Design, Construction and Delivery of 18m Police Patrol Vessel

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1 General

1.1 Introduction
This document has been developed for the Vietnamese Ministry of Public Security in response to their requirement for Police Patrol Craft.

The design is one of a family of vessels of which three 15m vessels are in-service with the UK Defence Police with a further three in build. Other vessels built include 16m Pilot Launches which operate successfully in challenging sea conditions around the UK coast.

Holyhead Marine has a track record of designing, constructing and providing through life support for craft for law enforcement and military roles.

1.2 Company Background
Holyhead Marine Services has been established since 1962 and is located on the island of Anglesey on the North West coast of Wales. In the very early days the company carried out refit and repair work on pleasure boats, but as the business has developed over the years it has moved away from the leisure market and is now predominately in the commercial and military markets.

Whilst in the past the company has been well known for its refit and repair services a strategic decision in the early 90’s started the company off in the design, construction and fit-out of new vessels.

The new build strategy started off with the construction of a 21.5m Multi-cat for the sister company Holyhead Towing Co during 1994 and at the same time the company started to develop their long standing refit and repair relationship with the UK Ministry of Defence into new vessel design and construction. A successful bid resulted in building a 27ft launch. Before completing the launch a contract for two 14m Patrol boats with an option for a further two was won against stiff competition, this option was exercised after delivery of the first craft.

Since building the Multi-cat the company has completed a in excess of 65 craft ranging from a 6.4m aluminium Fire Boat to our most recent contract for two 16m Pilot Launches which are moulded in GRP.

The facility at Holyhead is a very modern and well equipped one which benefited from a significant expansion during 2006, which comprised of a third boat shed and an environmentally controlled spray booth along with centralised offices and stores.
1.3 Holyhead Boatyard Group

Holyhead Marine Services is a wholly owned subsidiary of Holyhead Boatyard Ltd, the parent company which is located on the same site at Holyhead.

Other companies in the group include Holyhead Towing Company, Turbine Transfers and Caspisky Buksir.

Holyhead Towing Co – Operators of shallow draft Tugs and workboats engaged in supporting marine civil engineering, dredging and construction projects world wide.

Caspisky Buksir – Has a fleet of vessels that includes ice class anchor handling tugs and multi-cats and operates in the Caspian Sea in support of oilfield developments.

Turbine Transfers – Operates fast catamarans for the transfer of personnel and equipment between the shore and wind turbines at wind farms located throughout Europe.

1.4 Quality Assurance

The company quality management system has been approved by Lloyds Register Quality Assurance and meets the requirements of ISO 9001:2008.

1.5 Build Codes & Standard

The vessels will be built in accordance with the following rules and standards where they are applicable but will not be built to Class or under Class survey.

- Lloyds Register of Shipping (LRS) Special Service Craft (SSC) rules
- MCA - Small Commercial Vessel and Pilot Boat (SCV) Code (category 3)
- IMO Intact Stability Code (A.749(18))
- Institute of Electrical Engineers Regulations 16th edition
- ISO 7840:2004 - Small craft -- Fire-resistant fuel hoses
- The Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations 2007
- The Merchant Shipping and Fishing Vessels (Control of Vibration at Work) Regulations 2007
- ISO 12216 Small craft. Windows, portlights, hatches, deadlights and doors. Strength and water tightness requirements
- British Marine Federation Code of Practice for Electrical and Electronic Installations in Boats, 4th Edition
- The Institution of Electrical Engineers Regulations for the Electrical and Electronic Equipment of Ships with Recommended Practice for their Implementation, 6th Edition 1990
- ISO 10592 Small craft. Hydraulic steering systems
2 Principle Particulars

2.1 Vessel Dimensions
The vessel's principal dimensions are:

Length Overall 18.4m
Length Hull 16.8m
Length Waterline 15.3m
Breadth Overall 5.1m
Beam Hull 4.6m
Draft 0.8m

2.2 Capacities
Fuel 3000 Litres
Water 500 Litres
Crew 5

2.3 Hull Design
The hull design is an advanced double chine hull, by Camarc design, developed in conjunction with U.K. towing tank facilities since 1983. This extensive development programme has resulted in a hull design with very good internal volume and roll damping. Over 50 craft, ranging from 7 to 21 metres, have been built to this design in various different configurations.

The double chine hull combines a number of advantages; finer entry in the forward sections, efficient spray rails to keep the deck dry and to damp motions in heavy seas, a more sea-kindly shape in the forward slamming area, with a chine shape at the aft end to give stability in following seas. The double chine shape also exhibits economical operation at cruising speed.

The double chine hull has excellent manoeuvrability, as has been proven by the vessels in service, both at slow speed for harbour operation and at service speeds for pilot boarding operations. This is due to the shape of the hull, together with careful balancing of the lateral plane area.

2.4 Performance
The hull resistance parameters are well known, both from scaling of tank test data and from trials on a number of similar craft.

The methodology for performance prediction is to use the resistance at the trials weight of the craft and apply the various efficiency losses to the open water efficiency of the waterjet to obtain the OPC (overall propulsive coefficient) for the particular installation.

The vessel is to be designed in a twin engine/twin screw configuration to achieve a continuous maximum speed with the vessel fully fitted, with 100%
fuel and water, 100kg of stores, full crew and at the engine manufacturers stated power.

The performance is based on a hull with no fouling.

2.5 Performance Summary

Maximum Speed: 33 knots
Displacement: 29 tonnes
Sea State: 2
Range: 300nm @ 25 knots

3 Vessel Operating Conditions

3.1 Operating Profile

The vessel is designed to have a minimum service life of 15 years allowing for projected operating hours of 1,500 – 3,000 hrs/year of which 30% is at full power.

3.2 Significant Wave Height

The hull structure is designed for the Lloyd's Register of Shipping default value of 2m significant wave height at 24 knots.

4 Hull

4.1 Hull Construction and Materials

The GRP structure is to be designed and built to the requirements of Lloyd's Register of Shipping (LRS) Special Service Craft (SSC) rules.

Careful attention is constantly paid to weight control and detailed design, to produce a robust and sea-kindly craft fit for the demanding role of pilot transfer. In view of the operational requirements, weight refinement is not taken to the minimum limits allowed by classification rules, but is carefully considered to combine robust construction with efficient operation.

The main hull shell is a one-piece moulding produced in accordance with the hull construction drawing. The hull shell shall have pigmented gel coat above the waterline and clear gel coat below.

The first two laminates are of powder bound chopped strand mat reinforcement impregnated with isophthalic resin. The subsequent laminates are complexes of 600 g/m² & 800 g/m² woven rovings and 300 g/m² chopped strand mat reinforcement, impregnated with isophthalic resin.

The hull frames, stringers and longitudinals are of a combination of chopped strand mat and bi-directional reinforcement, impregnated with isophthalic resin, over foam sections.
GRP test samples will be taken from the cut-outs and sent for independent analysis for flexural properties, burnishing and Barcol testing.

Adequate limber holes are fitted throughout the craft to allow bilge water to drain. Under the main engines limber holes are omitted so the framing will form a drip tray.

Throughout the machinery compartment the internal GRP surfaces are finished in Crystic Fireguard fire retardant gel finish and bilges are finished in gel coat.

Under the classification rule requirement the craft will have reinforcement in the keel area but additional material will be fitted forward, due to the potential for damage from waterborne debris.

A sacrificial GRP stem shoe is fitted forward and the lower part of the forepeak is foam filled to provide a double skin in this area.

Primary stiffening is to be by longitudinal engine beds and the fuel tank construction. Deck joint knees are bonded in at each frame. All deck knees etc. shall taper in to frames as gradually as possible. Stiffeners are formed in CSM/WR with uni-direction tapes (UDT) reinforcement as necessary on stiffener faces.

A general arrangement plan is provided, together with details of the proposed hull, and the arrangement for the rest of the vessel.

4.2 Engine Beds
Within the machinery space and tank space the main longitudinals are built up and profiled to form engine beds to suit the specified engines. Construction is of box section with tapping strips along their upper faces to accept the engine feet. The tapping strips are mild steel the full width of the bed and suitably abraded before inclusion in to the laminate. At the centre of the engine bed bars, lightening holes are fitted, which also lock the tapping bars effectively in to the laminate.

4.3 Fuel Tanks
The fuel tanks are positioned amidships port and starboard. The tanks are constructed of GRP and bonded in to the hull to become an integral part of the hull construction.

Baffles are fitted inside the tank at each frame (800mm) to prevent surging.

Large tank lids are fitted in the top face of the tanks for easy access for cleaning the tanks. The tank lids are moulded from GRP and are secured in place with an aluminium strong back.
The tanks will be subjected to a 0.2 bar pressure test and marked accordingly.

A Tank Tender contents gauge will be fitted with the display head mounted in wheelhouse and a Cobham magnetic dipstick will be fitted to the tank top.

A fuel filler locker is to be positioned on the starboard side of the superstructure and is fitted with save-all. The filling system allows filling by normal fuelling hose. The fillers are piped down to the tank/s in 316 stainless steel pipe, with flexible sections where necessary. The main filler line is to be 38mm with the vent line being 50mm. The vent line will terminate inside the fuel filler locker and be fitted with gauze. A smaller “running” vent will be fitted in the locker.

The fuel tanks will be fitted with a remote closing device, operated from the Emergency Panel in the wheelhouse.

4.4 Bulkheads
The vessel is to be fitted with structural watertight bulkheads dividing up the vessel as follows:

- Forepeak
- Fwd Compartment
- Accommodation
- Tank Space
- Engine Room
- Aft Peak

Main bulkheads are constructed from GRP composite board and fully bonded to the structure. The bulkheads are set off the hull on LRS compliant resin filler and receiving strips are put in-way of the bulkheads, where there is no frame or floor.

The vessel is designed to sustain single compartment damage.

5 Deck

5.1 Superstructure & Arrangement
The superstructure is a one-piece moulding, manufactured in accordance with superstructure construction drawing. It is joined to the deck by a bonded flange with securing/locating bolts. The wheelhouse top shall incorporate a core to provide necessary stiffness. In high load areas, the balsa core is to be replaced with plywood.

The width of the windscreen mullions will be kept to the minimum to maximise forward visibility.
5.2 Flying Bridge
A flying bridge will be formed on top of the superstructure with access via a stainless steel ladder from the main deck.

5.3 Minor Fabrications and Mouldings
Generally, as many parts of the craft’s structure as possible, will be formed in GRP and bonded together to avoid corrosion issues. A number of smaller minor fabrications will be required and these will generally be fabricated in marine grade 316 stainless steel. Seat plinths, console, battery boxes and engine ventilation boxes are GRP mouldings.

5.4 Doors
A heavy duty powder coated aluminium alloy framed spray-tight door is to be fitted in the aft bulkhead of the superstructure. The door is to be half double glazed, fitted with an effective seal, for both watertight integrity and noise.

Watertight doors or hatches are fitted below deck between watertight compartments. Except for the machinery space door, all watertight doors are fitted on the forward face of the bulkheads.

All doors will be fitted with robust and substantial stainless steel hook backs.

All watertight doors are to have notices “Keep closed at sea”.

5.5 Hatches
Deck hatches are of a robust reliable type with adequate securing clips for both internal and external opening, and fitted as shown in the GA drawing.

A Lewmar Ocean Hatch (600mm x 600mm) will be fitted in the engine removal hatch to aid access into the engine space for maintenance.

All hatches are to have notices “Keep closed at sea”.

5.6 Windows & Portlights
All windows will be to BSMA25 standard with toughened glass in anodised aluminium frames. The configuration and number to be as shown on the GA drawing.

All windows are to be fixed type and are single glazed.

5.7 Windscreen Wipers
Hepworth 50Nm Heavy Duty pantograph wipers will be fitted to the three forward facing screens. A water wash system will be fitted using water from a dedicated tank to allow the addition of additives.
5.8 Anchors and Cables
Appropriately sized anchors will be supplied in accordance with the code of practice.

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Chain</th>
<th>Warp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Anchor</td>
<td>34 Kg</td>
<td>10mm x 14m</td>
<td>14mm x 53m</td>
</tr>
<tr>
<td>Kedge Anchor</td>
<td>17 Kg</td>
<td>8mm x 14m</td>
<td>14mm x 53m</td>
</tr>
</tbody>
</table>

The main anchor will be stowed on deck in a suitable chock arrangement and the kedge anchor will be stored in the forward store.

The main anchor warp/chain will be stowed on a rope reel situated in the forward store. A deck plate will be fitted in the deck above the reel for leading the warp to the deck. The kedge anchor warp/chain will be stowed in a portable container in the forward store close to the kedge anchor.

5.9 Windlass
A Lewmar Pacific V2000 windlass will be fitted for anchor retrieval.

5.10 Bollards and Fairleads
A set of six bollards and four fairleads will be fitted. Two bollards with fairleads fitted forward and aft and two bollards midships set into a recess in the side of the superstructure.

Bollards and fairleads will be manufactured from cast stainless steel.

5.11 Fendering
An high performance elastomer covered polyurethane foam fendering system will be fitted. The fender system will be bonded to the hull using a polyurethane adhesive system.

5.12 Handrails
A continuous stainless steel handrail (30mm diameter) at constant height along both sides and across the front of the superstructure will be fitted. An Island rail will be fitted fwd and pushpit rails fitted aft.

The handrails will be adequately braced with stainless steel brackets and struts. All handrail supports are cranked to allow free movement along the rails without impediment from the supports.

Internally, handrails will be fitted as necessary, to allow crew to move around the vessel easily and with safety. Generally all internal grab and guard rails will be 30mm diameter and manufactured from either stainless steel or aluminium tube.
5.13 Mast
The mast is a goal post arrangement fabricated from polished stainless steel tube and mounted at the aft end of the flying bridge.

The mast is fitted with brackets to carry all the navigation lights, VHF antennas, GPS, reflector, AIS, Radar, etc.

5.14 Lifting Gear
The vessel is designed to be lifted with slings by a boat hoist.

6 Mechanical and Propulsion
6.1 Main Engines and Gearboxes
Vessel is designed for twin engine operation with two MAN V12-1100, each fitted with a ZF 2050 reduction gearboxes and delivering the engine manufacturers stated continuous power of 1100mhp @2100rpm. This engine is IMO Tier I & II, EU Directive 94/25/EC and MARPOL 73/78. Annex VI and NOx Technical Code 2008 emissions compliant.

They will be arranged for electric start, be fitted with alternators, cooling water pumps and associated intake strainers and pipe work, with power take-off shafts for the nominated fire & bilge pumps.

The engines and gearboxes will be mounted on the correctly selected resilient mounts, aligned to the output half-couplings. Particular attention will be paid to the size of the mounts and their securing bolts.

The machinery will be installed in accordance with the manufacturer’s recommendations and the installation is to be approved by them upon completion.

Care and attention will be paid to providing a durable machinery installation with adequate support of piping and cable runs whilst minimising weight gain.

Guards are fitted to rotating machinery as is required by health and safety legislation.

Each engine will be fitted with a 120 amp alternator.

Torsional couplings are fitted between the engine and gearbox, and a torsional vibration analysis will be carried out by the engine manufacturer to ascertain that the correct coupling characteristics are selected.

Care will be taken to ensure that pipework for systems are adequately sized and incorporate the minimum number of 90 degree elbows.
Each engine/gearbox will be fitted with pipework, a three way valve and an instantaneous coupling to allow connection of a shore-based pump for oil evacuation.

6.2 Engine Controls and Monitoring

Engine and gearbox control will be integrated into the waterjet Vector Stick Control system.

Standard MAN instrument panels will be supplied for both the wheelhouse and fly bridge control positions.

Controls for remote operation of fuel valves and discharge of the fire extinguishing system will be brought together to a single point in the form of an emergency panel. Clear instructions for operation of the systems will be displayed by the panel.

6.3 Waterjets

A pair of Rolls Royce FF500 waterjets will be fitted connected to the main engine gearboxes with a cardan shaft.

The waterjets will be controlled using the Rolls Royce Vector Stick thrust control system which is a Joystick controlled thrust vectoring system, where all propulsion devices are integrated into a single joystick such that joystick movements correspond to exact vessel movements.

The Vector Stick system integrates control of waterjet steering and reversing, engine speed in such a way that translation and rotation commands are as simple as moving the stick in the direction you want the vessel to move and turning the helm in the direction you want the vessel to rotate.

6.4 Engine Removal

Engine removal will be through deck hatches in the aft deck. Each hatch is located directly above each engine and it will be possible to lift the engine directly off the engine bed in a straight lift.

6.5 Generator

A Fischer Panda 8kw DC generator will be installed. The unit is fitted in an acoustic enclosure.

7 Systems

7.1 Fuel System

Separ 2000 Duplex fuel filters will be fitted to supply each main engine.

The fuel system will enable each engine to be fed independently from each tank or alternatively linked to be supplied by either tank.
Fuel hoses to engines from tanks and return lines will be ISO – 7840 (marine hose).

A simplex Separ 2000 fuel filter will be fitted to the generator fuel supply.

To reduce the likelihood of fire, care and attention will be paid to shielding of fuel lines and filters.

7.2 Engine Cooling
Cooling water will be drawn through hull mounted intakes fitted with correctly sized scoops. Intakes will be fitted with isolating valves and clear top type strainers, one serving each engine.

Waste cooling water will be injected into stainless steel spray heads in the exhaust system to provide exhaust cooling.

Generator cooling will be through a dedicated skin fitting and strainer. Waste water will be injected into the exhaust system for cooling.

7.3 Exhaust System
Each main engine will be fitted with fabricated stainless steel exhaust risers terminating with water injection spray heads. The stainless steel risers will be insulated.

Lloyd’s approved nitrile diesel exhaust hose will connect each engine to a Halyard Water Lift exhaust silencer. The exhaust will then lead aft to terminate on the transom corners. All GRP spigots will be fitted with stainless steel sleeves to avoid the spigots being crushed. The silencers will be suitably supported, and all hoses double clamped with stainless steel hose clamps.

The generator exhaust will be fitted with a water lift silencer.

7.4 Engine Room Ventilation
Air for combustion and ventilation in the machinery space is drawn from a pair of Delta T moisture eliminators fitted with fire flaps in the machinery space coach roof sides. Air is ducted through aft deck vents into the machinery space low down.

Warm air is exhausted via two 350mm diameter 24v fans through Delta T moisture eliminators fitted with fire flaps through the coach roof sides.

Fire flaps will be operated remotely from the Emergency Panel in the wheelhouse.
7.5 **Freshwater System**
A freshwater system will be provided to supply water to domestic facilities. It will comprise of a tank moulded from medium density polyethylene, a pressure controlled pump, an accumulator and a calorifier.

The system will supply fresh water, both hot and cold to the sink in the galley area and to the WC compartment washbasin. A cold water supply will be provided for the water boiler in the galley area.

The pipework system will be Hep²O type polybutylene tube and fittings.

The tank filler will be located on the deck and connected to the tank with a reinforced plastic hose.

A stainless steel sinks will be fitted in the galley and the WC compartment, both fitted with a chromed brass taps and will drain overboard through a bronze skin fitting fitted with a screw down non-return valve.

7.6 **Fire Pump**
A hand operated fire pump whose capacity shall meet or exceed the code, will be provided c/w seawater intake to deck connections, piping, 15m lay flat hose and brass spray/jet nozzle with instantaneous coupling.

7.7 **Bilge System**
Each compartment will be fitted with a remotely mounted, electrically operated, Rule submersible bilge pump and a Whale Gusher Titan with a dedicated strum box. Each pump will have its own dedicated overboard discharge.

In the engine space the electric pump will be fitted with a Wavestream 2 filter. Also the engine space will be served by a main engine driven electromagnetically clutched 1 ½” Jabsco pump with its own dedicated strum box and discharging through a Wavestream 2 filter to a dedicated overboard skin fitting.

ABS plastic pipework will be used where possible with flexible sections at strum boxes and pumps. Pipework will be routed such that down flooding is not possible and thus overboard valves will not be required.

An “L” port valve will be fitted into the discharge line from the engine room electric pump to allow any oily bilge water to be diverted to a portable container.

All bilge suctions will be fitted at the lowest part of the bilge and fitted with a strum box.

A bilge alarm system will be fitted which will monitor all compartments.
7.8 **Sanitation**
One marine manual flush WC will be installed and sited in the WC compartment with seawater flush from a dedicated skin fitting with discharge to a “black water” tank and or directly overboard. A suitable pump will be provided for discharging the tank through a diverter valve either to a deck fitting or an overboard skin fitting.

7.9 **Domestic Systems**
The vessel will be fitted with basic arrangements for being able to make hot drinks and heat basic ready made food.

A small water boiler and microwave will be fitted both powered from the 240v AC system.

The boiler and microwave will be located in the lower accommodation in the galley area.

7.10 **Accommodation Ventilation**
An extract fan will be fitted in the W.C. compartment ducted to atmosphere.

A system of overhead fresh air ventilation for the officers will be fitted; each outlet will be controllable in a similar fashion to systems found on aircraft.

7.11 **Heating**
Three Passad heater/demister blower units will be fitted; one connected to each of the main engine FW cooling systems. Air in to each heater will be a combination of external air and internal air with the outlets ducted to the forward screens and around the wheelhouse and accommodation to provide demisting and low level background heating. If required the units can be run without heat to circulate fresh air.

One outlet from a Passad heater will be ducted into the steering compartment at low level and a high level vent to atmosphere will be fitted. A similar arrangement will be fitted to the lower accommodation.

7.12 **Air Conditioning**
Self contained dual cycle air conditioning units will be installed, one in the wheelhouse and one in the Accommodation area.

The units will be a HFL Coolmax Compact reverse cycle units rated at 24,000 Btu and powered from the 240v AC system.

7.13 **Fire Detection and Extinguishing**
The vessel will be fitted with a fire detection system with a smoke detector and a heat detector fitted above each engine.

The audible and visual alarm panel will be fitted in the wheelhouse.
A Stat-X fire extinguishing system will be fitted to protect the engine space. The control panel will be located in the wheelhouse at the emergency panel. Clear instructions on the operation of the system and the fire flaps will be posted next to the panel.

Four portable fire extinguishers will be supplied to meet the Code requirements.

7.14 Cathodic Protection
All underwater metallic fittings will be electrically connected in to a continuous bonding system with earth straps across flexible shaft couplings and connected to the anodes.

An earthing plate is to be fitted to the hull. All relevant electrical systems are connected to this plate.

Sacrificial zinc or aluminium anodes are fitted in-way of the stern gear. Anodes will be sized for a two year life.

8 Electrical systems

8.1 General
The primary electrical system on the vessel will be 24v DC which will be distributed through a main switchboard located in the tank space.

The electrical system will be a two pole protected two-wire, insulated return system throughout. Three banks of batteries are charged by main engine driven alternators or.

The supply to all equipment will be cable and/or flexible cord, insulated in fire retardant sheathing, to IEC 332-3. All wiring is to be carried in trunking and/or conduit. Trunking and conduit will be secured in an approved manner using junction boxes and accessories for all internal circuits in watertight compartments and mounted as high as possible within the vessel, minimum 500mm above loaded waterline. Where wiring penetrates bulkheads or deck heads appropriate glands are used. All external fittings will be of the highest waterproof marine quality.

All wiring on main engines and gearboxes is in proprietary cable. It will be adequately protected from mechanical damage and will be substantially clipped and where necessary protected. The wiring will be routed to avoid contact with high temperature surfaces of the engine.

All circuits and switchgear to be labelled to show their function, sockets will be clearly marked with their voltage.
Electrical motors, control and generating equipment are suppressed and screened where appropriate to prevent radio interference. Cable will be used for bonding and earthing where copper strip is impracticable.

8.2 24v DC System
The vessel will be fitted with three banks of batteries supplying 24v DC.

There will be one engine starting bank, one service bank and a small emergency bank for supplying essential communication and lighting.

All batteries will be AGM gel type and will be charged through blocking diodes by the main engine alternators. Secondary charging will be from shore supply via a Victron Energy Centaur 240 volt – 24 volt DC/40A battery charger.

The engine starting and service batteries will be secured in GRP battery boxes in the tank space which are vented to atmosphere. The emergency bank will be fitted just below main deck level.

8.3 12v DC System
A 24v/12v isolated DC/DC converter with a rated output of 10amps at 12v will be fitted to supply miscellaneous equipment such as phone chargers, etc.

8.4 Instrumentation
Digital combined voltage and current meters will be fitted monitoring each battery bank and the 240v AC system.

8.5 DC Equipment
The DC equipment fitted will include the following:

- Internal lights white
- Internal lights red
- Deck lights
- Deck floodlights
- Aft deck floodlights
- Chart light
- Emergency lights
- Portable hand light
- Signal lamp sockets
- Navigation lights
- Windscreen wipers
- Screen wash pump
- Fresh water system pump
- Searchlight
- Horn
- Portable VHF charger
- Navigation equipment
- Engine room fans
8.6 240v System
240v AC power will be supplied from a pair of Victron Multi-plus inverters with a combined maximum output of 10Kw.

A 8Kw Fischer Panda DC generator will be fitted to support the batteries in the event of high demand from the AC system. The generator will be connected to the service batteries, as will the inverters. The generator control system monitors the service batteries and when the voltage drops below a predetermined level the generator will automatically start and support the batteries until such time as the load on the batteries drops and the battery voltage rises and maintains a voltage above 27v at which point the generator will automatically shut down.

This system is significantly better than an AC generator which would be running for extended periods irrespective of the demand. The DC generator option would require less maintenance than the AC option.

8.7 AC Equipment
The AC equipment fitted will include the following:

- Water boiler
- Microwave
- Air Conditioning (x2)

8.8 Shore System
A 240v AC 16 amp watertight (IP 67) shore supply socket will be fitted on the aft superstructure to supply the battery charger.

8.9 Illumination
Internal lighting will be a mix of combined white/red LED fittings and white LED strip lights.

8.10 Navigation Lights
The following navigation lights will be fitted:

- Port
- Stbd
- Stern
- Anchor
- Masthead
- All round Red (x2)

All navigation lights will be LED type.
8.11 Searchlight/Deck lights
A Francis Voyager remote control searchlight will be fitted with single station joystick control and a hand held remote control.

Low level decklights will be fitted around the superstructure to illuminate the deck. Lights will be LED type.

LED flood lights will be fitted to illuminate the aft deck area.

9 Electronic Systems

9.1 Navigation Equipment
The following navigation equipment will be supplied and fitted:

1 – Furuno FR8062 Radar with 12.1” colour TFT display.
1 – Furuno GD1920C 10.4” Video Plotter
1 – Furuno DFF-1 Network Fishfinder
1 – Furuno PG-500 Fluxgate sensor
1 – Furuno RD-30 Remote display
1 – Jotrun EPIRB 40S
1 – Furuno FA 150 Class A AIS
1 – Magnetic Compass
1 – Engine room camera

Systems from other manufacturers may be supplied and installed.

9.2 Communication Equipment
1 – Sailor RT5022 VHF
1 – Sailor RT2048 VHF
1 – Furuno LH3000 Talkback system

10 Interior fit-out

10.1 General
The layout of the vessel is to comply with the GA drawings.

All accommodation areas will have sharp corners eliminated to prevent injury to personnel in extreme sea conditions. Suitable and adequate hand rails and hand holds are provided for safe passage throughout the vessel whilst at sea.

The quality of fit-out is to a high standard, commensurate with the duties of a pilot boat and its normal compliment of up to 8 persons.

All surfaces to be finished to a high standard, to provide a low maintenance finish.
Generally, all fittings will be best quality marine grade stainless steel, and all fasteners of A4 quality.

10.2 Forepeak
Access will be via an aluminium alloy bulkhead hatch.

10.3 Forward Compartment
Access to the Forward Compartment is through a bulkhead door in the Accommodation forward bulkhead and through a deck hatch on the fore deck.

The space is fitted out to provide sleeping accommodation for four in number crew in berths with stowage for personal gear.

The sole will be finished with Altro Mondopave non slip floor tiles.

10.4 Accommodation
Access to the Accommodation is via a staircase from the wheelhouse. From this space access is made to the Forward Compartment, Toilet and Tank Space.

The space is fitted out with a small galley area, mess table with seating and a two berth Officers Cabin.

The sole will be finished with Altro Mondopave non slip floor tiles.

10.5 Toilet
Access to the Toilet/Shower compartment is from the Accommodation.

The space contains a manual toilet and a small hand basin with hot and cold water. A mirror, toilet roll holder and grab rail are provided.

A mixer valve complete with shower head is fitted and the compartment sole doubles as a shower tray.

10.6 Tank Space
Access to the tank space is from the Accommodation through a door in the forward bulkhead, access to the Engine Room from the Tank Space is through a door in the aft bulkhead.

The main 24v DC and 240v AC distribution boards are contained in this space along with the three battery banks which are in GRP ventilated battery boxes.

10.7 Engine Room
Access from the wheelhouse to the machinery space is via the lower deck and a bulkhead door in the aft engine Room bulkhead. A bulkhead door in the forward engine room bulkhead gives access to the forward store area.
Two longitudinal handrails guardrails will be fitted either side of the central walkway in the space.

The engine room arrangement is arranged to allow good easy access to engines for maintenance and repairs.

Engine room floor plates will be manufactured from GRP non slip grating bolted to aluminium bearers, with lift up panel’s in-way of bilge strum boxes and sea suction valves.

10.8 Aft Peak
The Aft Peak compartment is fitted with a watertight door for access. The space contains the water jets and their hydraulic tank and system.

10.9 Wheelhouse
The vessel is fitted with a central steering position. A non-glare instrument panel will be positioned across the wheelhouse immediately behind the windscreens on the centreline and fitted with all instrumentation and controls as specified.

The wheelhouse finish above the window line is in a synthetic carpet material to lessen reflections and absorb noise. Linings below the window line are a laminate finish.

Throughout the wheelhouse, the sole is to be covered with Altro Mondopave. The emphasis is to be on providing an effective, durable finish for the role of the vessel.

All seats (9) are Kab Model 524 suspension seats c/w arm rests, head rest and lap belts.

An adequate number of hand rails will be positioned through the wheelhouse to allow personnel to move through the compartment whilst always having a handrail within easy reach.

The minimum wheelhouse headroom on boat centreline will be 1.95m.

10.10 Oil Stowage
Provision will be made to secure oil in 15 litre drums for engine and gearboxes, one 15 litre drum of hydraulic oil and one 15 litre drum of antifreeze, in the engine room.

10.11 Insulation
Engine room bulkheads and sides down to waterline level and underside of wheelhouse sole are covered with Halyard noise insulation material which is faced with an aluminised foil material and finally clad with perforated aluminium alloy sheet in areas of potential damage.
Noise insulation will also be fitted to the lower accommodation bulkheads and a polymeric barrier will be fitted below the sole.

10.12 Signage

Suitable SOLAS/MCA approved signage is to be used throughout.

SOLAS 1 Chart to be fitted to wheelhouse door.
Lifejacket donning instructions.
Liferaft deployment instructions – wheelhouse door.
Safety plan
Workboat Certificate

Signs and decals applied to the craft topsides, deck and superstructure as necessary. Final configuration will be confirmed with customer.

Vessel name and port of registry will be affixed to the transom (vinyl letters).

11 Painting and Finishes

11.1 External Finish

The hull below waterline will be coated with SFE200 for osmosis protection followed by primers and two coats of anti fouling.

The deck shall have Philliclad 200 urethane non-slip screed colour dark green applied or similar.

11.2 Internal Finish

Wheelhouse
Deckhead to lower window line – synthetic corded material
Below windows to deck – Laminate finish

Accommodation
Deckhead - synthetic corded material
Bulkheads – Gel wash finish and/or laminate

Tank space
All GRP surfaces – Gel wash finish

Engine space
Deckhead – Foil faced noise insulation
Bulkheads to waterline level– Foil faced noise insulation protected in vulnerable areas by perforated aluminium sheet
Hull sides to waterline level - Foil faced noise insulation protected in vulnerable areas by perforated aluminium sheet
Bilges to waterline level – Gel washed
11.3 Colour Scheme
Hull below waterline – Red
Waterline/boot top – White
Topsides – Dark blue
Wheelhouse and fly bridge - White

11.4 Decals
The superstructure below window line will be finished with yellow/blue chequerboard pattern Diamond grade reflective sheeting. The wording “POLICE” will be fitted down each side of the superstructure in blue Diamond grade reflective letters.

12 Life Saving and Loose Equipment

12.1 Life Saving Equipment
Lifesaving appliances shall meet the requirements of the code for 15 persons and will be free issued by client. Adequate storage space will be provided.

A safety plan will be provided identifying storage locations for all Lifesaving Appliances.

12.2 Lifebuoys
Two lifebuoys marked with vessel’s name and port of registry will be supplied and fitted into suitable stowage’s. One will be fitted with a light and both will have buoyant lines.

12.3 Loose Equipment
The following loose equipment will be supplied:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mooring lines</td>
<td>4</td>
</tr>
<tr>
<td>Fenders (Pneumatic type)</td>
<td>2</td>
</tr>
<tr>
<td>Torch/Signal lamp</td>
<td>1</td>
</tr>
<tr>
<td>Stretcher</td>
<td>1</td>
</tr>
<tr>
<td>Nautical Publications</td>
<td>As per code</td>
</tr>
<tr>
<td>Ships Bell (8” dia)</td>
<td>1</td>
</tr>
<tr>
<td>Multi-purpose fire extinguisher 13A/113B</td>
<td>2</td>
</tr>
<tr>
<td>Multi-purpose fire extinguisher 5A/34B</td>
<td>2</td>
</tr>
<tr>
<td>Fireman’s Axe</td>
<td>1</td>
</tr>
<tr>
<td>Fire bucket</td>
<td>1</td>
</tr>
<tr>
<td>Hand Bearing Compass</td>
<td>1</td>
</tr>
<tr>
<td>Combined clock &amp; barometer</td>
<td>1</td>
</tr>
</tbody>
</table>
13 Trials, Testing and Training

13.1 Trial Programme
Trials will be conducted in the waters around Holyhead.

A comprehensive set of trials will be undertaken to the customer’s and builder's requirements, this will include but not be limited to:

- Speed trials over an accurately measured nautical mile
- Manoeuvrability and steering at various speeds
- Monitoring of engine performance for a period of 4 hours
- Inclining test as part of the stability requirements
- Monitoring of sound levels at various speeds
- Full inspection of the entire vessel
- Testing of all systems and functions

A trials programme will be developed during the build of the vessel and will be issued 4 weeks prior to trials taking place.

13.2 Warranty
The following warranty applies for up to 12 months from acceptance:

Subject to the conditions set out below and otherwise expressly set out herein the Builders warrant to the Purchaser that the Boat will be of satisfactory quality and reasonably fit for any purpose made known to the Builder in writing prior to Agreement whether or not such purpose is one for which the Boat is commonly supplied and will correspond with the Specification or any variation addition or modification thereto. The Builders further warrant that the Boat will be free from defects in materials and workmanship for a period of twelve months from the time of customer acceptance. The warranty is subject to the following conditions:

(a) The Builders shall be under no liability in respect of any defect in the Boat arising from the Specification supplied provided or varied by the Purchaser.

(b) The Builders shall repair (or replace at their discretion) any defect in the workmanship materials or equipment or their failure to correspond with the Specification where the defect or failure was not apparent on reasonable inspection at the Final Acceptance Inspection or within a reasonable time thereafter.

(c) The Purchaser shall notify the Builders in writing immediately on discovery of any alleged defect and the Builders or their agent shall have the right to inspect the Boat including the right of sea trials to enable the Builders or their agent to examine or assess the extent of the alleged defect. The
expense of any such trial shall be borne by the Builder if the defect is shown to be one of workmanship or materials.

If any defective workmanship of the Builders and/or materials shall be discovered in the Hull, machinery or equipment (except as hereinafter provided) of the craft within eighteen months after the Final Acceptance Inspection, fair wear and tear excepted, and if written notice of the defect is given to the Builders within 14 days of the discovery (or is posted within 14 days of arrival at the next port of call, if discovery is made while the craft is on passage), the Builders at their option shall either repair and make good the defects on the craft or pay to the Purchaser a sum to be agreed before any repair work is put in hand.

13.3 Spares
During the fit out of the vessel a materials schedule will be maintained. From that schedule a list of consumable spares will be created detailing manufacturers, part numbers, etc.

Based on the clients anticipated annual hours running the schedule will also detail quantities required to support the craft for one year.

14 Documentation and Drawings

14.1 Manuals
A full set of manufacturers’ manuals including recommended maintenance and training programmes will be provided. A bespoke vessel specific manual will be provided.

A Safety Training Manual will be provided, in both hard copy and electronically.

14.2 Drawings
A full set of drawings will be supplied electronically (pdf format) and in hard copy form. This will cover the General Arrangement, Machinery Arrangement, Steering Arrangement, Docking Plan, Safety Plan, System Arrangements and Diagrams, Electrical Wiring Diagram, Cathodic Protection and Bonding Diagram, Propulsion Drawing and Sterngear, all “as fitted”.

Other drawings deemed appropriate may also be provided.

14.3 Trial Data
A copy of the trials data will be provided on completion of trials which will cover the Pre-launch trials, Harbour trials and Sea trials. Included will also be reference data on bearing clearances, alignments, bonding readings, etc.
14.4 Stability
An inclining experiment will be carried out and a stability booklet will be issued. The stability booklet will be approved to meet code requirements and two copies will be provided.

14.5 Certification
The vessel will be delivered complete with all relevant certification which will include the following:

- MCA Workboat Code certificate (Cat 3)
- Fire extinguishing system certificate
- Man overboard recovery system – Load test certificate

15 Options

15.1 Build to Class
This vessel can be designed and built under survey to Lloyds Register of Shipping (LRS) Special Service Craft (SSC) rules.

15.2 Waterjets
Fit Hamilton HM 461 waterjets with MECCS control system in lieu of Rolls Royce FF500 waterjets.

15.3 Hadrian Rail System
The Hadrian Rail system is fitted below the main handrail. The rail will finish at the aft end with a 180 degree bend to bring the rail inside the sheltered area at the back of the wheelhouse.

This safety rail system attaches the crew member’s harness to the structure of the vessel to enable safe movement around the deck whilst being secured to the vessel.

15.4 Man-Overboard Recovery
A Matesaver Man-Overboard (MOB) retrieval device will be supplied and fitted in a stowage.

15.5 Surveillance System
The Surveillance system incorporates a multi axis gyro stabilised surveillance camera and a solid state hard drive recording system. The surveillance camera uses multi sensor technology that offers an ultra low light starlight camera and high resolution thermal imaging camera both with zoom facility.

A computer with both an inbuilt and external separate solid state hard drive which records the camera image, radar and GPS plotter information as well as VHF communications.
The 2 hard drives mirror each other and are on a continuous loop; depending on the amount of information being recorded this loop can range from 36hrs to 8 days.

If there is any need to retrieve evidence you can remove the solid state hard drive in a matter of seconds and use a laptop or shore based computer, then you can either replace the solid state hard drive with a spare or operate on the single onboard computer internal hard drive. This means the boat can be fully operational within a matter of minutes of an incident.

15.6 Enhanced Domestic Facilities
In addition to the basic equipment the following will be installed:

Single element ceramic hob
Fridge

15.7 Interceptors
By combining Vector Stick control and Interceptor trim tabs Rolls-Royce has managed to elevate the current state of boat control technology to a completely new level.

The interceptor trim tabs can naturally also be operated in a normal way to provide control of trim and roll, independent of steering commands. Trim and roll angle of the craft can easily be adjusted by using dedicated control knobs.

Integrated control of Interceptor trim tabs and steering nozzles provides the best possible combination of precise control, high efficiency and comfort while turning at any speed.

At high speed, the most efficient way of implementing a steering correction while minimizing any steering induced roll effects is to use the Interceptor trim tabs. Whenever hard turns are required, Interceptor trim tabs combined with the steering nozzles provides the maximum combination of steering forces and vessel speed while maintaining a stable optimum roll angle.

15.8 Weapon Lockers
Three lockable gun lockers will be fitted which will be capable of stowing a Personal Defence Weapon such as a HK MP7.

16 Budget Price & Delivery

16.1 Price
One vessel as per this specification excluding options delivered ex works at Holyhead, United Kingdom - £1,564,184.00 excluding VAT
16.2 Delivery Time
First craft delivered 12 months after signature of contact. Following craft will be delivered at 5 month intervals.

16.3 Payment Terms & Method
To be agreed.

16.4 Assumptions
Contract will be for between 5 and 10 craft to be delivered consecutively.

16.5 Validity
60 Days from date of document.
GENERAL ARRANGEMENT
18m POLICE BOAT

Details:
- Number of Deck(s): 3
- Number of Boat(s): 1
- Main Deck Plan
- Lower Deck Plan
- Profile View

Preliminary