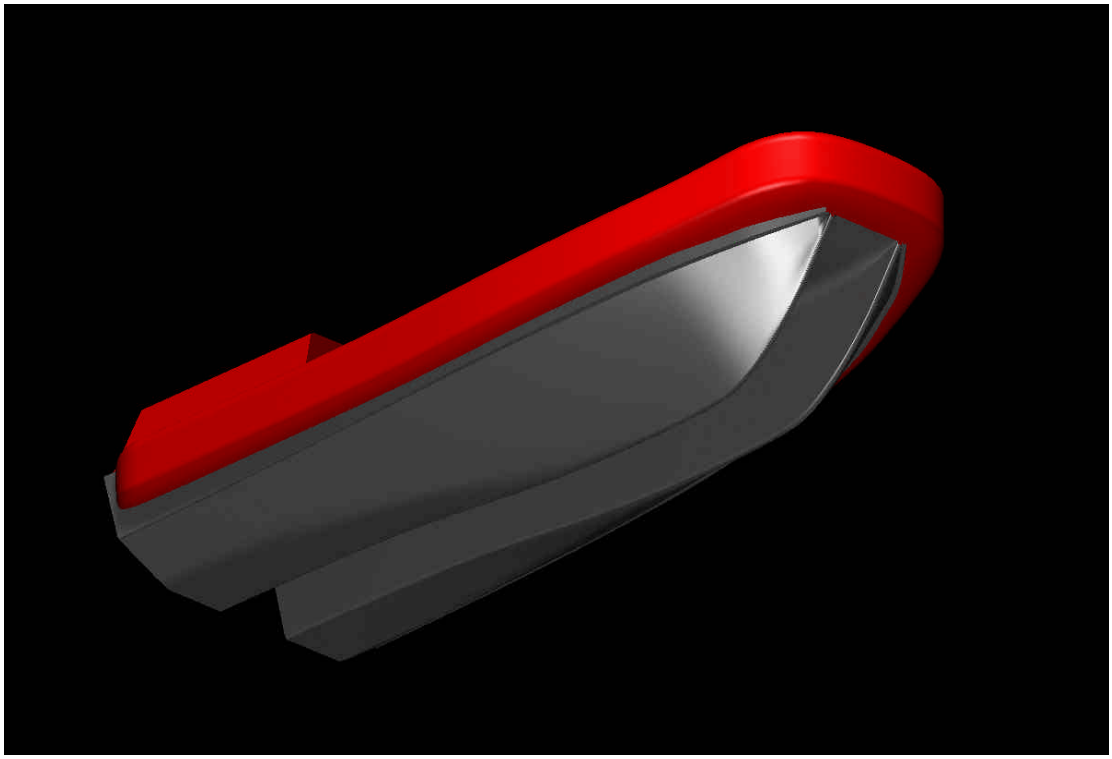
Outline Specification
for
the 7.3m Seismic Cable Repair Boat



Eur Ing Alastair G L Hunter, *in association with:* IMSCo Ltd.

The Energy Centre,
Mill Lane,
Binfield,
Isle of Wight
PO30 2LA

IMSCo House
Berth 29,
Southtown Road,
Great Yarmouth,
NR31 0JJ

tel.: +44 1983 826278
Fax: +44 1983 821884
'e' mail 106366.614@compuserve.com

+44 1493 446272
+44 1493 446273

Contents

1 General Description

This vessel is designed specifically for the duties of In-Water-Maintenance of Seismic ‘Streamers’ deployed from Survey ships in Open Ocean conditions.

The vessel has the following features:

1 Mechanised cable recovery
2 Safety and efficiency of the operation are improved by bringing the cable inboard to the central ‘moonpool' type working well. This gives safe access to Birds Compasses etc..
3 fully self-righting by means of a manually operated air bag.
4 High Bollard Pull and manoeuvrability enabling long sections of Streamers to be towed.
5 A removable powered Streamer Storage Drum on foredeck facilitating ‘change out’ of sections at sea.
6 Optional, self contained and powered ballasting system complete with built in tanks under the foredeck facilitating cable ballasting of oil filled cables at sea.

The vessel is of the Catamaran type with asymmetric deep vee monohedron hull form, constructed from marine grade Aluminium alloys. The Cable retrieval system is mounted amidships in the central well.

2 Principal Dimensions

Length overall	7.4 m
Breadth overall	3.25m
Displacement loaded exc cable	4.7 tonne (approx.)
Displacement loaded inc cable	5.3 tonne (approx.)
Draught (approx.)	0.7 m
Endurance at full power (approx.)	6 hours
Fuel capacities	2 x 130 litres
Bollard pull approx.(2 x 200 BHP)	1.6 tonne @ 4 knots

3 Layout

This catamaran vessel is arranged with a machinery compartment at the stern with the working deck forward of this. Crew seating is arranged across the vessel on the leading edge of the Engine Box. A central well houses the CRS[1] and allows the helmsman to sight the cable between the hulls prior to recovery.

The vessel has a rigid foam fender fitted around the gunwale.
The single point lift gantry is fitted amidships and a further gantry mast is fitted aft.

3.1 Machinery Compartment

The Machinery Compartment houses the two **Mermaid Turbo-Four II** marine diesels. These drive the **PP 115** Waterjets via **splined, constant velocity** couplings.(Aquadrive or equal).

The both engines are arranged to drive a hydraulic pump to provide motive power for the Cable retrieval system. The Starboard engine drives a mechanical bilge pump. Battery boxes house separate supplies for each engine and Services.

Ventilation is provided by two Vent Trunks built into the main mast vertical supports. These are arranged to self-close in case of a capsize.

The wet exhausts and crank case breathers are led to the transom as close to the outboard transom corners aft as possible to help to minimise smoke travelling down the tunnel. Care is taken to ensure that water ingress in case of a capsize is minimised.

3.2 Deck Layout

The After Deck, which forms the top of the Machinery Compartment, is fitted with a Gantry Mast. This houses the permanent righting Buoyancy, an emergency manually released air bag, the Navigation lights, Deck flood lighting, Aerials for VHF, GPS etc. and has space for additional equipment.

There are two substantial bollards fitted to the after quarters and a further two on the after side decks, additionally two bollards are fitted to the forward quarters.

Two watertight Engine Removal hatches are fitted and these give clear access to both the engines and Waterjets. The hatches are each fitted with quick release fasteners and are hinged at the outboard edges. Pneumatic struts are fitted to keep the hatches open. At the forward end of the after deck, seating is arranged for a maximum of four crewmembers on a seat running athwartships. The Engine controls, VHF, optional GPS, and ancillary equipment are fitted in the deck on the centreline adjacent to the Helmsman who is sighted to Port.

The Helmsman's Console is fitted directly in front of the Helmsman. This houses the Two Tachometers, cooling water temperature gauges, the visual and audible alarms for the main engines, the visual and audible Bilge level alarm, the Compass, Fuel tank contents gauges, electrical circuit switches and the hand hydraulic steering gear for the Waterjets. The VHF transceiver is fitted in the console and arranged for ease of use.

There is a central opening in the main deck, which houses the CRS. This is approx. 700mm wide and 2000mm long. (See section 6 for details).

[1] Cable Retrieval System

The Single Point Lift frame is fitted on the centreline at the forward end of the after deck. It is arranged for a quick release mechanism at the top. (Hendriksen onload type or equal)

The deck is fitted with a non-slip finish. The area in way of the moonpool is fitted with a closed cell foam mat.

3.3 Hull Layout

The hulls are each subdivided into three watertight compartments. Access into each of the forward two is by means of access hatches.

The compartment immediately forward of the Engine Room houses actuators and components of the CRS, double bottom fuel oil tanks, and the E/R fire fighting system. In addition, cable oil tanks can be built in for use by the cable ballasting system.

The Starboard central compartment houses the CRS hydraulic actuators.

4 Machinery

The main engines are MERMAID TURBO-FOUR II turbocharged, intercooled, fresh water-cooled, high performance, marine diesels. These drive the PP 115 Waterjets via Aquadrive constant velocity couplings. The engines are fitted with auto shutdown in case of a capsize in compliance with SOLAS requirements for a vessel of this duty.

The engines are fitted with 12v dc electrical systems and a 75 a alternator is fitted to each engine.

Each engine is fitted with its own individual cooling water circuits with sea water supplied from a bronze inlet fitted with shut off valve and strainer fitted on the pressurised side of the Waterjets. Thus, the main engines can be run in the davit for a period enabling engines to be started prior to the vessel being launched.

The exhausts are reinforced diesel resistant hose and are water injected and led to the stern in a manner designed to minimise smoke being blown through the tunnel.

Each engine is fitted with its own fuel oil system from separate tanks. A cross connection is also fitted to enable both engines to be supplied from either tank in case of contamination. (See Section 12)

The engines are fitted on flexible mounts.

Throttles are controlled by means of Kobelt (or equal) cable controls.

Engines are arranged with mechanical stops.

Each engine is arranged to drive a hydraulic pump for the cable handling systems.

5 Waterjets

The PP Waterjets are GRP mouldings fitted with bronze impeller and bearing housings. The shafting is S 316 stainless steel with replaceable sleeves in way of the bearings and seals. The forward bearings are opposed taper roller bearings, grease lubricated. Aft bearings are oil-lubricated bearings to facilitate dry running. The seals are rubber covered lip seals for the main bearings and mechanical face seal with Silicon Carbide faces for the main water seal.

Hydraulic controls are fitted. Hand hydraulic for steering and a powered system for the bucket control. Trim control is fitted by means of the nozzle being mounted in a bronze gimbal ring. The Hydraulic pump for the Jet control system is driven by the jet unit, the two jet units being independent.

6 Cable retrieval system (CRS)

The CRS is designed to retrieve the Streamer from the sea and to restrain it in such a way as to permit replacement of components such as ‘Birds’ or ‘modules’ or, indeed, sections of streamer, whilst the Streamer is deployed from the Ship.

The CRS is fitted in the central maintenance well and consists of a pair of retrieval arms fitted with soft, profiled rollers, a securing device with interchangeable tools and a Towing Winch.

The retrieval arms are actuated by individual hydraulic rams, the arms each rotate through approximately 90 degree (in opposite directions) thereby lifting the Streamer. The roller profile leads the streamer into the central notch ensuring that ‘Birds’ or other ancillary external equipment does not foul the tunnel.

The stainless steel arms are fitted with large diameter stainless steel shafts, which penetrate the tunnel wall to starboard and run in ORKOT bearings. Twin ‘O’ ring seals are fitted inboard and outboard. The Stainless steel actuator arms are fitted to the shafts with dowels.

Double acting hydraulic cylinders are fitted, one to each actuator arm.

The Towing Tool is a split coupling and attaches to the downstream side of the coupling in the annular tool recess. This tool is attached to the ‘Towing Winch’ by means of 120 metres of 3.9 tonne breaking strain 10mm ‘Dyneema’ rope. This enables the Streamer to be split safely.

The tooling is tailored to the Clients’ Streamer cable and is arranged to enable sections to be changed out at sea. The tools are closed and released manually.

7 Construction

The hull structure is built to Lloyds Small Craft rule scantlings and standards and can be built under Lloyds Register Survey.

The vessel is constructed from marine grade Aluminium alloy. Internal stringers and frames arranged to maintain small panel sizes.

Bulkheads are aluminium alloy and are suitably stiffened.

Seatings are fabricated from aluminium alloy sections for the main Engines and all mechanical actuators and equipment.

The fuel oil tanks are built into the structure as double bottom tanks in the central bays.

All edges that are likely to come into contact with the streamer cable are well radiussed. Sacrificial doubler plates are fitted at the tunnel edges at both ends of the vessel.

8 Electrical

The boats' electrical system is 12v dc and is provided from one of the Engine staring batteries. There are two independent batteries, each providing main engine starting. These are arranged so that either or both batteries may start either or both engines.

The following equipment is supplied:

a Port, starboard, stern, towing and steaming lights
b Deck flood lights. (2 off)
c VHF radio telephone (waterproof)
d GPS (*optional*)
e Compass light
f Whistle
g Searchlight
h Engine room lighting (2 off)
i Engine room ventilation fan (2 off)
j Underwater lighting in the tunnel (*optional*)
k Bilge system level alarm
l Fire alarm system alarm
m Bilge pumps (2 off)
n Rudder indicator (*optional*)
o Fuel oil tank level gauges (2 off)
p Cable Ballast pump (*optional*)
q Electromechanicaly clutched mechanical bilge pump

The electrical installation is to the highest marine standards and all circuits are switched and fused using MCB's.

The main electrical control panel is housed behind a watertight polycarbonate cover in a watertight enclosure (IP67) within the Machinery space and all switches are of the miniature circuit breaker type. The main power switch for the auxiliary circuits is fitted on the Helmsman's console and is of the waterproof, booted type. The power switch for the mechanical bilge pump is of the push button, non-latching type.

The two main Battery switches are fitted in the watertight enclosure. [IP 67].

The engines are both fitted with 70-ampere dc alternators.

The batteries are fitted in FRP containers well above the bilge level in the machinery space. These are fitted with lids and are vented to atmosphere.

The main engines are fitted with 42v DC block heaters, which are terminated with plug connectors.

A 42v DC to 12v DC battery charging set is mounted in the Port engine room with a waterproof, shore connection point in the transom. This connection point is wired to the Charging set and the Block heaters.

9 Fendering

The vessel is fitted with a closed cell foam Fendering system. The foam is closed cell 18 kg/m3 polyethylene covered in approximately 3mm of self-coloured Polyurethane Elastomer (high visibility orange).

The fendering extends around the vessel at gunwale level and is approximately 600 mm high.

Grab rope attachment points are attached to the gunwale edge.

The fendering system is bonded to the hull structure using Dunlop polyurethane adhesive, which will allow differential movement without detachment.

10 Colour Scheme

The vessel is finished in High Visibility Yellow polyurethane externally applied to the manufacturers recommended procedures. The working deck is painted with non- slip, deck composition.

The interior surfaces are not painted.

11 Bilge System

The vessel is fitted with individual suctions in each engine compartment and the CRS compartments. The overboard discharges are fitted with a non-return valves at the ships' side. There is a 500 gallon per hour centrifugal, computerised type electrical pump (sampling the bilge every two minutes for water) fitted in the CRS bay and in the Operators Deck recess.

Bilge water detectors are fitted in each of the major spaces, coupled to audible and visual alarms on the Helmsman's panel.

The circuits are separated to ensure that an electrical failure on one circuit does not impair the operability of the others. The Circuit breakers are sighted in the engine room within the sealed electrical distribution box.

The main bilge pump is an engine driven 'Jabsco' type impeller pump. This is driven off the starboard engine by means of a belt drive fitted with an electromechanical clutch. A valve chest is fitted allowing individual compartments to be easily selected.

12 Fuel Oil System

The vessel is fitted with two built in fuel oil tanks arranged to supply each engine individually. A system of valves allows both engines to run from either tank in case of contamination.

All pipework is executed in S 316 stainless steel and is securely clipped to the hull.

A hand-operated pump is fitted to each tank, allowing water and sediment build-up to be drained from the tank. These pumps are sighted in the machinery space in a convenient position.

Valves are operated from outside the Engine Room and are recessed into the seat to starboard.

The fuel system is fitted with SEPAR KWA - 90 Filter / water separators, one to each suction line after the isolation / selector valve chest. These are fitted to ensure only clean fuel reaches the engine mounted paper cartridge filter.

These filters are mounted in the machinery space and arranged to facilitate sighting the glasses and the drainage of any sediment or water.

Contents gauges are fitted with the displays at the helmsman's console.

13 Engine Room Fire fighting System

The engine room is fitted with a Fireater remotely operated CO2 gas flooding system. Fire detection is provided by means of a Fenwal Series 27100 thermal detector. This operates an audible alarm in the Helmsman's Console. The Gas is released manually by means of a pull handle housed behind a glass panel on the Helmsman's console. The Gas cylinder is housed in the Port compartment immediately forward of the Engine Room.

In addition, two portable foam extinguishers are fitted at convenient positions on the deck.

14 Hydraulic System

The vessel is fitted with an hydraulic power pack from which are driven two double acting actuator cylinders and two bi-directional motors.

The system is arranged as follows:
The hydraulic oil reservoir tank, which is fitted in the Port hull adjacent to the pump, contains 10 litres of **Energol HLP HM 32** high performance hydraulic oil. The use of an air bag within the reservoir and connected to the air vent ensures that even when inverted, there is no possibility of oil leakage or contamination.

A tank mounted full flow filter is fitted to the bottom of the reservoir.

The pumps are gear pumps and are mounted off the mechanical power takeoff on both engines. These pumps run continuously, the system running off load at ‘zero’ pressure. A seawater-cooled heat exchangers are fitted in the system in the main engine seawater cooling lines.

A Four gang, two way, proportional valve chest is fitted and is to hand to the CRS operator.

The system is designed to be fail safe in case of any device being overloaded, by means of pre set pressure relief valves in each circuit.

15 Towing Winch

The Towing winch is mounted at the after end of the Working Well and is arranged to house up to 150m of 10mm ‘Dyneema’ 3.9 tonne breaking strain rope. The function of this winch is to provide control over the aft end of the streamer when introducing or extracting a section.

The winch is driven by a bi-directional hydraulic motor driving a stainless steel drum directly. The motor is fitted with a pressure relief valve to allow the motor to be back driven when loads exceed 2 tonne.

The cable storage reel is also driven by a bi-directional motor with drive through a spur gear arrangement.

16 Miscellaneous

The vessel is supplied complete with the following equipment:

Manual release E/R fire extinguisher + Two hand held Foam extinguisher
Radar Reflector
Boat Hook,
Paddle
Flares
Search Light
Drogue and line
Torch
Operators Manual
On board spares pack (optional)
On board tool kit.

17 Cable Ballast System (Optional)

This system consists of a semi-displacement pump (Jabsco 23610-2003) protected by a Gresswell pressure relief valve (set to 1 bar) coupled by means of three ‘T’ ported ball valves to the two 45 litre tanks built into the hulls.

These valves will enable the pump to either draw from, or deliver to, the tanks facilitating in water cable ballasting work.

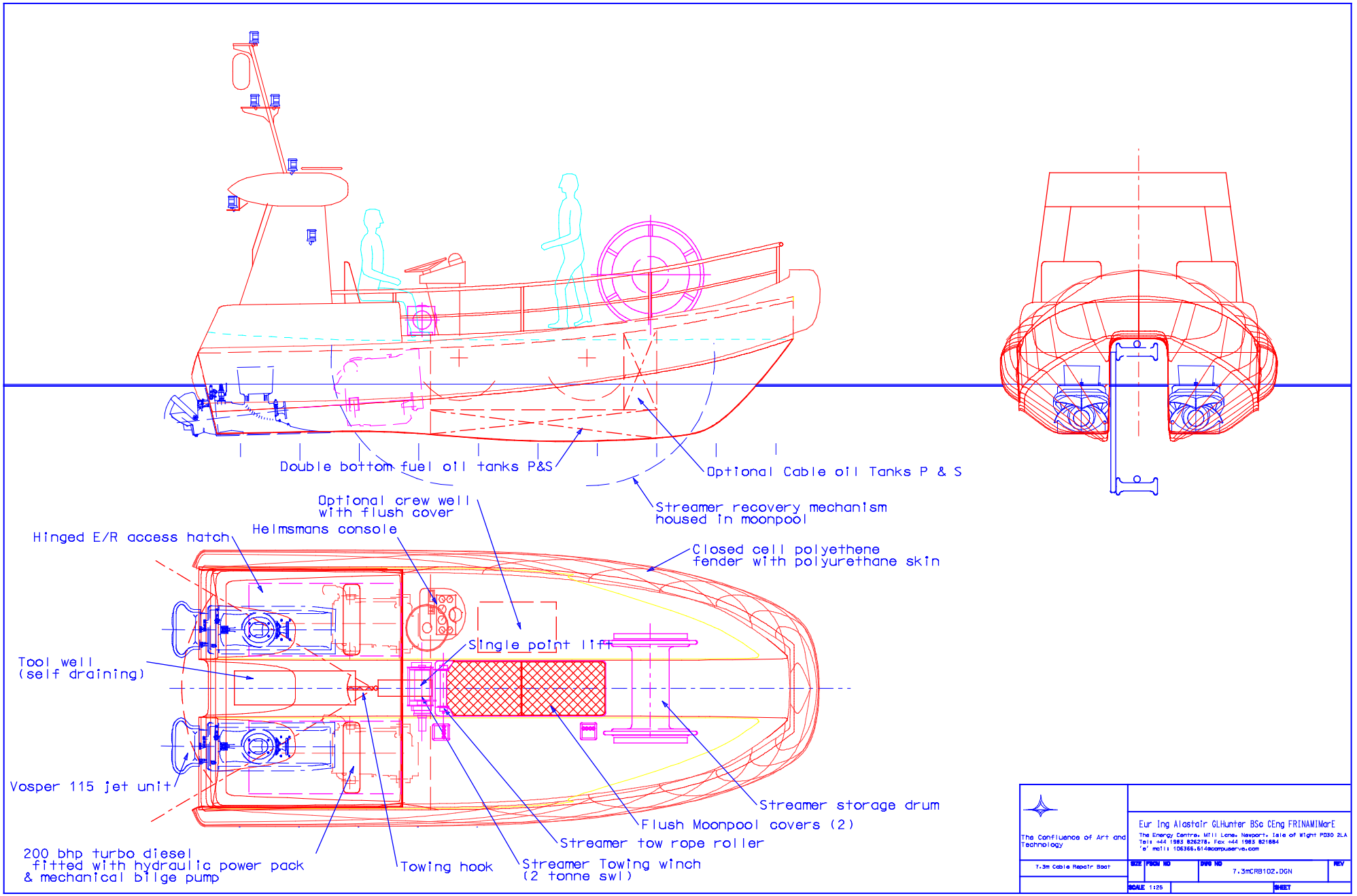
The pump is powered by a 12v DC motor fitted in the starboard central hull compartment. This is switched and protected by means of a MCB in the breaker box in the machinery space. Once the CBS flying lead is plugged into the deck socket (which should be done with the CRB in the davit) the circuit can be made live. The pump is controlled by means of the IP55 toggle switch mounted adjacent to the flow control valves on the main deck. A hinged cover protects these controls when not in use.

18 Streamer Cable Reel

This system consists of a demountable cable reel manufactured in frp with capacity for 100 metres of 76 mm Ø cable.

The drum is arranged with stainless steel shaft stubs at each end and an 80-tooth spur gear ring at one end. This engages with a 20-tooth spur gear on the hydraulic motor.

The bearings are arranged to split to allow the reel to be readily removed or exchanged with a pre filled reel. These bearings are machined from ORKOT material



The Confluence of Art and Technology

Eur Ing Alastair GLHunter BSc CEng FRINAMIMarE
The Energy Centre, Mill Lane, Newport, Isle of Wight PO30 2LA
Tel: +44 1983 826278, Fax +44 1983 821884
'e' mail: 106365.614@compuserve.com

7.3m Cable Repair Boat

SIZE | PROJ NO | DWG NO: 7.3mCRB102.DGN | REV

SCALE 1:25 | SHEET