

Polar Icebreaker Industry Data Package



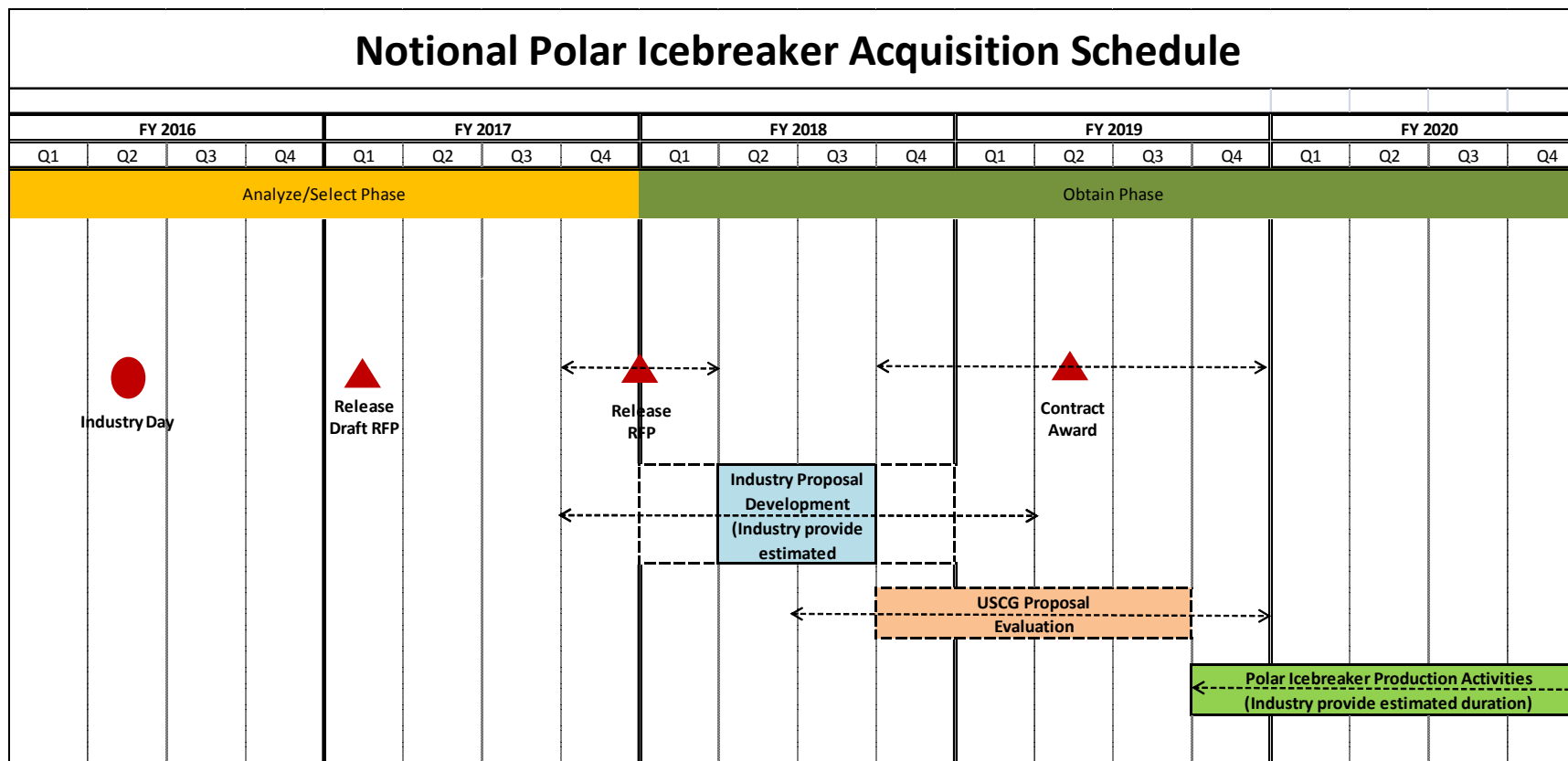
Table of Contents

1. POLAR ICEBREAKER SCHEDULE	3
2. POLAR ICEBREAKER REQUIREMENTS	4
3. QUESTIONS FOR INDUSTRY	22

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1. Polar Icebreaker Schedule

The Polar Icebreaker Program has not yet chosen an acquisition strategy. The following notional schedule is not based on a particular acquisition strategy, but reflects high-level milestones. The request for proposals is the only document that should be relied upon in determining the Coast Guard's official requirements.





2. Polar Icebreaker Requirements

1 MISSION DESCRIPTION

1.1 International Operations

The Polar Icebreaker (PIB) will operate in international waters and in the fragile ecosystems of the high latitude regions. Therefore, the PIB shall, to the maximum extent possible, consider international maritime standards, including those for safety, machinery, equipment, environmental compliance, signaling, communications, weather, meteorology and oceanography (METOC), and navigation support including, but not limited to the International Maritime Organization's (IMO) Polar Code, Convention on Safety of Life at Sea (SOLAS), International Convention for the Prevention of Pollution from Ships (MARPOL), and the Antarctic Treaty.

1.2 Climatic Envelope

The PIB will operate in a variety of climates and maritime weather conditions, including tropical, dry, temperate, and polar climates. The PIB will encounter air temperatures that range from -72 degrees Fahrenheit (°F) to 114°F, and sea water temperatures that range from 28.8°F to 87°F. In addition to the extreme air and sea water temperature, the PIB will experience currents of up to 8 kts with salinity ranges of 20 to 34 parts per thousand (ppt) and winds that can reach well above 100 mph (87 kts).

1.3 Mission Scenarios

Mission Operations Scenario #1: The PIB conducts a standard Operation Deep Freeze support deployment. This includes transits to and from Antarctica by way of logistics stops en route. The PIB experiences the extreme ranges of its climatic envelop during this deployment. Specific capabilities employed during this deployment include receipt of satellite ice imagery, embarkation of a DIVEDET, use of a UAS for ice reconnaissance, icebreaking/ice management, two-way long range communication (including via SATCOM), helicopter operations in support of OGA scientists and Department of State Antarctic Treaty inspectors.

Missions fulfilled: Ice Operations, Defense Readiness

Mission Operations Scenario #2: While deployed on a science support mission in the Arctic, the PIB responds to an emergent mass search and rescue and marine environmental protection incident when a cruise ship runs aground in ice infested waters. Specific capabilities employed during this operation include two-way long range communication (including SATCOM), helicopter operations (including in flight and on deck refueling), command and control of ownships and other assets, ice imagery via satellite communication, cutter boats, deployable oil spill response equipment, rescue and assistance personnel/equipment, DIVEDET, on scene endurance, icebreaking/ice management, medical facilities, and surge personnel holding/sustainment.

Missions fulfilled: Ice Operations, Search and Rescue, Marine Environmental Protection





Mission Operations Scenario #3: The PIB conducts a full multi-mission deployment to Alaska and Alaskan Arctic. During this deployment the PIB conducts onboard training, conducts fisheries law enforcement operations, conducts maritime domain awareness and aids to navigation support operations, supports OGA's conducting hydrographic surveys, and escorts an ice capable research ship. Specific capabilities employed during this deployment include icebreaking/ice management, two-way long range communication (including SATCOM), command and control of organic assets, underway replenishment of other vessels, helicopter operations, boat operations, onboard training, intelligence collection and processing, on scene endurance and heavy lift.

Missions fulfilled: Ice Operations, Living Marine Resources, Aids to Navigation, Marine Safety, and Other Law Enforcement





2 TOP LEVEL CAPABILITY REQUIREMENTS

2.1 Ice Breaking

- 2.1.1 (KPP) The PIB shall be capable of independently breaking though ice with a thickness ≥ 6 ft (threshold) / ≥ 8 ft (objective) at a continuous speed ≥ 3 kts.

Note: Key Performance Parameters (KPPs) state the quantifiable and measurable system capabilities or characteristics considered essential for successful accomplishment of the PIB's missions.

- 2.1.2 (KPP) The PIB shall be capable of independently breaking through ridged ice with a thickness of 21 ft.
- 2.1.3 The PIB shall be capable of breaking a single-pass channel to a width of at least 83 ft.

2.2 Endurance

- 2.2.1 (KPP) The PIB shall have a fully mission capable cutter endurance per deployment without replenishment (subsistence and fuel) ≥ 80 days underway (threshold) / ≥ 90 days underway (objective).

2.3 Speed

- 2.3.1 The PIB shall have a sustained speed of 15 kts.

Sustained Speed - Sustained Speed for the PIB is that speed which the cutter can maintain at maximum shaft horsepower reduced by the service margin and engine margin.

2.4 Range

- 2.4.1 The PIB shall have a minimum range of 21,500 nautical miles at 12 kts in ice free waters.

2.5 Operational Tempo

- 2.5.1 The PIB shall have the capability of performing 3,300 Operational Hours (threshold) / 4,050 Operational Hours (objective) per year.

2.6 Seakeeping

- 2.6.1 The PIB stability shall provide the ability to conduct evolutions in the conditions listed in Table 1. The Sea States contained in Table 1 are based on the Bretschneider formulation.





Table 1. PIB seakeeping requirements.

Sea State	Operations
Sea State 1 (0.3 ft)	Fueling Alongside Moving Cargo within Designated Topside Cargo Areas Transfer Recovered Oil
Sea State 3 (4.1 ft)	Underway Replenishment (UNREP) and Strike Down Fuel Astern Boat Operations (Launch and Recovery Only) of Cargo Landing Capable Boat Deploy & Retrieve Divers from the Water Recover Personnel Directly from the Water/Ice Surface/Alongside Platform Recover Unconscious Personnel Directly from the Water/Ice Surface/Alongside Platform
Sea State 4 (8.2 ft)	Boat Operations (Launch and Recovery Only) of OTH Capable Boat on best course and speed Aviation Operations (Launch and Recovery) on best course and speed Rescue and Assistance Vertical Replenishment (VERTREP) and Strike Down on best course and speed Science/Survey Support
Mid Sea State 5 (10.6 ft)	Towing
Sea State 7 (29.5 ft)	Limited Ops
Sea State 8 (45.5 ft)	Survive

2.6.2 The PIB shall have the ballast capability to compensate for fuel consumed through operations.

2.6.2.1 The PIB shall have the capability to treat the water of its independent ballast tanks prior to discharge to enable worldwide discharge of ballast water.

2.7 Maneuvering, Mooring, Anchoring and Berthing

2.7.1 The PIB shall have the capability to be conned from a location that allows visual evaluation of ice conditions for a minimum distance of 12 NM in all directions.

2.7.2 The PIB shall be capable of maneuvering alongside piers in ice covered waters up to the threshold continuous icebreaking capability.

2.7.3 The PIB shall be capable of maneuvering close aboard vessels to within a distance of half the PIB's width in ice covered waters up to the threshold continuous icebreaking capability.

2.7.4 The PIB shall be capable of mooring to a pier on both port and starboard sides and Mediterranean moors.





2.7.5 The PIB shall be able to berth without the assistance of tugs.

2.8 Cargo Handling and Underway Replenishment

2.8.1 The PIB shall be capable of underway transfer, strike-down, and stowage of stores from VERTREP locations.

2.8.2 The PIB shall be capable of receiving underway replenishment of fuel and water from USN/NATO/Allied Navy vessels, Military Sealift Command or other designated vessels.

2.8.3 The PIB shall be able to pump aviation fuels, diesel fuels, and water to shore facilities, including U.S. Scientific Research Stations.

2.8.4 The PIB shall be capable of moving cargo within topside cargo areas through sea state 1 while underway, anchored or hove to.

2.8.5 The PIB shall have a designated topside cargo area capable of transporting (not simultaneously):

2.8.5.1 Three 9 ft x 35 ft buoys including associated buoy mooring equipment.

2.8.5.2 Six twenty foot equivalent units (TEU) with a maximum weight of 20 tons each.

2.9 Aviation Capabilities

2.9.1 The PIB shall meet certification criteria for Level I, Class 2 aviation operations for the following aircraft in accordance with the USCG Shipboard Helicopter Operations Procedures Manual, COMDTINST 3710.2 (Series).

- United States Navy (USN)/United States Marine Corps (USMC)/United States Air Force (USAF)/United States Army (USA) Utility Helicopter (UH)-1.
- USA Observation Helicopter (OH)-6.
- USMC/USA/USAF/Customs and Borders Protection (CBP) H-60.
- Civilian and NATO variants of the UH-1, OH-6, H-60, or H-65.

2.9.2 The PIB shall be able to hangar a total of two of any combination of the following aircraft:

- USCG H-65 with blade-folding capability.
- USCG/USN H-60 with blade-folding capability.
- UAS (not to exceed the footprint of an USCG H-60 with blade folding capability).





- 2.9.3 The PIB shall have sufficient hangar space to enable one aircraft or the UAS to be moved in/out without disturbing the other aircraft or UAS.
- 2.9.4 The PIB shall meet certification criteria for Level I, Class 1 aviation operations for a total of two of any combination of the following aircraft in accordance with the USCG Shipboard Helicopter Operations Procedures Manual, COMDTINST 3710.2 (Series).
- USCG H-65 with blade-folding capability.
 - USCG/USN H-60 with blade-folding capability.
 - UAS (not to exceed the footprint of an USCG H-60 with blade folded)
- 2.9.5 The PIB shall be able to conduct VERTREP with the following airframes in accordance with the USCG Shipboard-Helicopter Operational Procedures Manual, COMDTINST M3710.2 (Series).
- USA/USN/USMC/USAF UH-1.
 - USA H-47.
 - USN/USMC H-53.
 - USCG/USN/USMC/USA/USAF/CBP H-60.
 - USCG H-65.
- 2.9.6 The PIB shall be capable of conducting HIFR of the following airframes in accordance with the USCG Shipboard-Helicopter Operational Procedures Manual, COMDTINST M3710.2 (Series).
- USCG/USN H-60.
 - USCG H-65.
- 2.9.7 The PIB shall have the capability for straight-in, sliding, oblique, and athwartships helicopter approaches .
- 2.9.8 The PIB flight deck shall be within the unobstructed field of view of the PIB primary aviation control station.
- 2.9.9 The PIB shall have the aviation fuel capacity to operate an H-60 for 250 flight hours with 24 flight hours of fuel capacity in service tanks.





2.10 Boat Capabilities

- 2.10.1 The PIB shall have the capability to independently launch, recover, fuel, maintain and operate two assigned boats with over-the-horizon (OTH) capability.
- 2.10.2 The PIB shall have the capability to launch, recover, fuel, maintain, and operate at least one assigned cargo landing boat capable of landing a minimum capacity of 4,500 pounds (e.g., people, cargo, and equipment).
- 2.10.3 The PIB shall have the capability to support the performance of organizational level boat maintenance and servicing including the capability to store adequate spare parts.
- 2.10.4 The PIB shall have the capability to support the performance of organizational level boat maintenance within an area internal to the ship.
- 2.10.5 The PIB's OTH boat launch/recovery system shall be capable of launching at least one boat from its secured state within 8 minutes.
- 2.10.6 The PIB shall have the capability to launch and recover one boat while simultaneously conducting operations.
- 2.10.7 The PIB shall have the capability to launch and recover on both port and starboard sides.
- 2.10.8 The PIB shall have boat bays onboard capable of protecting boats from the environment during storage and maintenance.

2.11 Towing Capabilities

- 2.11.1 The PIB shall have the capacity to tow astern a vessel not exceeding an equivalent displacement to that of the PIB.

2.12 Dive Detachment Missions Support

- 2.12.1 The PIB shall have the capability to support a DIVEDET of 7 personnel and their equipment, in accordance with the USCG Diving Policies and Procedures Manual, COMDTINST M3150.1 (Series) and the USN Diving Manual, SS521-AG-PRO-010 (Series).
- 2.12.2 The PIB shall provide space weight and power to support a portable hyperbaric chamber.
- 2.12.3 The PIB shall be capable of supporting a DIVEDET with Remotely Operated Vehicle (ROV) capabilities not to exceed the PIB's lifting and deck space capacity.





2.13 OGA Science/Survey Mission Support

- 2.13.1 The PIB shall have the capability to support conducting oceanographic observations to include: Hydrographic cast; Mapping surveys to include the shelf, ridges and basins, and full ocean depth; Biological sampling; Jumbo Coring; Trawling; Bottom sampling; Plankton tows; Conducting continuous measurements and data recording of oceanic properties.
- 2.13.2 The PIB shall have the capability to support conducting bathymetric measurements.
- 2.13.3 The PIB shall have the capability to support conducting hydrographic surveys in accordance with the International Hydrographic Organization (IHO) Standards for Hydrographic Surveys (Series).
- 2.13.4 The PIB shall have the capability to support conducting continuous surveys of water depth and sub-bottom profiling.
- 2.13.5 The PIB shall provide dedicated location(s) and reserved space, weight, power, hotel services, data network and phones to accommodate six 10 ft x 20 ft science vans that do not interfere with flight deck operations.
- 2.13.6 The PIB shall provide the space, weight, and power for a reconfigurable science wet lab.
- 2.13.7 The PIB shall provide the space, weight, and power for a reconfigurable science dry lab.
- 2.13.8 The PIB shall provide the space, weight, and power for a reconfigurable electronics lab with designated cableways to a reconfigurable topside antenna mounting area.
- 2.13.9 The PIB shall provide reserved space, weight, and power for one 265 ft² science freezer.
- 2.13.10 The PIB shall provide reserved space, weight, and power for one 170 ft² science refrigerator.
- 2.13.11 The PIB shall provide reserved space, weight, and power for two 105 ft² walk in climate control chambers.
- 2.13.12 The PIB shall have the capability to support the deployment and retrieval of research buoys up to 5 ft x 11 ft with 3000lb sinkers and up to 2000m of cable.
- 2.13.13 The PIB shall have the capability to provide ambient, continuous flow sea water samples in open waters and ice covered waters.
- 2.13.14 The PIB shall have the capability to launch and retrieve sub-surface hydrographic moorings.





2.13.15 The PIB shall have the capability to launch and recover surface and sub-surface unmanned vehicles not to exceed the PIB's lifting and deck space capacity.

2.13.16 The PIB shall provide storage capacity to operate with zero discharge into the water for 5 days.

2.14 Heavy Lift

2.14.1 The PIB shall have a heavy lift capability with a minimum capacity of 20 tons extending to at least one lift point 25 feet past the widest point of the ship's beam on both the port and starboard side of the ship.

2.14.2 The PIB shall be capable of providing non-simultaneous heavy lift capacity to both port and starboard sides of the PIB.

2.14.3 The PIB shall have the capability to provide a heavy lift capacity from:

- Pier/ice/water's edge to the PIB.
- PIB to pier/ice/water's edge.
- Across working deck areas.
- To/from topside cargo areas.

2.15 Marine Environmental Response

2.15.1 The PIB shall be capable of conducting response activities in open water, at the ice edge and in an ice field if equipped with non-organic response equipment.

2.15.2 The PIB shall provide reserved space, weight, and power for storage and transport of one USCG Vessel of Opportunity Skimming System not to exceed the heavy lift capacity and exterior storage space capacity.

2.15.3 The PIB shall be capable of transferring oil and hazardous material retrieved by surface skimming equipment if equipped with non-organic response equipment.

2.15.4 The PIB shall provide reserved space, weight, and power for storage and transport of equipment used for application and monitoring of alternative marine environmental response technologies (e.g., burning and dispersants) not to exceed the heavy lift capacity and exterior storage space capacity.

2.16 Defensive/Offensive Capability Systems

2.16.1 The PIB shall have the capability to employ four removable .50 caliber machine guns

2.17 Communications, Information Technology and Intelligence

2.17.1 Interoperability





2.17.1.1 (KPP) The PIB shall have the capability to exchange clear, Type I, Type II and Type III information (voice and data) with: USCG, DoD, DHS, NATO, DoS, NSF, & NOAA.

2.18 External Communications

2.18.1 The PIB shall be outfitted with communication systems to enable communication in accordance with Tables 2 and 3 below.

2.18.2 The PIB shall have the capability to communicate simultaneously via external radio frequency communication paths across the radio frequency spectrum as outlined in Tables 2 and 3 to support operations over clear Type I, Type II and Type III circuits.

Table 2. Voice communications path requirements.

Communications Path	Transmit/Receive (XMT/RCV)	Simultaneous (XMT/RCV)	Simultaneous Monitor
Marine Band VHF	4	3	X
Tactical VHF	4	2	X
VHF Amplitude Modulated (AM)	1	X	X
Tactical Ultra-High Frequency (UHF) (400 Megahertz (MHz))	2	X	X
Tactical UHF (700/800 MHz)	1	X	X
Military (MIL) UHF LOS	1	X	X
MIL Satellite Communications (SATCOM) UHF – Voice	2	X	X
HF	4	2	2
HF-Automatic Link Establishment (ALE)	2	X	X
Commercial SATCOM	2	2	X

Table 3. Data communications path requirements.

Communications Path	Simultaneous XMT/RCV	Bandwidth / Path
MILSATCOM UHF/ Extremely High Frequency (EHF), Wideband Global Satellite (WGS), Mobile User Objective System (MUOS)	2	≥ 512 Kilobytes per second (KBps)
COMSATCOM, Commercial FBB, Very Small Aperture Terminal (VSAT), KU ¹ , International Marine Satellite (INMARSAT) X.	3	≥ 2.25 Megabytes per second (MBps)

¹ U.S. designation of microwave band between 12 and 40 GHz.





2.19 OGA Science/Survey Mission Support (Communications)

2.19.1 The PIB shall provide a voice, data, and video network capability physically separated from the PIB's operations network for embarked OGA science/survey teams throughout their associated work spaces.

2.20 Command and Control

2.20.1 The PIB shall have an integrated capability from watchstations to exercise command and control over own ship operations and systems; organic boat and air assets; and other surface and air assets when assigned.

2.20.2 The PIB shall have an integrated command and control and navigation system.*

*The PIB shall utilize the Coast Guard's standard Command and Control and Navigation system.

2.21 Intelligence Systems

2.21.1 The PIB shall have a secure workspace that accommodates the following space, weight, and power requirements: 336 sq ft, 9,813 lbs, 23,309 Watts (115v/1-phase), 10,669 Watts (440V/3-phase), and 83,538 BTU/HR.

2.22 Navigation

2.22.1 The PIB shall utilize the Coast Guard's standard Command and Control and Navigation system.

2.23 Sensors

2.23.1 The PIB shall be equipped with a Surface Search RADAR, the exact type and performance characteristics of which will be defined in the specification.

2.23.2 The PIB shall be equipped with an Air Search RADAR, the exact type and performance characteristics of which will be defined in the specification.





3 DESIGN PARAMETERS

3.1 Constraints

- 3.1.1 The PIB shall be designed and built to meet applicable United States Laws and Regulations and applicable International Conventions, Codes, Resolutions and Circulars for a vessel of its type engaged on international unlimited voyages. This specifically includes, but is not limited to Acts, Regulations and Treaties governing operations in the Polar Regions (Arctic and Antarctic) and the domestic water of the United States.
- 3.1.2 The PIB shall be designed based upon the capability for continuous and independent operations in a low threat environment with a Service Life of 30 years.
- 3.1.3 The PIB's design shall ensure the structure has a fatigue service life of the design service life plus 10 years.
- 3.1.4 The PIB shall be designed to protect systems from functional degradation allowing for full mission capabilities while operating within air temperature ranges of -40°F to 114°F.
- 3.1.5 The PIB shall be designed with the capability of surviving through a minimum air temperature of -72 °F.
- 3.1.6 The PIB shall be designed with multiple propulsion machines.
- 3.1.7 The PIB shall be designed with multiple propulsors.
- 3.1.8 The PIB shall be designed with multiple steering systems.

3.2 Commonality

- 3.2.1 The PIB shall be designed to leverage common and USCG fleet standard equipment, such as electronics, engines, weapon systems, hardware and software including existing DHS/DoD/USN Program of Record/USCG equipment and government approved systems will be used whenever possible. System design concepts shall be consistent, though not necessarily identical, across operating units of various ship classes.

3.3 Open System

- 3.3.1 The PIB shall be designed with components and subsystems compliant with open architecture standards to facilitate future upgrades, modularity, and levels of servicing.

3.4 Technology

- 3.4.1 The PIB shall utilize state-of-the-market technology including technology that is non-developmental, and commercially available.





- 3.4.2 The PIB shall take advantage of Commercial-Off-the-Shelf (COTS) or Government-Off-the-Shelf (GOTS) equipment and systems.
- 3.4.3 Technology that is at the end of its life cycle or market availability will be avoided to preclude sustainability and supportability issues.

3.5 Habitability and Outfit

- 3.5.1 The PIB shall provide messing, berthing, sanitary facilities, and workspaces for all permanently attached crewmembers and 50 embarked personnel*

*The Coast Guard's initial assessment indicates the PIBs crew will likely be sized between 100 and 150 people. However, given the early nature of this estimate, the Coast Guard will continue to refine this number as the acquisition progresses and more information is known upon which to base the crew determination.

- 3.5.2 Commanding Officer, Executive Officer, Engineer Officer, Operations Officer, Senior Embarked Person shall be provided with separate compartment with individual berthing, sanitary facilities and adjacent office space.
- 3.5.3 All other Officers and Chief Petty Officers assigned aboard the PIB as permanent party crew members: Separate compartment with shared berthing for two individuals and shared sanitary facilities.
- 3.5.4 The PIB shall provide berthing compartments with adjacent sanitary facilities for all embarked personnel that accommodate no more than four individuals.
- 3.5.5 The PIB shall provide berthing compartments with adjacent sanitary facilities for all non-permanent party crew detachment personnel that accommodate no more than four individuals.
- 3.5.6 The PIB shall have medical facilities
- 3.5.7 The PIB shall have separate assigned multi-purpose spaces for Officers, Chief Petty Officers, engineering department, deck department, operations department, support department and other embarked personnel.
- 3.5.8 The PIB dining facilities shall accommodate at least 75 percent of the crew and embarked personnel at the same time.
- 3.5.9 The PIB shall be capable of accommodating mixed gender crews up to a 50-50 percent gender mix.

3.6 Food Service Operations

- 3.6.1 The PIB shall utilize a single food service preparation area to prepare and serve food to the maximum number of crew/embarked personnel for four meals per 24-hour period.





3.6.2 The PIB shall have sufficient cold and dry food storage to meet endurance parameters.

3.7 Training Support

3.7.1 The PIB shall provide a dedicated space to assemble at least 25 seated personnel and one presenter for training, briefings, and instruction.

3.8 Morale and Well-Being

3.8.1 The PIB shall have a ship's store and secure storage.

3.8.2 The PIB shall have a dedicated gym/exercise facility to accommodate at least 15 percent of crew/embarked personnel.

3.8.3 The PIB shall provide self-service commercial grade laundry facilities sized for use by 20 percent of the crew/embarked personnel.

3.8.4 The PIB shall have a dedicated space to store equipment for Morale, Welfare and Recreation (MWR).

3.8.5 The PIB shall have a dedicated space for the ship's barber shop.

3.8.6 The PIB shall have the ability to receive and display satellite television signals

3.9 Storage Capacity

3.9.1 The PIB shall have ordnance storage capacity to ensure ammunition is available for all armament in accordance with the USCG Ordnance Manual, COMDTINST M8000.2 (Series).

3.9.2 The PIB's magazines and ready service lockers shall comply with the USCG Ordnance Manual, COMDTINST M8000.2 (Series).

3.9.3 The PIB shall provide central hazardous materials (HAZMAT) storage to hold HAZMAT for maintenance, operations and science/survey support.

3.9.4 The PIB shall provide each work space with HAZMAT ready storage for up to 2 days of HAZMAT required for maintenance and operations.

3.9.5 The PIB shall provide HAZMAT storage sufficient to hold waste generated during underway operations.

3.9.6 The PIB shall provide dedicated storage of CBRN Personal Protective Equipment (PPE) for all embarked persons.





3.9.7 The PIB shall provide dedicated storage that will accommodate all solid waste streams in accordance with the PIB's endurance requirements.

3.9.7.1 The PIB shall be capable of processing solid waste streams.

3.10 Work Space

3.10.1 The PIB shall include dedicated administrative work spaces for each of the PIB departments.

3.10.1.1 The PIB's departmental administrative work spaces and divisional workshops are mutually exclusive spaces and shall not be shared.

3.10.2 The PIB shall include the appropriate number of dedicated work spaces for each applicable organization component in accordance with the USCG Cutter Organizational Manual, COMDTINST M5400.16 (Series).

3.10.3 The PIB shall have a dedicated workspace to accommodate the AVDET.

3.10.4 The PIB shall have a dedicated workspace to accommodate the DIVEDET.

3.10.5 The PIB weapons maintenance facilities shall meet physical security requirements for storage in accordance with the USCG Ordnance Manual, COMDTINST M8000.2 (Series).

3.10.6 The PIB shall have a dedicated law enforcement work space of sufficient size to simultaneously store gear for; 12 boarding team members, 9 boat crew members and storage for ready service weapons and ammunition.

3.10.6.1 The PIB's law enforcement work space shall be accessible from the weather decks, the hangar and from the interior of the ship.

3.10.7 The PIB shall have a dedicated space at each boat storage position to store boat deck personnel protective equipment.

3.11 Supportability and Sustainment (Integrated Logistics)

3.11.1 Integrated Logistics Support

3.11.1.1 The PIB maintenance philosophy shall follow the standard Coast Guard bi-level structure: organizational and depot levels that ensures vessel supportability criteria and characteristics are equally and thoroughly integrated into the cutter design, systems integration, construction, testing, and life cycle support planning processes.

3.11.1.2 The PIB shall include automated capabilities to identify system faults, localize failed components, and guide organizational level maintenance.





- 3.11.1.3 The PIB shall incorporate non-intrusive means for diagnostics and maintenance data collection for mission essential systems and equipment.
- 3.11.1.4 The PIB shall have equipment removal routes and access capable of minor equipment and machinery removal within 72 hours.
- 3.11.1.5 The PIB shall have maintenance envelopes surrounding major equipment and machinery to support in-place maintenance.
- 3.11.1.6 The PIB provisioning strategy (including ship design impacts) shall be tailored for routine, extended, and isolated operations conducted far from sources of logistics support.
- 3.11.1.7 The PIB's sparing shall allow for organizational accomplishment of unscheduled maintenance to Mission Critical Function (MCF) equipment that would typically be depot level in homeport or Continental United States (CONUS) locations.
 - 3.11.1.7.1 The PIB's sparing shall allow for all scheduled organizational level maintenance that is required to achieve mission availability requirements.
- 3.11.1.8 The PIB's depot level maintenance philosophy shall be based upon a triennial drydock schedule.

3.12 Reliability, Availability and Maintainability

- 3.12.1 The PIB's design shall include redundancy and ensure all scheduled and unscheduled maintenance may be completed in order to achieve the required availability.
- 3.12.2 The PIB shall have an AO of 0.85 (threshold) and 0.92 (objective) based on the minimum functions required for the PIB to maneuver and control the cutter, conduct damage control, and sustain the crew.

Operational Availability (A_0) - The probability that the PIB is able to fulfill primary mission requirements at any random point during its scheduled underway deployment.

3.13 Survivability

- 3.13.1 Damage Control
 - 3.13.1.1 The PIB shall be designed to USCG standards for survivability when damaged and damage control organization and response.
 - 3.13.1.2 The PIB shall have a central location to direct all shipboard damage control and remotely control permanently installed damage control systems.





- 3.13.1.3 The PIB shall have the capability to direct all shipboard damage control from a secondary locations (bridge, Engineering Control Center and the Repair Lockers).
- 3.13.1.4 The PIB shall have designated Repair Lockers and be outfitted in accordance with NSTM Chapters 555 volume 1, 079 volume 2 and 074 volume 3 (Series).
- 3.13.1.5 The PIB shall provide fixed damage control systems including an automated detection and monitoring capability to detect smoke, fire, flooding, and toxic gas per the NSTM Chapters 555 volume 1, 079 volume 2 and 074 volume 3 (Series).
- 3.13.1.6 The PIB shall provide fixed damage control systems including a remote initial response capability to counter fire and flooding.

3.13.2 Wintering Over

- 3.13.2.1 The PIB shall be capable of wintering over for a minimum of 210 days.¹

¹*This requirement is not intended to provide an operational capability or sustain any more than the minimum necessary crew to ensure ship survival.*

3.13.3 Recoverability

- 3.13.3.1 The PIB shall be designed with enhanced arrangement, such as equipment separation and redundancies, to ensure survivability consistent with Coast Guard Technical Standards.

3.14 Human Systems Integration

3.14.1 Human Systems Integration Processes

- 3.14.1.1 The PIB and its systems shall incorporate Human Systems Integration (HSI) processes, which will improve human performance effectiveness, efficiency, and safety of the crew and ship, and all support systems.
- 3.14.1.2 The PIB shall have the capability for manned (non-machinery) space air temperatures to be adjustable and maintained between 68°F (heating season) and 80°F (cooling season).

3.14.2 Operational Sustainment and Workforce Allocation

- 3.14.2.1 The PIB shall be capable of being operated, maintained and supported underway by an assigned crew complement (excluding detachments).
 - 3.14.2.1.1 The PIB's bridge watch-station tasks shall be capable of being performed by the minimum number of personnel specified in the Coast Guard Navigation Standards Manual, COMDTINST M3530.2 (Series).





- 3.14.2.1.2 The PIB's engineering watch-station duties shall be performed by no more than two persons with unmanned engine rooms for normal, unrestricted operating conditions.
- 3.14.2.1.3 The PIB's operations center/communications watch-station duties shall be performed by two persons for normal, unrestricted operating conditions.
- 3.14.2.1.4 Inport watch-station duties shall be performed by no more than eight persons for homeport conditions.

3.15 Security

3.15.1 Access Control

- 3.15.1.1 The PIB shall be fitted with an automated system to account for and record all permanently assigned crew members who board and depart the ship.

3.15.2 Classified and Sensitive Material

- 3.15.2.1 The PIB shall have facilities for handling, storing, processing and destruction of classified material.

3.15.3 Accreditation

- 3.15.3.1 The PIB information systems (including C2, propulsion control, machinery control, data networks and communication) shall be certified and accredited for cybersecurity in accordance with DoD, Intelligence Community, and USCG policies.





3. Questions for Industry

The Polar Icebreaker Program has not yet chosen an acquisition strategy. The following questions are meant to increase the Coast Guard's understanding of industry's capabilities and concerns. The request for proposals is the only document that should be relied upon in determining the Coast Guard's official requirements. These questions will guide the one-on-one discussions. Please come prepared with answers to the questions relevant to your industry. Written responses will be accepted following the one-on-one discussions.

Requirements

- 1) Do you perceive any challenges with the requirements?
- 2) Other than the Key Performance Parameters (KPPs), are there any requirements, including the constraints in Section 3.1, which the Coast Guard could consider modifying to produce significant benefits to cost, schedule and/or performance of the acquisition?
- 3) Do any of the requirements appear to conflict or complicate achieving other requirements? What changes could resolve the conflict or complication?
- 4) How would application of the IMO Polar Code impact the requirements?
- 5) Are there particular areas of the design trade space that may be necessary to develop a compliant, yet affordable, Polar Icebreaker?

Acquisition Strategy

- 6) Is there value in providing a USCG indicative design as guidance in order to communicate the Government's interpretation of requirements?
- 7) What are your thoughts on an acquisition approach incorporating a Government-provided design?
- 8) Are you aware of any existing vessels or mature designs that may meet, or require minimal changes to meet, the Polar Icebreaker requirements? If so, what are your thoughts on an acquisition approach requiring that industry provide an existing or mature design?
- 9) What are your thoughts on how the Government can mitigate design and performance risk in the area of evaluating and validating icebreaking performance (e.g. tow tank and ice tank testing)?

Schedule

- 10) Do you have any concerns regarding the notional schedule in Section 1? Do you think it is feasible?





- 11) What is the estimated time needed to develop a proposal?
- 12) What is a feasible duration for contract design of a Polar Icebreaker?
- 13) What is a feasible duration for detail design of a Polar Icebreaker?
- 14) At what point in the design schedule would you consider it feasible to identify long lead time material?
- 15) What is a feasible duration for the construction of a Polar Icebreaker?
- 16) If multiple Polar Icebreakers were awarded, could your facility support the construction of more than one icebreaker in series?
- 17) What would be the optimum spacing between the start of a lead ship and the start of a follow-on ship?
- 18) How much time would it take to qualify the equipment to Polar standards with the climactic conditions listed in Section 1.2?
- 19) What are your suggestions for accelerating the Polar Icebreaker acquisition program?

Unique to Polar Icebreaker

- 20) Since the design and construction of the last USCG Polar Icebreakers, there have been substantial changes in US and International regulations, and to the makeup and capabilities of the US shipbuilding industry which may impact this acquisition. Do you see any specific impediments to the design of a Polar Icebreaker and subsequent construction in a domestic shipyard?
- 21) What challenges would application of the IMO Polar Code, specifically safety, environmental compliance, and low temperature impacts, have on the design and component selection?
- 22) The Polar Icebreaker is required to operate in ice as well as make long transits in open water. What particular design challenges do you see in developing an icebreaker that balances open water sea keeping with icebreaking capability?
- 23) The prior USCG Polar Icebreaker acquisition experienced schedule delays and cost impacts due to the complexities in constructing the icebreaking hull structure and integrating and commissioning of the propulsion systems. What steps could be taken early in the acquisition/design process to mitigate the reoccurrence of similar issues?
- 24) Is there infrastructure (i.e. facility), equipment, or expertise you would need to obtain or improve to build a Polar Icebreaker?





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- 25) What do you consider the greatest risks in constructing a Polar Icebreaker?
 - 26) What are the lessons learned from the production of ships with similar complexity to a Polar Icebreaker?
 - 27) Is there any additional information that would improve your understanding and help you better prepare for the Polar Icebreaker acquisition?

