

## AURORA AUSTRALIS

### Introduction

The Antarctic Division of the Commonwealth Government of Australia has operated in Antarctica for some 50 years predominantly supported by time chartering European Vessels to provide the necessary logistic and research vessels to fulfil their objectives. Throughout this period the Antarctic Division developed their particular desires for a Research and Supply Vessel and over the last two decades numerous projects were instigated to achieve this objective. The successful project for this acquisition commenced in 1986 and resulted in the finalisation of the tender process with an award of contract to P&O Polar Australia Ltd in December 1987 and the delivery of the then completed RSV AURORA AUSTRALIS from Carrington Slipways Pty Ltd on 30th March 1990.

### Vessel Design Role

The Vessel required to support the Australian Division's operations was required to fulfil the roles of:

- To operate independently in the Southern Ocean in the Southern Ocean for a minimum 180 day annual period.
- To be a stable research platform capable of performing:
  - Oceanographic Studies
  - Acoustic and Hydrographic surveys
  - Commercial Scale Trawling
  - Finer net sampling
  - Environment monitoring
- To transport expeditioners to and from Antarctic bases.
- To transport the supplies necessary to support the bases.
- To transport the fuel necessary to operate the bases.
- To be capable of loading/discharging dry/liquid cargoes independently in open roadsteads and undeveloped harbours.
- To be capable of supporting medium lift helicopters with hangar, heli deck, fuel and navigation aids.
- To be capable of long uninterrupted voyages with no shore support.

These diverse and at times conflicting design roles necessitated a detailed design development period and full evaluation of the various priorities and associated role design emphasis.

### Design Development

Whilst P&O Australia developed designs with four different internationally recognised designers the Wartsila Marine design was eventually selected and in conjunction with P&O Technical Services the design was developed as possible prior to the award of the contract and thereafter.

The design development included an extensive model tank testing program which studied ice breaking capability, seakeeping capability, maneuvering capability, water flow, hull resistance and propeller design.

In parallel to the development of the theoretical design, the general arrangement and systems required to fulfil the operational roles were developed. The final design necessitated the amalgamation of both the theoretical and operational objectives and requirements. Some examples of particular design decisions are the bow shape, construction materials and propulsion systems.

The bow design was required to be a highly effective ice breaking design whilst maintaining effective open sea capabilities. Whilst the ice breaking capability is essential for the successful independent operation in the Southern Ocean the actual time the high ice breaking capability is required is less than 10% of the 180 day operating period with the vast majority of the operations being undertaken in the weather and sea conditions of the Southern Ocean. The resulting design has proven to be a successful compromise.

The selection of the construction materials needed to consider the very high scantling strength requirements of the hull for ice breaking whilst maintaining a demanding dead weight requirement for the size of the vessel. The resulting design utilised a relatively high percentage of higher tensile steels together with specific matching of steel grades and sizes to the particular strength requirement of all sections of the vessel.

The development of the propulsion system included evaluation of direct diesel and diesel electric systems. Whilst the diesel electric option offered many advantages the additional capital and operating costs could not be justified, particularly in a public tender.

The resulting design is a highly sophisticated multi purpose vessel which has demonstrated its capability to perform the objective roles and is described as follows:-

## DESIGN DESCRIPTION

### Classification

Classified with Lloyds Register of Shipping as +100A1, LMC, UMS, DP(CM), 1A SUPER ICE BREAKER. Letter of compliance to Canadian Arctic Pollution Prevention Regulations for Class 2 with Class 3 hull strength fore and aft.

### Principal Data

Length overall	94.91 m
Length D.W.L	88.40 m
Breadth maximum waterline	20.30 m
Depth, MLD to 2nd deck	10.43 m
Draft, D.W.L.	7.65 m
Draft, L.W.L.	7.862 m
Dead weight	3,911 t
Engine output (1x5,500 Kw)	
(1x4,500 Kw)	10,000 Kw
Speed; maximum	16.8 kts
cruising	13.0 kts
Icebreaking	1.23 metres of first year 500 Kpa level ice at 2.5 kts.

## OPERATIONAL DESIGN CHARACTERISTICS

### Research Vessel

The design characteristics of the Vessel which enable it to perform the various research roles are:

A joystick controlled maneuvering system of one transverse bow thruster, two retractable azimuth stern thrusters, main propeller and rudder which will enable the vessel to be maneuvered accurately in confined waters and to maintain a position when undertaking operations.

The azimuth stern thrusters are designed to enable accurate slow speed operations with low waterborne noise levels.

An extensive research instrumentation system of sensors and data logging/processing computers primarily installed in a dedicated Instrument room.

A total of nine laboratories with dedicated (meteorology, oceanography, biomass) and general roles. A total of eight further laboratory containers can be carried and integrated to the vessel's systems.

A conference/library/word processing space adjacent to the instrument room and laboratories.

An aft control station where the essential ship control and navigational equipment are duplicated or slaved. Also installed in this space is the centralised remote control position for the trawling and research winch systems.

A comprehensive and extensive deck machinery system including a commercial scale trawl winch system and specialised instrument towing, deploying and retrieval systems.

Stowage and maintenance facilities for the research operations including workshops, net store, fish processing space and dedicated fish freezer.

#### SUPPLY VESSEL

The vessel is designed to undertake the various supply roles by incorporation of the following features:-

##### Expeditioners

Berths for 109 expeditioners in 2 single, 1 double, 31 triple and 3 quadruple berth cabins, all with private facilities.

Restaurant, galley, servery and provision spaces designed for the efficient support of the ship's total complement for a period of up to 90 days.

Recreation facilities including a quite recreation space, bar, video/music systems, gymnasium and sauna.

The design also incorporates a stabilising system to reduce the rolling amplitude of the vessel and thereby increase the comfort and efficiency of the ship's complement.

##### Supply Cargo

Design features for cargo supply include:

Cargo hold forward of 1700 cbm capacity designed for break bulk and/or containerised cargo.

Deck and hatch space forward designed for container and equipment stowage.

3 cranes of 25/31, 7/13 and 2 tonne SWL for cargo handling. The 25/31 tonne crane also incorporates a high speed 5 tonne hook for efficient cargo operations in open roadsteads.

2 forklifts of 5 and 2 tonne SWL for cargo transfer and handling.

### Supply Fuel

Design features for the efficient transportation and discharge of supply fuel include:

A total of 1 Mega litre of supply fuel tank capacity.

Manifolds both via side door amidships and on the forecastle.

### Helicopter Operations

Design features to support helicopter operations include:

A helicopter deck aft which is designed for the day and night operation of Sea hawk type medium lift aircraft.

A bulk aviation refuelling system of 120 cubic metre capacity.

A passage way to allow transfer via the ancillary crane and forklift of cargo from the hold to the helideck.

Aviation communication and navigational systems.

### Icebreaking

The icebreaking design features include:

Hull lines proven by tank testing.

High installed propulsion power with the power transmission system designed for shock loadings and incorporating alternative engine cooling systems.

Low friction hull coating.

Heeling system.

Satellite receiver for weather satellite for interpretation of sea ice coverage and vessel routing.

### Tender

This 10 metre tender craft is carried on board the AURORA AUSTRALIS and used for operations including:

Ferrying of expeditioners between the vessel and shore.

Inshore research operations including hydrographic, fisheries, bottom sampling and diving.

Landing of shore parties on remote locations.

Maneuvering of barges and other support operations during lightering operations.

Escorting of the Aurora Australis when approaching unchartered shorelines.

### Construction

The Commonwealth Government of Australia required that the vessel was constructed in an Australian shipyard. P&O Australia contracted Carrington Slipways Pty Ltd to build the vessel after full appraisal of competitive offers received.

The Ship Building contract was effectively entered into in late December 1987 with delivery scheduled for October 1989. The design of the vessel was undertaken by Wartsila Marine Contracting of Finland with all concept, general and detailed drawings being produced at their offices in Helsinki.

The remoteness of the designer from the shipyard resulted in difficulties in the timely production and implementation of the design and particularly in the resolution of issues on site.

Whilst the Owner endeavoured to maximise Australian content in the vessel the unavailability of the majority of equipment from Australian manufacturers required the selection and importation of the majority of machinery and equipment. The shell plating and bulb bar frames required for the construction of the vessel were also imported.

Maritime Technical Services, a subsidiary of P & O Australia Ltd undertook plan approval and onsite inspections on behalf of the Owners throughout the design and building schedule.

Carrington Slipways constructed the vessel utilising integrated block construction methods with final outfit being undertaken on the erected units. The first block was laid on 28th October 1988 and the vessel was launched on the 18th September 1989 with Mrs Hazel Hawke naming it "Aurora Australis".

As the vessels draft exceeded the available channel depth between the shipyard and the port of Newcastle flotation tanks were fitted to the vessel to facilitate this transit.

The commissioning and trials of the vessel successfully demonstrated the performance of the various equipment and systems and full compliance with the contracted capacities and performance criteria.

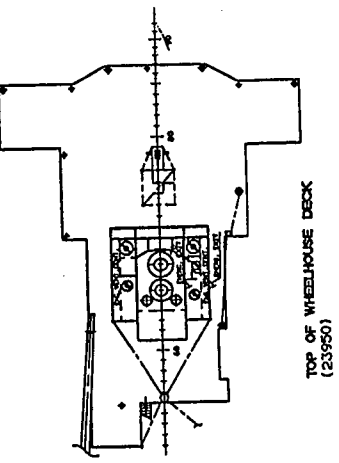
The Aurora Australis was accepted by the Owners on 30th March 1990 and concurrently commenced operations under charter to the Australian Antarctic Division.

#### Service Experience

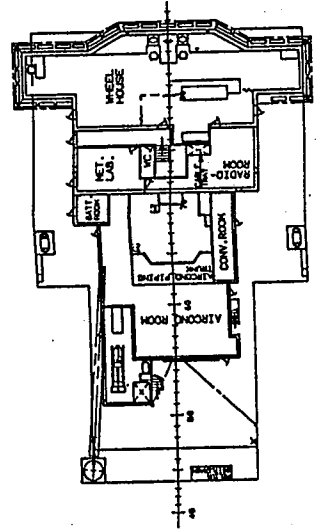
The vessel has now completed one winter research expedition in the Southern Ocean and a full summer season supporting the research and supply objectives of the Antarctic Division.

As anticipated with a specialised multi purpose vessel with a large scope of equipment and systems the initial period of operation was not without difficulties. The Aurora Australis however successfully fulfilled the charterers requirements throughout this period and the problems identified have been progressively rectified.

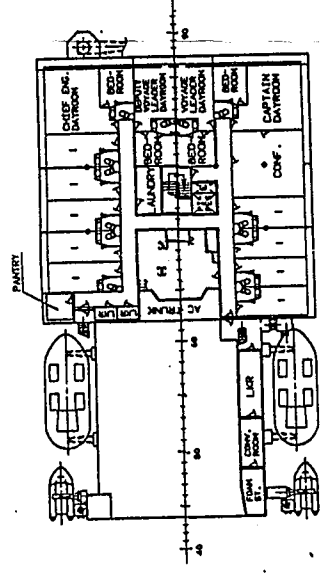
The Owners are satisfied that the design and construction of the Aurora Australis has resulted in a vessel which has, and will continue to provide a very effective platform for the Australian Antarctic Research and Supply Operations as well as other deployments.



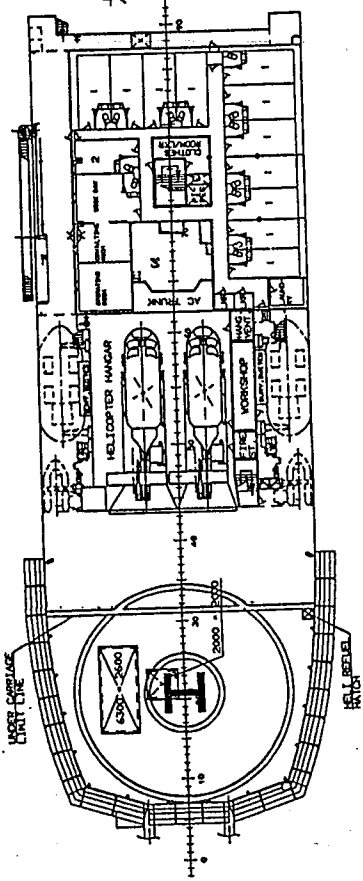
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(23950)



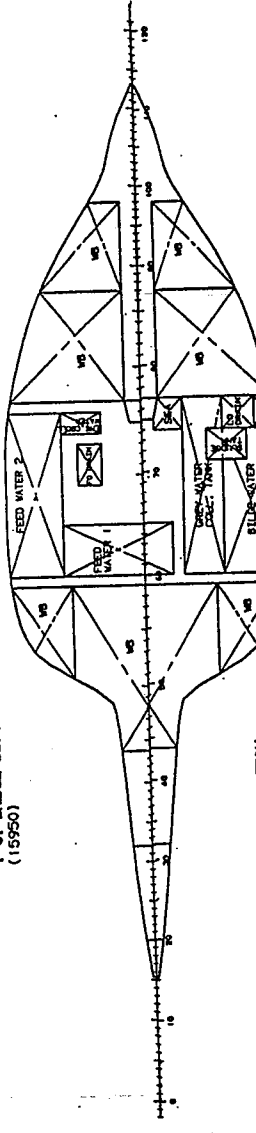
WHEELHOUSE DECK  
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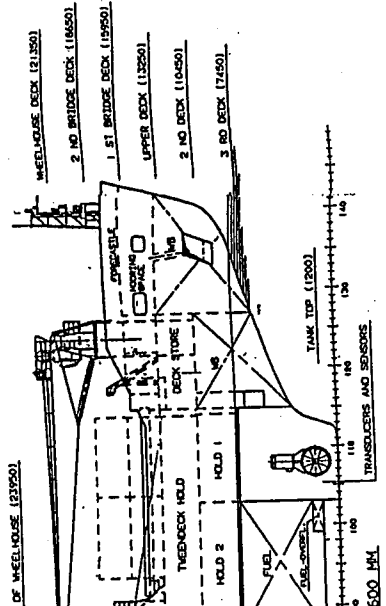
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(18650)



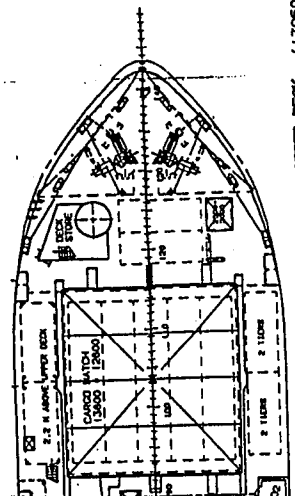
1 ST BRIDGE DECK  
(15950)



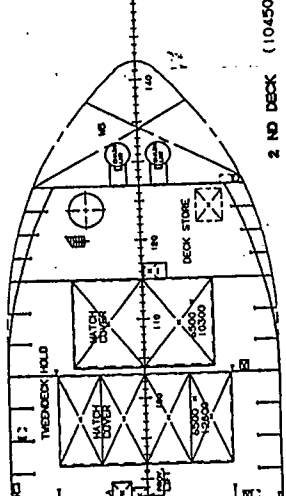
FORECASTLE DECK



OF WHEELHOUSE (23950)



UPPER DECK (13250)



2 NO DECK (10450)

