

DIRECTORATE FOR
GEOSCIENCES

OFFICE OF POLAR PROGRAMS

Antarctic Research Vessel (ARV)

UNOLS AICC Meeting

10 January 2024

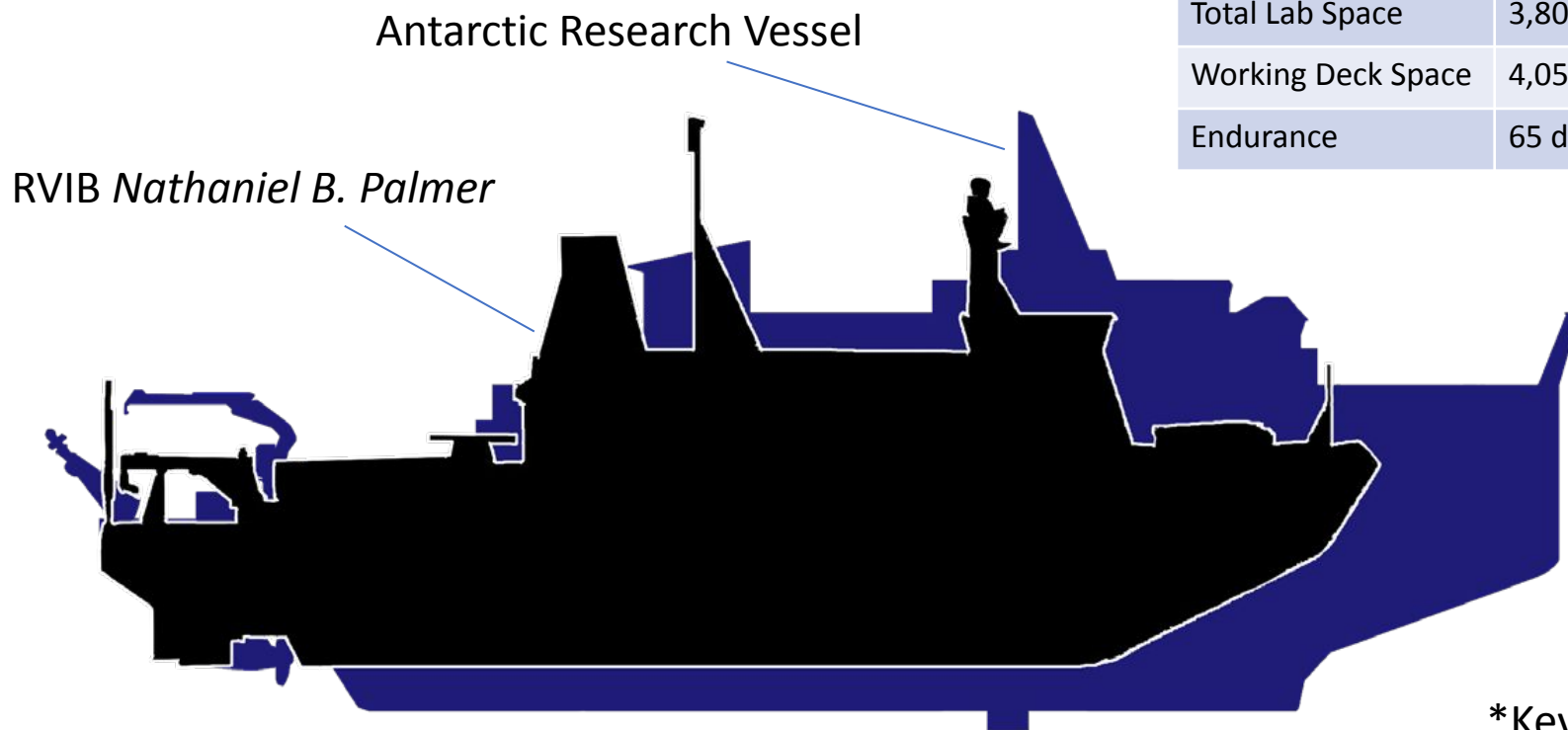
NSF ARV Team

Stephanie Short, ARV Program Lead

Tim McGovern, ARV Program Manager

Caitlin Jarecki ARV Assistant Program Manager (USN PEO Ships)

Mike Prince, ARV Project Manager



	<i>Nathaniel B. Palmer</i>	Antarctic Research Vessel	
Length	309 ft	365 ft	Bigger
Sci/Tech Berthing	45	55*	More scientists
Total Lab Space	3,805 sq ft	4,497 sq ft	More lab space
Working Deck Space	4,054 sq ft	7,197 sq ft	More deck space
Endurance	65 days	90 days*	Longer endurance

**AND greater icebreaking capability
≥4.5 ft @ 3 kts (Polar Class 3)***

**Key Performance Parameter (KPP)
Current Design & Hull Form meets all KPPs*

ARV Placemat with Specifications



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Antarctic Research Vessel (ARV) Preliminary Design Placemat



REFERENCE MISSION

Duration	90 days
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DIMENSIONS

Length, Overall	365.0 ft
Length, BP	349.0 ft
Beam, Overall	80.0 ft
Beam, WL	79.3 ft
Design Draft	32.5 ft
Working Deck Freeboard	13.0 ft
Displacement (Design Draft)	13,430 LT
Light Ship Weight (including margins)	9,790 LT
Deadweight	3,640 LT

ACCOMMODATIONS

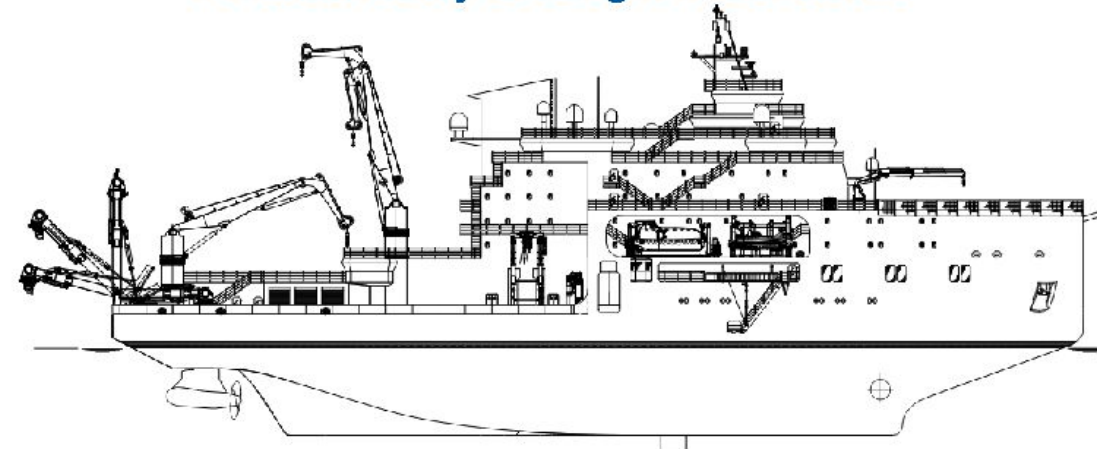
Ship's Crew	29
Science Complement	55 (Including 2 ADA-accessible berths)

PROVISIONS

Freeze	90 days
Chill	90 days
Dry	90 days

AVIATION

UAV Launch/Recovery	150 lbs
UAV Hangar	1,472 ft ²
Helicopter Landing	Bell 407 Airbus H125



MACHINERY SYSTEMS

Azimuthing Padded Propulsors	2 x 9.5 MW
Bow Thrusters	1 x 1.9 MW
Ship Power Plant	22.3 eMW
Propeller	2 x 16.0 ft FPP

AUXILIARY SYSTEMS

A/C Plants	Qty 3 @ 205t
Fire Suppression	NOVEC and Water Mist
Mission Fuel Capacity	60,000 gal
Ship Service Battery	2.7 MWh
Wastewater Holding	20 days

COMMUNICATIONS

HF Transmit and Receive
Ku, Ka, C, and UHF SATCOM
GMDSS
INMARSAT
UHF/VHF LOS Comms
UAS Comms
Fleet Broadband

NAVIGATION

AIS
ECDIS
S & X Band Radar
Ice Radar
DGPS

MISSION EQUIPMENT

2 Main Deck Cranes	Maximum reach: 65ft 70,000 lbs @ 50ft
Portable Utility Crane	4,000 lbs @ 40ft
Forward Crane	4,000 lbs @ 40ft
Stern A-Frame	80,000 lbs slewing
Side A-Frame	
Meteorology Mast	1
Atmospheric Mast	1
CTD Hydroboom	Fast-acting, Reaches water level
Piston Core LARS	40m
Multibeam Sonar Suite	
Sonar Drop Keel	0 ft / 3 ft / 10 ft
Container Quantity	20 TEU

PERFORMANCE

Open Water	
Maximum	> 17 kt
Cruise	11 kt
Quiet	8 kt
Ice	
Continuous 3 kt	> 4.5 ft + 1 ft snow
Continuous 6 kt	> 1.6 ft
Turning out	> 4.5 ft
Range	> 17,000 nm
Towing	
4 kt	25,000 lbs
6 kt	10,000 lbs

CLASSIFICATION

ABS #A1 Oceanographic	#AMS
CCO-POLAR (-35°C, -45°C)	Ice Class PC3
#ACCU	CRC
Unrestricted service	R2
EEDI-PH3	ENVIRO
HAB++(WB)	BWT+
ESS-LIBATTERY	HYBRID IEPS
ILM	UWILD
POT	

MISSION SPACES

Containers	8 in Science Hold 12 on Weather Decks
Lab Area, Total	8,263 ft ²
Aft Work Deck	7,724 ft ²
Science Stores	42,571 ft ³
Side Deck Length	170 ft
Baltic Room Area	704 ft ²
HA ZMAT Storage	214 ft ²
Science Observation Deck	1,163 ft ²



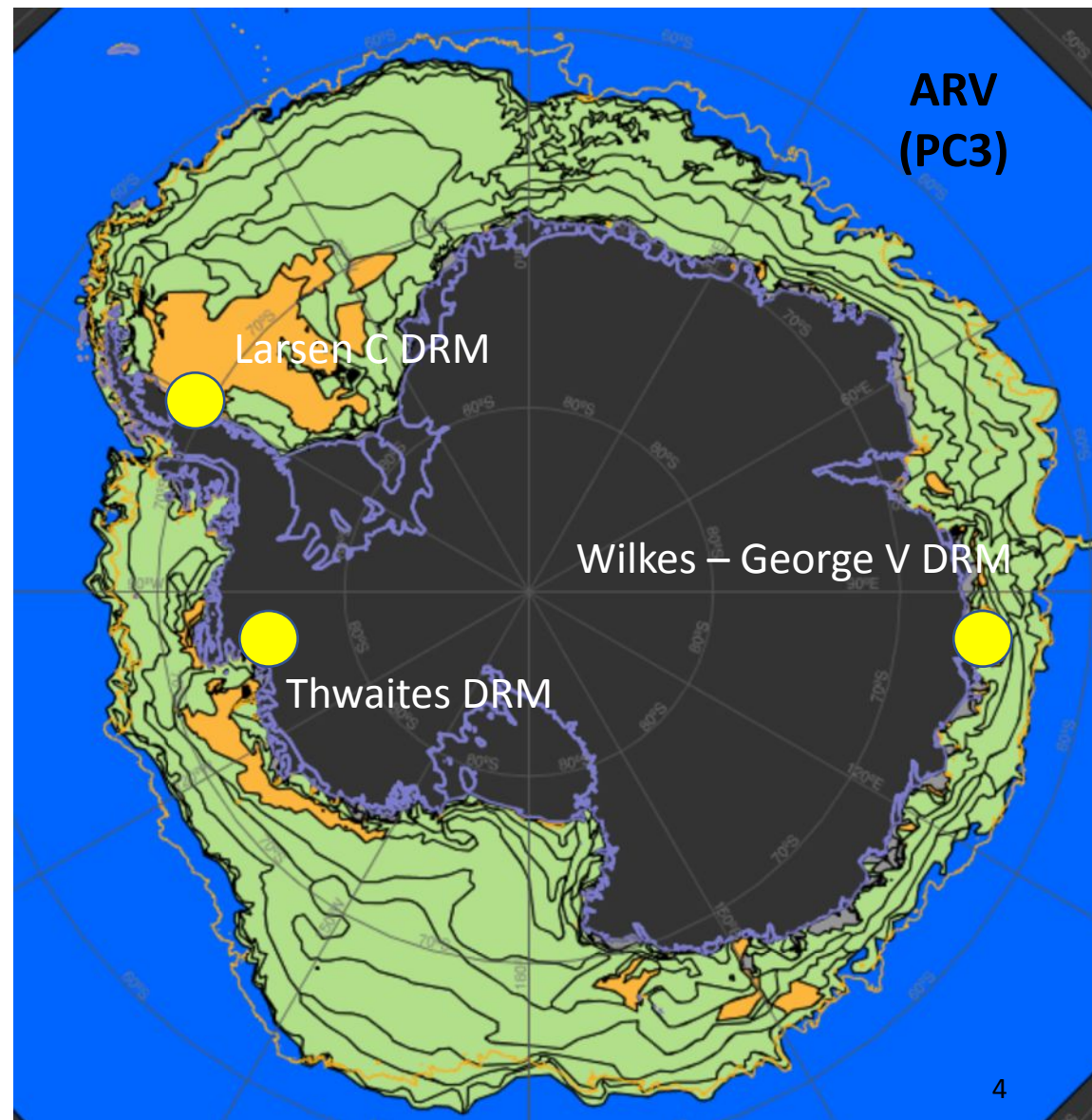
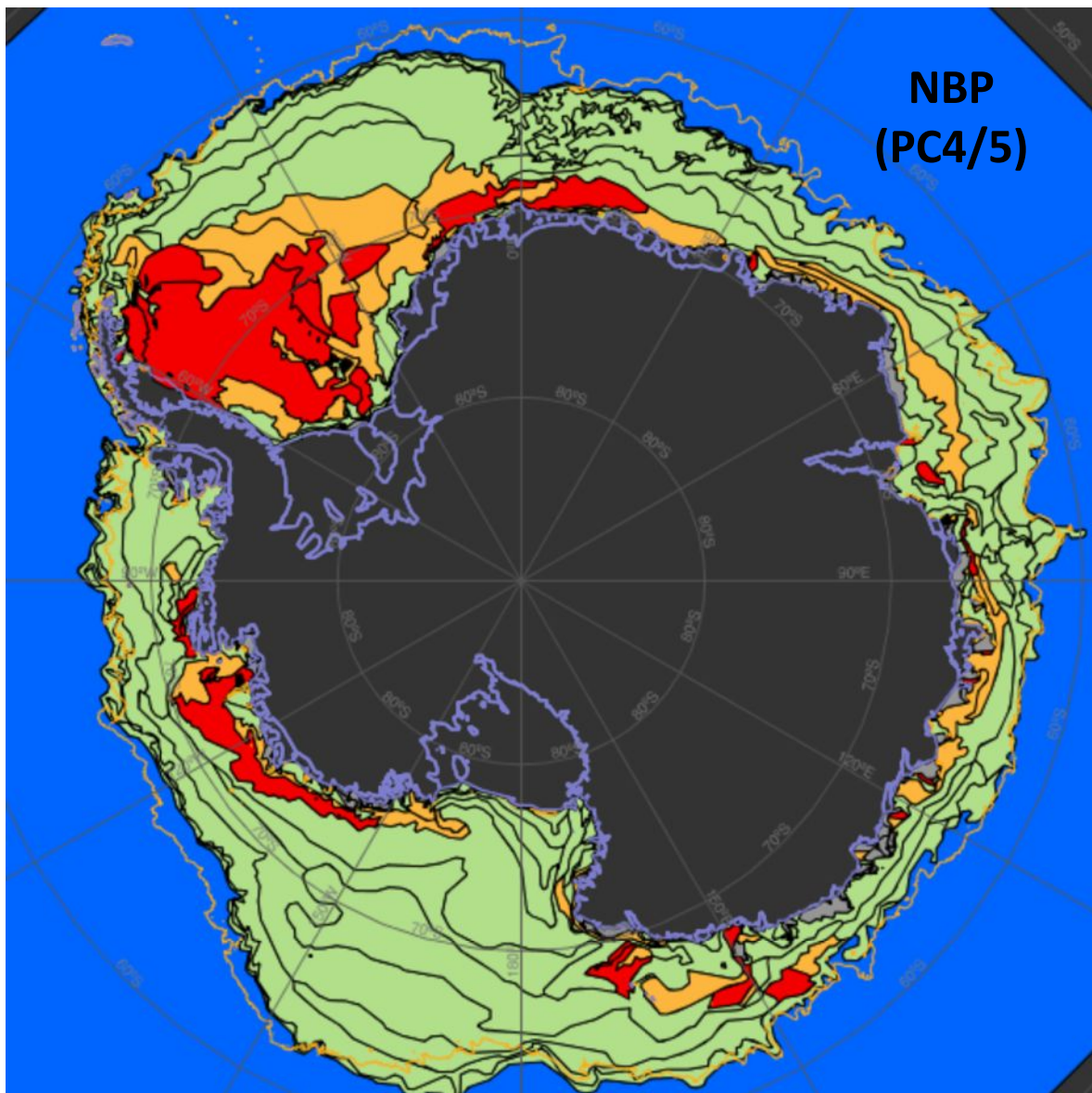
November 7, 2023

PC3 & Icebreaking KPP

Green = accessible; Orange = accessible with difficulty & slower speeds; Red = not accessible



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Model Test Results Showing Ice Management



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Clearing of a pool with thrusters in the HSVA Test Basin (Side Step)

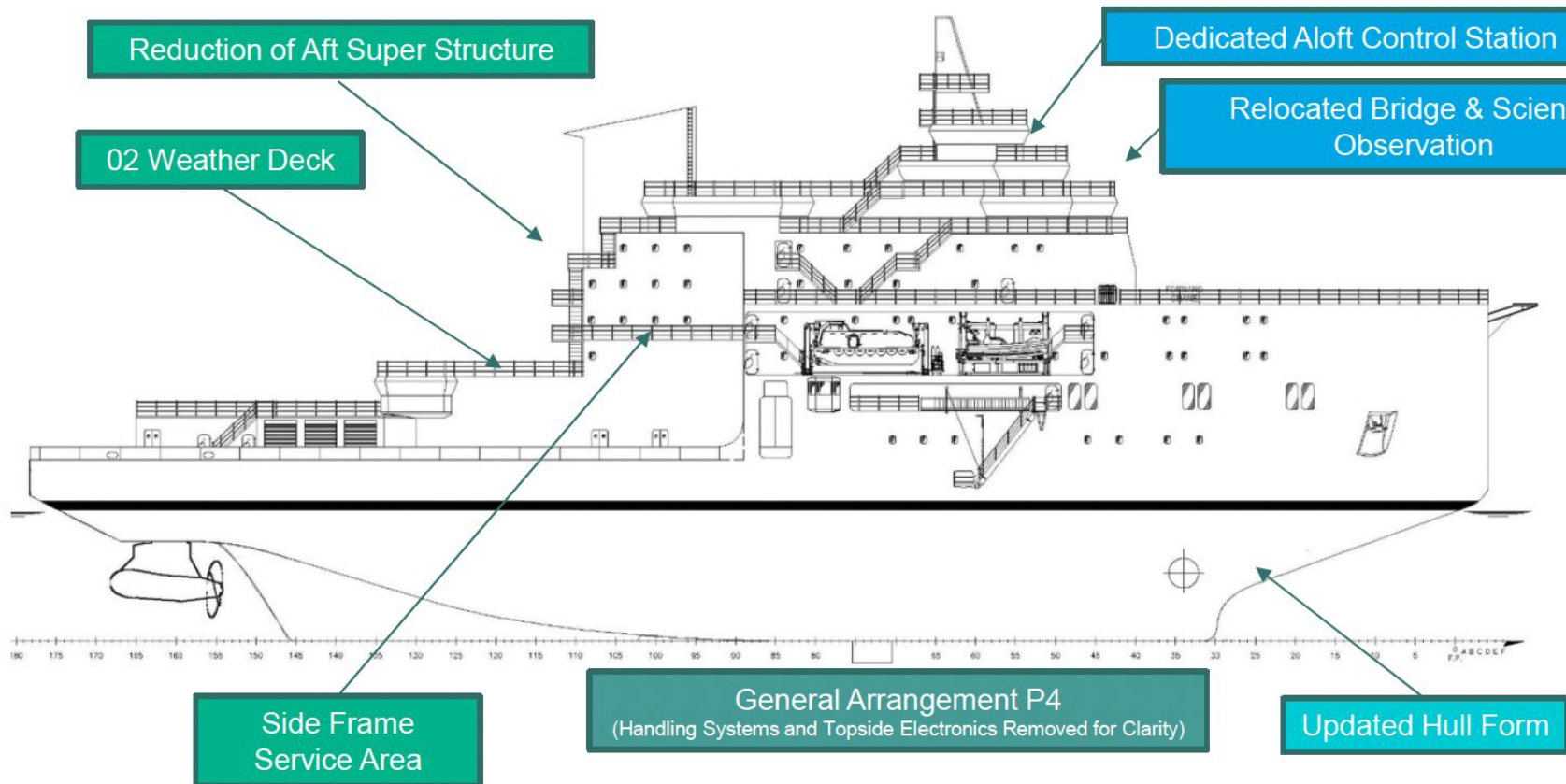


R/V Sikuliaq creating pool in
Ice with thrusters



Ice Management Astern in the HSVA Test Basin (30° toe-in angle)

General Arrangement – Recent Changes



Sightline Improvements

- 08 Level Aloft Control Station
- 07 & 06 Level Relocation

Superstructure Modifications

- Improved Incubation Area
- Creation of Side Frame Servicing Area
- Improved Range of Motion for Starboard Main Crane
- Improved Location for Flagging Block to Serve Aft A-Frame

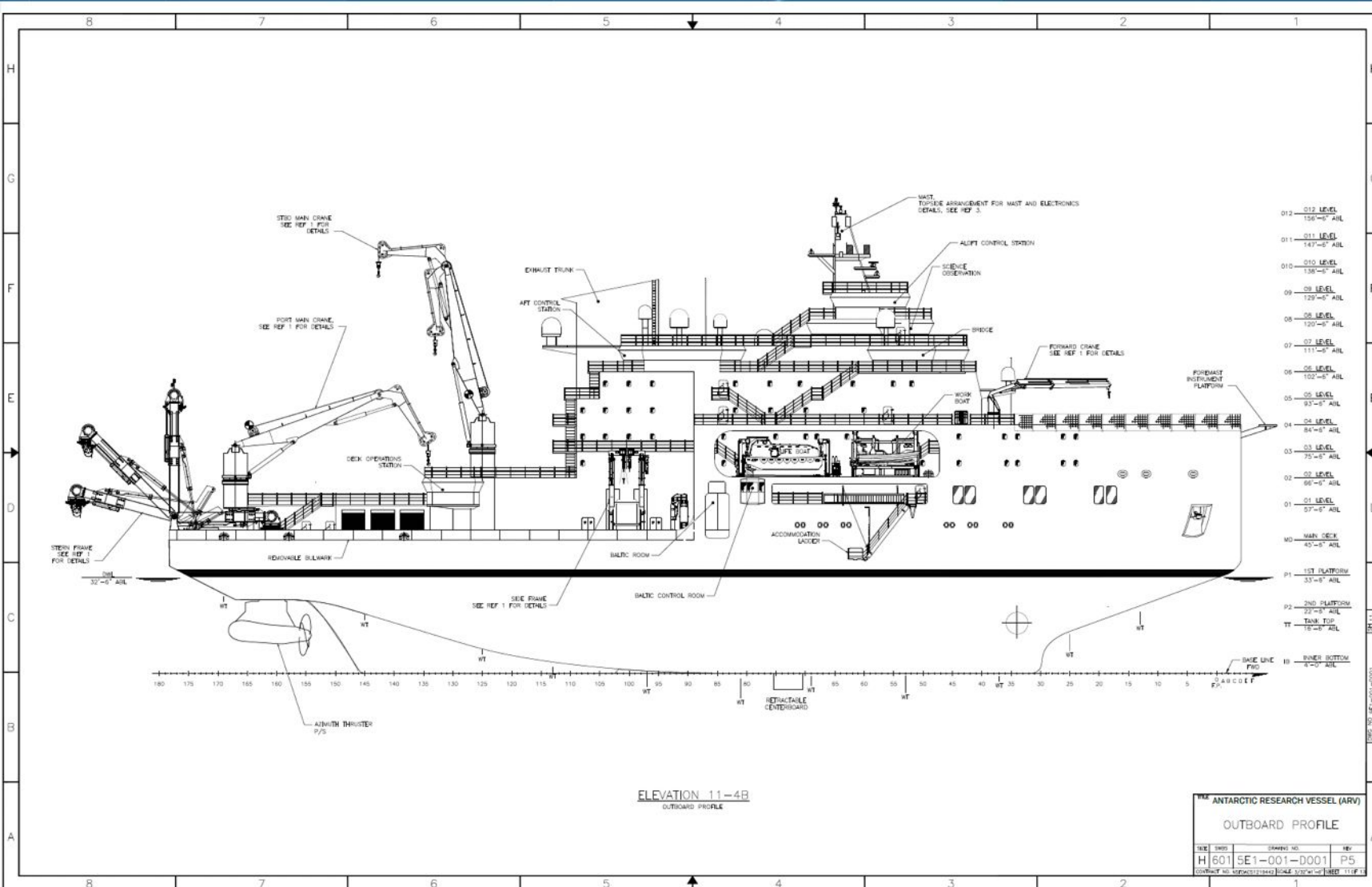
Improved Hull Form

- Improved Bubble Sweepdown Performance
- Improved Fuel Oil Capacity

General Arrangement – Profile



Drawings & Reports go to:
<https://future.usap.gov/arv-doc-library/>



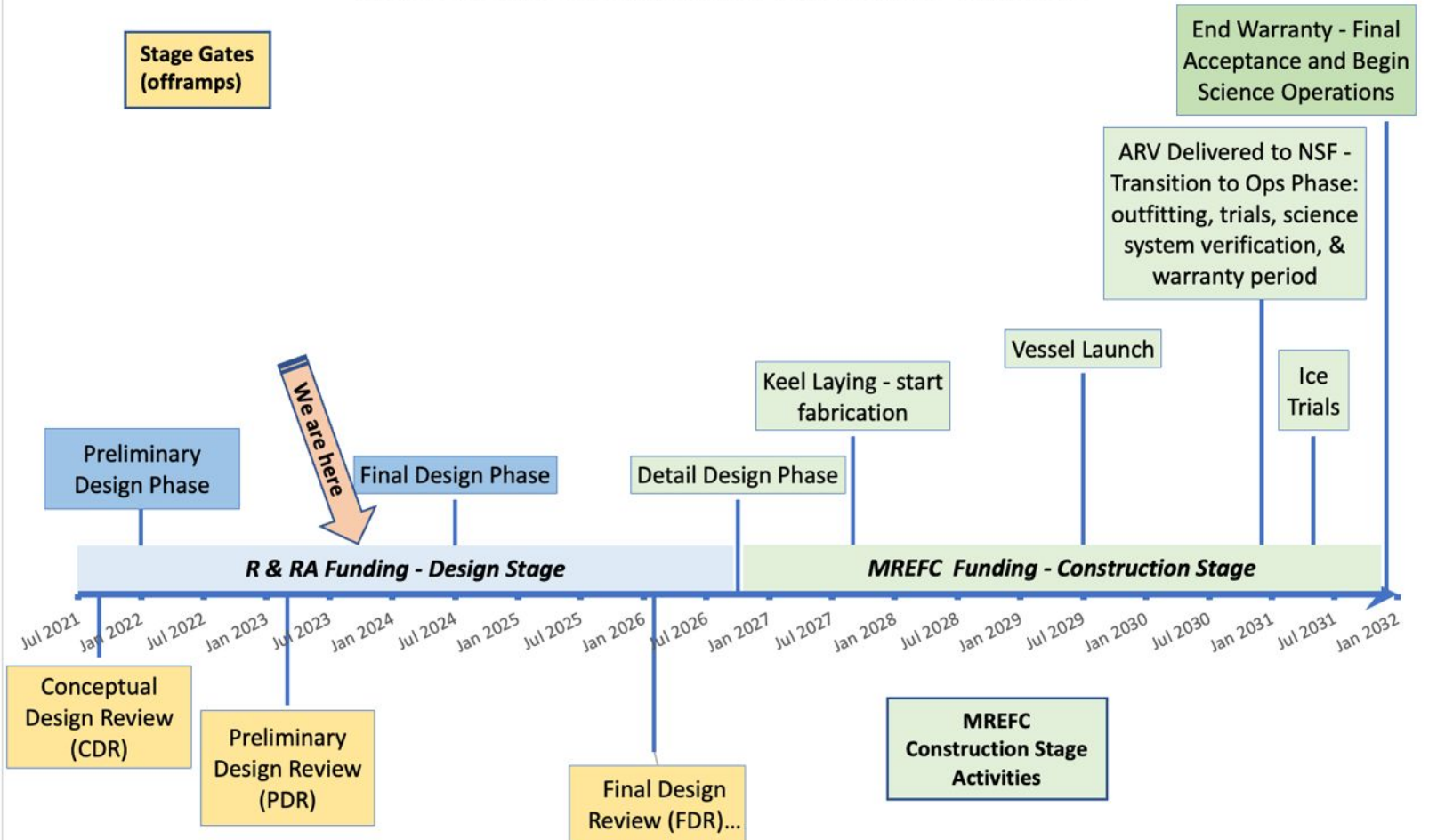
ARV Schedule



ARV Project Timeline

Rev - November 2023 - Preliminary Design Phase

Reflects possible 6 month delay in start of Final Design Phase



Next Steps:

- RFP and Selection of the Vessel Integrator to complete the project. (CY 24)
- Final Design Phase (CY 24-26)
- Final Design Review (CY 26)
- Appropriation and Approvals to start Construction Stage (CY 26)

Science Community Engagement



National Academies of Sciences, Engineering,
and Medicine

**Future Directions for Southern Ocean and
Antarctic Nearshore and Coastal Research**

<https://www.nationalacademies.org/our-work/future-directions-for-southern-ocean-and-antarctic-nearshore-and-coastal-research>



Science Advisory Subcommittee (SASC)

Reports:

<https://future.usap.gov/arv-community-input/>

- Dr. Amy Leventer, (Chair) Colgate University
- Ms. Alice Doyle, UNOLS
- Dr. Carlos Moffatt, Univ of Delaware
- Dr. Deborah Steinberg, VIMS
- Dr. Kristin O'Brien, UAF; GEO AC Rep

Past Members

- Dr. Patricia Quinn, NOAA/PMEL
- Dr. Clare Reimers, OSU
- Dr. Bruce Appelgate, UCSD/Scripps

*** Seeking nominations for 3 new members**



New Antarctic Research Vessel

Planning for the Next Generation of Oceanographic Research Vessels

What's New?

JUL 22, 2021

New Antarctic Research Vessel

Advanced Icebreaking Research Vessel Development Beginning

[Read More](#)



Conceptual rendering of the new Antarctic Research Vessel

New Antarctic Research Vessel (ARV)

Planning for the Next Generation of Oceanographic Research Vessel



Documents Library

Concept Design

- Conceptual Design Memo
 - [Leidos ARV Conceptual Design Memo](#)
- Concept Design Reports (Glosten Documents)
 - [19136 Concept Design Report](#)
 - [19136 Science Berthing Study Project Memorandum](#)
 - [19136.01 ARV Deck De-icing Systems Study - Status Update 09/29/20](#)
 - [19136.01 ARV Ice Environment Study - Status Update 09/25/20](#)
 - [19136.01 ARV Jumbo Piston Coring Study - Status Update 09/25/20](#)
 - [19136.01 - Manning Study](#)

Trade Off Studies

- [19136-000-01 ARV USCG Compliance Study Report](#)
- [19136-000-02 ARV Propulsor Study Report](#)
- [19136-000-03 ARV Power Systems Study Report](#)
- [19136-000-04 ARV Climate Study Report](#)
- [19136-000-05 ARV Seakeeping Study Report](#)
- [19136-000-06 ARV Ice Environment Study Report](#)
- [19136-000-07 ARV Green Ship Alternatives Report](#)
- [19136-000-08 ARV Autonomous Vehicle Handling Study Report](#)
- [19136-000-09 ARV Deck De-icing Study Report](#)
- [19136-000-13 ARV Triple Propulsor Report](#)

Applicable UNOLS Guidelines and Reports

- [American Disabilities Act \(ADA\) Guidelines for UNOLS Vessels](#)

FOR OFFICIAL USE ONLY

Design placemat of the new Antarctic Research Vessel

Credit: NSF, Leidos Inc.

New Antarctic Research Vessel

Planning for the Next Generation of Oceanographic Research Vessels

Ship Design

Current Science Mission

Key performance parameters, operational requirements, and other information found here.

Science Mission Requirements (PDF)

Placemat

The ARV Preliminary Design Placemat is a tool for the design team. It lists overall hull dimensions, internal

DIMENSIONS	
Length, Overall	345 ft
Length, BP	325.5 ft
Beam, Overall	73.5 ft
Beam, W/L	72 ft
Draft, FLD, Load Line	28 ft
Draft, Full Load	29 ft
Draft, Lightship	27 ft

PERFORMANCE	
Open Water	11 kt T / 12 kt O
Cruise	11 kt T / 12 kt O
Quiet	8.5 kt
Ice	
Continuous 3 kt	4.5 ft
Continuous 6 kt	1.6 ft
Turning out	4.5 ft
Range	17,000 nm

ACCOMMODATIONS	
Ships' Crew	29
Deck	15
Engineering	9
Stowage	5
NSF Science Party	2
ADA Accessible	2
Scientists	30
Waterwater (days)	20T / 40O

PROVISIONS	
Freeze	90 days
Chill	45 days
Dry	90 days

AVIATION	
UAV Launch/Recovery	150 lbs
UAV Hangar	No IP-5
UAV Workshop	

COMMUNICATIONS & COORDINATION	
HF Terminal	
C-Band SAT	
UHF SATCOM	
GMDSS	
INMARSAT F	

MACHINERY	
Fixed Pitch	
Bow Thrust	
Ship Power	
Propulsion	

NAVIGATION	
AIS	
ECDC	
S & B Radar	
Ice Radar	
DGPS	

OTHER FEATURES	
Bulk Room Area	1,200 ft sq
Fuel Capacity	60,000 gal

What is Future USAP?



Future USAP is a part of the United States Antarctic Program (USAP). Funded by the National Science Foundation, Future USAP is dedicated to long range investments in Antarctic infrastructure.

News and Updates



Wednesday - July 06, 2022
Construction of New Pier at Palmer Station Now Complete

future.usap.gov/arv

Preliminary Design Rendering



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Preliminary Design Rendering



OFFICE OF
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Preliminary Design Rendering



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- ❖ ~20 years of sustained scientific demand
- ❖ Continued ability to support cutting edge NSF research for the next 40 years
- ❖ Enhanced capabilities over existing USAP research vessel
- ❖ Strong Teaming with Industry

