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New research vessel – new epoch

Aranda is the first research vessel delivered from the Helsinki shipyard, but altogether 50 research vessels have been built by the Wärtsilä shipyard group. "This number reflects the customers' firm confidence in our shipbuilders, which has been built up over several decades. These ships are known and respected in marine research circles all over the world", comments **Mr Mikko Niini,** Sales Manager at the Helsinki shipyard.

All the knowhow accumulated in the construction of these 50 vessels has been brought to bear on the building of this new Finnish research ship, and the combination of knowhow and R & D work has created the first of a new generation of research vessels.

A new Aranda to replace the old one

The Finnish Marine Research Institute needed a new vessel, in order to develop Finnish marine research both in the Baltic and on the oceans. The Aranda will be used for physical, chemical and biological research. It will measure the salinity, temperature and flow of the water by taking samples of water, plankton, seafloor organisms and sediments. By means of chemical and biological analyses of these, the chemical and biological processes of the sea will be investigated and its state and changes in its status will be monitored.

The main area in which the Aranda will operate is the Baltic, but in November 1989 she will be setting course for the everlasting southern ice of Antarctica, to deliver research personnel to a permanent research station in this realm of the penguins, also in particular to study conditions during the Antarctic summer at Weddell Sea.

Finnish marine research has acquired a new tool. This vessel, called Aranda like her predecessor, has been delivered by the Helsinki shipyard of Wärtsilä Marine Industries. For the Finnish Institute of Marine Research the new Aranda is their first custom-built research vessel. The new Aranda represents the cutting edge of the Finnish research vessel construction, which has won respect all around the world. Wärtsilä is keen on developing this knowhow further and combining it with ice-breaker technology. The scientific equipment of the vessel, too, represents the peak of international standards, emphasizes Mr *Martti Jalkanen,* Project Manager at the Wärtsilä Helsinki shipyard.

The standard-bearer of a new generation

From the beginning, very high demands were set for the new vessel. She wasd to be the forerunner of a new generation, a pioneer who could serve as an effective vehicle for Finnish marine research far into the future and would represent the peak of international development in research vessels. The design of this vessel is the result of many years' co-operation between the shipyard's specialists and the Finnish Institute of Marine Research.

One important consideration in designing this ship efficiently, points out Mr Jalkanen, was to locate the research facilities as near the sampling areas as possible, in order to ensure speed and flexibility in operations. The research facilities have been concentrated in a special separate area at the vessel's stern, which also makes it easier to keep them clean; cleanliness is a matter of the utmost importance in research work. The most through possible elimination of the effect of impurities on research results is essential.

Research work demands careful concentration and a peaceful environment, and the builders have therefore tried to minimize the noise level on board the Aranda.

Owing to her advanced automation, the Aranda can be handled by a considerably smaller crew than the old ship, thus also significantly reducing the operating costs.

The research facilities – the heart of the Aranda

Most of the research facilities on board the Aranda have been concentrated on a special research deck: e.g. the sampling court, laboratories comprising 270 m² and the instrument workshop. Premises alone, how-

ever, are not enough. Effective research equipment and computer systems are needed, not to mention the scientists. Contrary to the usual practice, the shipyard has in this case supplied the entire scientific research equipment. The choice of equipment has been planned in collaboration with the Institute of Marine Research. Accommodation is provided for between 12 and 24 scientists on board.

The sampling court is a covered space, centrally situated between the CTD laboratory, where salinity, temperature and depth of water are measured, and the bottling laboratory. The court is a speciality of the Wärtsilä Shipyard Group. At the center of this sampling court is the moonpool running down through the bottom of the vessel. Through the moonpool the samplers can be lowered through the ship's hull directly into the sea. This is a great advantage, especially during stormy weather or in severe ice conditions. On the outer side of the sampling court, there is also a gate opening outwards and upwards, which can be used as a research davit; with this davit research equipment can be lowered into the sea.

Water samples can be taken either using the CTD-Rosette system which can be lowered into the sea with its own winch or with a pump winch or with series samplers using a hydrographic winch. The samples can easily be transferred to the bottling or wet laboratories nearby and then to other laboratories for investigation. The samples can be analyzed in the chemical, biological, nutrient, metal and isotope laboratories oand the data fed to computers linked to the research equipment. The laboratories have been designed in collaboration with the Institute of Marine Research in order to obtain the best possible result in the light of practical experience. In order to ensure quiet working conditions for the scientists, the sound insulation has been improved and level of vibration reduced by installing in all the laboratories a floating floor with mineral wool between two steel plates.

Attention has also been paid in the design of the laboratories to the possible future need to expand or reorganize the facilities. The ship also has space for three 20-foot containers on board; one of these houses, a fully-equipped ice research container supplied by the shipyard, which also provides two storage containers.

State-of-the-art research equipment

One of the most important pieces of research equipment is the CTD-Rosette system, i.e. a probe/bottling system, where water samples are taken into bottles from different depths, and the salinity, temperature and depth of the water measured by a probe.

The structure and strata of the sea bottom can be charted with the impressive Krupp Atlas research echo sounder system. The ship is also equipped with sediment echo sounders, a CTD laboratory echo sounder and a hydrocaustic sonar. There is a hightech Finnish Milos weather station made by Vaisala Oy; the actinometric arm belonging to this system is mounted in the bows enabling the weather station sensors to be operated in air as free of disturbance as possible.

For research work outside the Baltic, there is also a helicopter pad and storage for two helicopters on board the ship. Bearing in mind the small size of the ship – length 59.2 meters – it seems almost a miracle to store two helicopters inside the ship, but with careful construction the necessary space has been arranged.

For the maintenance of the scientific equipment, there is a separate instrumentation workshop on board the Aranda. Other fittings include a hold for large research equipment, a workshop, and cold storage facilities with sensitive temperature adjustment.

Computer for efficient scientific work

The scientific nature of the Aranda can also be seen in the amount of computing equipment aboard for scientific work. The central computer is a MicroVax II minicomputer and in the various laboratories there are altogether fifteen PC/AT microcomputers. These are used both for standard data processing routines, but also to control a wide range of research equipment. The central computer and micros are networked with an Ethernet system. In addition to the micros, there are also about ten terminals linked to the central computer, most of which are graphic terminals. A special feature in the wet laboratory is the splash quarded terminal.

The system also incorporates several plotters and printers including a laser printer for publishing scientific reports. The ship's computer equipment is controlled by a centralized data management system, the purpose of which is to collect observations and measurements.

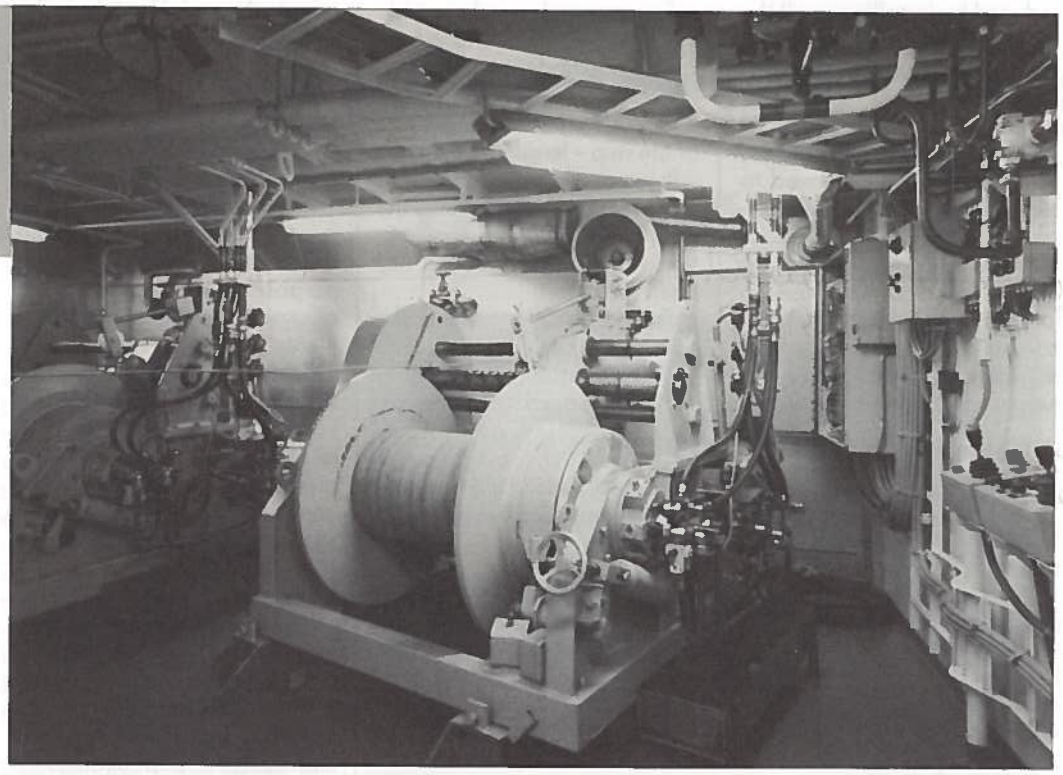
Some idea of the extent of the data management system can be qained from the number of software suppliers, of whom there are almost twenty, if the control programs for the research equipment and software tools for the scientists are included.

The integration of the software has been carried out by a new Finnish computer company called Promartec Oy, which enjoys an extensive background knowledge of shipbuilding.

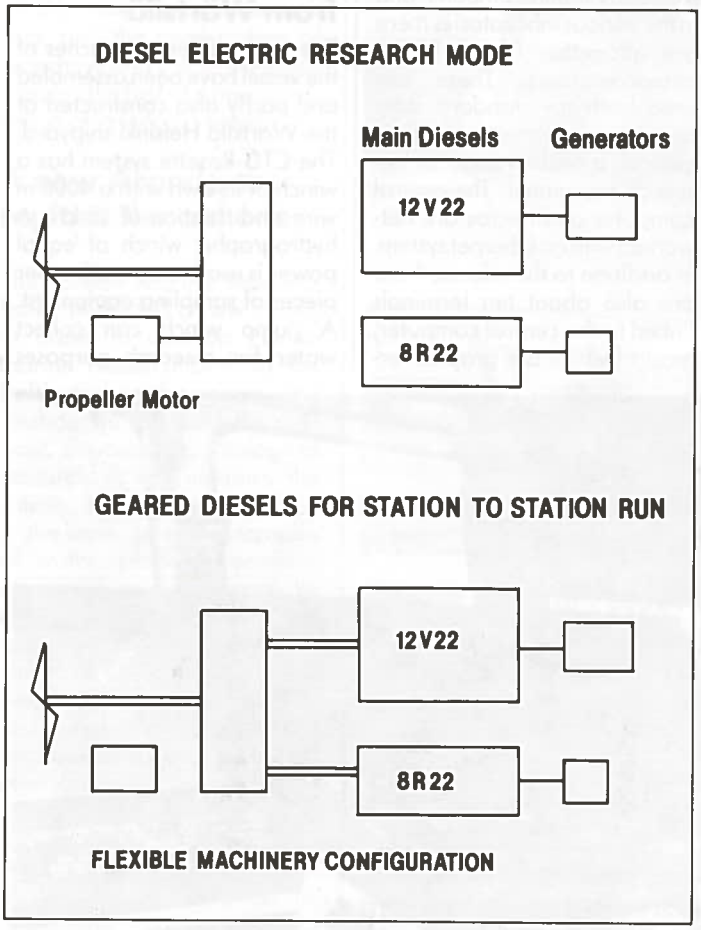
Specialist winches from Wärtsilä

The seven different winches of the vessel have been assembled and partly also constructed at the Wärtsilä Helsinki shipyard. The CTD-Rosette system has a winch of its own with a 4000 m wire and traction of 15 kN. A hydrographic winch of equal power is used to operate other pieces of sampling equipment. A pump winch can collect water for research purposes ▶

Control panels for dynamic positioning and integrated navigation computer.



▲ Two of the seven scientific winches on board.
▼ Alternate flexible machinery configuration.



when large quantities of water of up to one cubic metre are needed. The CTD-Rosette winch is below the sampling court, where the CTD-Rosette winch can be lowered into the sea through the side gate; the hydrographic winch and the pump winch are also placed inside the ship, in the winch hold below the sampling court.

Two small universal winches mounted at the side of the winch court on the boat deck, together with two L-davits, are used for sea bottom sampling etc. On the boat deck at the stern there is a large universal winch and a towing winch, which can be used for handling sampling nets towed behind the ship and also for lifting and lowering heavy instrument buoys. The traction of the towing winch is 50 kN, and that of the universal winch 15 kN. Both have 3000 m wire. For these two winches there is a large 100 kN A-davit in the stern. These winches can be operated from mobile control panels, which can be placed, wherever is most convenient.

Dual engine systems

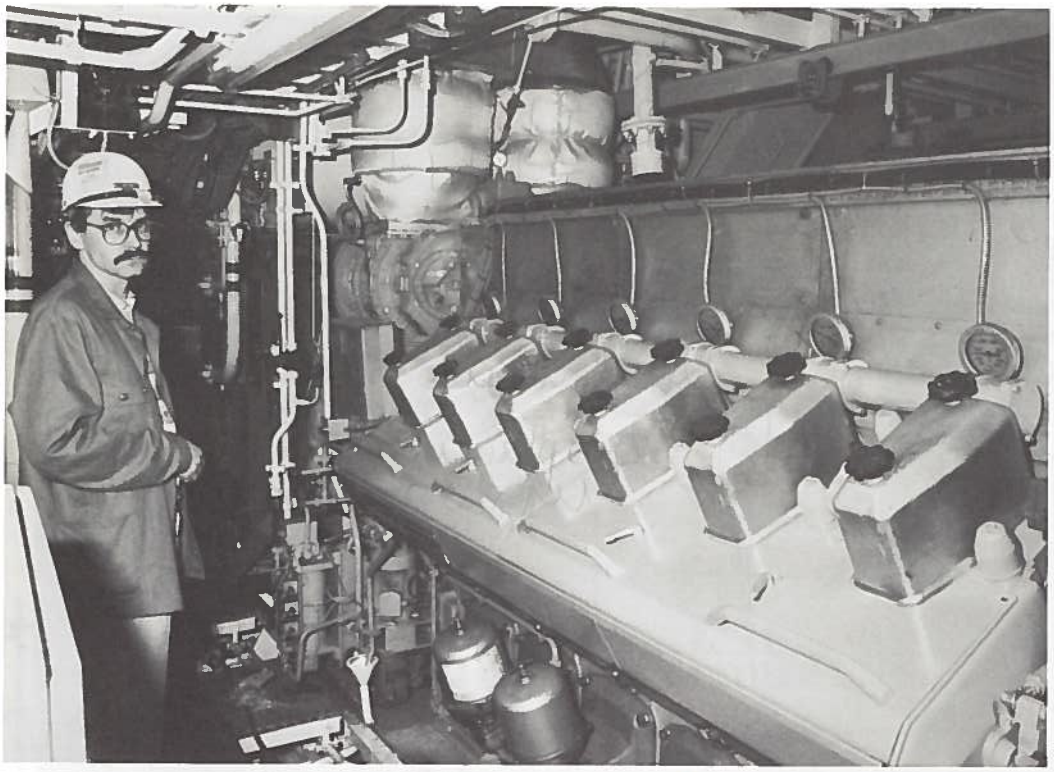
The Aranda has unusual machinery. The total thrust of the two main engines is 3000 kW. The engines are of two different types, the Wärtsilä Vasa 8R22 and 12V22, enabling the ship to operate in two different running modes. During voyages, the main engines can be connected direct to the reduction gear and a nozzle-mounted controllable-pitch propeller. Alternatively, in the research run mode, the main generators are connected to the free end of the diesels and the generator can supply a 1000 kW electric propeller engine, thus creating a diesel-electric drive.

The thrust of the engines is adequate for moving in ice conditions. The ship is constructed to conform with ice class 1 A Super. In order to improve the soundproofing and reduce vibrations, both diesels are mounted on suspension, and the main engine used during research runs is also totally contained within a soundproof housing.

A ship with outstanding maneuverability and position-finding

The Aranda is a beautifully maneuverable ship. During her sea trials her response to control attracted praise. In research work sensitivity and maneuverability are very important features; difficult experiments and sampling have to be performed as reliably as possible. The ship has a dynamic positioning system and several location methods. The exact position can be calculated with the navigation computer from various values, including co-ordinates, course, speed etc. For radio navigation there are the normal Decca, Loran C Omega and Syledis devices, supplemented by the GPS and NNSS satellite navigators. With the taut-wire system the ship can be held steady in a fixed location in relation to a weight lowered to the sea bottom. This weight can be lowered to depths of several hundred meters, and the ship's position in relation to the weight can be calculated from the angle of the wire.

The ship is also fitted with a bow thruster of 400 kW mounted in a tunnel, which be lowered and turned through 360°, enabling it to be used as a pushing propeller as well as a 150 kW stern thruster and an efficient Schilling rudder capable of turning ± 65° instead of the normal 35°.



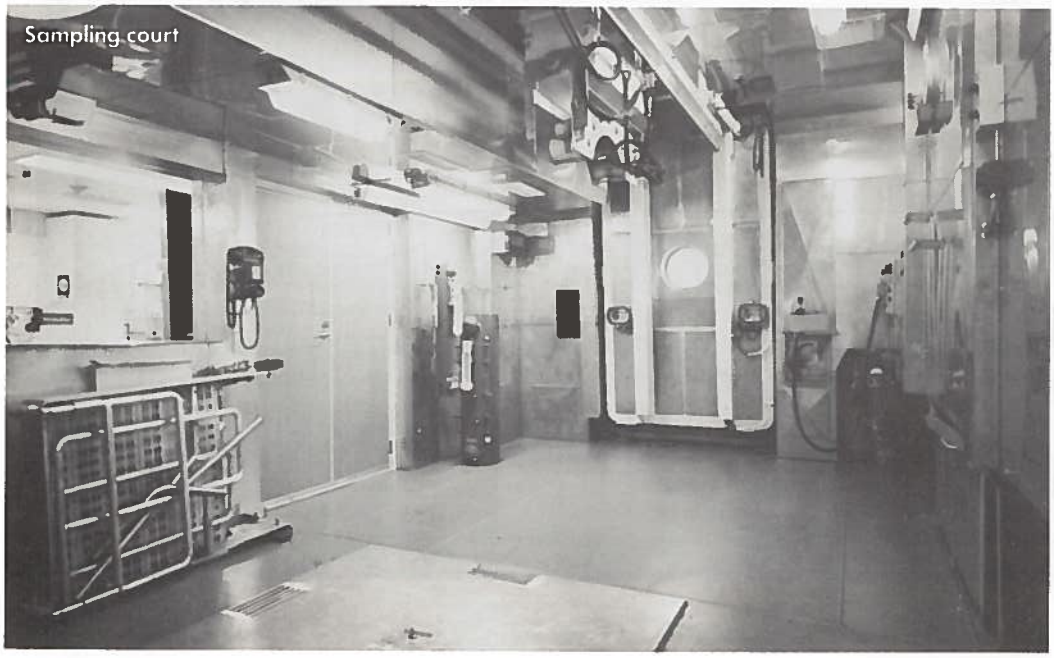
One of the two main diesels manufactured by Wärtsilä Vasa.

The wheelhouse is unsymmetrical in shape. From one wing there is an excellent view of the sampling areas at the stern and side. Behind the wheelhouse is the research bridge providing excellent visibility over all the main research areas, since the entire aft wall is made of glass. An extensive video network and TV monitors mounted all over the ship show what is happening and where.

Although the Aranda is bigger than her predecessor, she is still small and maneuverable: 59.2 m in length, 13.8 m in breadth and with a draught of 4.6 m. The tonnage is 1400 GRT, i.e. double that of the old Aranda.

Icebreaker/research vessels are the vessels of the future

In the future, suggests Mr Mikko Niini, marine research will increasingly be concerned with cold conditions, in ice-bound regions. Increasingly research vessels will need to be a combination of an icebreaker and a research vessel. In building vessels of this type Wärtsilä can combine the knowhow aquired in the construction of both research vessels and icebreakers. Wärtsilä has already made contracts for the design of such vessels: knowhow has been sold for a British Antarctic research vessel, and design and production control have also been ordered from Wärtsilä for an Australian research vessel to be built for research in Antarctica. Wärtsilä is also supplying components to the vessel. In addition to these new projects are currently being negotiated.



R/V ARANDA MAIN SUPPLIERS

Main engines: Wärtsilä Vasa 8 R 22, 12 V 22
Engine automation: Damatic
Main generators: ABB Strömberg
Harbour and emergency diesels: Valmet
Separators: Westfalia
Reduction gear: Lohman & Stolterfront
Propeller: J.W. Berg
Propeller motor: Babker
Side thrusters: Johan Dane
Integ. nav. system: Selesmar/AES (Vector)
Dynamic positioning: Robertson
Radars: Selesmar
Echo sounders: Krupp Atlas
Taut wire: Eiken
Gyro compass: Robertson
Loran C & GPS & Omega: Furuno
Common aerial: Philips
Central clock: Favag
Antiheeling system: M.G. Honkanen
Air conditions & ventilation: Vallox
Galley equipment: Kopal
Doors: Saajos
MOB-boat: Waterman
Workboat: Juha Snell
Davits: Schat-Davit
Life rafts: DSB
Rescue suits: Ursuit
Paints: Teknos Winter
Cranes: Hägglunds, Effer
Winches: Steen

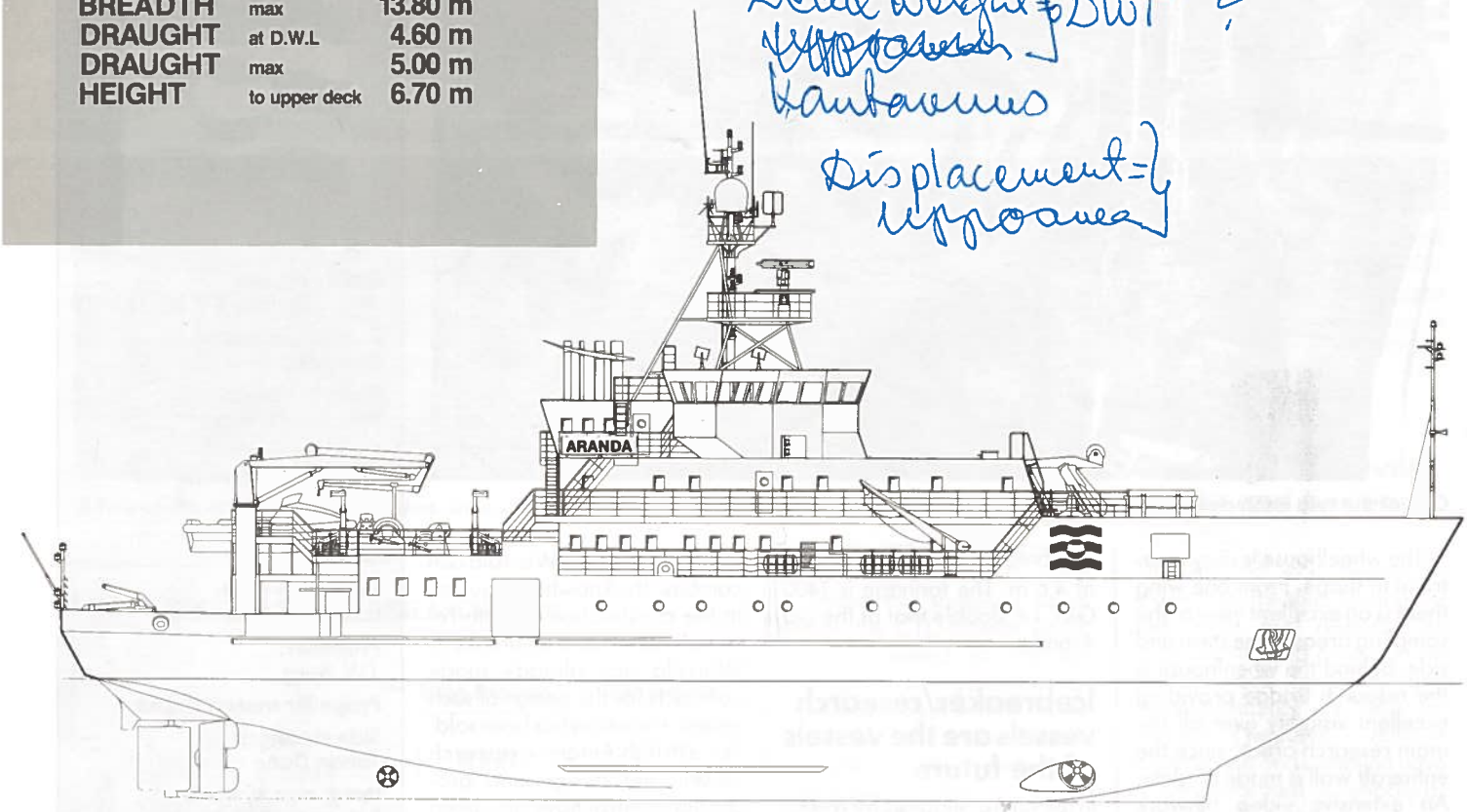
R/V ARANDA

LENGTH	over all	59.24 m
LENGTH	at D.W.L	52.20 m
BREADTH	max	13.80 m
DRAUGHT	at D.W.L	4.60 m
DRAUGHT	max	5.00 m
HEIGHT	to upper deck	6.70 m

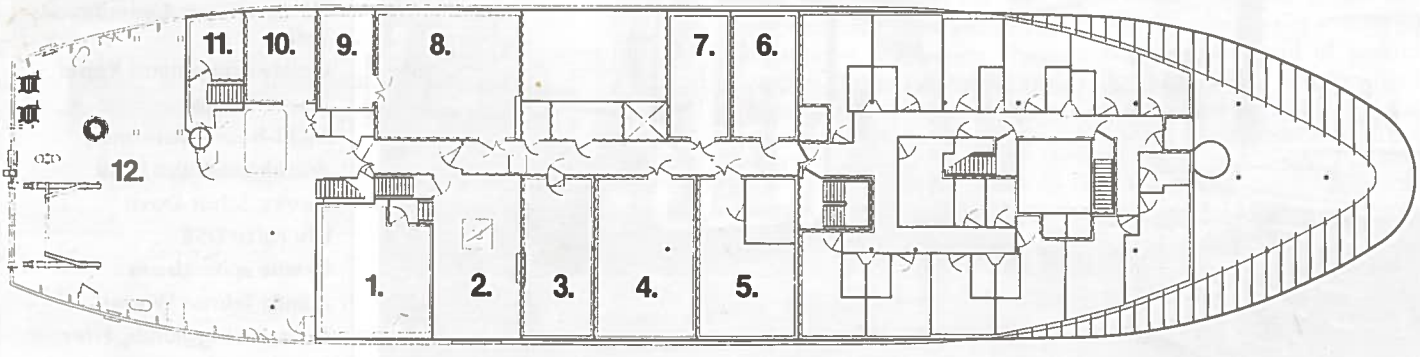
NRT 521 t
BRT } 1734 t
GRT }

Dead weight } DWT ?
Lastavarus

Displacement =
Uppgavas



1. CTD-LABORATORY
2. SAMPLING DECK
3. SAMPLE HANDLING
4. GENERAL CHEMICAL LABORATORY
5. COMPUTER ROOM
6. METAL LABORATORY
7. NUTRIENT LABORATORY
8. BIOLOGICAL LABORATORY
9. ISOTOPE LABORATORY
10. WET LABORATORY
11. INSTRUMENT WORKSHOP
12. RESEARCH DECK



General chemical laboratory

CTD laboratory

SAMPLING SYSTEMS