

AIRLIFT

H O V E R C R A F T

24B August Lane, Alberton, QLD 4207, Australia
Ph +61 (0)7 3804 6636 Fax +61(0)7 38046646
Web: www.airlifthovercraft.com Email: sales@airlifthovercraft.com

DOCUMENT No:

GSS-311 v1.0

Hovercraft Specification Sheet

April 2008

Customer: *Sales Draft*

Design: *Pioneer Mk2*

Hull No: *311*

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General Description

The Pioneer Mk2 hovercraft is an amphibious hovercraft designed to carry 17 to 19 passengers (or 1.8 tonnes payload) plus 1-crew. It is a continuation of the very successful Pioneer and Surveyor series of designs that we introduced in 1986 and follows this already well proven format while at the same time incorporation many incremental improvements, resulting in an outstanding new design.

The Pioneer Mk2 is powered by one Deutz turbo diesel engine of 190kW and will cruise comfortably at 30 knots and provide a top speed in excess of 40 knots on hard surfaces. Operating efficiency and controllability is excellent with the renowned economical Deutz engine powering a pair of high efficiency reversible pitch propellers and the hydraulically coupled mixed flow lift fans.

The air-conditioned cabin provides comfortable seating and good visibility for the passengers and crew.

Construction is in accordance with Australian USL class 1D and other international shipping codes.

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Technical Details Table

Dimensions	When Hovering (includes hard & soft structure)	Hard-structure overall size (Survey Measure)	Minimum For Transporting (with ducts & rudders removed)
Length	10,980mm	10,800 mm	10,580 mm
Width	5,500 mm	4,100 mm	4,100 mm
Height	2,810 mm	2,200 mm	1,790 mm
Cockpit length	5,200 mm (at seat top level)		
Cockpit width	2,255 mm (at seat top level)		
Cabin Internal Height (centre)	1,525 mm (floor to ceiling on craft centre-line)		
Cushion height	700 mm at bow, 600mm at stern		
Isolated obstacle clearance	550mm		
Wave height clearance	1500mm at a pitch of >15 metres.		
Maximum recommend speed (for safety)	70 km/hr (38 kts) on smooth water 37 km/hr (20 kts) on land		
Economical cruising speed	45 to 56 km/hr (25 to 30 kts)		
Max wind speed (heavy)	37 km/hr gusting to 46 km/hr (20 kts gusting to 25 kts)		
Max wind speed (light)	46km/hr gusting to 55 km/hr (25 kts gusting to 30 kts)		
Seating (According to Survey)	Total = 1 crew plus 17 to 19 passengers.		
Cabin	The cabin incorporates laminated glass front windscreen and Acrylic side windows. The cabin door is top hinged. Steps fold out from the front deck for easy passenger access.		
Climate Control	An air-conditioner of approximately 20,000 BthU's/hr is fitted.		
Payload (Normal) (for a water-start)	17 to 19 persons (or 1,800kgs) plus 200 litres diesel fuel and safety equipment.		
Overload Payload	Up to 2,500 kg (reduced performance & good conditions).		
Empty weight	2,800 kg		
Engine	Deutz turbo diesel, 190kW @ 2300rpm.		
Fuel capacity	2 x 100 litres (200 litres total)		
Hull construction	Moulded using non-woven E-glass fabrics and Divinycell [®] PVC foam core. Under-hull Urethane landing pads for abrasion protection.		
Skirt type	Pressurised bag tapered from front to back with larger sections at the front for improved wave clearance. All fingers are separate and detachable.		
Skirt Structure Options	Bag and fingers made from Urethane with RF welded seams. The fingers and fastened to the bag with nylon nuts & bolts.		
Thrust system	Pitch controllable (and reversing) propeller of 1300mm diameter x 5 blades.		
Thrust transmission	Industrial rated components of toothed belts, shafts and self-aligning bearings. An automatic clutch is incorporated for smooth engine starting and stopping and to allow engine idle without the prop turning for safety of bystanders.		
Lift System	Mixed flow type fan direct coupled to a hydraulic motor. Very efficient and quiet.		

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Lift Transmission	Hydrostatic. Pump driven by engine providing oil to the lift fan motor. The lift fan speed is automatically controlled to a constant pre-set speed regardless of the changing speed of the main engine.
Steering	By power assisted rudders fitted behind the thrust duct.
Longitudinal pitch control	By power assisted elevators fitted behind the thrust duct.
Roll control	By differential action of rudders and elevators combined
Controls	Siemens PLC duplex system and Human Interface (HMI) touch screen and data display. Engine power and propeller pitch by lever mounted to left of helm seat. Rudder and elevator by joystick mounted to right of helm seat.
Electrical System	Nominal 12-volt system. Battery charging by 14-volt, 105-amp alternator fitted to the thrust engine. All circuits wired and protected in compliance with codes.
Pumping	Double acting manual bilge pump with manifold to each compartment, strum boxes and non-return valves. One electric pump 3785 l/hr (1000 gph) in the cabin. Two electric pump 3785 l/hr (1000 gph) in the engine room.
Fire Fighting	Fixed CO ₂ type fire extinguisher to the engine room. Portable CO ₂ type extinguisher recessed into the cockpit sidewall.
Navigation & Communications Options	Standard equipment includes a 75 mm compass, Marine scanning VHF transceiver and matching antenna. Many additional options are available. Navigation data may be displayed on the HMI screen.

Technical Details, Descriptions

Classification

Classification may be carried out according to the Australian Uniform Shipping Laws, "Class 1D or Class 1C" if required. Otherwise the build standard complies with the code but may be certified at extra cost if required.

Hull and Superstructure

The hull is moulded with reinforcement from non-woven E-glass fibreglass reinforcements and Divinycell cores for increased panel stiffness. This method of construction is lightweight while retaining excellent strength and stiffness. Thermal and sound isolation properties are excellent for this construction system. All laminating is conducted with active quality control procedures to ensure the highest quality. The hull construction complies with or exceeds the Australian U.S.L. and other international survey society requirements. Seat fixing strong points are moulded directly into the hull. Under-hull moulded Urethane landing pads are fitted for hull protection.

Four lifting 'U-bolts' are mounted through the deck and internally strengthened. A towing eye is fitted to the bow and to the stern. There are four cleats mounted to the deck (separate to lifting eyes) for general mooring duties.

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Accommodation

Cabin:

The cabin sides and ceiling are finished in fire retardant fabric to owner choice. The floor is covered with cork tiles painted with gloss urethane finish.

There is one main door in the front centre of the cabin. In front of the door are a set of fold out steps providing easy access for passengers.

Glazing:

The front windscreens are manufactured from laminated safety glass. The side windows are manufactured from moulded acrylic sheeting. The front screens have wipers and washers fitted. All glazing is bonded with polyurethane adhesive sealant.

Seating:

Seating arrangements may be varied according to demand but are normally arranged in pairs facing forward. The seats have under-mounted life jacket containers and easily replaceable covers with hard wearing fire retardant fabric to buyer choice.

Total seating capacity is variable, 1-crew plus 0 to 19-passengers. With seats removed the floor provides a flat work space and the seat mounting rails can be used for securing cargo.

A bilge pump is fitted into a recess at the rear of the cockpit for water removal. Two large diameter (38mm) 'drain-bungs' are also fitted in the rear floor area to facilitate washing out of the cabin.

Engine

The engine is one Deutz diesel engine with turbo-charging and inter-cooling.

Manufacturer	Deutz, Germany
Type	BF6M 1013 ECP
Maximum rating	190 kW @ 25 C, 100 metres
Maximum continuous rating (8 hr)	176 kW @ 25 C, 100 metres
Maximum Speed	2300 rpm
Serial number	00168798

A coolant radiator, air charge cooler and a lubricating-oil cooler keep the engine cool. The radiator and charge-air coolers are mounted above the engine room. The oil-cooler is mounted to the engine.

Exhaust Systems

The engine exhaust system is manufactured entirely from stainless steel. An exhaust-air ejector system is incorporated to remove excess heat from the exhaust ducting and to lower the exhaust gas temperature for safety of personnel.

Propeller

There are two in-flight pitch adjustable and reversible ducted propellers of 1300mm diameter X 5 blades. The propeller blades are precision moulded from Carbon-Fibre and Epoxy resin and are post-cured at high temperature to obtain consistent high tensile strength. The propeller hubs provide pitch adjustment of the blades to suit the different operating conditions for each operating

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location and also reverse thrust capability. The leading edges are protected by moulded Urethane. A stainless steel wire guard protects the propeller. The pitch controller can optionally be operated by the pre-programmed PLC system on with manual over-ride.

Propulsion Transmission System

An automatic clutch is fitted directly to the rear of the engine. The clutch automatically disengages the engine at idle speed to stop the propellers. This provides added safety for bystanders and also reduces shock loading on the transmission during engine starting and stopping. A toothed belt provides positive power transmission from the engine shaft to the propeller shaft. The propeller shaft is firmly supported on two self-aligning and sealed ball bearing units within the transmission housing.

Lift Fan

The lift fan is a mixed flow type for maximum efficiency and minimum noise. It is moulded from Carbon/Epoxy.

Lift Transmission

The lift fan is mounted to a hydraulic motor. The hydraulic motor is provided by oil from a pump mounted to the engine. The pump is of the variable displacement type and is controlled automatically to a pre-set speed which keeps the lift fans running at constant output independent of the engine speed. The pre-set speed may be easily varied at any time by the pilot for different operating modes. This is a unique system which is easily controlled and allows efficient use of available power by applying only what is necessary to meet lifting requirements and leaving all other available power for thrust. All hydraulic filtration and cooling is suitable for tropical (+40°C) to arctic (-35°C) operation in salt water and dusty conditions.

Skirt

The skirt is a fully pressurised tapered bag and finger system. The bag pressure is higher than the cushion pressure and is regulated by control orifices in the bag inner membrane. This system is well proven to be the most stable and dynamically efficient skirt system available for amphibious hovercraft today. The skirt is computer cut for consistent and exact fitting to the hull.

The skirt is manufactured from Urethane coated Nylon fabric. Urethane is extremely tough and provides considerably greater resistance to abrasion and tearing compared with other fabric types commonly used on other hovercraft. All joints are R.F. welded for exceptional strength. Urethanes have good low temperature flexibility (down to -35 °C) and are suitable for use in very cold areas. Colour is black.

Controls

All primary and most secondary controls are managed by a Programmable Logic Control (PLC) system. The system is based upon two Seimens 'S7' PLC's installed in parallel for complete redundancy. The system has a touch screen display that can be used to control all craft electrical and control functions and also to display a wide range of data from the various sensors located around the craft and navigation systems. Normally the controls are operated according to pre-programmed maps which can provide 'economy' and 'power' settings. 'Manual' control by-passes these maps. In the event of a total failure of both systems, all primary controls revert to 'Emergency mode' and actuate the control function directly, even with total power off to the PLC's.

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Joystick mounted to the right side of the helm seat. This joystick normally operated through the PLC system to provide co-ordinated control of the rudders and elevators. Additional controls are worked from the joystick such as windscreen wipers, windscreen washer, radio transmit etc.

The 'power and pitch control levers' are mounted to the left side of the helm seat. These controls are normally operated through the PLC system. Incorporated in the power lever is the lift system controller and an optional spot-light controller.

The PLC can operate in normal (automatic) mode where all controls are programmed, manual mode where the program is by-passed and in 'Emergency mode' where the control are actuated directly from the input regardless of the state of the PLC system.

Instrumentation

Interactive touch screen (HMI) displays the following...

Hydraulic System

Main Loop Pressure	0 – 220 Bar
Charge Pressure	1 to 5 Bar
Normal Temperature	45 °C to 85°C

Thrust Engine

Tachometer	0 – 3000 RPM
Oil Pressure	0 – 500 kPa (0 - 80 PSI)
Coolant Temperature	48 °C to 116 °C (120 F to 240 F)
Fuel Pressure	0 – 500 kPa (0 - 80 PSI)
Warning light	On low oil press or high engine temp.

Other Instrumentation

Fuel contents port side	Empty to Full
Fuel contents starboard side	Empty to Full
Volt Meter	0 – 18 Volts
Cab Bilge Pump	Indicator light
Engine Room Bilge Pump	Indicator light
Water alarm in engine room	Indicator light
Alternator	Charging indicator light
Compass	75 mm illuminated card

Electrical System

System voltage is nominally 12 volts DC. The normal voltage range is 10.5 volts to 14.6 volts. The engine has a 105-amp alternator.

Batteries

There are two batteries, each of 220 Ah capacity and fitted with a dual pole isolator switch. Normally the batteries are isolated and used individually. A parallel switch with voltage sensing auto dis-connect is fitted for emergency starting. Automatic battery charging controls are fitted for management of both batteries regardless of the isolator switch setting.

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Protection

Circuit breakers or fuses according to classification requirements protect all circuits. All electrical cable is marine type tinned copper multi-strand cable with V95°C (or better) Low Halogen insulation according to CE requirements. All terminations in exposed areas are crimped and covered with heat shrinking and hot-melt insulation for corrosion protection. Exposed cable runs are protected in conduits. Circuits are clearly marked with an engraved switch panel and a matching circuit diagram in the operating manual.

Lighting

All navigation lights are of 'Aquasignal' series 20 type and comply with IMO recommendations. In addition a flashing orange beacon is mounted atop the thrust duct according to the British CAA requirements for hovercraft.

The cabin lighting is provided by dimmable LED's. Beside the cabin door is a 15 Amp power outlet suitable for connecting a high-powered spotlight or other auxiliary device.

Fuel System

There is one fuel tank of approximately 180 litres constructed of welded aluminium and pressure tested according to class rules. All fuel piping (apart from short flexible elements near the engine) is of copper pipe. A safety shut off valve is mounted to the tank. A fuel pump is mounted to the engine. The fuel gauge sender is incorporated into the tank assembly. Preferred fuel type is regular automotive grade diesel.

Fire Safety

The thrust engine room 'hot zone' is fitted with a fixed CO₂ type smothering system that can be activated from outside the engine room. An additional portable CO₂ type extinguisher is recessed into the cockpit side. The engine room is protected in hot areas by metal heat shields. The stainless steel exhaust system is fitted with heat shields to reduce heat radiation and increase safety.

Lifting

There are four lifting attachment points protruding from the deck upper surface for easy connection by lifting shackles. Approximate lifting weight for the hovercraft with fuel and equipment and no additional payload is 2,500kg.

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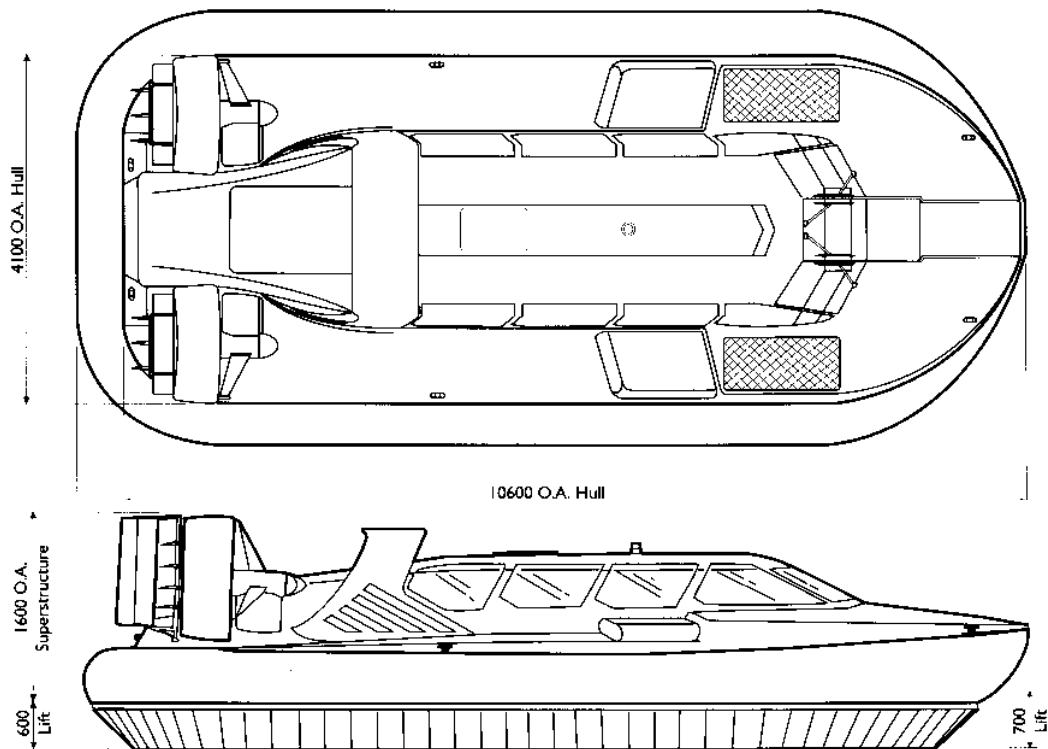
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Sister craft's representing the appearance of Pioneer Mk2-Hull number 311.

NB: The above specifications pertaining to performance are based on a properly trimmed and maintained craft with a competent operator. These specifications are subject to change as improvements are made and should be used as a guide only unless specifically annexed to a build contract and signed by all parties to that contract. Specifications may also be varied from time to time by agreement between the parties involved. This document is based upon pre-production specifications of April 2008.