

USAP operational plans and future design/construction activities

comments prepared by J. Swift, July 2018
(not vetted or endorsed by NSF)

Ship access to McMurdo Station is required, and this requires annual support from a heavy icebreaker. That icebreaker support is presently a US Coast Guard mission. [A non-USAP US Arctic break-in requirement (Thule support) is currently met by Canada.]

Icebreaking capability is additionally needed for scientific research purposes in both the Arctic and the Antarctic.

Antarctic oceanographic research currently uses two classes of ship, i.e. both the Lawrence M. Gould and the Nathaniel B. Palmer.

Arctic region oceanographic research currently uses R/V Sikuliaq , and one medium-plus icebreaker (Healy), plus some foreign (Canadian, Swedish, German, etc.) icebreakers.

There is an ongoing need to (1) assess the capacity and capability of the fleet available for Antarctic (and Arctic) science and science support missions and (2) evaluate options for adequate support of the needs of the US research community. For example, future US polar marine research could potentially require – at times - improved icebreaking & winter capabilities.



R/V Lawrence M. Gould

ECO contract w. NSF Antarctic contractor
constructed 1997
3780 tons / 4575 HP
70 L / 14 W / 6 D meters

28(38) science / xx crew

Works Peninsula & Palmer Station area.

Resupply, personnel transfers, and
science.

RVIB Nathaniel B. Palmer

ECO contract with
NSF Antarctic
contractor (extended)

constructed 1992
6800 tons /12600 HP
94 L / 18 W / 6? D m
≈3-foot ice capability
43 science / 22 crew



The Nathaniel B. Palmer is a well-outfitted research ship. NSF's Antarctic contractor provides on-board technical support well beyond that from UNOLS.

Icebreaking is not the ship's primary strength, but the ship works well in first-year Antarctic ice. Might not be a true over-wintering vessel? Has worked various locations around Antarctica (and in other oceans) but mostly works Peninsula through Ross Sea.

Community planning has considered science missions Palmer cannot support.

R/V Sikuliaq

In service 2014

Ice-capable (up to 2.5 feet) research vessel designed for Arctic science missions.

8300 HP 3400 tons
80 L / 16 W / x 6 D m

26 scientists / 22 crew

Ample labs

In service in the UNOLS fleet, used by NSF OCE & OPP, ONR, etc.

An ice-capable research ship; UNOLS Global-class.



USCGC Healy

built 2000
icebreaker / research
vessel

30000 HP 16000 tons
128 // 25 w / x 9 d m

35(50) scientists / \approx 80+
crew

labs similar to UNOLS
over-winter *capability*

Annual total science days limited by crewing and
shore maintenance (also by planned AA mission).

A capable polar research vessel. OK in open seas.
Additional technical support at sea provided by the
academic community (via NSF grant).



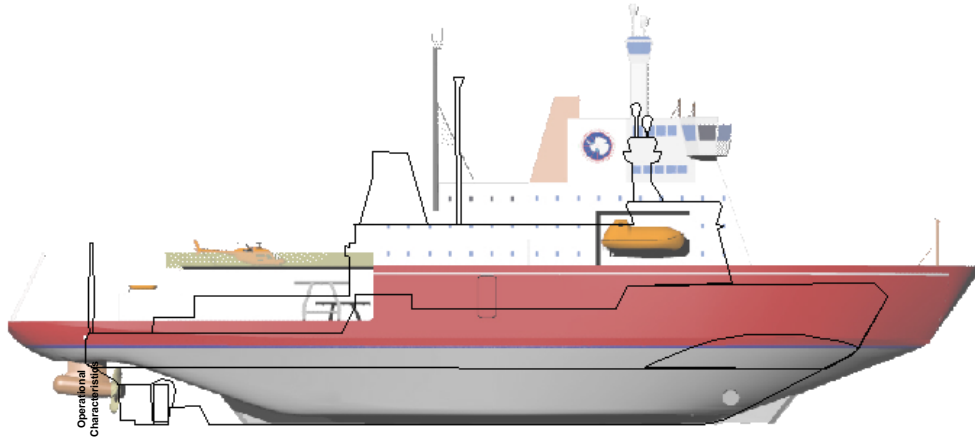
USCGC Polar Star



built 1976
18000/75000 HP
13200 tons
122 L / 25 W / 9 D m
20+ scientists / 144
crew

Primary NSF-related mission is McMurdo break-in support. Historically the Polar Star has not proven to be robust during the heavy icebreaking for which it was intended. Otherwise, this has been an strong icebreaker (especially the hull), and with its science system upgrades, was in use as a polar research ship. Not well suited for some open-water science operations (due to hull form).

Polar Research Vessel Draft Conceptual Design 2004 (unofficial)



- 50-meter core capability
- Box keel sized for enhanced acoustic arrays
- Bottom mapping during icebreaking
- Clear view aft from pilot house
- Enhanced equipment towing in ice
- Flexible van arrangements
- Geotechnical drilling capability
- Helicopter complex
- Inter-deck science/cargo elevator
- Moon pool for AUV/ROV, CTD, diving, drilling, etc.
- Uninterrupted sea water intake during icebreaking

| | Nathaniel | New |
|-------------------------|------------------|--------------|
| | B. Palmer | PRV |
| Length (ft) | 308 | 378 |
| Beam (ft) | 60 | 74.5 |
| Draft (ft) | 22.4 | 29.6 |
| Displacement | 6800 | 11000 |
| horsepower | 12600 | 22500 |
| Icebreaking (ft) | 3 | 4.5 |
| Endurance (nm) | 15000 | 20000 |
| Lab space (ft) | 7600 | 17300 |
| Science berths | 39 | 50 |

What are the realistic options?