Homeland Security

U.S. COAST GUARD

U.S. Coast Guard Polar Ice Operations Program AICC March '04

Polar Icebreaker Mission Analysis

Purpose: Evaluate "national" polar icebreaking mission needs through the year 2020.

Method: Contractor will gain input from various Polar Icebreaker "customers" to determine polar region mission needs and recommended systems to accomplish mission goals.

Goal of Mission Analysis: A mission analysis is required as the first step in the Gov't's Major Acquisition Process. Since POLAR performance & reliability are declining rapidly, we need to complete this study as soon as possible.

Homeland Security

Mission Analysis Details

- Identify & analyze past, current & potential future polar missions through the year 2020.
- Identify current capability shortfalls
- Identify technological improvements that could improve mission effectiveness and efficiency.
- Identify viable alternative methods of mission success
- Identify & quantify polar region logistics & science support.
- Identify potential icebreaker support for future NW passage or northern sea route marine operations.
- Evaluate, analyze and quantify various systems that could most efficiently and effectively accomplish USCG polar region missions through the year 2020.

Homeland Security

Mission Analysis Details (cont'd)

- Evaluate equipment & science communication needs onboard polar icebreakers.
- Evaluate USCG science personnel support and determine most viable & effective method to meet science research needs
- Evaluate level of aerial asset support currently provided and needed in the future.

Homeland Security

Polar Region Mission Requirements

1. USCG logistical support for the U. S. Antarctic Program – OPERATION DEEP FREEZE.

2. USCG science research support in the polar regions.

3. U. S. “national asset” requirements

Homeland Security

Research/Science

- Ocean circulation studies, polar meteorology studies, living resource inventories, hydrographic surveys, geological surveys, ice trafficability studies, monitoring former USSR radiation releases
- International exchange of information on ice operations
- Users:
  - National Science Foundation
    - Grants to academic institutions
  - Office of Naval Research
  - NOAA
  - Department of the Interior
  - EPA
  - State Environmental/Wildlife agencies
  - Army Corps of Engineers
  - NASA

Homeland Security

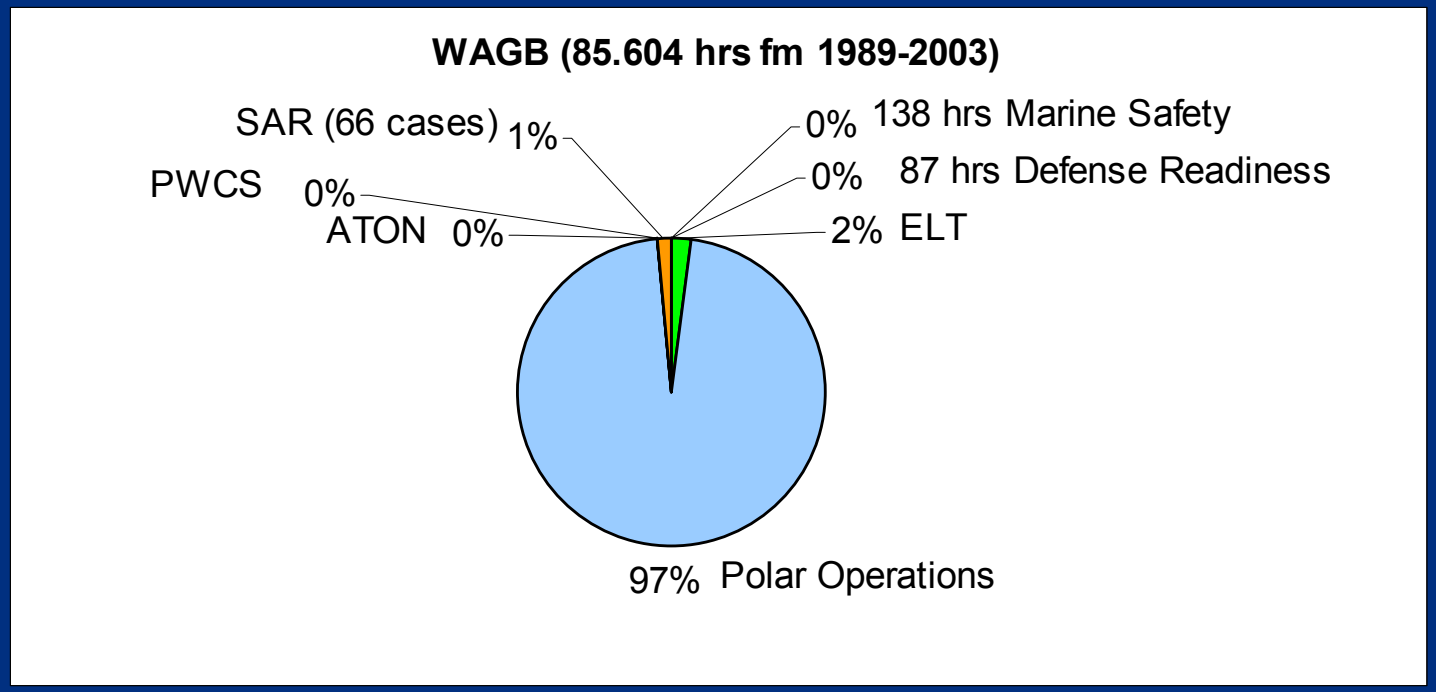
Strategic/National Security

- Project U.S. presence in polar regions. (DOD plans & policy)
  - USCG has only U.S. surface assets that can accomplish this task
- McMurdo Station (OP Deep Freeze)
  - USCG supported since 1956
- Thule Air Force Base re-supply (OP Pacer Goose)
  - USCG supported since 1960s
- Support possible commercial US polar operations (North Slope of Alaska)
- Antarctic Treaty Compliance Inspections to enforce treaty
  - USCG completed in 1982, 1987, 1995
- Maintain capability to conduct national security/DOD research in polar regions
- Diplomatic missions related to US strategic interests


Thule AFB
Bering Strait
Seattle
Arctic Ocean
Greenland Sea
Baffin Bay
Davis Strait
Labrador Sea
Hudson Bay
Denmark Strait
Beaufort Sea
Gulf of Alaska
North Pacific
RUSSIA
Chersky
Pevek
Anadyr'
Provideniya
Nome
Prudhoe Bay
Barrow
UNITED STATES
(Alaska)
Bethel
Fairbanks
Anchorage
Valdez
Kodiak
Juneau
Ketchikan
Prince Rupert
Vancouver
Seattle
Portland
Whitehorse
Dawson
Inuvik
Yellowknife
Uranium City
Lake Athabasca
Great Bear Lake
Great Slave Lake
Edmonton
Calgary
Saskatoon
Regina
Winnipeg
Great Falls
Missouri River
Columbia River
Fraser River
Mackenzie River
Yukon River
CANADA
Victoria Island
Banks Island
Queen Elizabeth Islands
Cambridge Bay
Arctic Bay
Repulse Bay
Echo Bay
Churchill
Baffin Island
Frobisher Bay
Ivugivik
Schefferville
Goose Bay
Fort George
Moosonee
Lake Winnipeg
Lake Superior
Lake Huron
Thunder Bay
Quebec
Montreal
Ottawa
Toronto
Boston
Bangor
St. John
Halifax
Island of Newfoundland
St. John's
St. Pierre and Miquelon
(FRANCE)
Gulf of St. Lawrence
Alert
Nord
Danmark Havn
Itseqqortoormiit
Greenland
(DENMARK)
Nuuk (Godthåb)
Qaqortoq
Qeqertarsuaq
Ammassalik
Arctic Circle
ICELAND
Reykjavik

Other "National Asset" missions

- Search & Rescue (93 SAR cases since 1986)
- Law enforcement in Marginal Ice Zone (fishery/pollution)
- Environmental pollution response
- Assist commercial shipping in the Arctic (potential)



Homeland Security

Homeland Security

USCG – Polar Ice OPs Program History

1885
Cutter Bear – explores Alaskan waters for 40 years

1900

1936-1941
USCG initiated intensive study of heavy icebreaker design

WWII
USCG/USN Wind class & Mackinaw

1946
Operation High Jump – Admiral Byrd's Antarctic expedition

1950's
DEW stations built - required icebreakers for re-supply

1955-56
First Operation Deep Freeze - permanent US presence on Antarctica

1965-66
Joint study - USN xfers all icebreakers to USCG – 8 icebreakers

1971
Alaskan north slope oil discovered – polar icebreakers receive national interest

Late 1970's
POLAR STAR & POLAR SEA built

1980's
Older icebreakers decommissioned. By 1989, PSEA & PSTAR only 2.

1999/2000
USCGC HEALY: Planned in 80's, funded 90's, operational in 2000

2000

TODAY

Homeland Security

USCG POLAR ICEBREAKERs Today

POLAR SEA, POLAR STAR & HEALY are the only U. S. surface assets capable of supporting national asset mission needs and capable of operating in polar regions year around.

- POLAR STAR & POLAR SEA commissioned 1976, 1977 respectively

- HEALY commissioned 1999

Polar Class WAGB 399' Capabilities

WAGB 399 Design

- Traditional sloping bow
- Reinforced/thick hull
- Round hull
- High power/weight ratio
- Redundant propulsion systems for fuel efficiency and reliability in polar regions (very complex)
- Variety of diesel-electric & turbine engine configurations w/ 3 shafts
- Large, single rudder
- Capacity for two HH-65 helos & support eqpmt.
- Science support facilities & eqpmt.
- Fuel tanks are ballast tanks

Most powerful non-nuclear icebreakers in the world

Russians have most powerful icebreakers (nuclear)

HEALY WAGB 420' Capabilities

State of the art polar region science & icebreaking platform

WAGB 420 Design

- Fixed pitch propellers (more durable)
- Integrated diesel-electric propulsion & power supply system. (less complex, easier to maintain)
- Two unsupported rudders, two shafts
- Separate ballast & fuel tanks
- State of the art science oceanographic, meteorological & biological equipment and spaces
- Automated for minimal permanent manning
(19 Officer, 12 CPO, 54 Enlisted, 35 Scientists, 16 Surge, 2 Visitors)
- Cranes - 5 hydraulically operated, 100% coverage of working decks
- Accommodations for two HH-65 aircraft
- Dynamic positioning system
- Integrated Bridge System for minimal manning

US Polar Icebreaker capabilities

USCG assets

	Length (ft)	Displacement (tons)	Horsepower (SHP)	Icebreaking Capability
HEALY	**420**	**16,400**	**30,000**	**4.5 ft at 3 kts** **7 ft (ramming)**
Polar Class (2)	**399**	**13,190**	**60,000**	**6.5 ft at 3 kts** **21 ft (ramming)**
RVIB **Nathanial B. Palmer** (NSF asset)	**293**	**6,800**	**12,700**	**3 ft at 3 kts** **5 ft (ramming)**

Homeland Security

USCG Polar Icebreaker Statutes

- 14 USC 2: CG is tasked with developing, maintaining, and operating icebreaking facilities for the US.
- 14 USC 93: Authorizes maintenance of icebreaking facilities
- 14 USC 94: Authorizes conduct of oceanographic research
- 14 USC 141: Utilization of CG personnel and facilities in assisting other federal and state agencies, including icebreaking
- 15 USC 4101: Arctic Research and Policy Act of 1984
- 16 USC 2431: Antarctic Marine Living Resources Convention Act of 1984

Homeland Security

Antarctic Treaty & US Antarctic Program

US Policy for Antarctica:

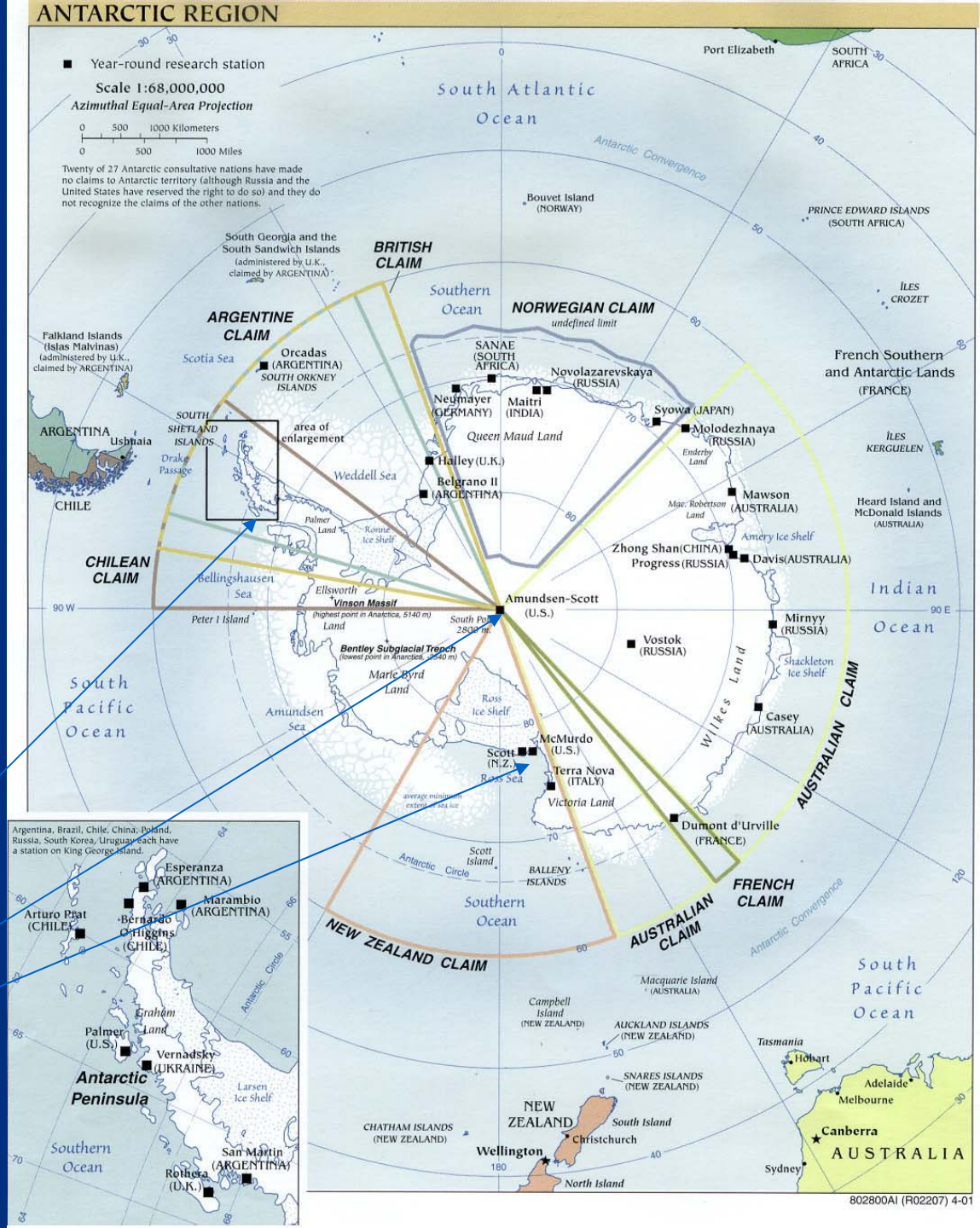
- Maintain Antarctic Treaty; ensure peaceful uses of region only. (no commercial or military)
- Protect environment; ensure equitable use of resources (mineral resource use is banned).
- Foster science that solves regional and global problems.

1982 Presidential Antarctic Memo:

- Directs executive branch to manage & maintain three permanent bases year round

- Palmer Station
- South Pole Station
- McMurdo Station

Homeland Security

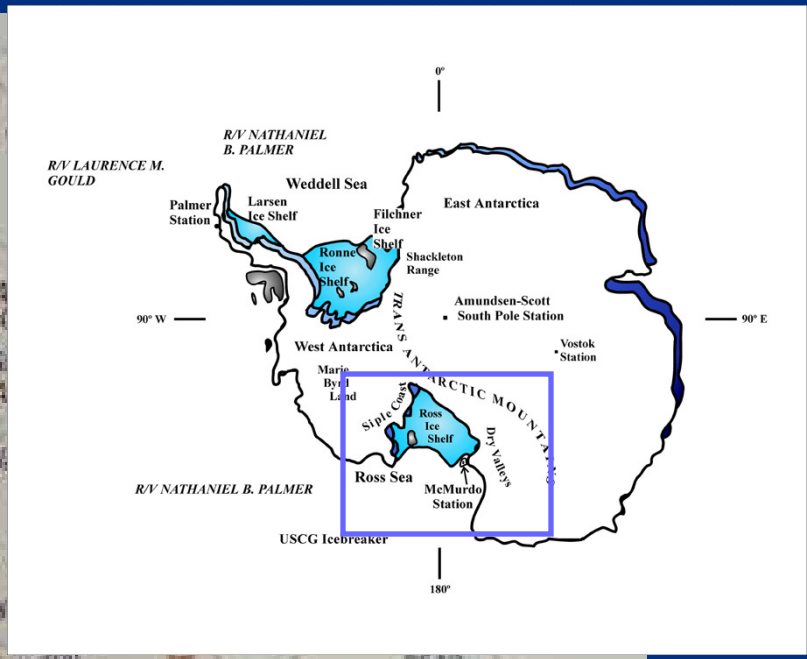


OPERATION DEEP FREEZE

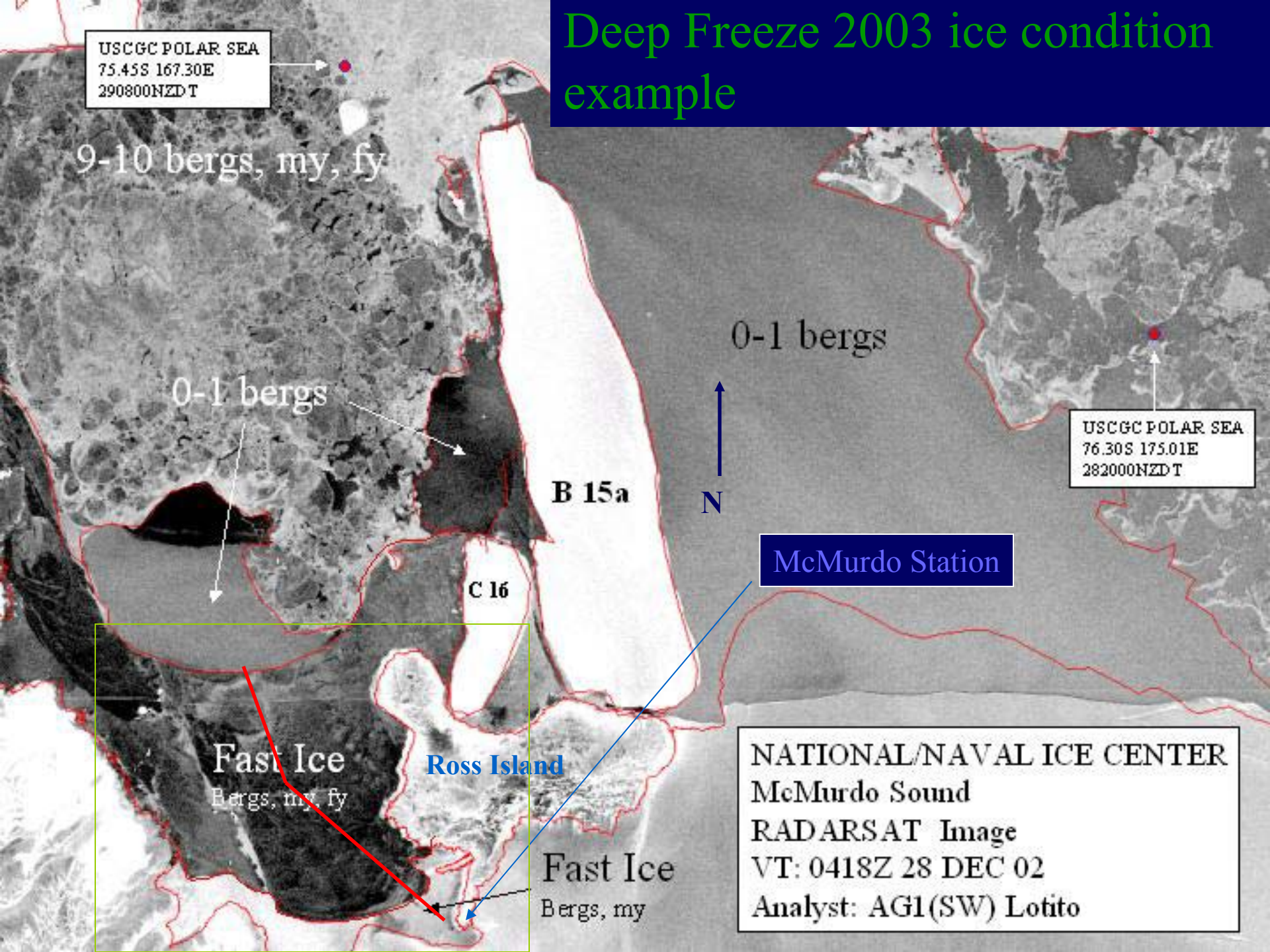
USCG Provides icebreaker support to:

1. Open channel through fast ice into McMurdo Station & clear McMurdo ice pier for logistics vessels (most difficult tasking)
2. Escort MSC tanker & container ship into & out from McMurdo ice pier (typically most hazardous)
3. Refuel remote helicopter fueling station & RVIB Nathanial B. Palmer

Ross Sea/McMurdo Sound OPAREA



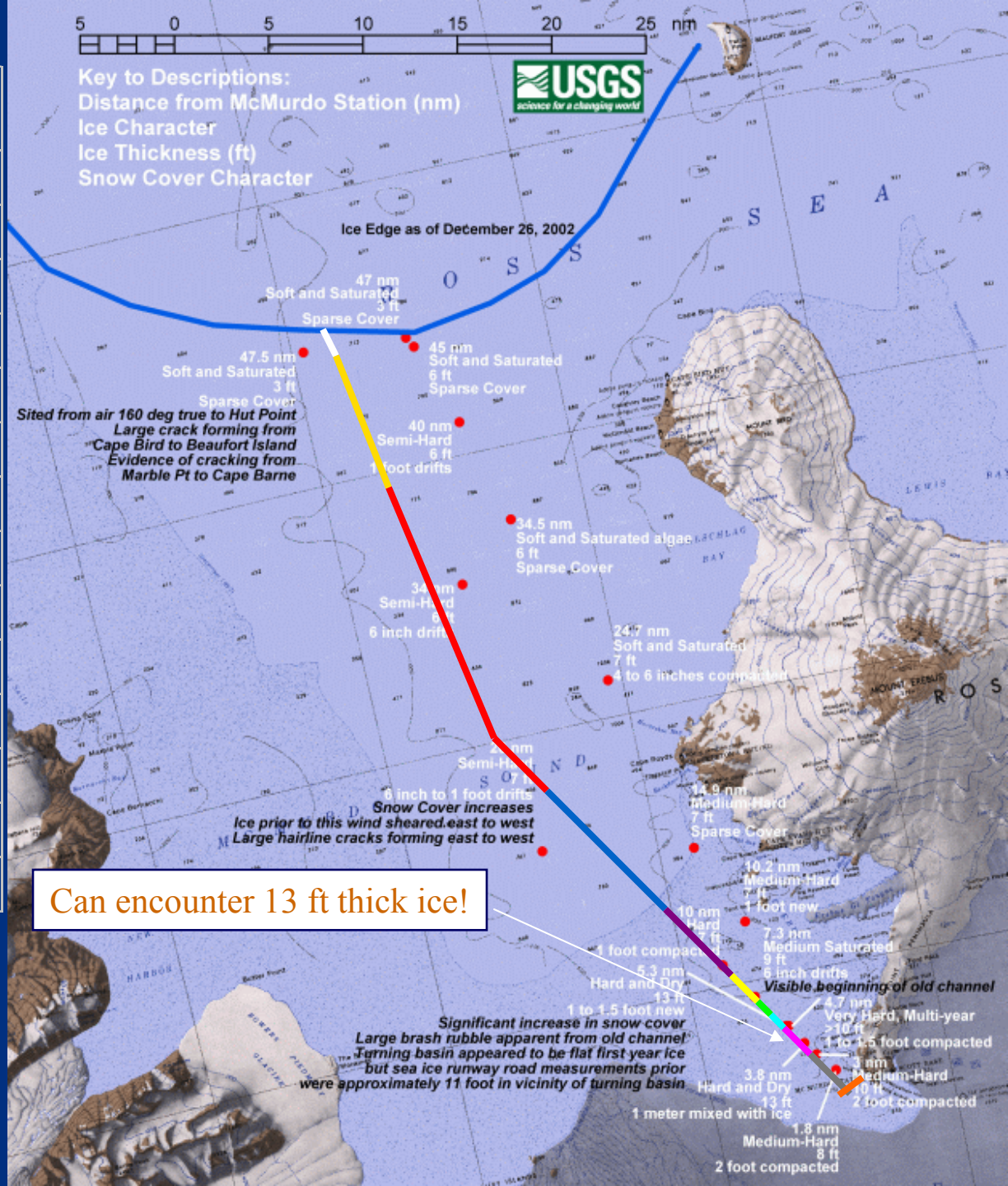
Deep Freeze 2003 ice condition example



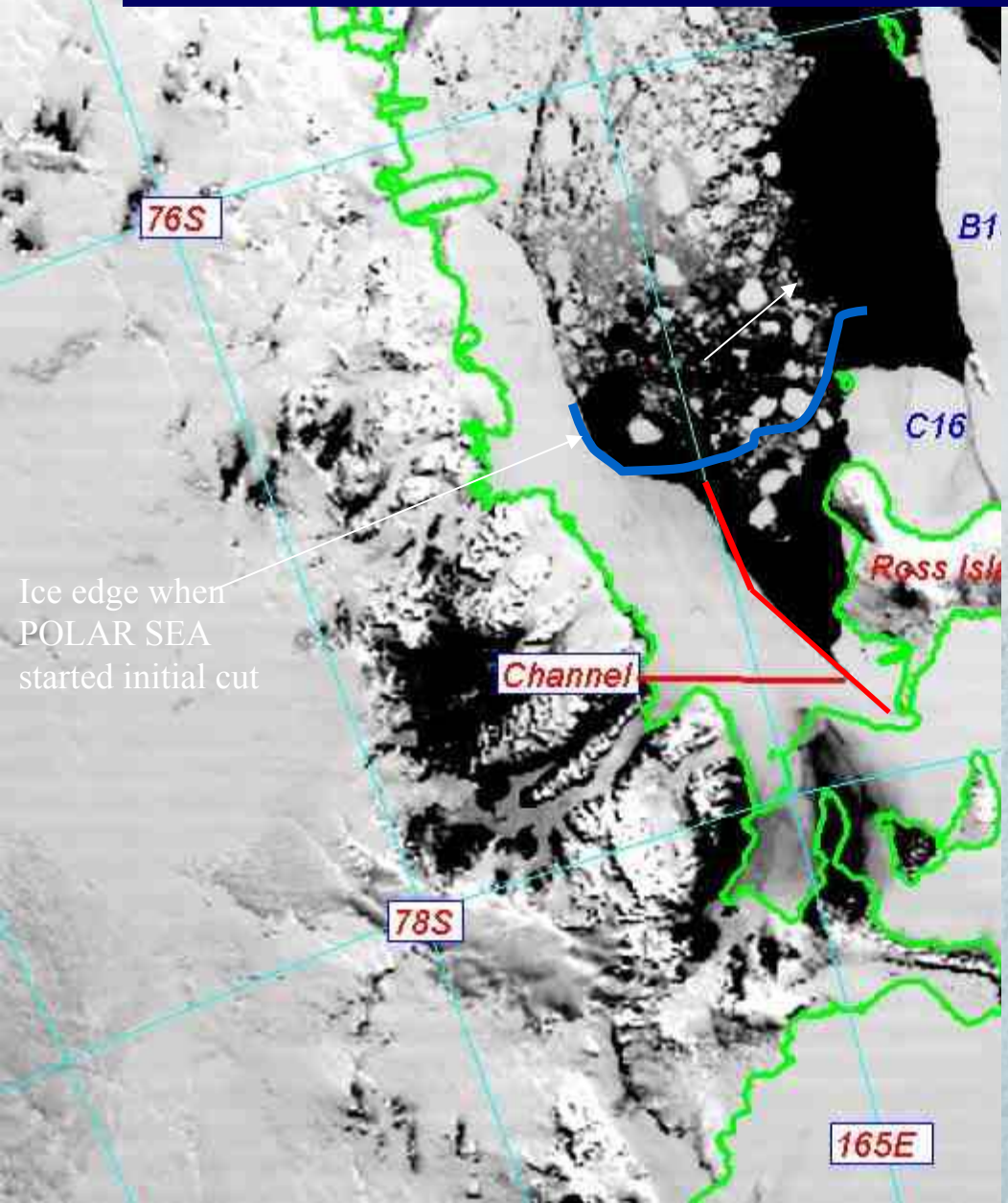
Day	Distance	Ice thickness (in)	Engine Configuration	Hrs ran
30-Dec	0.75	42	2-2-2	5.5
30-Dec	1.25	48	2-T-2	5.1
31-Dec	9	48	T-2-T	8
1-Jan	19	60	T-2-T	16
2-Jan	1.5	66	T-2-T	1.5
2-Jan	7.8	72	T-T-T	9
3-Jan	3.2	72	T-T-T	4
3-Jan	2.3	84	T-T-T	10
4-Jan	1.7	96	T-2-T	16
5-Jan	0.4	156	T-T-T	8
6-Jan	0.8	156	T-T-T	15
7-Jan	1.2	133	T-T-T	16
8-Jan	2.5	108	T-T-T	16
9-Jan	1.5	84	T-T-T	14

DF 03 Initial Cut

Homeland Security



Results of USCG DF03 Polar Icebreaker efforts



Ice edge when POLAR SEA started initial cut