*International Hydrographic Review*, Monaco, LXIII (2), July 1986

# CSS "JOHN P. TULLY" A HYDROGRAPHIC AND GEOPHYSICAL RESEARCH VESSEL

by W.S. HUGGETT (*)

## THE SHIP

### Principal Particulars

| | |
|---|---|
| Length overall | 68.9 m |
| Length waterline | 62.0 m |
| Breadth moulded | 14.0 m |
| Draft | 4.5 m |
| Displacement — loaded | 2 100 tonnes |
| Shaft power | 3 000 HP |
| Shaft revs | 230 rpm |
| Trial speed | 13.6 knots |
| Endurance | 120 days |
| Range | 12,000 miles |
| Complement | |
| Officers | 9 |
| Crew | 16 |
| Hydrographers | 15 |
| Classification | Lloyd's 100 Al<br>Lloyd's Ice Class 1* LMC-UMS<br>Non-passenger, Home Trade I<br>Arctic type "A", Foreign-Going |

### Machinery

| | |
|---|---|
| Main propulsion | 2 Deutz model SBVM628 diesel engines<br>1150 KW 91564 HP @ 900 rpm |

(*) Canadian Hydrographic Service, Sidney, B.C., Canada.


FIG. 1. — CSS *John P. Tully*.

| | |
|---|---|
| Reduction gear | 1 Reintjes model DVA 335B with 3.918:1 ratio |
| Propeller | 1 KaMeWa controllable pitch four-bladed, diameter 2 500 mm turning in nozzle |
| Auxiliary power | 3 Caterpillar diesel-driven AC ship's service generators |
| | 1 Caterpillar diesel-driven AC emergency generator |
| Thrusters | 1 Omnithruster 500 HP horizontal bow thruster |
| | 1 Omnithruster 350 HP vertical stern thruster |

The *Tully* is designed primarily for hydrographic surveying on the west coast of Canada and in the Western Arctic. The secondary purpose of the vessel is to carry out geophysical surveys in the NE Pacific Ocean.

The design consultants for the vessel were Cleaver and Walkinshaw Ltd. of Vancouver, B.C., and the builders were Bel Aire Shipyards Ltd. of North Vancouver, B.C. Design talks began in 1981 and the vessel specifications were completed in 1983. The contract was placed with the shipyard in November of that

year and she was launched in October, 1984, and handed over to the Department of Fisheries and Oceans in May, 1985, after the successful completion of her acceptance trials. In July, the vessel sailed for the Beaufort Sea in the Western Arctic.

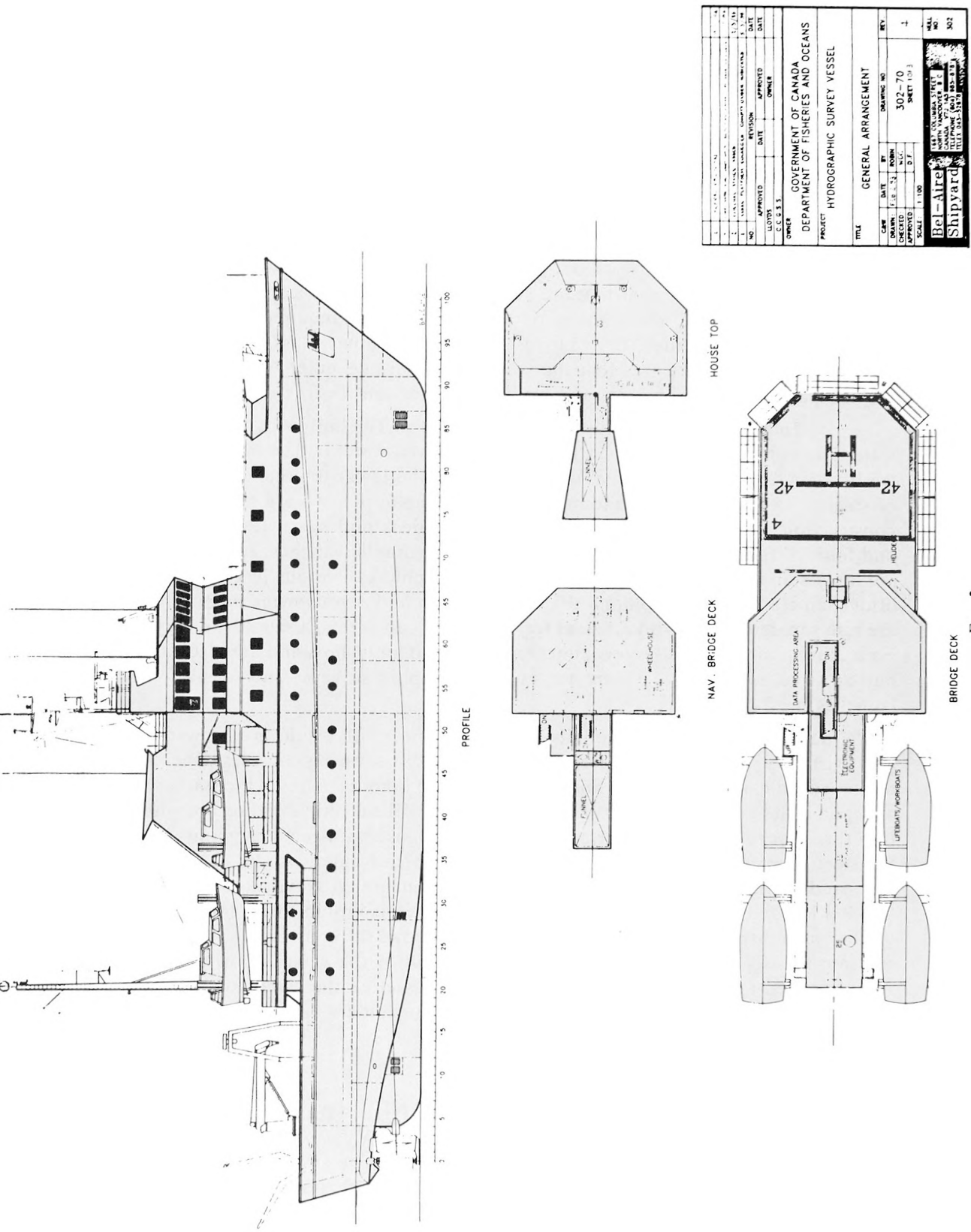
One of the main design characteristics to be resolved before conceptual drawings could take place was whether a helicopter should be carried aboard or not. It was decided that on the West Coast of Canada and in the Western Arctic hydrography would only have need for a helicopter landing-pad with no re-fuelling facilities. In other words, no helicopter would be permanently carried aboard the ship. This decision then made it possible to have a clear working deck aft by placing the helicopter-pad forward, and also dispensed with the complex fuelling system, fuel tanks and hangar that are all part of carrying a helicopter to sea. The next decision involved the amount of ice strengthening required. After much discussion it was decided that Lloyds ice strengthening Class 1* would be sufficient. The reasoning was that the vessel would always enter Arctic waters in the company of an ice-breaker, and would only work in ice-free waters.

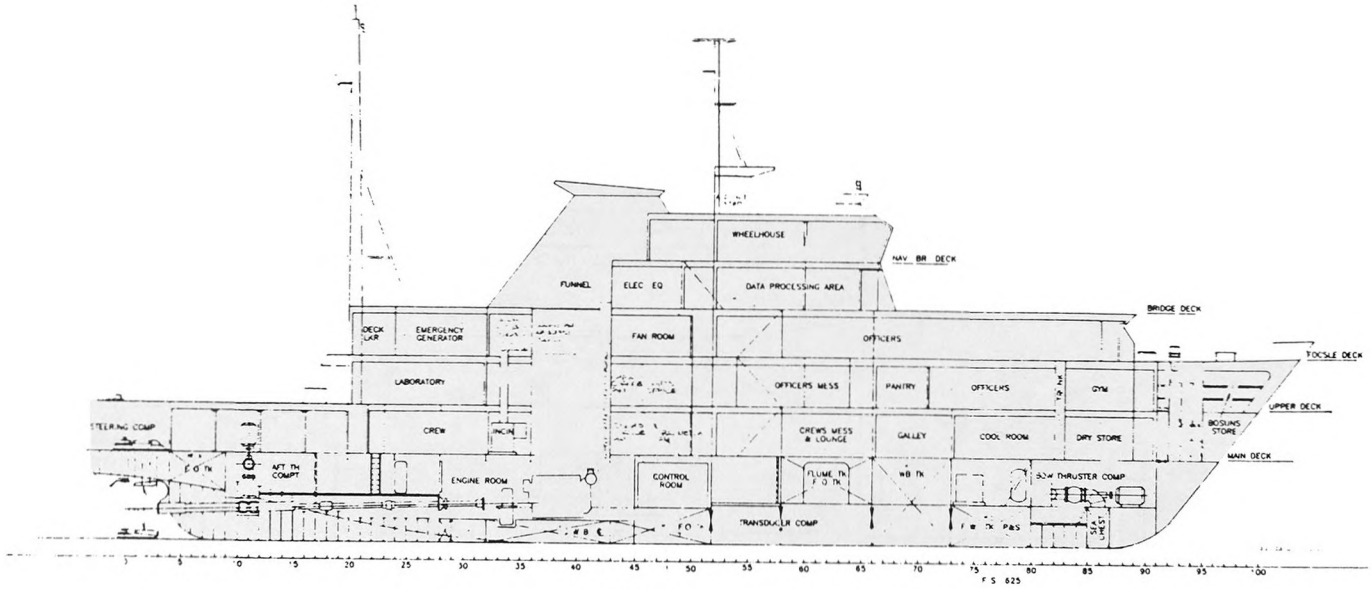
The *Tully* has a normal bow and a transom stern. The hull is divided into five watertight compartments with ten fuel oil tanks, seven water ballast tanks and two fresh water tanks. There are five decks, of which the lower three are constructed of steel — to the helicopter landing deck — and the upper two are of aluminium construction. The after deck is the main working deck and has a 10-tonne crane and four 'A' frames, provision for carrying seven hydraulic winches, and a 6-metre (20-foot) standard container. There is a hydrographic chartroom just below the bridge, an electronic workshop, a dry lab, a wet lab and a gravimeter room. There are also separate lounges and messes for the officers and crew, a sauna and a gym. Four aluminium 9-metre survey launches are carried amidships and are also fitted out to serve as lifeboats. When not on hydrographic surveys, only two of the launches need be carried.

The wheelhouse is exceptionally large (110 sq. m.) with windows all round for good visibility. There are three steering and ship manoeuvering consoles. One, the master console, is on the centre line forward and the other two are on the starboard and port sides at the after end of the wheelhouse. All the ship's radios are fitted into three racks across the after end of the wheelhouse with remotes going to all the steering consoles, chart table and forward starboard bulkhead. In addition to the standard navigation instruments (see list), an Integrated Navigational System (SN 81) is fitted that includes a digitizer to construct electronic charts for viewing on the video display which, at the same time, also shows the courses that have been fed into the SN 81. The SN 81 also gives a printout of the vessel's position and, when coupled to the auto-steering, will keep the vessel on the given courses. The vessel is also outfitted with two automatic direction finders and a citizen's band radio for search and rescue work.

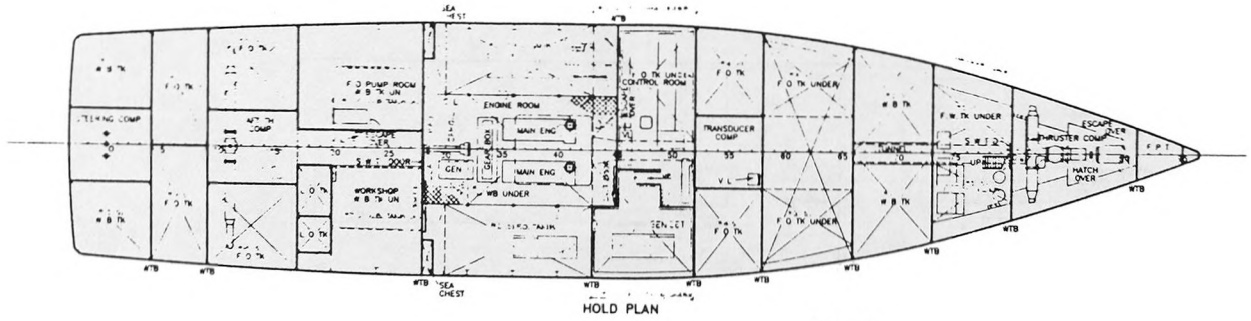
Radios fitted on the ship are:

| | | |
|---|---|---|
| I.T.T. | Model MSR8000 | 1 KW HF/SSB |
| Skanti | Model 52835 (2) | 250W HF/SSB |
| I.M.R. | Microtor | teletype system |
| Glenayre | Model GL1142 | teletype system |
| Sailor | Model RT145 (3) | VHF/FM |


PROFILE
HOUSE TOP
NAV. BRIDGE DECK
BRIDGE DECK
GOVERNMENT OF CANADA
DEPARTMENT OF FISHERIES AND OCEANS
PROJECT HYDROGRAPHIC SURVEY VESSEL
TITLE GENERAL ARRANGEMENT
DRAWING NO 302–70
SHEET 1 OF 3
Bel-Aire Shipyard
HULL NO. 302




INBOARD PROFILE




HOLD PLAN

FIG. 3.

| | | | | |
|---|---|---|---|---|
| 4 | | | | |
| 3 | | | | |
| 2 | | | | |
| 1 | | | | |
| NO. | REVISION | | | DATE |
| APPROVED | | DATE | APPROVED | DATE |
| LLOYDS | | | OWNER | |
| C C G S S | | | | |

OWNER: GOVERNMENT OF CANADA
DEPARTMENT OF FISHERIES AND OCEANS

PROJECT: HYDROGRAPHIC SURVEY VESSEL

TITLE: GENERAL ARRANGEMENT
INBOARD PROFILE & HOLD

| C&W | DATE | BY | DRAWING NO | REV |
|---|---|---|---|---|
| DRAWN | FEB '83 | ROBIN | 302-70 SHEET 2 OF 3 | 4 |
| CHECKED | | WB | | |
| APPROVED | - | DF | | |
| SCALE | 1:100 | | | |

Bel-Aire Shipyards
1607 COLUMBIA STREET
NORTH VANCOUVER B.C.
CANADA V7J 1A8
TELEPHONE (604) 983-8781
TELEX 04-352

HULL NO. 302

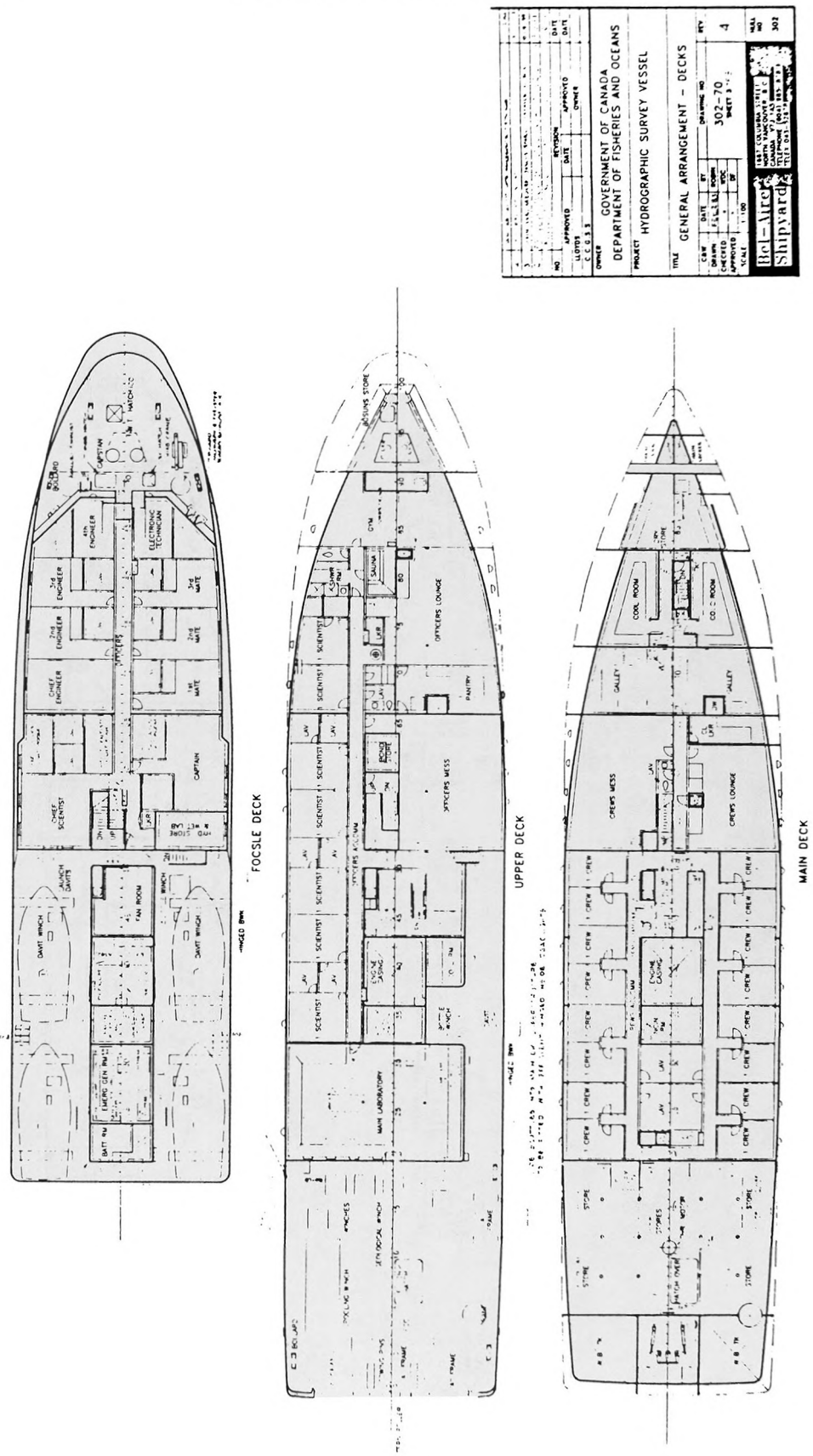

GOVERNMENT OF CANADA
DEPARTMENT OF FISHERIES AND OCEANS
HYDROGRAPHIC SURVEY VESSEL
GENERAL ARRANGEMENT – DECKS
302–70
Bel-Aire
Shipyards
FOCSLE DECK
UPPER DECK
MAIN DECK
CAPTAIN
CHIEF SCIENTIST
CHIEF ENGINEER
2nd ENGINEER
3rd ENGINEER
ELECTRONIC TECHNICIAN
OFFICERS LOUNGE
OFFICERS MESS
MAIN LABORATORY
CREWS MESS
CREWS LOUNGE
GALLEY
COOL ROOM
CO2 ROOM
GYM
SAUNA
SCIENTIST
CREW
STORE

FIG. 4.

| | | |
|---|---|---|
| ICOM | Model M80 | VHF/FM |
| Collins | Model 251 (2) | VHF/AM with AC beacon |
| Intech | Model 1511 | 2182 guard receiver. |

Navigational aids fitted on the ship are:

| | |
|---|---|
| JRC SN81 | Integrated Navigation System |
| JNA-104 | Omega |
| JNA-760 | Loran C |
| JLE-3200 | SatNav dual channel |
| Sperry | MK 227 gyros (2) |
| | MK 340 radars (2) X and S band |
| Furuno | C1-30 Doppler log |
| Taiyo Musen | TD-C338 MF/HF automatic direction finder |
| | TD-L1620 VHF automatic direction finder |
| Alden | Weatherfax |
| Raytheon | DSF6000 dual frequency echo sounder. |

The hydrographic chartroom is divided into two parts. The plotting tables and "command position" when the *Tully* is running sounding lines are on the starboard side, and the computer for data processing and the plotter are all on the port side. The "command" post has two echo sounders, one for shelf work on 24 and 100 kHz and one for deep work on 12 kHz. The racks for the positioning system are also here.

Just aft of the chartroom is the electronic workshop which, besides having a workbench and electronic rack for test equipment, also houses the electronics for the two gyro compasses, ship's telephone system and electric clock system. The wiring from the transducers for the echo sounders on the bridge and hydrographic chartroom all terminates here in a patch panel. The bridge and chartroom sounders are the same models — different frequencies — so that these two sounders are now interchangeable if one or the other should break down.

The wet lab is directly under the after end of the bridge house. The hydrographic winch (bottle) and chains are just forward of the launches and are situated under the deck to deckhead windows on the after starboard side of the bridge which give a clear view to the bridge of this bottle station and wire angle. The wet lab has non-skid tiling on the deck and stainless steel bulkheads, bench and sink. This lab, when the vessel is on hydrographic surveys, doubles as a storeroom for survey equipment with easy access to the launches.

On the same deck as the wet lab are the ship's officers' and the chief hydrographer's quarters. Between the launches are the emergency generator room, battery charging room, paint locker and emergency survival suit storage.

On the main deck are the officers' and hydrographers' messes and lounges, hydrographers' cabins, gym, sauna, ship's office and the main lab. The main lab is a large room (77 sq. m.) with benches around all four bulkheads, with the centre of the room fitted out to take electronic racks. There is a cable tray set into the deck head that allows the easy distribution of cable leads from the racks to the benches or through ports to the outside decks. These cable trays are part of the total cable tray system that runs from the mast to the transducer space with offshoots on each deck for the installation of temporary wiring or cable runs. The bench on the

starboard side of the lab is stainless steel with two sinks and a fume hood, and a desk on the forward bulkhead is fitted out to take the recorders of the 12 kHz and 16 × 3.5 kHz array of transducers. There is also a VDU from the SN 81 and a repeater from the doppler log. The main lab also has the master computer for the SAIL (*S*erail *A*scii *I*nterface *L*oop) loop that is fitted to the vessel. There are twenty outlets on the loop to which various sensors can be coupled and read sequentially at specific time intervals. Permanently coupled to the loop are air temperature, humidity, wind speed and direction, barometric pressure, sea temperature and conductivity, ship's course, speed and latitude and longitude. This information is displayed on VDUs in the wheelhouse, hydrographic chartroom and the two labs.

On the lowest deck are the stewards' storerooms, galley, crew's mess and lounge, and the crew's cabins. These cabins are single occupant as are all the crew's cabins on the vessel. Only the hydrographers' cabins have pullman berths to allow for double occupancy.

Just forward of the Machinery Control Room (MCR) is the transducer space where transducers for 24, 40, 100 and 200 kHz for the shallow sounders, the doppler log which is flush mounted with the hull, and two 12 kHz and 16 3.5 kHz transducers are wired. There are also two 18-inch rams that can protude 1 m below the hull and are wired for additional transducers, if required. These can be added or changed while the vessel is at sea. Two Salt Water pumps for the scientific SW loop in the labs are also in this space, and all piping connected with the SW loop is insulated to allow temperature measurements to be taken in the labs.

**Machinery Spaces**

Below the main deck forward is the bow thruster compartment, and aft of this is the forward machinery space which houses the domestic fresh water pumps, refrigeration, vacusan system and two reverse osmosis fresh water makers capable of making 14 tons of potable water a day.

Forward of the engine room is the Machinery Control Room which, besides housing the pneumatic engine controls by PMC, also has the ship's electrical switch boards. The engine room, being an Unmanned Machinery Space (UMS), is monitored by two TV cameras with the display on the control console. The machinery monitoring system is by NORTEK and monitors all machinery, tanks and alarm systems, displaying the information on a VDU. There is also a hard copy printout. Alongside the MCR is a separate room housing the harbour generator, a Caterpillar 3412 to a Stanford alternator. Two similar generating sets, also 450 kW, are in the engine room and an additional 800 kW Stanford alternator is mounted on the starboard engine to run, primarily, the bow and stern thrusters. Emergency power is supplied by a 140 kW Caterpillar 3306 and Stanford alternator.

The main propulsion is two Deutz 628 8 cylinder in-line engines coupled to a single shaft by a 3-1 reduction via a Reintjes gear box. The engines produce a total of 3100 HP at 900 rpm. Either or both engines can be used by engaging or disengaging Vulcan friction couplings. The propeller is a four-bladed skewed type CP Kamewa operating in a Koit nozzle.

The steering is by Wagner, a hydraulic ram system coupled to a triple rudder. This system gives very positive steering with very little helm.

Other features on the vessel include an incinerator for waste disposal, a FAST sewage treatment system, PACE oily water separator and a fuel monitoring system by Econometer.