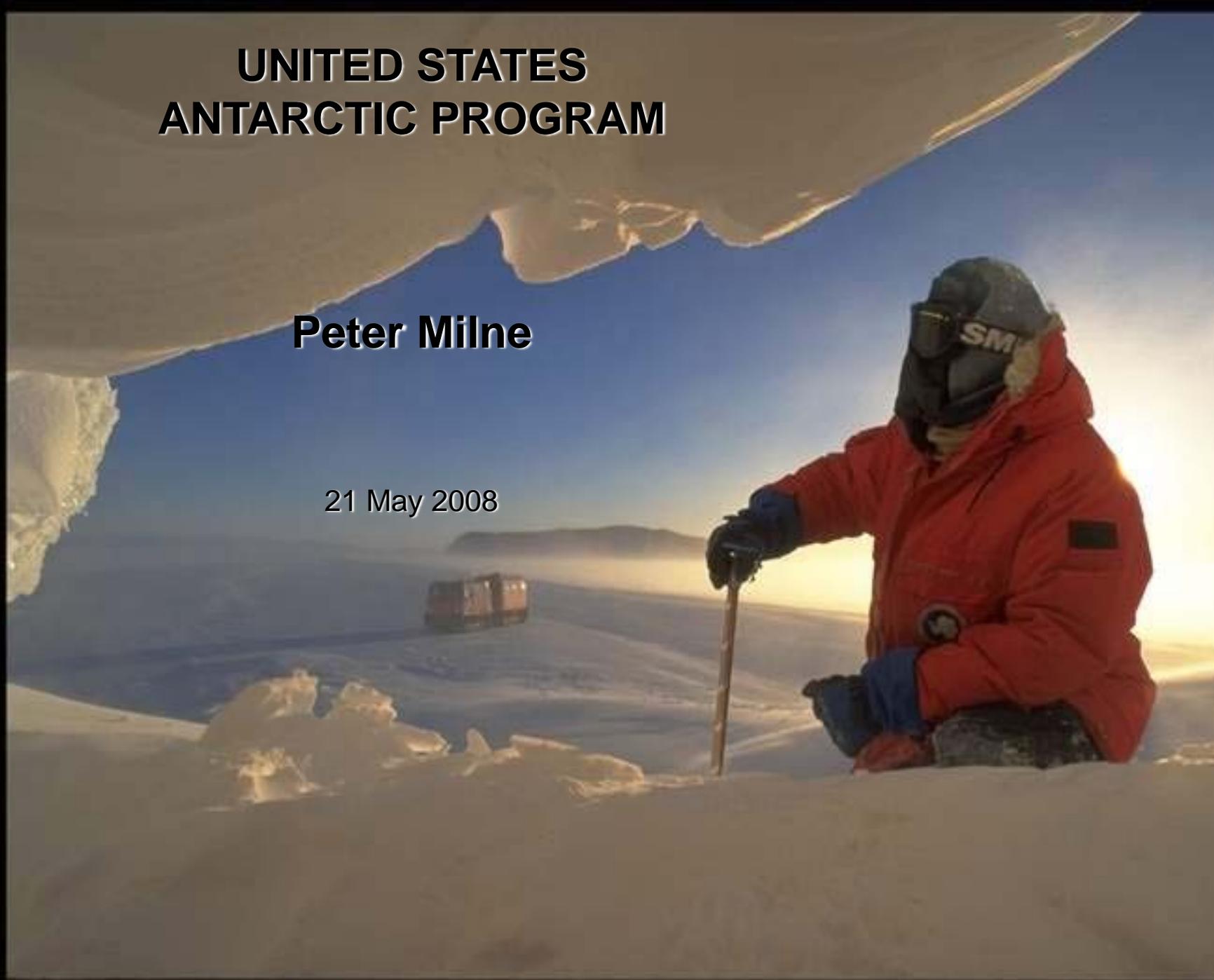


UNITED STATES ANTARCTIC PROGRAM

Peter Milne

21 May 2008



Reasons for Antarctic research

- Exploration
 - aero geophysics, sea-floor mapping, long term ecological research, geological exploration
- Antarctica's role in global systems
 - ozone layer, greenhouse gases, climate, ocean circulation, sea-level, plate tectonics
- Antarctica as a platform
 - astronomy, upper atmosphere/space physics, meteorites, seismology

U.S. Antarctic Policy

- “The United States Antarctic Program shall be maintained at a level providing an active and influential presence in Antarctica designed to support the range of U.S. antarctic interests.”
 - White House Memorandum 6646, 5 February 1982
- “Science has provided a successful basis for international accord, and the Antarctic is the only continent where science serves as the principal expression of National policy and interest.”
 - The White House, October 1970

USAP

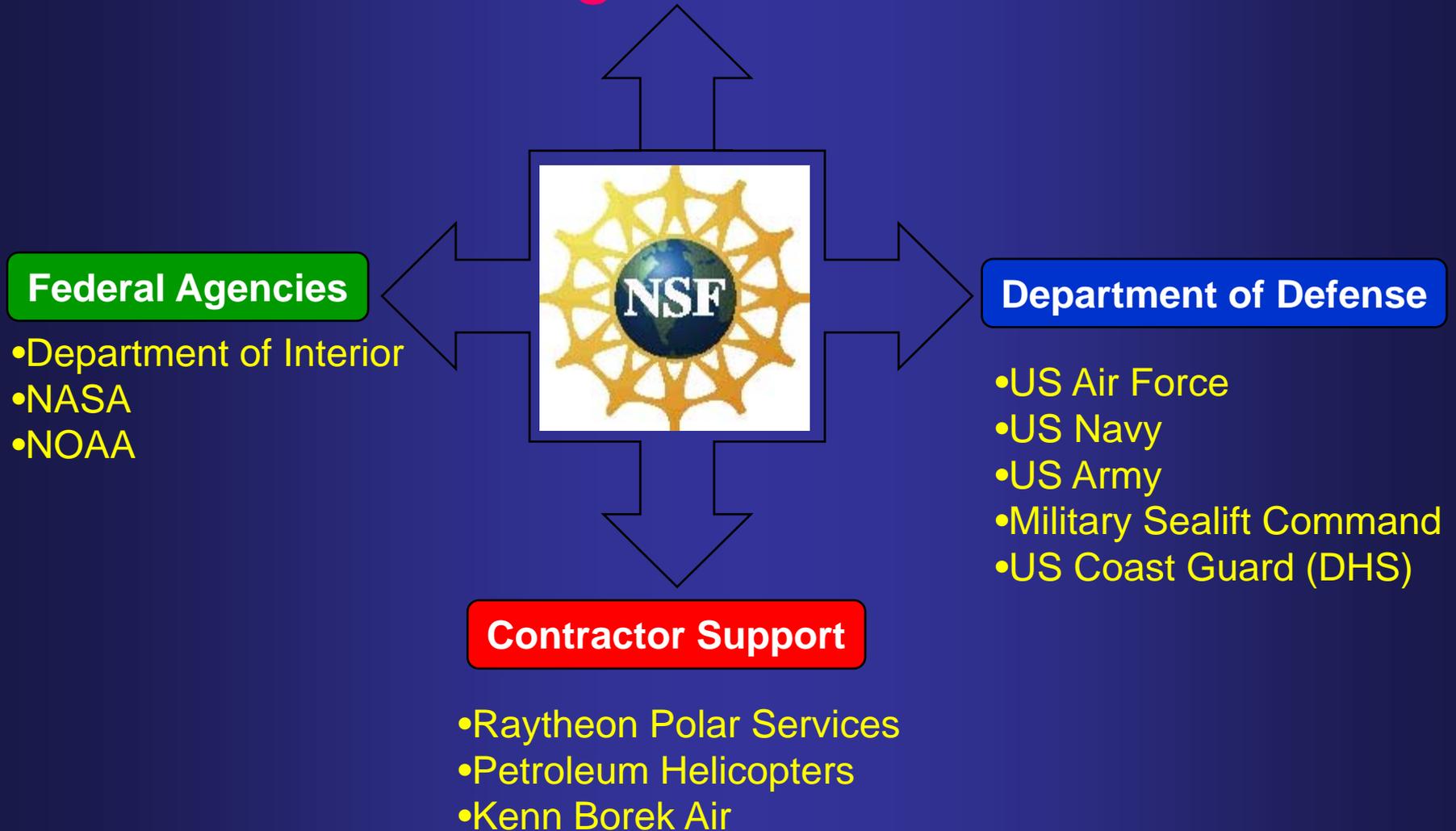
Responsibilities

- NSF is the lead agency for the U.S. Antarctic Program (USAP).
- Since 1970, NSF has been responsible for managing and budgeting for the USAP.
- NSF provides U.S. presence in Antarctica, including
 - year-round occupation of the South Pole and two coastal stations
 - full logistic support for over 650 scientists working in Antarctica

USAP Support Agencies

AMC	Air Mobility Command
ANG	Air National Guard
CRREL	Cold Regions Research Engineering Labs
DCMA	Defense Contracting Management Agency
DOI	Department of Interior
FAA	Federal Aviation Administration
MSC	Military Sealift Command
NASA	National Air and Space Administration
NAVCHAPS	Naval Cargo And Handling Group
NAVFAC	Naval Facilities Command – Pacific Division
NOAA	National Oceanic and Atmospheric Agency
PACOM	Pacific Command
SPAWAR	Space and Naval Warfare System Center
RPSC	Raytheon Polar Services Company
USAF	US Air Force
USCG	US Coast Guard
USGS	U.S. Geological Survey
USTRANSCOM	U.S. Transportation Command

U.S. Antarctic Program – Organization



Strategic Focus Areas

- Science Support: to effectively anticipate, plan, and to meet current and future science support requirements
- IT and Communications - to provide network systems that allow intra- and inter- continental communications to and from Antarctica comparable to that found at typical business and higher education establishments in the continental United States.
- Infrastructure – to build, operate, and maintain the facilities, and services necessary to operate and support the USAP enterprise.
- Transportation and Logistics - to effectively manage, deliver and people/cargo/science to, from, and within the Antarctic.

USAP Int'l and Contractor Participants

Foreign Gov.

NZDF	New Zealand Defense Forces
RNZAF	Royal New Zealand Air Force
INEA	Italian Antarctic Program
SWEDARP	Swedish Antarctic Program
BAS	British Antarctic Survey
IPEV	French Antarctic Program
FRG	German Antarctic Program
ANARE	Australian Antarctic Research Program

Transportation and Logistics

To effectively deliver people/cargo/science to, within, and from Antarctica



USAP Aircraft and Research Ships

Aircraft:

- 10 ski-equipped C-130 airplanes
 - provide inter- and intra-continental transportation and field support
- 4 contracted helicopters
 - provide support field operations and search-and-rescue operations
- 3 leased ski-equipped Twin Otter aircraft
 - provide field support

Research Ships:

- R/V *Nathaniel B. Palmer*
- R/V *Laurence M. Gould*
- Coast Guard icebreaker

Airlift Operations

Southbound 2007/2008

	Missions	PAX	Cargo
WINFLY (Actual)	3 (3 C-17)	296 (Southbound)	131,862 lbs (Southbound)
Austral Summer (Actual)	82 (54 C-17/ 25 LC-130/ 3 C-130 RNZAF)	3,157 (Southbound)	2,733,876 lbs (Southbound)
Redeployment (Post vessel)	11 (6 C-17 / 4 LC130/ 1 C-130 RNZAF)	854 (Northbound)	80,999 lbs (Northbound)

Note: an additional medevac mission was flown at the conclusion of Winfly on 28 Aug

R/V L.M. Gould
R/V N.B. Palmer



Swedish Icebreaker Oden

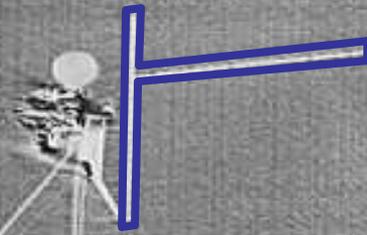


Vessel Operations 2007/2008

	Arrival	Departure	Comments
M/V Gianella	Jan 30	Feb 01	9.0M gallons
M/V American Tern	Feb 06	Feb 12	8.7M pounds
R/V Nathaniel B. Palmer	Various	Various	Science support
IB Oden	Dec 25	Feb 15	Channel break-in and escort

Note: M/V American Tern made two Port Calls at Lyttelton. R/V Nathaniel B. Palmer made two Port Calls at Lyttelton.

Williams Field



Scott Base



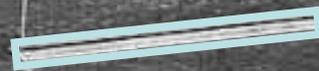
McMurdo Station



Ice Runway



Pegasus



USAP Year-Round Stations

- **McMurdo Station (summer population 1,100)**
 - **the main USAP science and logistics base**
 - **located on Ross Island**
- **Palmer Station (summer population 42)**
 - **primarily used for interdisciplinary ocean science and LTER**
 - **located in Antarctic Peninsula area where claims overlap**
- **Amundsen-Scott South Pole Station (summer population 255)**
 - **the best occupied site on Earth for certain observations in astronomy and astrophysics**
 - **background air of planet**
 - **geophysical studies related to Earth's axis of rotation; magnetospheric cusp**

Crary Laboratory

McMurdo Station



South Pole Station



South Pole Science



U.S. Antarctic Program Resources – Airplanes



USAP LC-130



**PHI
helicopter**



U.S. Air Force C-17



New Zealand C-130



Tasked with 55 missions
Christchurch NZ to McMurdo Station
C-17 for 06-07 Season

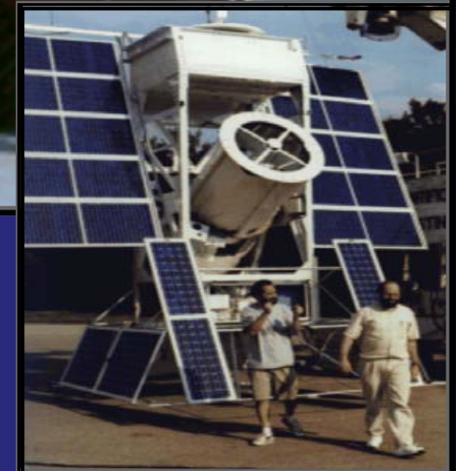
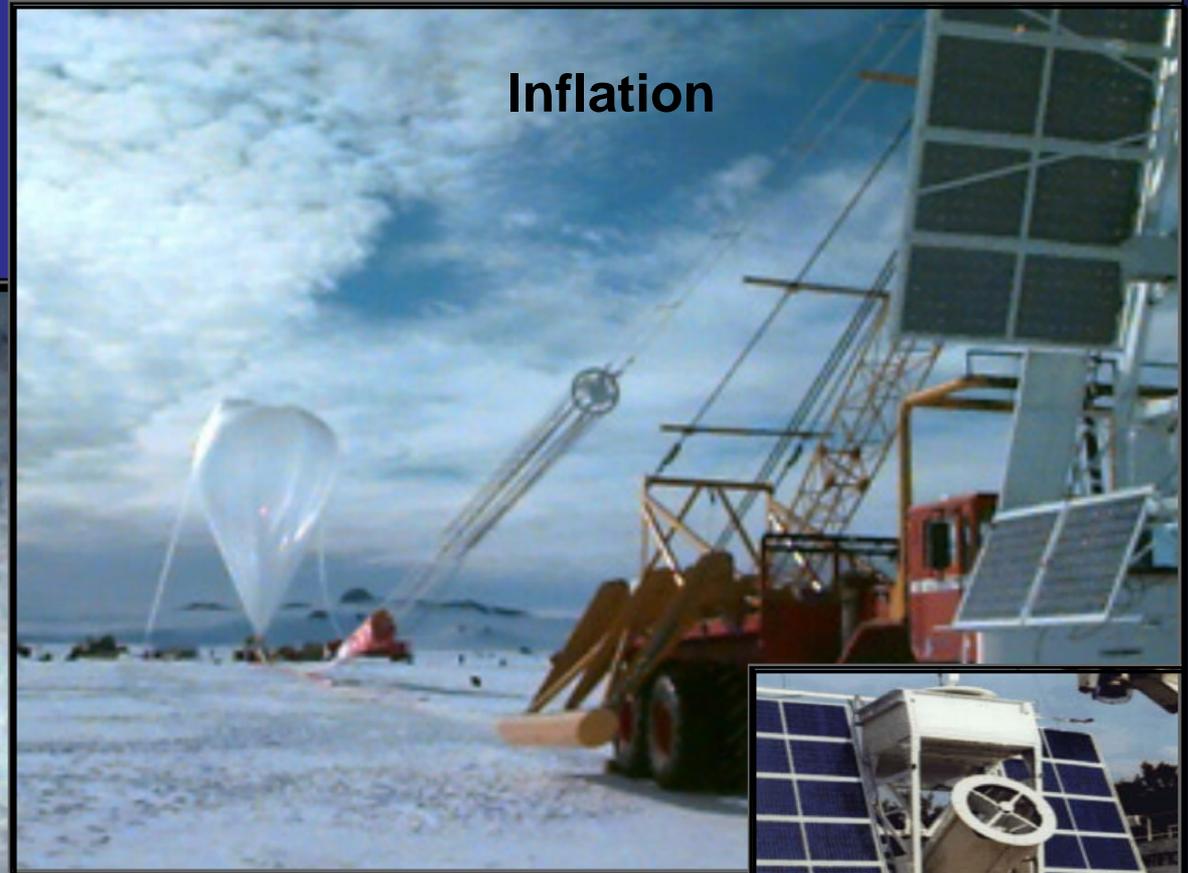
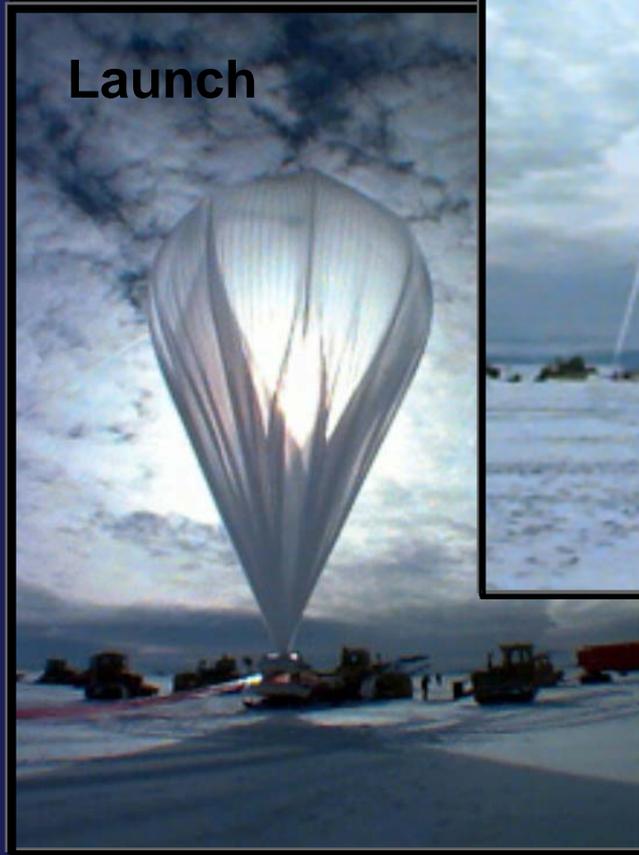


Instrumented Twin Otter (Kenn Borek Air)



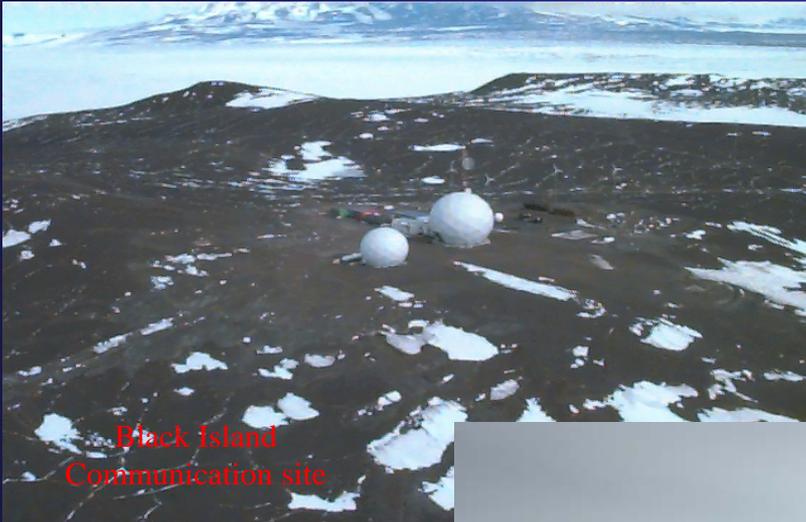


Long-Duration Balloon Program



IT and Communications

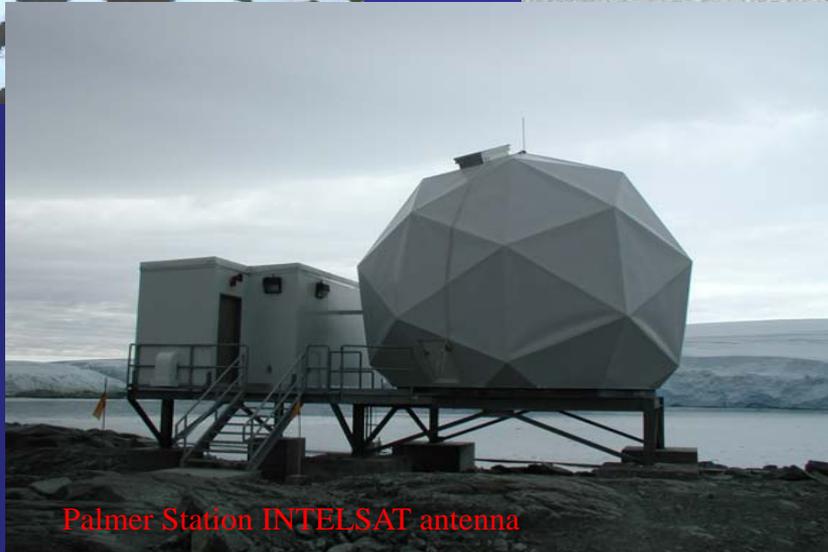
To provide network systems that allow intra- and inter- continental communications comparable to that found at typical business and higher education establishments in the continental United States



Black Island
Communication site



South Pole MARISAT antenna



Palmer Station INTELSAT antenna



109AW Antarctic Mission Timeline



- **OCT 1975- 109 TAG receives mission from 17th AS, ELMENDORF AFB**
 - **Distant Early Warning line support (DEW Line)**
 - **Science support to other Greenland locations**
- **OCT 1984 Conversion from C-130D TO LC-130H2**
- **JAN 1988 First Antarctic Deployment (Increased each year from this point)**
- **FEB 1990 Recommendation for 109 AW as Single Point Provider for ALL LC-130 Arctic and Antarctic airlift**
- **1996-1999 Antarctic LC-130 Operations from Navy to New York Air Guard**
- **SEP 1999 - Present: New York Air Guard - Single Point Provider, LC-130 Arctic & Antarctic**

Joint Operating Area



LC-130 06/07 On-Continent Airlift



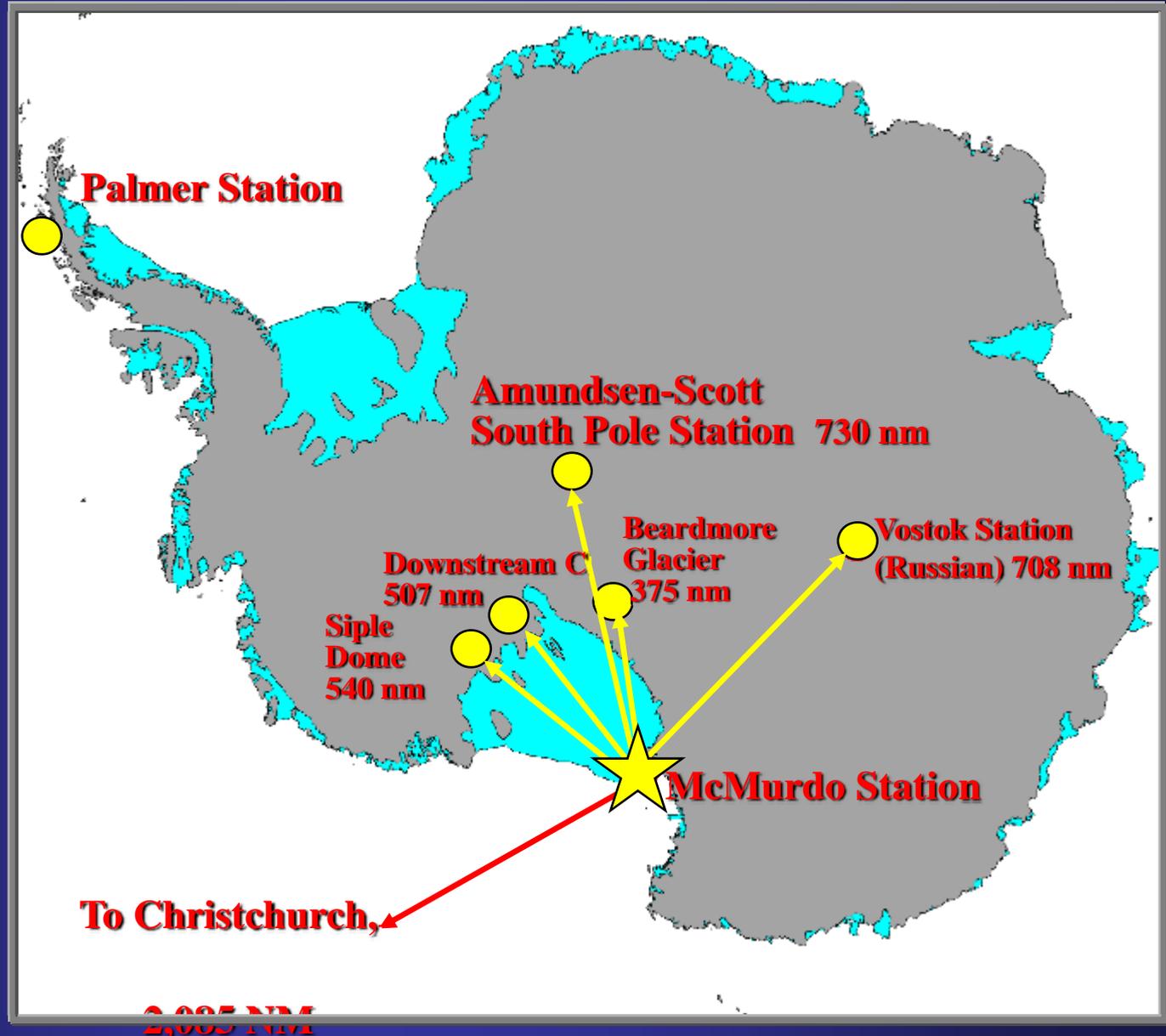
- 8 LC-130 Aircraft
- 6-8 Missions per day
- 10-12 Hr crew day
- 7 Days/Wk
- 24 Hr/Ops
- 456 Ice Missions
- 3,000+ Flt Hrs

- **BDM** – Beardmore Glacier
- **FDK** – Fosdick Mountains
- **NBY** – Byrd Surface Camp
- **ODL** – Odell Glacier
- **PHL** – Patriot Hills
- **SDM** – Siple Dome
- **WSD** – West Divide Camp
- **VOS** – Vostok (Russian Camp)

Antarctic Science

Science performed includes:

- Upper atmosphere studies
- Astrophysics
- Climate change
- Seismology
- Glaciology
- Volcanology
- Marine biology



LC-130 Unique Challenges

Ski Takeoffs



Taxi – Getting unstuck
Take-off slide
Prepared Skiway / Open Snow

Varying flap settings for Takeoff
Pulling the nose ski off
Fire ATO (assisted takeoff)







Unique Maintenance Challenges



U.S. AIR FORCE

Specialized Maintenance Skills

- No hangars, shelters, or deice chems
- Engine runs on snow (no brakes)
- Specialized cold-wx procedures
- Unique A/C systems: Skis, ATO, Nacelle preheat, Hydraulics, APU heat



Articulating Arm



JATO is very expensive; 8 bladed props will not require the assist but it will probably be included for fallback

LC-130 – Modernizing for the Future







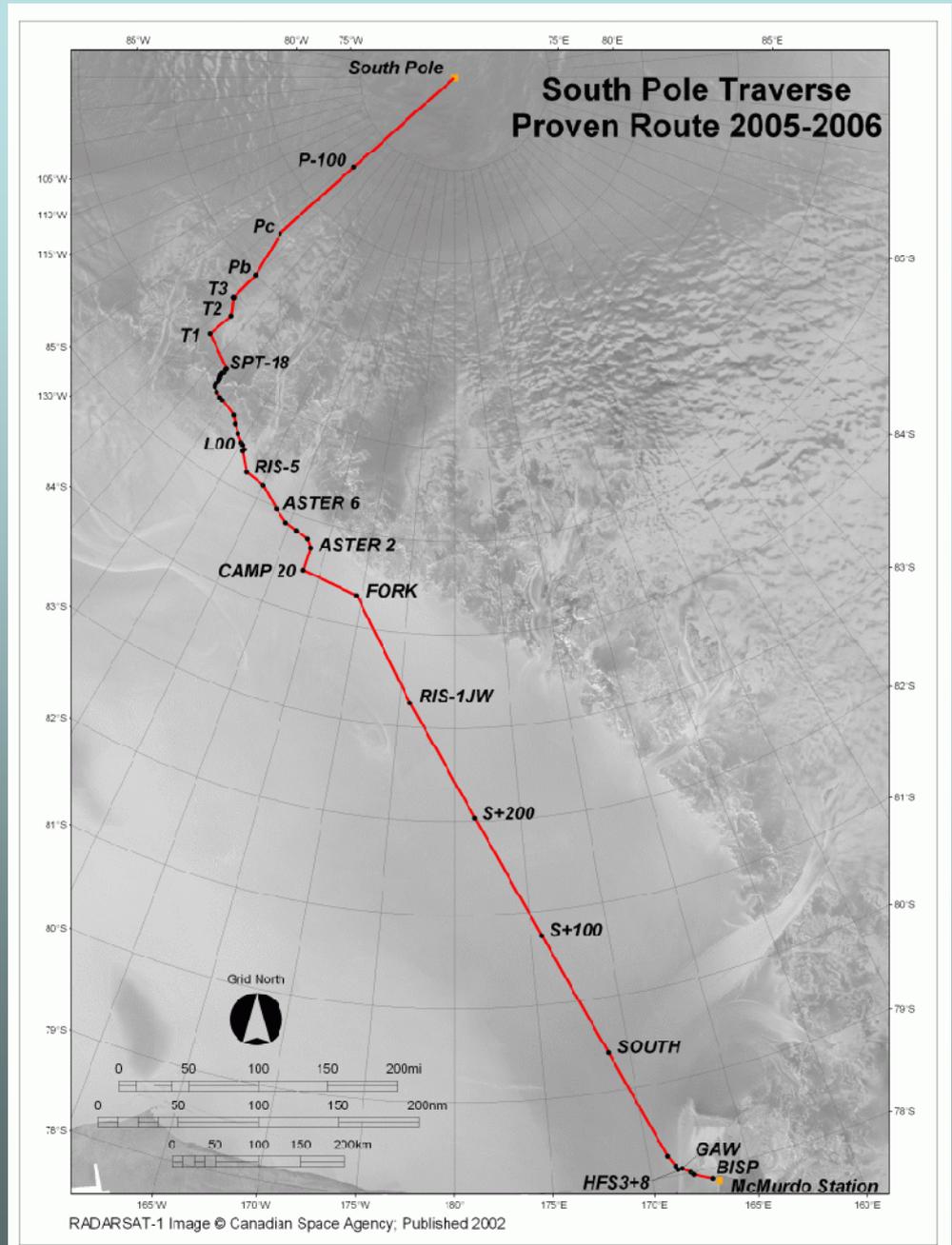






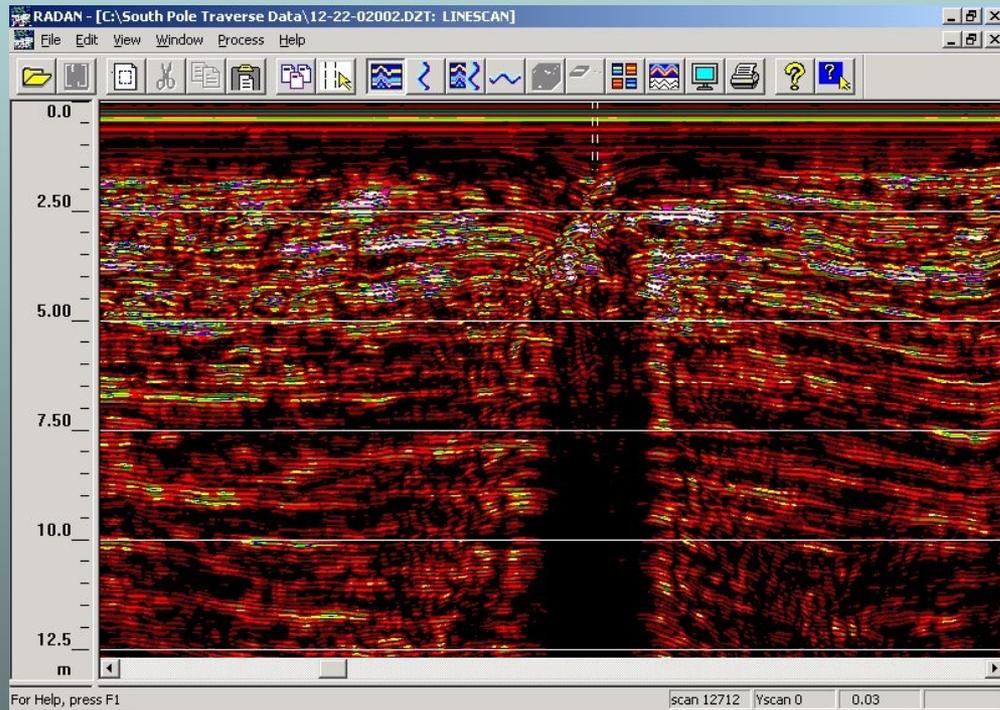
Proof of Concept Phase (2000-2005)

Proven Route



Proof of Concept Phase (2000-2005)

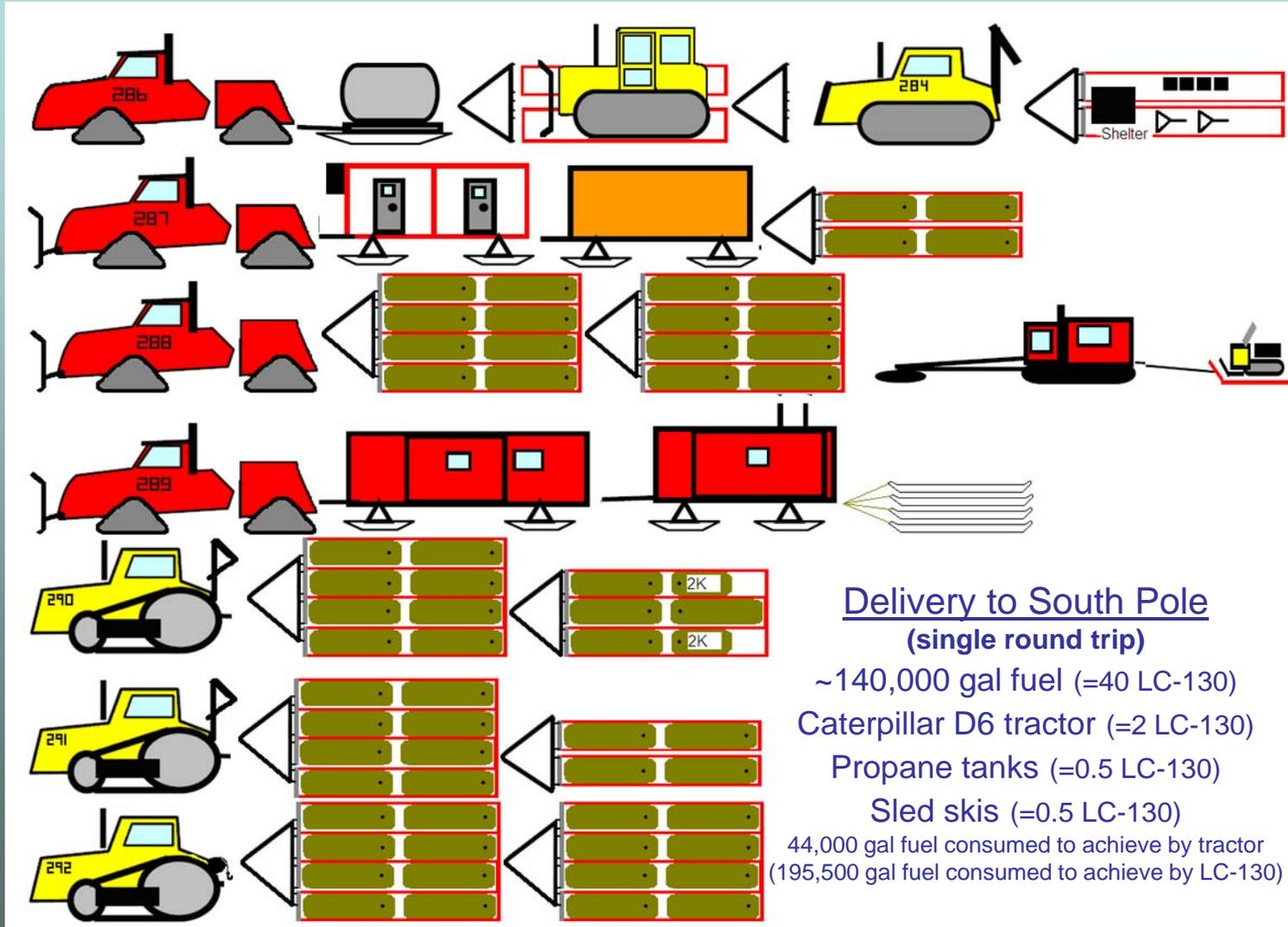
Crevasse Detection



Production Traverse Second Season (Field) (2008-2009)

Goals:

- Depart McMurdo with maximum payload predicted by load planning tool
- Depart McMurdo with entire tractor fleet
- Target round trip in less than 50 days (prove that two-swing season is possible)
- Perform head-to-head tractor tests





1957: Fuel carried in drums on steel sleds and in 500-gal "seal bladders"



2008: Fuel carried in 3000-gal bladders on Polyethylene sleds 11.12.2007