



DIRECTORATE FOR GEOSCIENCES
OFFICE OF POLAR PROGRAMS

Antarctic Research Vessel (ARV)

Arctic Icebreaker Coordinating Committee (AICC)
2023 Summer Meeting

19 July 2023

[Future.usap.gov/arv](https://future.usap.gov/arv)



ARV Technical Requirements



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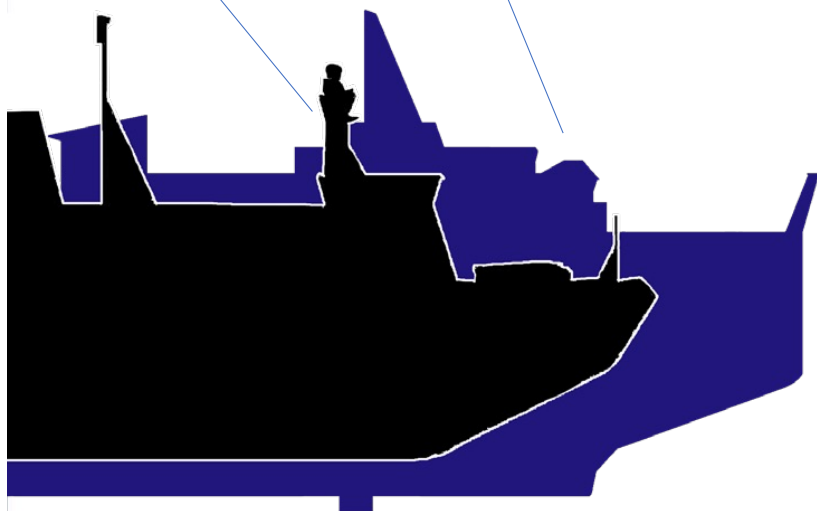
ARV Technical Overview



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Antarctic Research Vessel

RVIB *Nathaniel B. Palmer*



	<i>Nathaniel B. Palmer</i>	Antarctic Research Vessel	
Length	309 ft	365 ft	~20% Larger
Sci/Tech Berthing	45	55*	~20% More scientists
Total Lab Space	3,805 sq ft	4,497 sq ft	~20% More lab space
Working Deck Space	4,054 sq ft	7,197 sq ft	~80% More deck space
Endurance	65 days	90 days*	~40% Longer endurance
Icebreaking	3' @ 3 kts	4.5' @ 3 kts*	50% Greater icebreaking

*Key Performance Parameter

Design Reference Mission



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Location	Fair Weather Duration (days)		
	Southern Ocean	Amundsen Embayment	Amundsen Sea
1A - Open water transit	10	-	-
1B - Acoustically quiet transit	-	17.5	-
2 - Icebreaking	2	9	-
3 - On station	-	32	-
4 - On station, DP	-	11.5	-
5 - Deployment	-	4	-
6 - In-Port	1	-	-
7 - Ice Transit	-	3	1
Totals (91-day total mission duration*)	13	77	1

* DRM includes 0.5 days of In-Port activity prior to and following the 90-day science mission duration to account for fuel burn associated with certain mobilization and de-mobilization activities.

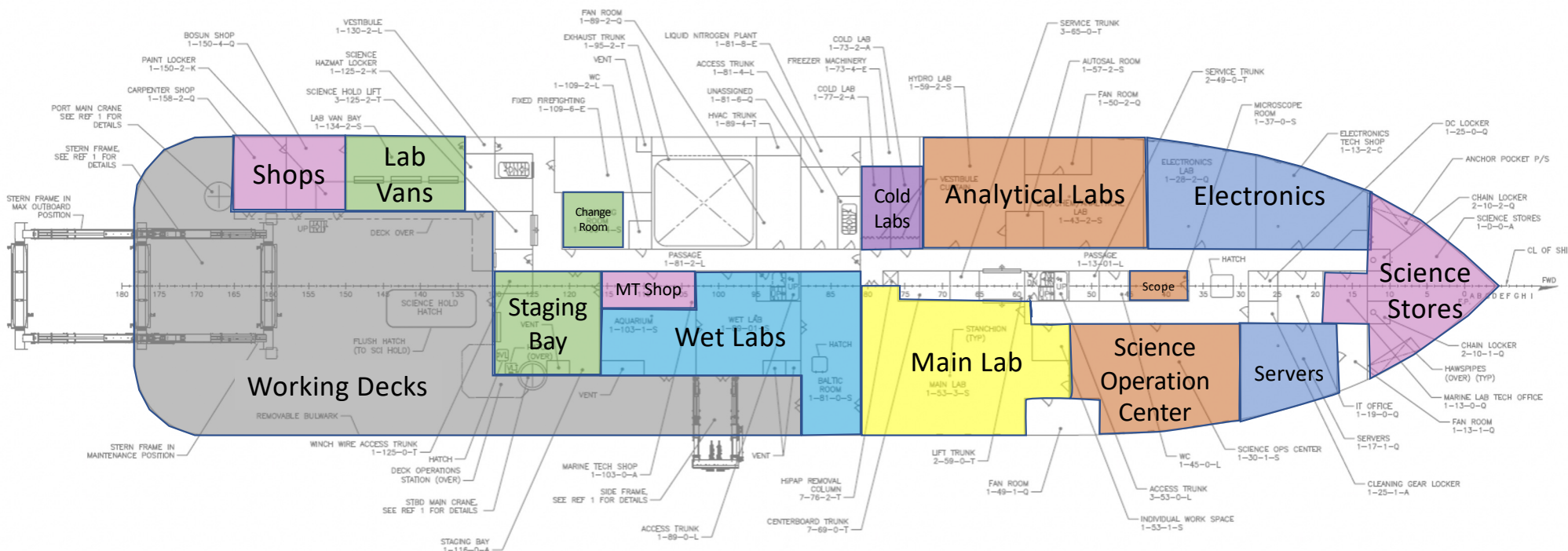
Activity Start		Activity End		Activity Hours	Location	Operation	Cruise days	Activity Type	Approx. Mileage
Date	Shift	Date	Shift						
13-Dec	PM	13-Dec	PM	12	Punta Arenas, Chile (PUQ)	Depart	N/A	6 - In-Port	0
14-Dec	AM	18-Dec	PM	120	PUQ to Amundsen Embayment	Transit open ocean	1 - 5	1A - Open water transit	1,320
19-Dec	AM	20-Dec	PM	48		Icebreaking into science area	6 - 7	2 - Icebreaking	144
21-Dec	AM	22-Dec	PM	48	Amundsen Embayment	CTD work	8 - 9	3 - On station	0
23-Dec	AM	23-Dec	PM	24		Trace metal tow-fish	9 - 10	1B - Acoustically quiet transit	144
24-Dec	AM	24-Dec	AM	12		Sea glider deployment	11	3 - On station	0
24-Dec	PM	27-Dec	AM	72		Transit - first and second year ice	11 - 14	2 - Icebreaking	216
27-Dec	PM	28-Dec	PM	36		CTD work	14 - 15	3 - On station	0
30-Dec	AM	30-Dec	AM	12		Sea glider deployments	16	3 - On station	0
30-Dec	PM	30-Dec	PM	12		Transit - first and second year ice	16	2 - Icebreaking	36
31-Dec	AM	31-Dec	AM	12		Mega-core/CTD	17	4 - On station, DP	0



General Arrangement – Main Deck

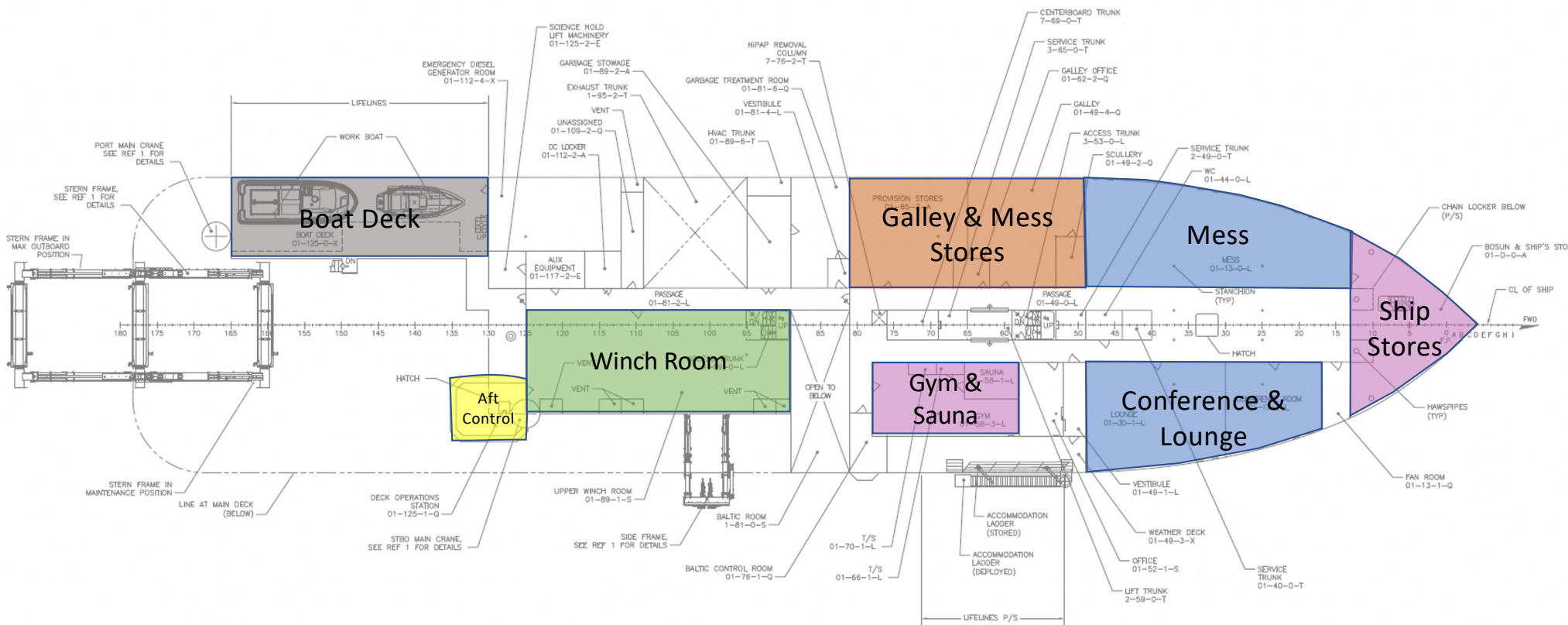


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Over 7,000 sq. ft aft working deck

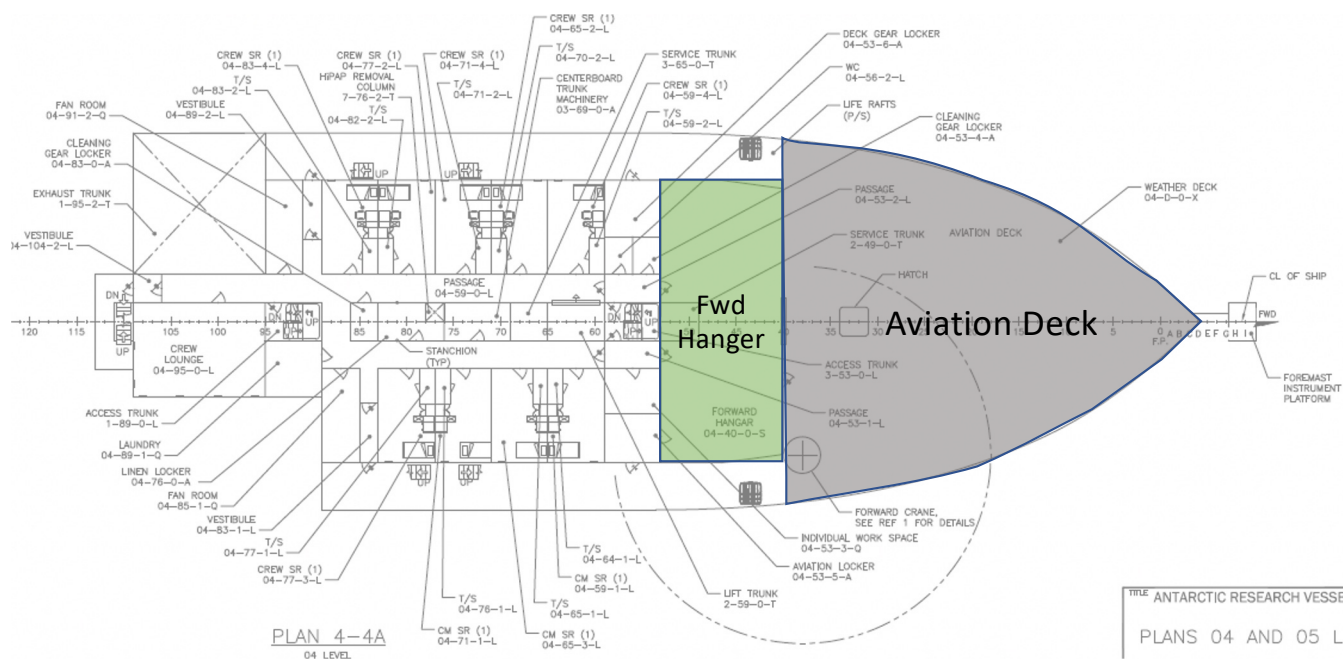
General Arrangement – 01 Deck



General Arrangement – 04 Aviation Deck



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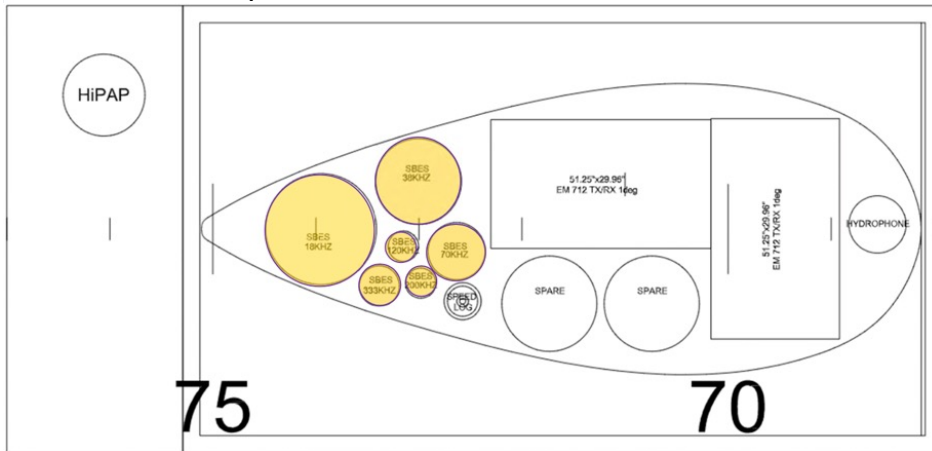


Acoustic Systems



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Drop Keel



Drop Keel Systems

EK-80 Bio-Acoustic System – 18, 38, 70, 120, 200 & 333 kHz

EM-712 Multibeam – 1 x 1 array

2 Spare Transducer Wells

Hydrophone, Speed Log

Fwd. Looking SONAR & Camera

Possible Side Scan SONAR

SONAR Flat Systems

ADCP – 38, 75, 150, & 300 kHz

EM-124 Multibeam - 1 x 1 array

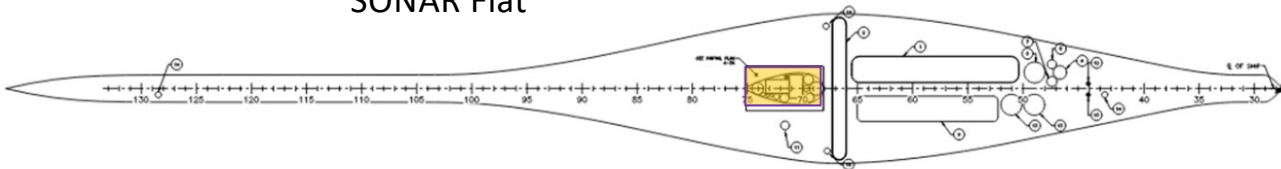
SBP 29 Sub-Bottom Profiler
(uses EM124 receive array)

USBL – HiPAP 502P

Hydrophones, cameras

Possible additional Spares

SONAR Flat



Cranes & Frames



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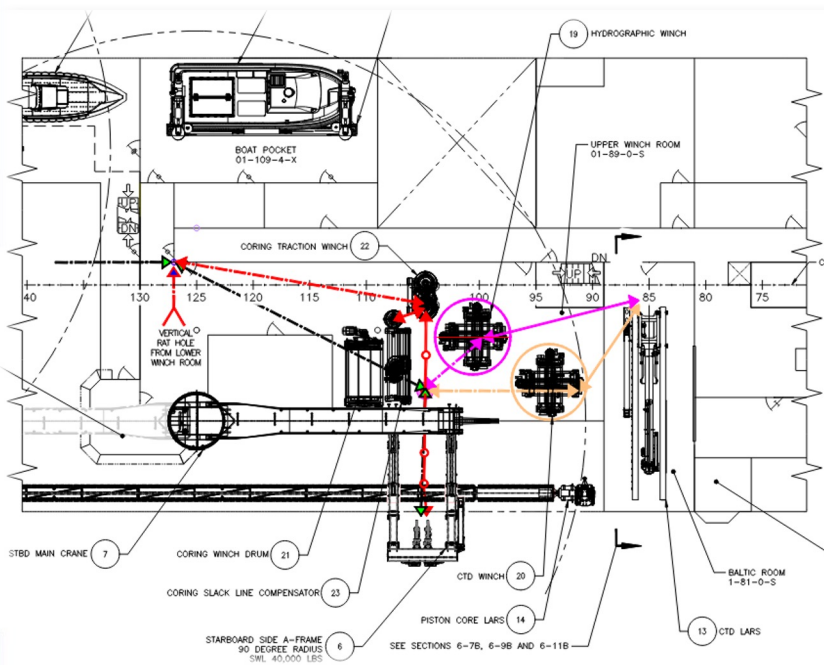


Type	Capacity	Notes
Port Main Crane	<ul style="list-style-type: none"> SS5-SS6: 20,000 lbs. / 40ft. In Port: 67,200 lbs. / 65ft. 	<ul style="list-style-type: none"> Located Aft Working Deck, Port Side Personnel Rated
Starboard Main Crane	<ul style="list-style-type: none"> SS5-SS6: 20,000 lbs. / 40ft. In Port: 67,200 lbs. / 65ft. 	<ul style="list-style-type: none"> Located Starboard Working Deck, Stbd Side Personnel Rated
Aft Working Deck Crane	<ul style="list-style-type: none"> SS5: 4,000 lbs. / 40ft. 	<ul style="list-style-type: none"> Portable Crane Located Aft Working Deck, Stbd Side
Fwd Working Deck Crane	<ul style="list-style-type: none"> SS5: 4,000 lbs. / 40ft. 	<ul style="list-style-type: none"> Located Fwd. Aviation Deck, Stbd Side
Stern A-Frame	<ul style="list-style-type: none"> 30+ ton thru full motion Cables up to 1-inch diameter with 120,000 lbs. nominal breaking strength 	<ul style="list-style-type: none"> Located at the transom 20.5 ft. clear width 30 ft. vertical clearance
Side A-Frame	<ul style="list-style-type: none"> 30+ ton through full motion Cables up to 1-inch diameter with 100,000 lbs. nominal breaking strength 	<ul style="list-style-type: none"> Located Starboard Working Deck, aft of Baltic Room 15 ft. clear width 25 ft. vertical clearance 10 ft outboard reach position
LARS Hydroboom	<ul style="list-style-type: none"> SS5: Maximum working load of 20,000 lbs. Safe working load of 6,000 lbs in the towing configuration. Design loads applied at angles of up to 50 degrees from vertical. 	<ul style="list-style-type: none"> Minimum Extension over the side of 12 ft Maintains positive control of CTD through range of motion extending to the water surface Capable of positioning design package from full inboard to full outboard locations in less than 30 seconds

Winches



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Type	Capacity	Notes
Hydrographic Winch	<ul style="list-style-type: none"> Coaxial electro-mechanical (EM) cable or fiber-optic cable, 10,000 meter (m) length, 0.25-inch to 0.50-inch diameter 	<ul style="list-style-type: none"> Located in Upper Winch Room Serves either Baltic Room LHS or Side A-Frame Active Heave Compensated Serves as backup to CTD Winch Can also serve Aft A-frame
Oceanographic Winch	<ul style="list-style-type: none"> Torque balanced wire rope, 12,000 m length, 9/16-inch diameter 3x19 wire rope, or Fiber-optic cable, 10,000 m length, 0.681-inch diameter, or Coaxial EM cable 10,000 m length, 0.680-inch diameter Slack Line Compensator to support operations in up to sea state 4. 	<ul style="list-style-type: none"> Located in Lower Winch Room Serves Stern A-Frame and portable LARS on the aft working deck crane Active Heave Compensated Traction winch with slack line compensator and level winds Two storage reels
Conductivity-Temperature-Depth (CTD) Winch	<ul style="list-style-type: none"> EM cable, 10,000 m length, 0.322-inch diameter 	<ul style="list-style-type: none"> Located in Upper Winch Room Integrated with Baltic Room LHS/docking head Active Heave Compensated
Coring Winch	<ul style="list-style-type: none"> Cable (steel or synthetic), 7,000 m T or 10,000 m O length, 3/4"-inch diameter, 100,000-pound (lbs.) nominal breaking strength 	<ul style="list-style-type: none"> Located in Upper Winch Room Serves Side A-Frame to support coring loads Capable of 80,000 lbs. line pull Active Heave Compensated May be rove to Stern A-Frame or Starboard Main Crane

Science Small Boats



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Science Small Boats

20 – 30' RHIB (2) – Open Boat w/large payload, low dead rise hull, air collar/fendering system, bow pulpit, light davit, bolt pattern for mounting instruments.

~ 30' Science Survey Work Boat – Handling system, light winch, instrumentation, acoustic systems, Navigation and Safety Systems.

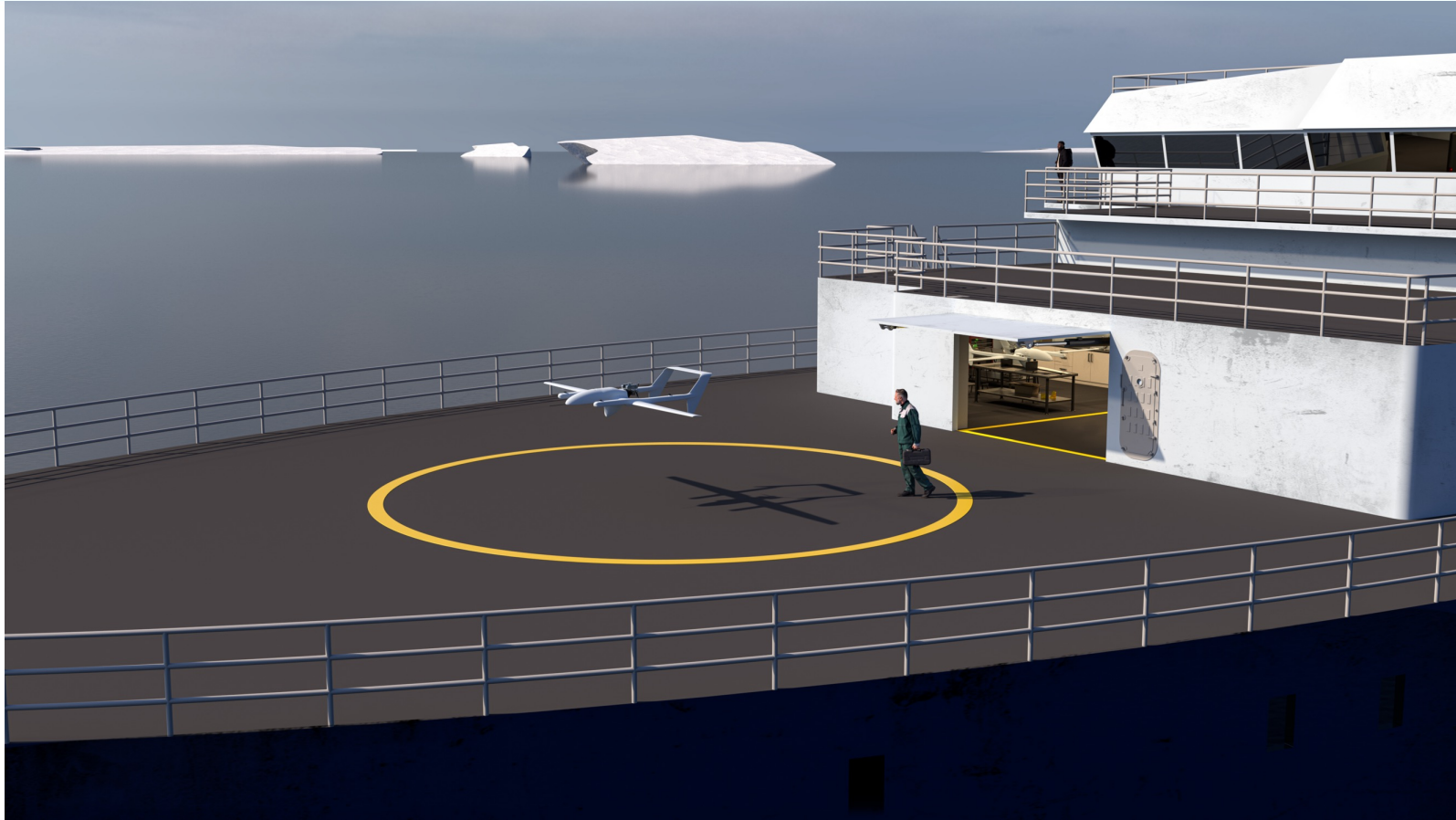
~ 30' Landing Craft – looking at innovative solutions



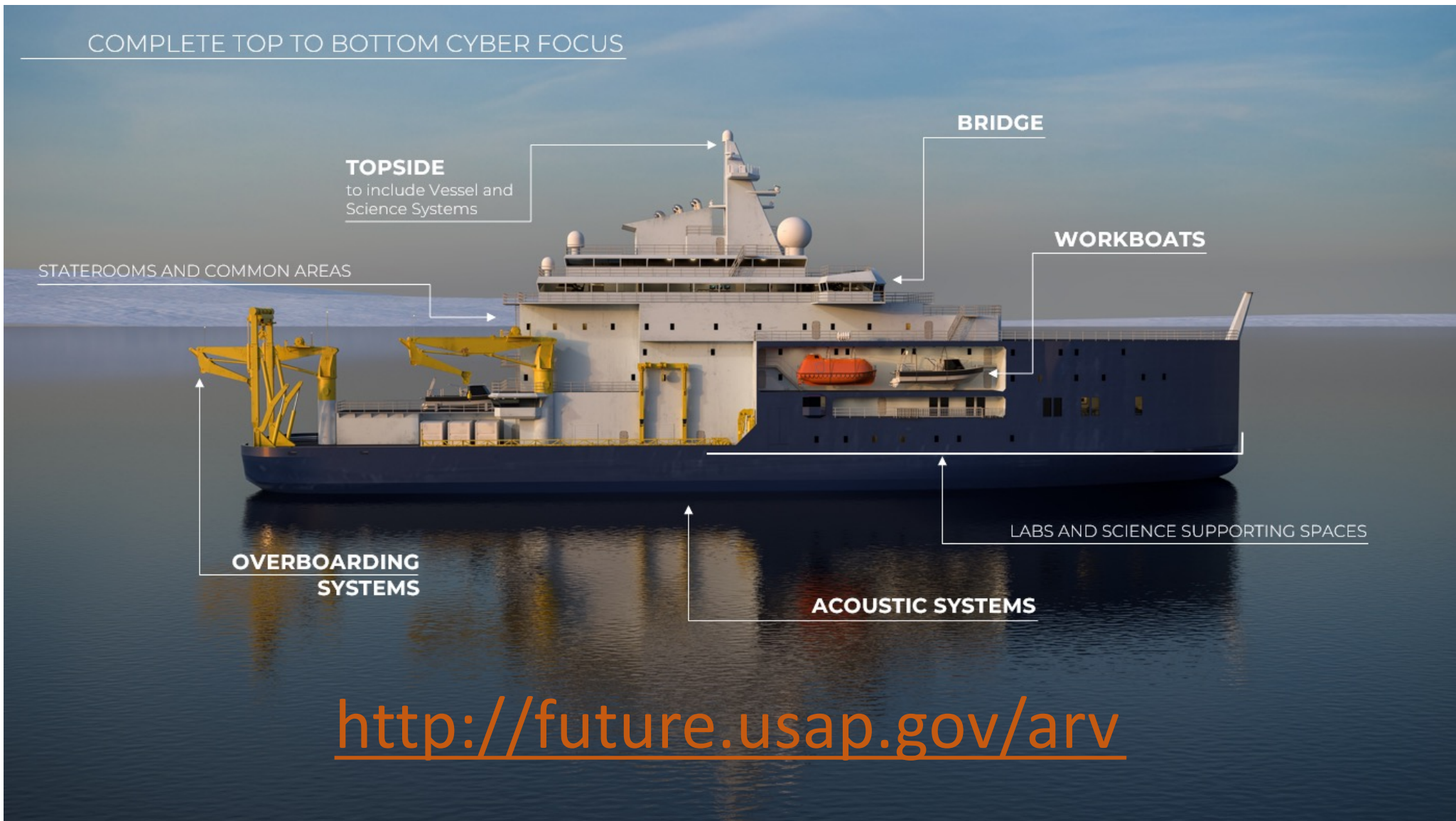
Aviation/UAV Deck



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COMPLETE TOP TO BOTTOM CYBER FOCUS



TOPSIDE
to include Vessel and
Science Systems

STATEROOMS AND COMMON AREAS

BRIDGE

WORKBOATS

**OVERBOARDING
SYSTEMS**

LABS AND SCIENCE SUPPORTING SPACES

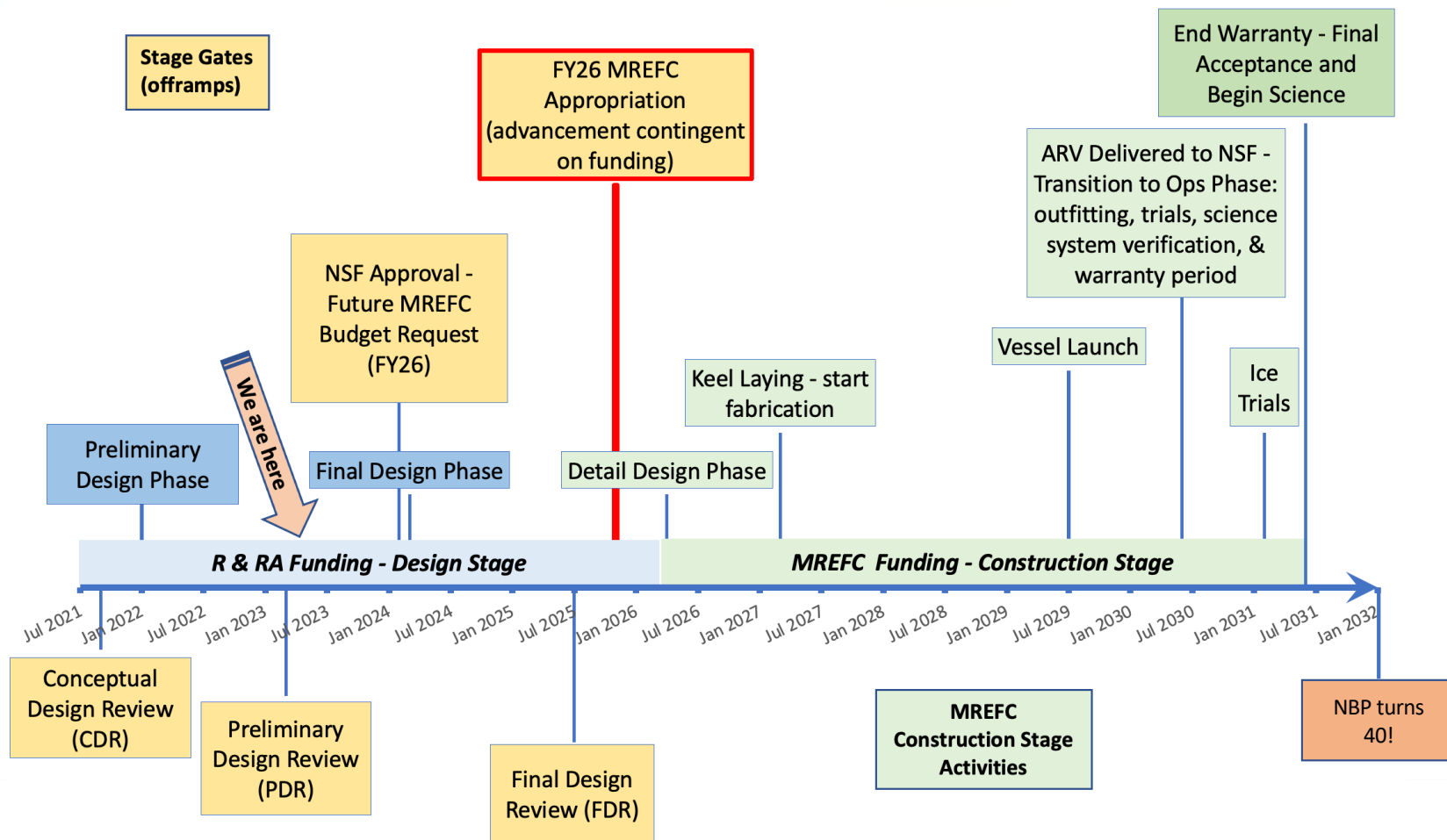
ACOUSTIC SYSTEMS

<http://future.usap.gov/arv>

ARV Schedule



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Questions?