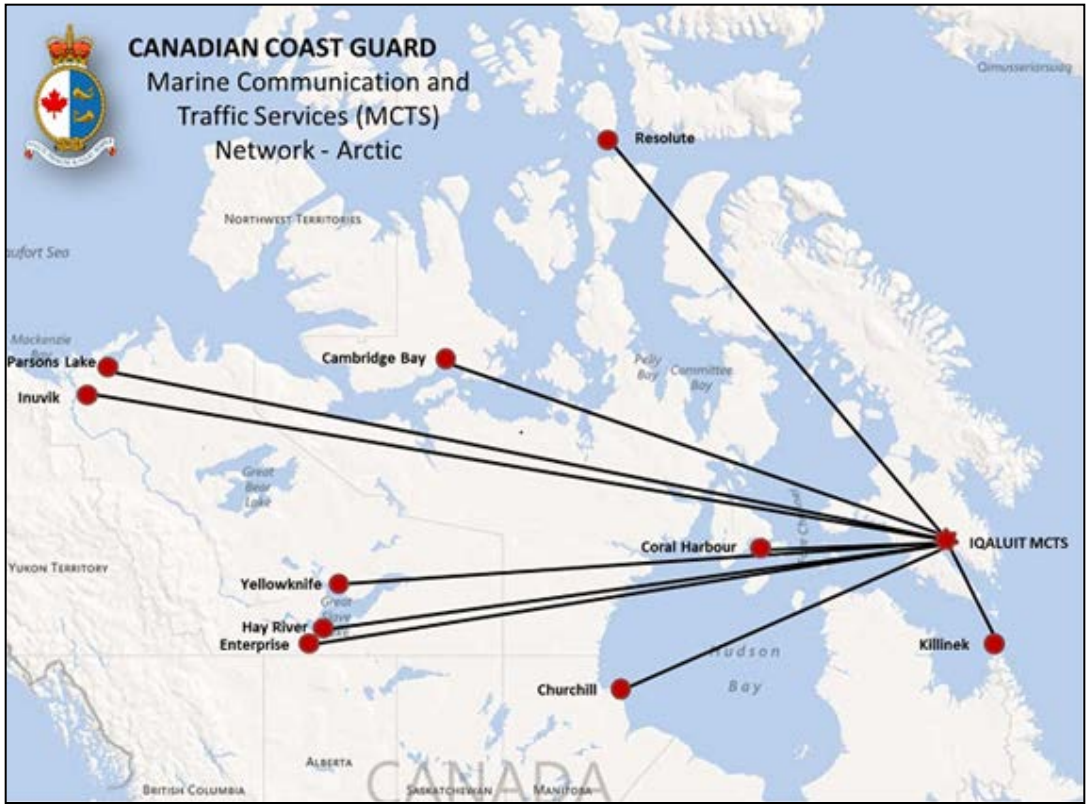
Exercise Scenario

- Cruise Ship encounters “issues” in contiguous areas of USA and Canada international waters in Beaufort Sea
- Challenges Crystal Cruise Lines, USCG and CCG emergency strategies – plans, communications, coordination, response
- Requires coordinated response from US and Canadian agencies and resources
  - Canadian side of TTX to extend outside of Table in a controlled test of alerting processes, internal and inter-agency communications, coordination

Full Exercise After Action report available at: https://www.uscg.mil/pvs/docs/NWPassage/NWP2106_Joint_Final_28Jul16.pdf

Objectives & Take-Aways: Table Top Exercise:

- **Objective**: Assess the notification and communication processes
- **Take-Away**: “Both U.S. and Canadian Coast Guard communication in the region is generally well covered via [VHF, MF, HF, SAT PHONE, SatCom (email)].” ***- Northwest Passage Exercise - After Action Report***



For any incident, Crystal Cruises intends to use a proprietary WEB EOC software system, allowing the company to establish an Emergency Operations Centre (EOC) as officials travel to their home EOC in Los Angeles, CA.

Communications between SAR services and the vessel flowed through the company’s EOC until resources arrived on scene.

Objectives & Take-Aways: Table Top Exercise:

- **Objective**: Examine existing SAR capabilities and limitations in emergency response:
- **Take-Away**: “Large Passenger vessels should not expect any significant SAR assets for the first 72-96+ hours due to vast distances between aircraft bases and remote locations within the [Northwest Passage].” ***- Northwest Passage Exercise - After Action Report***

Objectives & Take-Aways: Table Top Exercise:

- **Objective**: Identify operational and logistical requirements for the safe waterside transport of survivors
- **Take-Away**: “Lifeboats are not designed to hold survivors for long periods of time nor travel large distances unescorted. Freeboard alignment issues are likely to occur between responding vessels and lifeboats, making transfer of [persons] dangerous and time consuming.” ***- Northwest Passage Exercise - After Action Report***

“Airlifting survivors…out of a raft or lifeboat often requires the survivor to enter the water before hoisting can occur”

- Northwest Passage Exercise - After Action Report

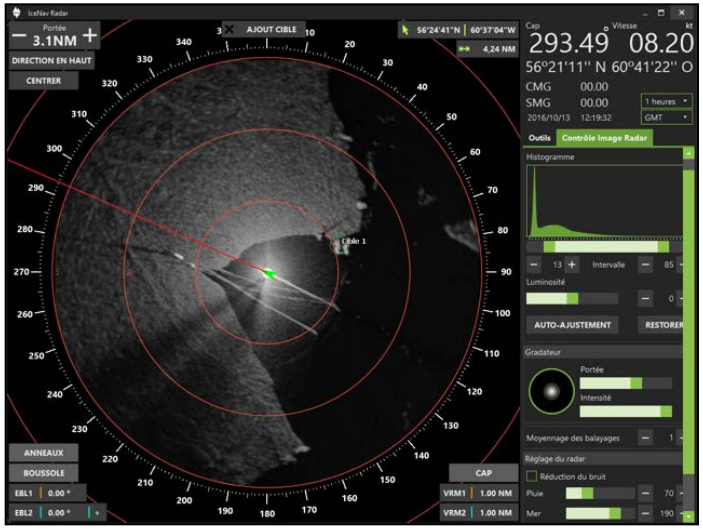
Image credit: Albert Law, SAREX 2013

Logistical Requirements: Abandon Ship

- Crystal Serenity was escorted by RRS Ernest Shackleton
  - 1A1 Super Icebreaker
  - 75 tonnes of bollard pull towing capacity
- It carried:
  - Expeditionary small boats (~30)
  - Light-duty helicopters (x2)
- Can accommodate ~ 600 additional persons on board

Crystal Serenity: Lessons Learned

1. **Preparation:** Building an **open** and **honest** relationship
2. Having a complete understanding of the **technical and operational capabilities** of the vessel. Make modifications where required
    - Ice Searchlights
    - Forward Looking Sonar
    - Thermal Imaging
    - High-Frequency Ice Radar (Enhanced Target Detection)
    - Ice Pilots
    - IceNav



IceNav Radar

Logistical Requirements: Other Positives

1. **Flexible Schedule:**
   - 7 supplemental days built into schedule
   - Transparency with passengers from onset - weather may delay or cancel the Northwest Passage transit

And Also

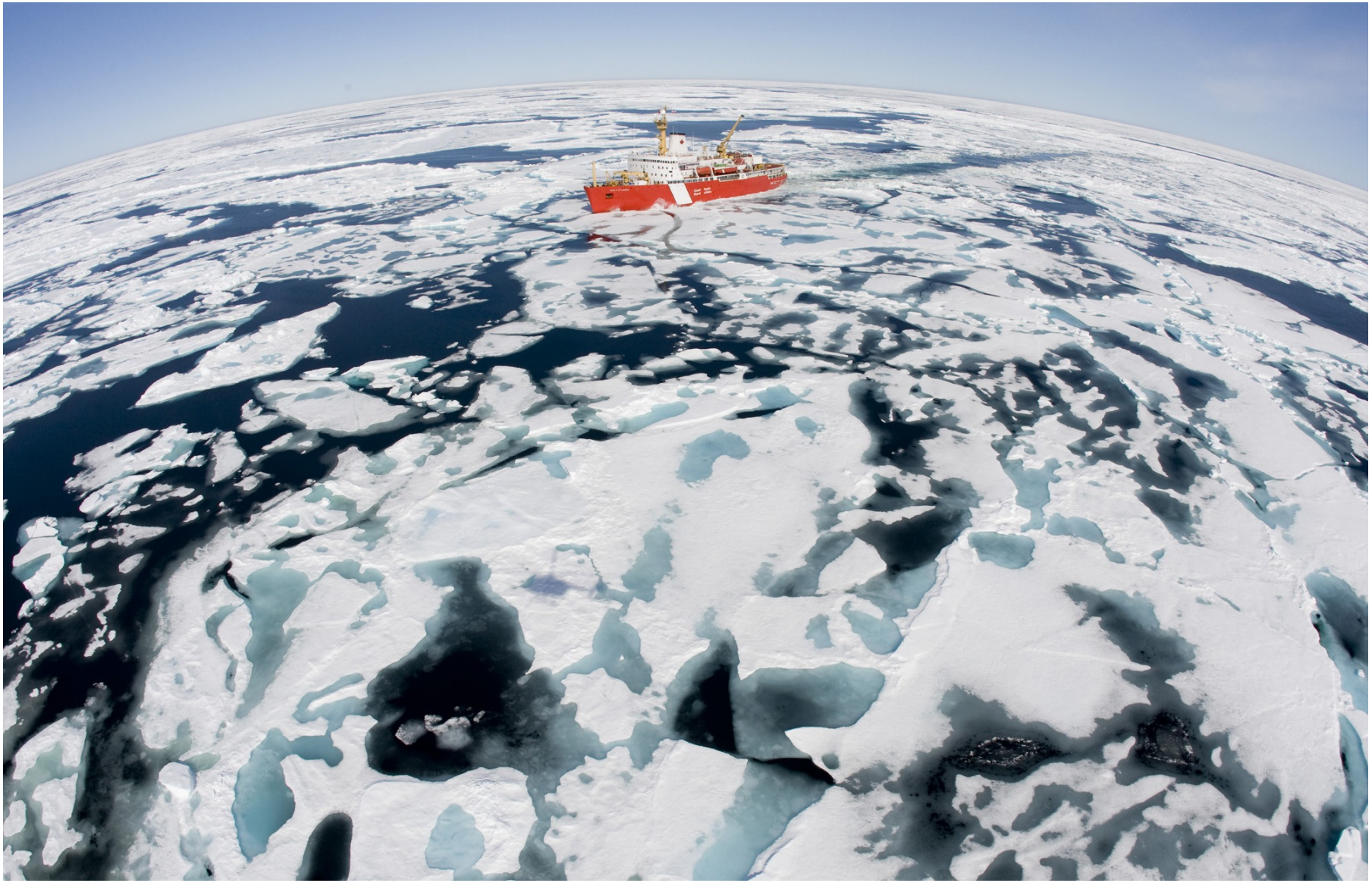
2. Crystal Cruises went out of its way with **engagement** of the hamlets it intended to visit:
   - Ensured in pre-voyage visits with the locals that there were no negative impacts on the residents of Ulukhaktok and Cambridge Bay, Pond Inlet and the isolated beaches and fjords they planned to visit

CCG, USCG, Denmark Joint Arctic Command Table Top Exercise: May 16-17, 2017

Exercise Scenario

- Location: Pond Inlet, NU
- Mass Rescue Operation - Cruise Ship has engine room electrical fire that disables water supply and discharge systems, heat, galley operations and propulsion.
- Multiple response scenarios will be evaluated:
  - Small (70 passengers)
  - Medium (300 passengers)
  - Large (1200 passenger)
- Presentations by USCG and Denmark Joint Arctic Command on how the scenario would unfold in their respective national waters

Questions?



Annex: Icebreaking Program
CCGS John G. Diefenbaker

- Canada's first polar icebreaker will provide Canada with enhanced Arctic capabilities
  - Capable of sustained operations in the Arctic for **270 days** in very difficult ice conditions
  - Can accommodate a crew of approximately 60 (with space for an additional 40 program personnel), two medium-lift helicopters and a large cargo/equipment carrying capacity
  - Modular mission payload approach to ensure the vessel is operationally adaptable and capable of meeting current and future program needs

Heavy Icebreaker

- Capable of two season operations
- Continuously break ice up to 1.3 m thick
- Operations dependent on prevailing ice conditions

Polar Icebreaker

- Capable of three season operations
- Continuously break ice up to 2.5 m thick
- Operate where it is needed, when it is needed
- Conduct over-winter operations, as required

Icebreaking Fleet: Heavy Icebreakers

Type 1300 - Heavy Gulf Icebreaker

- "Large vessel escort in most severe Atlantic and Gulf Operations, extended season operations through ice zone 6 or areas of less severity."
- Quantity: 1
- Power: 29,400 kW
- Max. Speed: 18.3 Kts
- Draft: 9.91 m
- Range: 23,000 n.m.
- GRT: 10,908 t
- Length: 119.63 m
- Fuel Capacity: 3,600 t
- Capable of maintaining a speed of advance of 3 Knots through uniform first year ice 1,400 mm (4.5 ft.) thick.

CCGS *Louis S. Saint-Laurent*

Heavy Icebreaker / Supply Tug

- "Large vessel escort in all areas of Southern Canada, summer Arctic Operations."
- Quantity: 1
- Power: 23,200 kW
- Max. Speed: 15.43 Kts
- Draft: 8.3 m
- Range:
- GRT: 4,234 t
- Length: 88 m
- Fuel Capacity: 1919 t
- Ice Class: Arctic Class 4

CCGS *Terry Fox*

Icebreaking Fleet: Medium Icebreakers

Type 1200 - Medium Gulf / River Icebreaker

- "Large vessel escort in all areas of Southern Canada, summer Arctic Operations."
- Quantity: 4
- Power: 10,000 - 12,000 kW
- Max. Speed: 16.5 Kts
- Draft: 7 m
- Range: 15,000 n.m.
- GRT: 5,910 - 6,172 t
- Length: 98 - 100 m
- Fuel Capacity: 1,584 - 2,215 t
- Capable of maintaining a speed of advance of 3 Knots through uniform first year ice 900 mm (3.0 ft.).

Icebreaking Fleet: Light Icebreakers

Type 1100 - Major Navaids Tender / Light Icebreaker

- "Buoy handling and heavy cargo; small to large vessel escort in all areas of Southern Canada and Sub-Arctic."
- Power: 5,000 - 6,000 kW
- Max. Speed: 15.5 Kts
- Draft: 4 - 6 m
- Range: 5,500 - 6,500 n.m.
- GRT: 2,200 - 3,800 t
- Length: 70 - 80 m
- Fuel Capacity: 323 - 783.7 t
- Capable of maintaining a speed of advance of 3 Knots through uniform first year ice 600 mm (2.0 ft.).