



# Antarctic Research Vessel (ARV)

## RHIB Builder Specification

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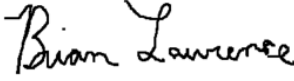
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Preliminary

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## Group 000 General

Reqmt ID	Requirement Text
<b>RHIB-000-1</b>	<b>000 GENERAL GUIDANCE AND ADMINISTRATION</b>
<b>RHIB-000.1-1</b>	<b>000.1 General Requirements</b>
<b>RHIB-000.1-1.1</b>	This document describes two (2) identical Rigid Hull Inflatable Boats (RHIBs) which are tenders to the Antarctic Research Vessel (ARV) and will be designed and built according to the requirements of the National Science Foundation (NSF, the Owner), the Contract, and any other standards and regulations described herein.
<b>RHIB-000.1-1.2</b>	All requirements specified in this document shall be met.
<b>RHIB-000.1-1.3</b>	Each RHIB shall be fully tested and outfitted at the time of delivery with a report documenting adherence to requirements and outfitting inventory for verification by the Owner.
<b>RHIB-000.1-1.4</b>	All material and equipment entering the construction and outfitting of the boat shall be new, unless specifically stated otherwise, herein.
<b>RHIB-000.1-1.5</b>	The vessel shall be constructed in the United States.
<b>RHIB-000.1-1.6</b>	Material grade selected shall be suitable for operation in Antarctic Waters per ABS Guide for Vessels Operating in Low Temperature Environments.
<b>RHIB-000.1-1.7</b>	These RHIBs shall be optimized for work in brash ice and rocky shore landings.
<b>RHIB-000.1-1.8</b>	These RHIBs shall be capable of transferring scientists and their gear from ship-to-shore and ship-to-ice to make measurements, install instruments, and collect samples.
<b>RHIB-000.1-1.9</b>	When referenced herein, “vessel” refers to the RHIB.

Reqmt ID	Requirement Text
<b>RHIB-000.2-1</b>	<b>000.2 CONVENTIONS</b>
<b>RHIB-000.2.1-1</b>	<b>000.2.1 Threshold and Objective Specifications</b>
<b>RHIB-000.2.1-1.1</b>	Threshold specifications are requirements that must be met or exceeded to satisfy the Contract.
<b>RHIB-000.2.1-1.2</b>	[Objective] specifications need not be met to satisfy the Contract, but should be met, if possible, within the other constraints of the design.
<b>RHIB-000.2.2-1</b>	<b>000.2.2 Units</b>
<b>RHIB-000.2.2-1.1</b>	English units (feet [ft], long tons, gallons, etc.) shall be used unless otherwise specified.
<b>RHIB-044-1</b>	<b>044 SHIP OPERATION</b>
<b>RHIB-044.1-1</b>	<b>044.1 Accommodations</b>
<b>RHIB-044.1-1.1</b>	The RHIB shall have one (1) oversized operator seat.
<b>RHIB-044.1-1.2</b>	The RHIB shall have one (1) fold down padded seat on the front of the center console.
<b>RHIB-044.1-1.3</b>	The air collars shall accommodate seating for Threshold nine (9) [Objective ten (10)] personnel.
<b>RHIB-044.2-1</b>	<b>044.2 Working Deck</b>
<b>RHIB-044.2-1.1</b>	The working deck shall have the following requirements:
<b>RHIB-044.2-1.1.1</b>	1. An open 4'x7' obstruction free foredeck.
<b>RHIB-044.2-1.1.2</b>	2. Non-skid self-draining deck.
<b>RHIB-044.2-1.1.3</b>	3. High-capacity deck drains.

Reqmt ID	Requirement Text
<b>RHIB-044.3-1</b>	<b>044.3 Launch and Recovery</b>
<b>RHIB-044.3-1.1</b>	The RHIB shall be capable of being launched and recovered by the ARV in up to Sea State 4, following NATO STANAG 4194 Sea State Scale.
<b>RHIB-044.3-1.2</b>	The RHIBs shall be launched and recovered by crane from the ARV therefore each RHIB will need to have the necessary lifting points installed.
<b>RHIB-044.3-1.3</b>	The lift points must be designed to allow launch and recovery with one (1) crew member onboard.
<b>RHIB-044.4-1</b>	<b>044.4 Environmental Requirements</b>
<b>RHIB-044.4-1.1</b>	The RHIB shall be designed to operate in a maximum external dry bulb temperature of 100 degrees F.
<b>RHIB-044.4-1.2</b>	The RHIB shall be designed to operate in a maximum external wet bulb temperature of 82 degrees F.
<b>RHIB-044.4-1.3</b>	The RHIB shall be designed to operate in a minimum external dry bulb temperature of -49 degrees F.
<b>RHIB-044.4-1.4</b>	The RHIB shall be designed to operate in a maximum water temperature of 90 degrees F.
<b>RHIB-044.4-1.5</b>	The RHIB shall be designed to operate in a minimum water temperature of 28 degrees F.
<b>RHIB-050-1</b>	<b>050 SHIP SYSTEM PERFORMANCE</b>
<b>RHIB-050.1.1</b>	At transit and max speeds, the vessel shall reach a stable plane with no porpoising or other undesired sea keeping characteristics.
<b>RHIB-051-1</b>	<b>051 TOWING</b>
<b>RHIB-051-1.1</b>	The RHIB shall be capable of towing a variety of craft of similar displacement and weight (within +/-15%), astern in conditions up to Sea State 3.

<b>Reqmt ID</b>	<b>Requirement Text</b>
<b>RHIB-051-1.2</b>	The RHIB shall be capable of being towed by the bow in conditions up to Sea State 3.
<b>RHIB-051-1.3</b>	The RHIB shall have the following towing components:
<b>RHIB-051-1.3.1</b>	1. Removable bow tow post.
<b>RHIB-051-1.3.2</b>	2. Stern tow post.
<b>RHIB-051-1.3.3</b>	3. Horizontal towing rail with port and starboard stops above the outboard engines.
<b>RHIB-063-1</b>	<b>063 ELECTRICAL</b>
<b>RHIB-063-1.1</b>	The RHIB shall have the following electrical accommodations:
<b>RHIB-063-1.1.1</b>	1. Dual service marine battery charger.
<b>RHIB-063-1.1.2</b>	2. Preheaters / block heaters for outboard engines.
<b>RHIB-063-1.1.3</b>	3. Waterproof D/C outlet with dual USB C and cigarette lighter socket.
<b>RHIB-063-1.1.4</b>	4. 1-2-Both-Off battery disconnect switch.
<b>RHIB-063-1.1.5</b>	5. Electrical shore-power umbilical for charging while on parent vessel.
<b>RHIB-063-1.1.6</b>	6. Manual / Automatic bilge pump switch within reach of operator.
<b>RHIB-063-1.1.7</b>	7. 12/24V, waterproof circuit breaker panel for installed electronics.
<b>RHIB-063-1.1.8</b>	8. Two (2) deep cycle marine batteries connected to a 24 Volt DC two wire electrical power generation and distribution system for propulsion engine starting and DC power distribution with power capable of 8 hours without charging.



Reqmt ID	Requirement Text
<b>RHIB-064-1</b>	<b>064 COMMAND AND SURVEILLANCE</b>
<b>RHIB-064-1.1</b>	The RHIB shall have the following bridge systems:
<b>RHIB-064-1.1.1</b>	1. Automatic Identification System (AIS).
<b>RHIB-064-1.1.2</b>	2. Depth Sounder.
<b>RHIB-064-1.1.3</b>	3. VHF Radio with fixed whip.
<b>RHIB-064-1.1.4</b>	4. Fish finder.
<b>RHIB-064-1.1.5</b>	5. Analog Compass.
<b>RHIB-064-1.1.6</b>	6. Electronic Chart Display (ECDIS).
<b>RHIB-064-1.1.7</b>	7. Navigations lights as defined by the appropriate CFRs.
<b>RHIB-064-1.1.8</b>	8. Dash gauges (temp, oil press, rpm, fuel, trim, hours, etc.).
<b>RHIB-065-1</b>	<b>065 AUXILIARY SYSTEMS</b>
<b>RHIB-065-1.1</b>	The RHIB shall have the following auxiliary systems onboard or installed:
<b>RHIB-065-1.1.1</b>	1. Electrical bilge pump with float switch.
<b>RHIB-065-1.1.2</b>	2. Heated outboard engine covers for use when vessel is in stowage.
<b>RHIB-065-1.1.3</b>	3. Deck cradle (moveable).
<b>RHIB-065-1.1.4</b>	4. Air collar foot pump.
<b>RHIB-065-1.1.5</b>	5. D/C electric air pump (if inflatable tubes).
<b>RHIB-065-1.1.6</b>	6. Integrated fuel tanks or fuel bladder system.

<b>Reqmt ID</b>	<b>Requirement Text</b>
<b>RHIB-066-1</b>	<b>066 OUTFITTING</b>
<b>RHIB-066-1.1</b>	The RHIB shall have the following outfitting accommodations:
<b>RHIB-066-1.1.1</b>	1. An antenna arch installed above the outboard engines.
<b>RHIB-066-1.1.2</b>	2. An emergency stern retractable dive ladder installed on the aft platform.
<b>RHIB-066-1.1.3</b>	3. Removable bow pulpit.
<b>RHIB-066-1.1.4</b>	4. Portable CO2 fire extinguisher.
<b>RHIB-066-1.1.5</b>	5. Oars with stowage.
<b>RHIB-066-1.1.6</b>	6. OEM repair kit.
<b>RHIB-066-1.1.7</b>	7. OEM tool set.
<b>RHIB-066-1.1.8</b>	8. All weather boat cover.
<b>RHIB-066-1.1.9</b>	9. Full vessel floor rail for handholds and lashing.
<b>RHIB-066-1.1.10</b>	10. Beaching pads.
<b>RHIB-066-1.1.11</b>	11. Full length keel guard.
<b>RHIB-066-1.1.12</b>	12. Three (3) lift points installed to support full displacement lift with one crew member.
<b>RHIB-066-1.1.13</b>	13. One removable aluminum j-davit capable of a 200lb lift.

Reqmt ID	Requirement Text
<b>RHIB-070-1</b>	<b>070 GENERAL REQUIREMENTS FOR DESIGN AND CONSTRUCTION</b>
<b>RHIB-070.1-1</b>	<b>070.1 General Requirements</b>
<b>RHIB-070.1-1.1</b>	The RHIB shall have the following characteristics:
<b>RHIB-070.1-1.1.1</b>	1. Aluminum Hull - as applicable for polar environments.
<b>RHIB-070.1-1.1.2</b>	2. Air filled, or soft foam filled collar.
<b>RHIB-070.1-1.1.3</b>	3. Fuel Type - Diesel.
<b>RHIB-070.1-1.1.4</b>	4. Drive Type - Outboard or Inboard/Outboard(electric). Min two (2).
<b>RHIB-070.1-1.1.5</b>	5. Weight (Lightship Max) - 2,000lbs.
<b>RHIB-070.1-1.1.6</b>	6. Full Displacement - 4,800 lbs.
<b>RHIB-070.1-1.1.7</b>	7. Maximum Payload - 2,800 lbs.
<b>RHIB-070.1-1.1.8</b>	8. Length - 19 feet - 23 feet (6m-7m).
<b>RHIB-070.1-1.1.9</b>	9. Width - 9 feet (Max).
<b>RHIB-070.1-1.1.10</b>	10. Draft - 15 in. (Max).
<b>RHIB-070.1-1.1.11</b>	11. Bottom Contour - Low Deadrise Planing Hull.
<b>RHIB-070.2-1</b>	<b>070.2 Storage</b>
<b>RHIB-070.2-1.1</b>	The RHIB shall have the following stowage accommodations:
<b>RHIB-070.2-1.1.1</b>	1. Waterproof center console storage locker (tools, flares, etc.).
<b>RHIB-070.2-1.1.2</b>	2. Anchor and rode with bow locker storage.
<b>RHIB-070.2-1.1.3</b>	3. Personal Flotation Devices (PFDs) waterproof storage.

Reqmt ID	Requirement Text
<b>RHIB-070.3-1</b>	<b>070.3 Handrails, Guards, Lifelines</b>
<b>RHIB-070.3-1.1</b>	The RHIB shall have the following accommodations:
<b>RHIB-070.3-1.1.1</b>	1. Passenger grab rails on center console.
<b>RHIB-070.3-1.1.2</b>	2. Engine crash rail.
<b>RHIB-070.3-1.1.3</b>	3. Internal and external lifelines.
<b>RHIB-070.3-1.1.4</b>	4. Rub strake.
<b>RHIB-070.3-1.1.5</b>	5. Beaching Pad.
<b>RHIB-070.4-1</b>	<b>070.4 Performance Specifications</b>
<b>RHIB-070.4-1.1</b>	The vessel design shall meet or exceed the following performance threshold requirements while testing in Sea State 2:
<b>RHIB-070.4-1.1.1</b>	1. Transit Speed - Threshold: 17kts [Objective: 20kts].
<b>RHIB-070.4-1.1.2</b>	2. Max Speed - Threshold: 25kts [Objective: 30kts].
<b>RHIB-070.4-1.1.3</b>	3. Endurance Speed - Threshold: 16kts.
<b>RHIB-070.4-1.1.4</b>	4. Maximum endurance without replenishment: - Threshold: 8hrs [Objective: 16hrs].
<b>RHIB-070.4-1.1.5</b>	5. Range - Threshold: 128nm [Objective: 256nm].
<b>RHIB-070.5-1</b>	<b>070.5 Parent Craft Requirements</b>
<b>RHIB-070.5-1.1</b>	The RHIB design in terms of the hull form shall be directly traceable, at a minimum, to one boat of the same design, for a similar environment, or same family of designs referred to herein as a parent craft.
<b>RHIB-070.5-1.2</b>	The parent craft RHIB shall meet the following requirements:

<b>Reqmt ID</b>	<b>Requirement Text</b>
<b>RHIB-070.5-1.2.1</b>	1. Have a minimum of two years of commercial or Government service.
<b>RHIB-070.5-1.2.2</b>	2. Not be more than 25 feet or less than 19 feet in overall length.
<b>RHIB-070.5-1.2.3</b>	3. Not be more than 9 feet in overall beam.
<b>RHIB-070.5-1.2.4</b>	4. Not weigh more than 3,500 pounds in the Performance Weight Condition.
<b>RHIB-070.5-1.2.5</b>	5. Have a minimum sustained speed of 25 knots.
<b>RHIB-074-1</b>	<b>074 WELDING</b>
<b>RHIB-074-1.1</b>	Welding, brazing, and related procedures including joint design, joint strength calculations, edge preparation, fabrication, and records, shall be in accordance with the standards set forth by the American Welding Society (AWS).
<b>RHIB-074-1.2</b>	Procedure qualification, welder's qualification, and nondestructive test personnel qualification for welders and welding inspectors shall be in accordance with the American Welding Society (AWS).
<b>RHIB-077-1</b>	<b>077 SAFETY</b>
<b>RHIB-077-1.1</b>	The RHIB shall have the following Safety equipment and accommodations:
<b>RHIB-077-1.1.1</b>	1. Waterproof container with appropriate emergency signal kit.
<b>RHIB-077-1.1.2</b>	2. First aid kit.
<b>RHIB-077-1.1.3</b>	3. Handheld LED search light with D/C charger.
<b>RHIB-077-1.1.4</b>	4. Water rescue throw bag.
<b>RHIB-077-1.1.5</b>	5. Two (2) expandable floating boat hooks.

<b>Reqmt ID</b>	<b>Requirement Text</b>
<b>RHIB-078-1</b>	<b>078 MATERIALS</b>
<b>RHIB-078-1.1</b>	The hull structure material shall be aluminum and the design category shall be Category A (“Ocean”) and in accordance with “heavy duty workboats” of Annex J of ISO 12215-5:2019.
<b>RHIB-078-1.2</b>	Hull plating shall be 5083 H116 or 5086 H116, meeting ASTM B928 requirements for intergranular corrosion resistance.
<b>RHIB-078-1.3</b>	The collars shall be either air filled, or soft foam filled.
<b>RHIB-078-1.4</b>	Hard foam shall not be used in the collars.
<b>RHIB-086-1</b>	<b>086 TECHNICAL MANUALS AND OTHER DATA</b>
<b>RHIB-086-1.1</b>	Specifications for equipment shall require all equipment vendors to provide parts lists, manuals, and maintenance procedures in electronic form for integration with a Computerized Maintenance Management System (CMMS).

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**Table 1: Definitions**

Acronym/Term	Description
ABS	American Bureau of Shipping
ABYC	American Boat and Yacht Council
AIS	Automatic Identification System
ARV	Antarctic Research Vessel
ASTM	American Society for Testing and Materials International
AWS	American Welding Society
CFR	United States Code of Federal Regulations
CMMS	Computerized Maintenance Management System
CO2	Carbon Dioxide
Construction	The term 'construction' means the construction of the ship to meet the requirements identified in the Contract
Contract	The written agreement between the Owner and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, furnishing of labor, provision of materials, and the basis of payment.
DC	Direct Current
ECDIS	Electronic Chart Display Information System
F	Fahrenheit
ft	Feet
ISO	International Organization for Standardization
Kts	Nautical Miles (per hour)
Lbs.	Pounds
LED	Light-Emitting Diode
m	Meters
Max	Maximum
NATO	North Atlantic Treaty Organization
Nm	Nautical Miles
NSF	National Science Foundation
OEM	Original Equipment Manufacturer
Owner	The National Science Foundation (NSF), or other designated agents or employees of NSF, to the extent that those individuals have been authorized by NSF to act on its behalf.

Acronym/Term	Description
PCB	Polychlorinated Biphenyls
PFD	Personal Flotation Device
Porpoising	A sustained repetitive motion than causes a boat's bow to rise up and down out of the water while on or attempting planing speed.
RHIBs	Rigid Hull Inflatable Boats
RPM	Rotations Per Minute
STANAG	Standardization Agreement
USB	Universal Serial Bus
VHF	Very High Frequency

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**Table 2: References**

<b>American Bureau of Shipping (ABS) References</b>
ABS Guide for Vessels Operating in Low Temperature Environments.
<b>American Society for Testing and Materials (ASTM)</b>
ASTM B928, Standard Specification for High Magnesium Aluminum-Alloy Products for Marine Service and Similar Environments.
<b>American Welding Society (AWS)</b>
AWS D3.7-90: 2004, Guide for Aluminum Hull Welding.
AWS B5.1:2013-AMD1 Specification for the Qualification of Welding Inspectors
<b>International Organization for Standardization (ISO)</b>
ISO 12215-Small craft – Hull construction and Scantlings
<b>North Atlantic Treaty Organization (NATO) Standards Agreement (STANAG)</b>
NATO STANAG 4194 Sea State Scale

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