

## NEW SPANISH HYDROGRAPHIC SHIPS

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Two new survey ships have been delivered to the Spanish Navy, thus completing the second phase of the construction program of new hydrographic ships (see *I.H. Bulletin*, Feb. 1974).

Like their predecessors *Rigel* and *Antares*, they were built at the Empresa Nacional Bazan de Construcciones Navales Militares shipyard at San Fernando, Cadiz, and were commissioned for service in the first half of 1975. These two new ships, *Malaspina* and *Tofiño*, follow the tradition of taking the names of previous hydrographic ships, thus perpetuating the memory of two Spanish hydrographic officers.

These are multi-purpose ships, having been specially designed and constructed not only for hydrographic surveys, which are their main role, but also for the gathering and processing of oceanographic data. These ships form two operational units, each one making a pair with one of the previously constructed ships, *Rigel* and *Antares*, for whom they can provide logistic support.

All living and working spaces, and laboratories, are air-conditioned, and much attention has been given to fitting the ships with habitability standards for long periods at sea.

Their principal characteristics are :

Length overall .....	57.7 m
Beam .....	11.7 m
Maximum draught .....	3.6 m
Full load displacement .....	1 090 tonnes

Two MWM diesel motors totalling 2 800 HP are coupled to two variable pitch propellers, giving a maximum speed of 15.3 knots, with a range of 4 500 miles at 12 knots. The engines can be controlled from the wheelhouse and the starboard bridge wing. The ships have a supplementary propulsion system — a 150 HP Pleuger active rudder with fixed pitch propeller, fitted in the rudder blade, which is also controllable from the wheelhouse and the starboard bridge wing. This active rudder allows easy manoeuvring at very low speeds or stopped, for precision hydrographic and oceanographic operations. To further facilitate these operations a Flume passive stabilization system limits platform motion.

Electric power is provided by three main generators of 250 KVA and an emergency 30 KVA diesel, at 440 volts A.C., three phase, 60 Hz. There are also 220 & 115 V A.C. and 24 V D.C. supplies for various services.



FIG. 1. — *Malaspina* (A-31).



FIG. 2. — *Toñiño* (A-32).

The crew consists of 9 officers and 51 petty officers and men, plus two civilians; four berths are also provided for scientists embarked for various tasks.

Basic navigation equipment includes an Anschutz Standard IV gyro compass with 7 repeaters, a Sagen electromagnetic log with 4 repeaters, a Raytheon RM/1220/6x radar, a Koden KS-500 direction finder, an Omega Raytheon JRC-JLA-101 radionavigation system and a magnetic compass situated on the upper bridge with steering periscope. Normal meteorological instruments are provided, the anemometer having direction and speed repeaters. The external communications system has the normal HF and MF radios together with portable UHF radiotelephones, model PRC-41, which are used as much for hydrographic operations as for normal ship's traffic. For internal communications an intercom unit connects working spaces, laboratories and bridge; as well as the usual administrative broadcasts and telephones, an automatic 28-line exchange is fitted.

In designing these ships much attention has been paid to the maximum automation of hydrographic surveys, and thus a Magnavox navigation and data acquisition system has been fitted, based on an HP 2100 A computer with 16 K memory, which records, correlates and processes data from the following instruments :

For position : a radionavigation system Raydist DR-SM or alternatively a Satnav system MX 702 A (dual frequency) with interfaces for integrating speed and course data supplied by the gyro and log.

Soundings : data arrives via an EDIG-10 AZ/16017 digitizer from two switchable echo sounders Atlas Deso-10 AN/1021 with two ranges 1400 or 280 m and two frequencies — 210 kHz for bathymetry, and 33 kHz for sediment detection. All data together with date, time, course, speed and other parameters are presented visually on a small video screen and can also be printed out with a Texas Instruments high speed teleprinter. Similarly the track is recorded on a track plotter. All this data is finally recorded on magnetic tape for subsequent processing in the computer at the Hydrographic Institute.

Off-line from the automated system, the ships also have an Echograph 680 echo sounder (33 kHz) with a range of 4 500 m and a Kelvin Hughes MS-36 Strata Recorder (9.6 kHz) with range of 100 m. One of the ships has a side scan sonar with 500 m range each side; this sonar is portable and can thus be used on either of the ships.

All the automated system is installed at the rear of the bridge. On the upper deck there is a large chart room with four drawing tables, one being lit from below, and four tables for calculations and for the table-top computer Compuicorn 322 G Scientist. Both ships have a photographic laboratory with reproduction equipment for plans, enlargers, etc.

On the fore deck is space for carrying two jeeps or small trucks, with a two-ton crane for embarking/disembarking them and for buoy work. Each ship has two fibreglass hydrographic launches of 7 metres with a 6-cylinder Volvo Penta motor of 106 HP, giving a maximum speed of 12 knots and an endurance of 10 hours at 10 knots. These boats have an automatic navigation and data recording system similar to the ships, with

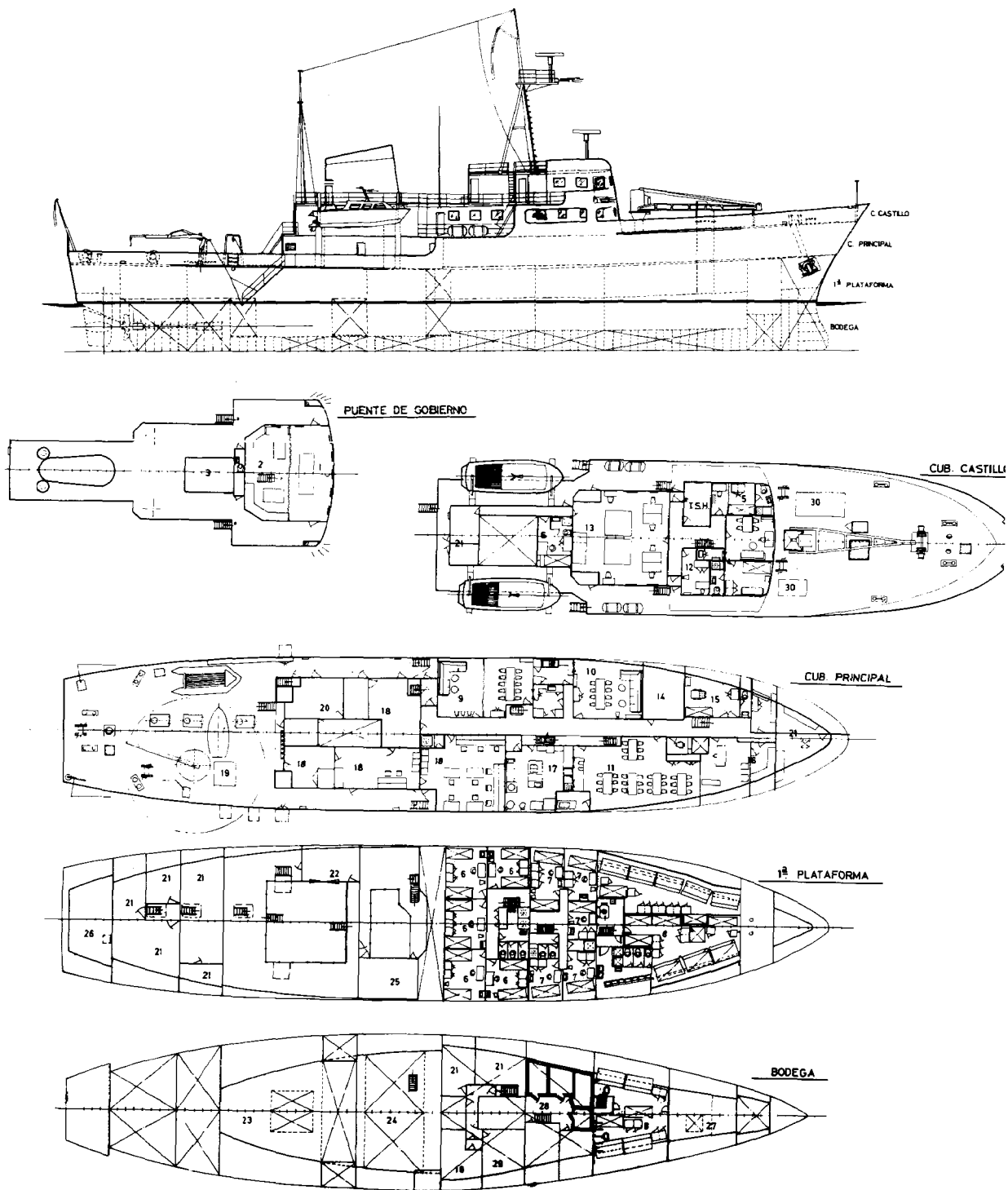


FIG. 3. — Elevation and plans.

- 1 : Wheelhouse. 2 : Charthouse. 3 : Air conditioning plant. 4 : Captain's quarters. 5 : 1st officers's cabin. 6 : Officers' cabins. 7 : Petty officers' cabins. 8 : Crew quarters. 9 : Officers' mess. 10 : Petty officers' mess. 11 : Crew's mess. 12 : Offices. 13 : Plotting room. 14 : Communications. 15 : Hospital. 16 : Laundry. 17 : Galley. 18 : Laboratories. 19 : Winch. 20 : Emergency winch. 21 : Store room. 22 : Machinery control room. 23 : Engineerroom. 24 : Generator room. 25 : Shipwright's shop. 26 : Steering gear. 27 : Hold. 28 : Cold room. 29 : Electronics workshop. 30 : Spaces for jeeps.

an HP 2100-A computer (4K memory), a Raydist DR-SM, and an Atlas DESO 10 sounder (210 and 100 kHz) with range 280 m. They also have an Edig-10 digitizer, video monitor screen and UHF radiotelephone.

The ships have a Burnett sonar (range 3 000 m) with retractable dome; the transducer can be tilted to 90°, and there are three modes of operation : active at 55 kHz, passive at 8 to 45 kHz and interrogative at 55 kHz.



FIG. 4. — Inside the wheelhouse.

The installations and oceanographic instruments of these ships are designed for the acquisition and processing of very large quantities of oceanographic data. They have three laboratories with a total area of 80 m<sup>2</sup>, each supplied with 220 and 115 V A.C. and 25 V D.C. All laboratories have a compressed air supply, and the chemical laboratory has butane gas. In the chemical and wet laboratories there are taps for hot and cold fresh water and sea water; the electronics laboratory has course and speed repeaters. These laboratories are situated towards the stern, and open onto each other for the easiest possible supervision of instruments and equipment. Next to the laboratory there is a small compartment with a refrigerator giving temperatures of + 10° to - 15° for the preservation of water and sediment samples which cannot be analysed immediately. Here also is space for the power packs for the seismic instruments, sparker or similar.

A space has been provided for a gravimeter in the part of the ship least affected by acceleration.

The oceanographic instrumentation includes, in addition to standard chemical equipment, a Technicon automatic system for the analysis of micro-nutrients, a spectrophotometer, a pH-meter, an induction salinometer, a thermosalinograph for continuous measurements of surface salinity and temperature, an XBT bathythermograph, and standard shallow, medium and deep bathythermographs.

A Geometrics proton magnetometer can, like the side scan sonar, be used on either ship. The data from the magnetometer can be integrated into the ship's automatic system and recorded on magnetic tape for later processing.



FIG. 5. — *Malaspina*. One of the laboratories.

One of the ships has an AMF Transponder acoustic navigation system with four channels, a bathysonde for continuous deep measurements of salinity, temperature, sound velocity and conductivity of sea water, a set of Niskin bottles and the usual Nansen reversing bottles, pingers and corers, as well as mooring buoys for currentmeters with 3 MHz transmitters for relocation.

Among the stern deck equipment for handling these instruments, the ships have a 20 HP electro-hydraulic winch with seven-conductor slip rings and interchangeable drums for cables of 4 and 6 mm with a 7 000 m cable capacity, as well as for 3 000 m of six-conductor electric cable. A 3 HP portable electric winch with interchangeable drums is fitted for handling the magnetometer and side scan sonar, and a 3 HP electric winch for the bathythermographs and light sediment corers, as well as various davits and a 1-ton telescopic crane. There is also a Zodiac inflatable dinghy with outboard motor and a 4 m plastic dinghy.

On delivery to the Navy, the *Malaspina* and *Tofiño* went through a work-up followed by operational trials. The state of efficiency of the ships was checked as well as the correct operation of their instruments, in order to prove that the systems were fit for operation and maintenance as designed and installed.

Following the trials, the ships ran sounding lines in an area recently surveyed by classical methods, so that the new techniques and methods could be compared with the former ones. Both units are now deployed in their working areas.

(Translated from the Spanish).