

(ANNEX D) VESSEL TECHNICAL REQUIREMENTS – (PATROL)

SECTION 1 - VESSEL REQUIREMENTS

1.1 General Characteristics

- 1.1.1 Length overall (LOA): approximately 33-38 feet.
- 1.1.2 Beam: approximately 10-12 feet.
- 1.1.3 Deadrise: approximately 25 degrees at the transom.
- 1.1.4 Light ship draft: ≤ 24 inches with engines trimmed up.
- 1.1.5 Fuel capacity: minimum 300 U.S. gallons.
- 1.1.6 Payload capacity: minimum 3,500 pounds.
- 1.1.7 Crew and passenger capacity: minimum 12 personnel.
- 1.1.8 Approximate range: 200-300 NM @ Cruise speed: ~25–30 knots,
- 1.1.9 Hull certification: ISO 12217 Category B or higher.
- 1.1.10 Hull colour: Proponent standard grey, or equivalent approved by RBRCG.

1.2 Environmental Suitability

- 1.2.1 The Vessel shall maintain operational capability in Sea State 5.
- 1.2.2 The Vessel shall maintain survivability in Sea State 6.
- 1.2.3 All materials and finishes shall be UV-resistant, corrosion-resistant, and suitable for continuous saltwater exposure.
- 1.2.4 The Vessel shall remain functional in air temperatures between 10°C and 40°C, and seawater temperatures between 10°C and 32°C.

1.3 Operational Profile

- 1.3.1 The Vessel shall support high-speed interdiction missions.
- 1.3.2 The Vessel shall support coastal and offshore patrol operations within Bermuda's territorial limits and up to 50 nm from shore.
- 1.3.3 The Vessel shall support Search and Rescue (SAR) operations, including rapid recovery of persons in the water.
- 1.3.4 The Vessel shall support maritime law enforcement operations, including vessel boarding and tow operations.
- 1.3.5 The Vessel shall support environmental monitoring and marine pollution response.

1.4 Design Life Expectancy

- 1.4.1 The Vessel shall be designed for a minimum service life of 15 years, assuming standard operational use and compliance with maintenance schedules.

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1.4.2 Critical structural components shall be designed with a fatigue life suitable for high-speed operations in moderate to rough seas.

SECTION 2 - HULL, DECK & SUPERSTRUCTURE

2.1 Hull Construction

2.1.1 The hull shall be constructed from 5083-H116 marine-grade aluminum or approved advanced composite providing equivalent strength and durability.

2.1.2 All hull construction, welding, and reinforcement shall comply with ISO 12215 standards for small craft structural integrity.

2.1.3 The hull shall include a reinforced keel structure suitable for repeated beach approaches and shallow-water operations.

2.1.4 The hull shall include appropriate transverse and longitudinal framing to maintain structural rigidity during high-speed operations.

2.1.5 The hull shall include watertight compartments to enhance buoyancy and survivability.

2.1.6 The hull bottom shall include sacrificial anodes for corrosion protection.

2.2 Deck & Storage

2.2.1 Deck structure shall be self-bailing without reliance on mechanical pumps.

2.2.2 The Vessel shall incorporate the following storage compartments:

- a. Forward bow storage compartment,
- b. Forward cuddy access / maintenance hatch,
- c. Dual aft rigging lockers,
- d. Transom inspection hatch,
- e. Weapon locker.

2.2.3 All storage areas shall be water-resistant or watertight depending on purpose.

2.2.4 Storage compartments shall include drainage and ventilation where appropriate.

2.3 Superstructure

2.3.1 The Vessel shall employ an enclosed cabin layout, optimized for visibility and operator ergonomics.

2.3.2 The cabin shall support:

- a. Radar,
- b. Thermal imaging system,
- c. Navigation lights,
- d. Blue LED light bar and blue LED forward/aft/side lights,
- e. Comm antennas (VHF, UHF, AIS, Airband, GPS, Satellite compass, Satellite Comm),
- f. Searchlights,
- g. Floodlights,

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h. Life raft.

2.3.3 The cabin and superstructure shall provide 360-degree operator visibility..

2.3.4 Handrails shall be installed along the superstructure and deck edges to support safe crew movement underway.

2.4 Collar System

2.4.1 The Vessel shall incorporate a full-length foam, hybrid foam, or air chamber collar system.

2.4.2 Collar colour shall be grey/black unless otherwise approved.

2.4.3 Collar shall include designated SAR cut-outs to support rapid personnel recovery.

2.4.4 Collar attachment shall allow field-replaceability.

2.5 Deck Coverings

2.5.1 All deck walking surfaces shall be covered with non-skid, UV-resistant materials.

2.5.2 The cabin dash shall incorporate anti-glare rubberized material.

2.5.3 Deck surfaces shall allow safe movement in wet conditions.

2.6 Vessel Signage

2.6.1 The Proponent shall install the following text on the port and starboard hull sides:

“BERMUDA COAST GUARD” accompanied by a red and blue stripe.

2.6.2 The Proponent shall install the following text on the port and starboard bow hull sides and on the cabin top: “12345”.

2.6.3 Lettering colour: black.

2.6.4 Letter height: 8-12 inches, depending on available hull space.

2.6.6 Signage shall be UV-resistant and marine-grade.

SECTION 3 - ERGONOMICS & SEATING

3.1 Shock-Mitigating Seating

3.1.1 The Vessel shall include a minimum of six (6), crew, shock-mitigating seats designed for sustained high-speed operations in rough seas.

3.1.2 Seats shall be commercial or military-grade models with integrated suspension or dampening systems designed to reduce crew fatigue and prevent injury.

3.1.3 Seat frames, mounts, and dampening components shall be constructed of corrosion-resistant marine-grade materials.

3.1.4 Each shock-mitigating seat shall include side grips or secure handholds.

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3.2 Helm Ergonomics

3.2.1 The helm station shall incorporate an adjustable operator seat with height, angle, and distance adjustment.

3.2.2 A navigator/co-pilot seat with equivalent adjustability shall be provided adjacent to the helm.

3.2.3 Footrests shall be installed at both helm and navigator positions.

3.2.4 All helm controls, switches, and displays shall be operable with one hand and while wearing gloves.

3.2.5 The helm layout shall follow modern ergonomic principles for maritime interceptor craft.

3.3 Crew Comfort Features

3.3.1 Grab handles shall be installed at all crew seating stations and along primary transit paths.

3.3.2 Crew deck areas shall feature unobstructed movement pathways and non-slip surfaces.

3.3.3 Adequate knee, leg, and head clearance shall be provided for all crew seating positions.

3.4 Charging Ports

3.4.1 The Vessel shall include a minimum of four (4) waterproof USB-A/USB-C charging ports distributed between helm and crew seating areas.

3.4.2 Each charging port shall have a protective marine-grade cover and be safeguarded against overcurrent, water intrusion, and corrosion.

3.4.3 Charging ports shall support mobile devices, tactical radios, and GPS receivers.

SECTION 4 - PROPULSION & MACHINERY

4.1 Engine Package

4.1.1 The Vessel shall be powered by outboard motors installed to the maximum rated horsepower for the hull.

4.1.2 Proponents shall submit two (2) separate engine proposals, one based on Yamaha outboard engines and one based on Mercury outboard engines. Each proposal shall be complete, stand-alone, and fully compliant with the performance and integration requirements of this RFP.

4.1.3 Each engine proposal shall clearly identify and include, at a minimum:

- a. Engine model designation and rated horsepower,
- b. Total installed horsepower configuration,
- c. Digital throttle and shift (DTS) or manufacturer-certified equivalent,
- d. Electronic steering compatibility,
- e. Fuel consumption data at idle, cruise, and maximum speed,

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- f. OEM-certified service and training support availability.

4.1.4 The propulsion system shall deliver:

- a. Top speed ≥ 50 knots,
- b. Cruise speed 25–30 knots,
- c. Sufficient low-speed thrust for tow operations,
- d. Efficient fuel consumption at patrol speeds.

4.1.5 Engine mounting, rigging, and alignment shall follow OEM engineering standards.

4.1.6 Propellers shall be selected to optimize performance and load characteristics.

4.2 Steering System

4.2.1 The Vessel shall be equipped with a full electronic steering (DES) system compatible with the selected outboard engines.

4.2.2 The electronic steering system shall include:

- a. Digital Electric Steering (DES) actuators,
- b. Electronic helm pump assembly,
- c. Redundant power supply,
- d. Integrated position sensors.

4.2.3 A joystick docking system shall be installed to enable:

- a. Low-speed precision manoeuvring,
- b. Lateral movement,
- c. Rotational (“spin-in-place”) capabilities,
- d. Assisted docking in confined spaces.

4.2.4 The joystick system shall include a Dynamic Position Hold Function, capable of:

- a. Automatically maintaining vessel position using GPS-based referencing,
- b. Holding heading while compensating for wind, waves, and current,
- c. Enabling precision hold during SAR, boarding, inspection, or mooring operations,
- d. Integrating with the Vessel’s navigation suite for enhanced accuracy.

4.2.5 All steering and joystick components shall be:

- a. Marine-grade,
- b. Corrosion-resistant,
- c. Installed per manufacturer specifications,
- d. Fully integrated with twin-outboard power configuration.

4.2.6 A backup manual emergency steering mode shall be provided to ensure basic control in the event of electronic steering failure.

4.3 Machinery Spaces

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4.3.1 Machinery spaces shall provide unobstructed access to:

- a. Rigging tubes,
- b. Pumps,
- c. Electrical systems,
- d. Batteries,
- e. Bilge spaces.

4.3.2 All equipment shall be mounted on anti-vibration isolation mounts where practical.

4.3.3 Rigging components shall be installed to minimize chafing, wear, and exposure to moisture.

4.3.4 All penetrations shall be properly sealed and reinforced.

4.4 Rigging Requirements

4.4.1 The engine integration network shall be fully connected to the Vessel's NMEA 2000 system to provide engine data to multifunction displays.

4.4.2 Each engine shall have a dedicated starting battery, isolated from the house bank.

4.4.3 Cross-start capability shall be installed for redundancy.

4.4.4 Charging systems shall maintain separate battery banks with automatic charging control.

4.4.5 All cabling shall be:

- a. UV-rated,
- b. Marine-grade tinned copper,
- c. Installed in supported conduits,
- d. Labelled for maintenance clarity.

4.5 Gyro-Stabilization System

4.5.1 The Vessel shall be equipped with a gyro-stabilization system (GSS), appropriate for the size of the Vessel, to reduce roll and improve crew safety during patrol, SAR, and enforcement operations.

4.5.2 The GSS shall be installed in accordance with manufacturer guidance and integrated into the Vessel's electrical and cooling systems.

4.5.3 The GSS shall achieve:

- a. Minimum 30–50% roll reduction at rest,
- b. Maintenance-free sealed flywheel system,
- c. Fully digital helm control interface.

4.5.4 Proponent shall provide:

- a. All mounting foundations,

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- b. Structural reinforcement (if required),
- c. Electrical integration,
- d. Commissioning and calibration.

4.5.5 The GSS shall be included in FAT, HAT, and SAT testing.

SECTION 5 - ELECTRICAL SYSTEMS

5.1 General Electrical Requirements

5.1.1 The Vessel shall include a 12V DC electrical system capable of powering all navigation, communication, lighting, and mission equipment.

5.1.2 All electrical work shall comply with ABYC standards, including ABYC E-11 for AC and DC systems.

5.1.3 All wiring shall be:

- a. Marine-grade tinned copper,
- b. Sized appropriately for load and distance,
- c. Routed through protective conduits,
- d. Labeled at both ends for identification.

5.1.4 All electrical connections shall be sealed using heat-shrink terminals or marine-rated terminal blocks.

5.2 Battery Systems

5.2.1 The Vessel shall include:

- a. Independent start battery for each engine,
- b. A dedicated house battery bank.

5.2.2 Battery banks shall be isolated to prevent cross-loading, with operator-controlled cross-connect capability for emergency starting.

5.2.3 Batteries shall be secured in ventilated compartments with appropriate tie-downs.

5.3 AC Shore Power System

5.3.1 The Vessel shall include a 110VAC shore power inlet with a watertight deck cover.

5.3.2 An isolation transformer shall be installed for AC input protection.

5.3.3 Dual multi-bank smart battery chargers shall support start batteries and house batteries simultaneously.

5.3.4 Shore power wiring shall comply with ABYC standards for safety, grounding, and overcurrent protection.

5.4 Inverter System

5.4.1 The Vessel shall include a pure sine wave inverter.

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5.4.2 The inverter shall support electronic equipment, laptop chargers, and mission equipment requiring AC power.

5.4.3 The inverter shall include:

- a. Overload protection,
- b. Low-voltage shutoff,
- c. Temperature protection.

5.4.4 The inverter installation shall not interfere with navigation or communications systems.

5.5 Lightning Protection System

5.5.1 A lightning air terminal shall be installed at the highest structural point.

5.5.2 A continuous bonding system shall connect:

- a. Engines,
- b. Console electronics,
- c. Rails and metallic fixtures,
- d. Antenna bases,
- e. Ground plates.

5.5.3 Critical electronics shall be protected by surge protection devices.

5.5.4 The system shall comply with ABYC TE-4 lightning protection guidelines.

SECTION 6 - NAVIGATION, SENSORS & ELECTRONICS

6.1 Integrated Navigation Suite

6.1.1 The Vessel's helm station shall include minimum of two (2), multifunction displays (MFDs), each between 12–16 inches, capable of displaying radar, sonar, charts, AIS, thermal imaging, and engine data.

6.2 Radar System

6.2.1 The Vessel shall include a marine open-array radar system, minimum 250W output, capable of long-range detection of vessels, land masses, and weather systems.

6.2.2 Radar shall support overlay integration with electronic charting and heading data.

6.2.3 Radar installation shall ensure unobstructed 360° visibility.

6.3 Sonar System

6.3.1 The Vessel shall include a CHIRP SideScan + DownScan sonar suitable for:

- a. SAR operations,
- b. Underwater object detection,
- c. Navigation,
- d. Shallow-water operations.

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6.3.2 The transducer shall be installed per manufacturer recommendations to avoid cavitation and turbulence.

6.4 GPS & Heading Sensors

6.4.1 The Vessel shall include a marine-grade GPS/GNSS receiver fully integrated into the Vessel's navigation network.

6.4.2 The Vessel shall include a precision heading sensor / fluxgate compass suitable for radar overlay, AIS synchronization, and high-speed manoeuvring.

6.4.3 The navigation suite shall support Secure Data Exchange over AIS, ensuring:

- a. Encrypted or protected data pathways where available,
- b. Secure vessel identification,
- c. Anti-spoofing and anti-tampering measures,
- d. Compatibility with maritime enforcement communications networks.

6.4.4 Heading data must remain accurate and stable during rapid acceleration, sharp turns, and high-speed operations.

6.5 AIS System

6.5.1 The Vessel shall include an AIS Class A transceiver, supporting Secure AIS Data Exchange, encryption options, and enhanced identification protocols.

6.5.2 AIS data shall be fully integrated into the MFDs with blue-on-blue discrimination capability.

6.6 Blue-on-Blue Identification System

6.6.1 The navigation and AIS system shall support blue-on-blue identification features enabling friendly-force recognition and reducing risk of fratricide during joint operations.

6.6.2 The system shall:

- a. Display friendly assets with distinct iconography,
- b. Support encrypted or secured AIS messaging,
- c. Integrate with navigation suite.

6.6.3 The Proponent shall configure the system to RBRCG operational standards.

6.7 Thermal & Visual Imaging System

6.7.1 The Vessel shall include a stabilized thermal imaging system mounted on the cabin top.

6.7.2 The system shall provide:

- a. Stabilized thermal imaging,
- b. Daylight/low-light visible camera,
- c. 360° continuous pan,

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- d. multi-axis stabilization,
- e. Spotlight.

6.7.3 A joystick control panel shall be mounted at the helm and aft console for operator ease of use.

6.7.4 Thermal and visible imagery shall be displayable on the MFDs.

6.8 Marine Camera System

6.8.1 The Proponent shall supply and install a marine-grade camera system integrated into the Vessel's DVR system.

6.8.2 The camera system shall include:

- a. Four (4) cameras, one (1) mounted per corner of Vessel,
- b. One (1) elevated forward-mounted camera inside of the cabin.

6.8.3 All cameras shall be:

- a. Marine-grade and waterproof (minimum IP66),
- b. Low-light capable,
- c. Shock and vibration resistant.

6.8.4 Camera feeds shall be:

- a. Recorded by the installed DVR system,
- b. Time-stamped for evidentiary use.

6.8.5 Camera placement shall not obstruct vessel operations or crew movement.

6.9 DVR / Video Recording System

6.9.1 A DVR with a minimum of 4 TB storage shall be installed to record:

- a. Thermal video,
- b. Visible camera feeds,
- c. Radar output,
- d. Navigation overlays
- e. Sonar
- f. Vessel/engine metrics

6.9.2 Recordings shall be timestamped and exportable via USB or network connection.

6.10 Data Streaming & Remote Connectivity

6.10.1 The Vessel shall be configured to support live streaming of navigation data and camera feeds to shore-based or remote command locations via the Vessel's satellite communications system.

6.10.2 The live-streaming capability shall include, at a minimum:

- a. MFD screens,

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- b. Radar overlays,
- c. Chartplotter views,
- d. AIS targets,
- e. Forward, aft, port, and starboard facing camera feeds,
- f. Forward camera overlooking the aft deck and helm station,
- g. FLIR

6.10.3 Streaming shall be available in real time or near-real time, subject to satellite bandwidth and network conditions.

6.10.4 The system architecture shall utilize IP-based networking to allow secure routing of video and navigation data to external networks.

6.10.5 The Proponent shall ensure that the streaming configuration does not degrade core navigation, safety, or Vessel control systems during normal operations.

6.10.6 The Proponent shall supply all necessary networking hardware, switches, encoders, cabling, and configuration required to enable live streaming functionality.

6.10.7 All streamed data shall be capable of being secured and access-controlled, with authentication measures to prevent unauthorized viewing.

6.11 Lighting Systems

6.11.1 Navigation lights shall be LED based and compliant with international COLREGS.

6.11.2 Deck/work areas shall be illuminated by white LED floodlights, suitable for SAR and night operations.

6.11.3 Two (2) LED searchlights shall be installed with helm and aft station-mounted controllers.

6.11.4 Interior and console lighting shall include a red-light mode to preserve night vision.