International Hydrographic Review, Monaco, LXIII (1), January 1986

HSwMS "JOHAN NORDENANKAR" A SWEDISH HYDROGRAPHIC SURVEY SHIP

by Lt. Cdr. Ulf DYBERG, Royal Swedish Navy (*)

HSwMS *Johan Nordenankar* was built for the Swedish Hydrographic Department and specially adapted to the Swedish hydrographic survey method — the parallel-sounding method — which consists of a lead ship operating with eight or less satellite boats in a line abreast combing formation. Data from the echo sounders aboard the boats are transmitted to printers on the lead ship by a microwave link. A special radiosignal measures a given distance and feeds it back for control. The position can be maintained by different electronic positioning systems. While operating in surveying the lead ship is maintained on a predetermined track by a computer controlled steering system. The whole surveying process is supervised by a microcomputer.

The ship was delivered by Falkenberg Shipyard, Sweden, in July 1980. It was designed by the shipyard in close co-operation with the Hydrographic Department.

Main characteristics

Displacement	2,200 tons
Length o.a	73 m
Length b.p.	64 m
Breadth	14 m
Draught	4 m

Main machinery

The main machinery consists of two Hedemora V16A/12 engines, each one developing 1,760 bhp. These engines drive a single shaft through a Reintjes twin-input, single-output reduction gear. The propeller, a KaMeWa controllable

(*) c/o Sjökartedirektören, Sjöfartsverket, 601 78 Norrköping, Sweden.

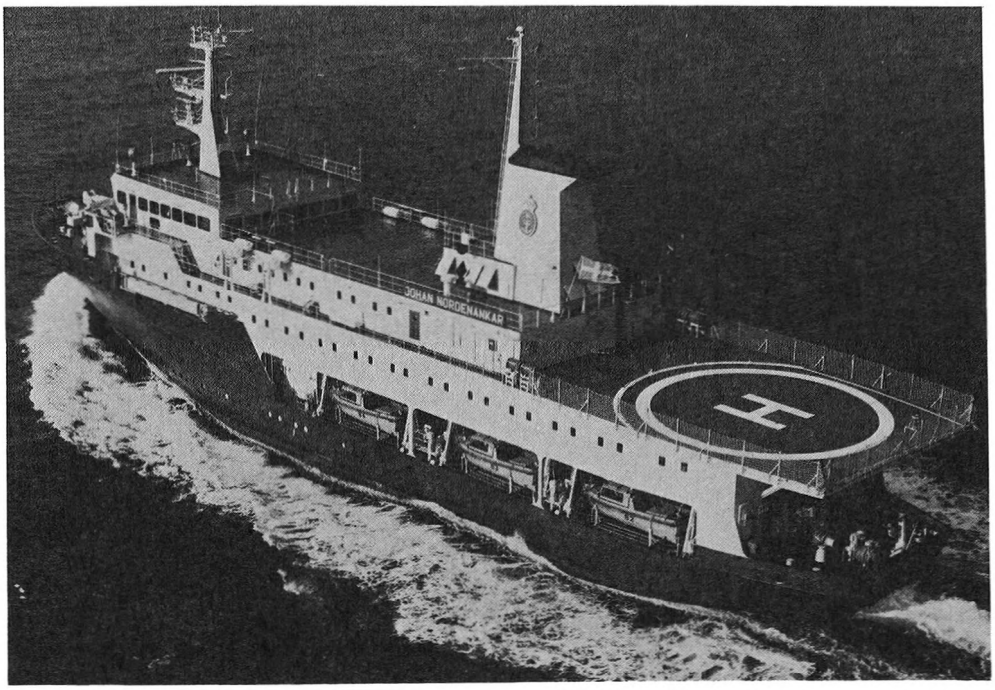


FIG. 1. — HSwMS *Johan Nordenankar*

pitch propeller, is highly-skewed and placed in a fixed nozzle. The machinery is arranged for operation with an unmanned engine control room. The ship's speed with both engines is of 15.5 knots and with one engine 12.5 knots.

Auxiliary machinery

The ship has three auxiliary engines, type Hedemora V8A/10, each one developing 780 bhp. In addition, it is equipped with an emergency generator set, type Scania V8 DS 14.

Bow thruster

The bow thruster, a White Gill type TA40, is driven by an electric motor via a fluid coupling. In the hull on each bow, below the waterline, there are seawater intakes and in the bottom of the hull there is a gap with a rotatable deflector. By operating the bow thruster the bow can be moved in any direction. The bow thruster alone is capable of giving the ship a speed of about 5 knots.

Steering system

The steering control systems are developed by the Danish company, EMRI Ap S, and consist of :

- an analog servo system for steering gear;
- an electronic main steering system on the bridge;
- an autopilot;
- a track Control System for survey operations;
- a rate of turn indicator system;
- a rudder indicator system.

The steering gear, made by A/S Cylinderservice, Norway, controls a flap rudder of Becker KSR type. The steering system gives the ship very good manœuvrability at any speed. When operating in track steering it is possible to reduce track error to about 1 m. The diameter of full-speed turning is slightly less than 150 m.

Safety

The ship has a two-compartment buoyancy standard which means that the ship is divided into several watertight compartments. Two compartments can be damaged and filled up with water without risking the stability of the ship. Some of the waterlight bulkheads are fitted with hydraulically operated watertight doors. These doors are remote controlled from the bridge.

There is a high standard of fire protection. For example, most of the materials used in the accommodation spaces are flameproof. The integrity of every space in the ship is controlled by the fire alarm system. Certain spaces, for example the engine control room, the radio room, the bridge, etc., have A60 insulation.

Navigation equipment

The ship is fitted with the following navigation equipment :

- Gyro compass, Anschütz standard 4;
- Raytheon 10 cm and 3 cm radars connected to one Raycas indicator and one TM indicator via an interswitch unit;
- Raytheon dual axis doppler log type DSN-450;
- Decca Navigator Mk 21;
- Satellite Navigator, Magnavox MX 4102;
- Radio Director Finder, Ramantenn G 82.

Hydrographic survey equipment

For hydrographic surveying purposes the ship is equipped with :

- Positioning system, Syledis (Sercel);
- Positioning system, Mini-Ranger (Motorola);
- Positioning system, Sea-Fix (Decca);
- Echosounders, Atlas DESO 20 S;
- Digitizers (Objecta);
- Positioning computer, Databoard 4680 (SATTCO);
- Micro-wave links (SATT) (to transfer depth information from satellite boats to the control ship);
- Distance-keeping equipment with feedback (to position the satellite boats);
- Sea level gauge with radio connection to the ship (Objecta);
- Data-logging system (Objecta).

Survey motorboats

The *Johan Nordenankar* has nine survey motorboats, eight of which are used simultaneously as satellite boats in the parallel-sounding system.

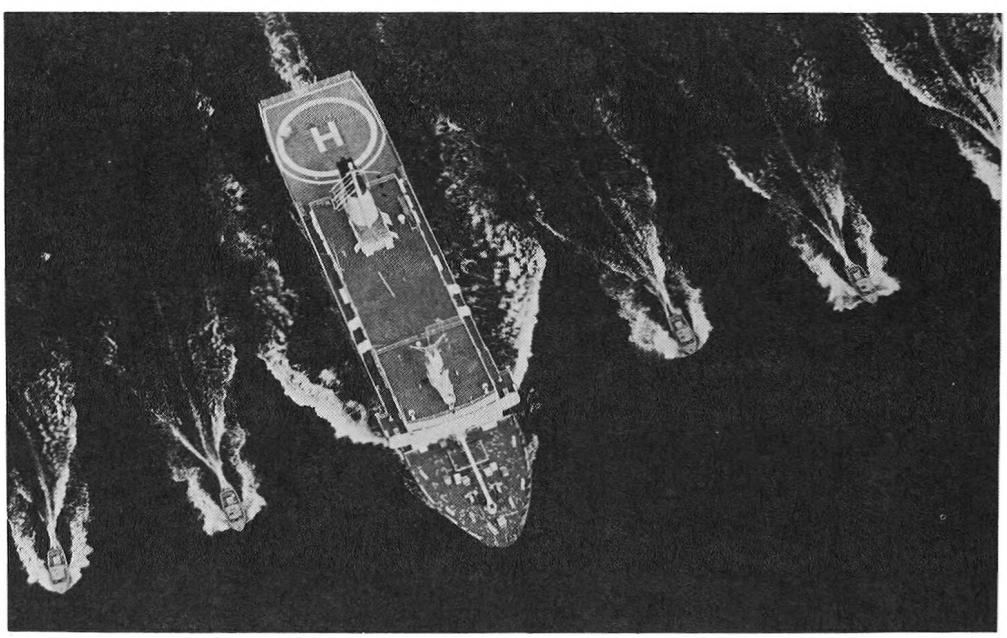


FIG. 2. — Parallel sounding

Characteristics :

length o.a.	6.70 m
breadth	2.42 m
draught	0.75 m
speed	15 kn

The survey boats, which are specially designed for the *Johan Nordenankar* have semi-planing hulls. The boats are powered by diesel engines, Volvo Penta TMD 40. The propellers and rudders are of conventional type.

Their equipment includes :

- transmitter and receiver unit for the echo-sounder (the recorder is on board the control ship);
- distance-keeping equipment with steering-indicator;
- micro-wave link;
- VHF.

Each boat is manned by one rating. The boat handling systems on board the *Johan Nordenankar* include specially designed hydraulic davits and two overhead travelling hoists for boat transfer. All boats are fitted with quick-acting safety hooks operated by the coxswain from the cabin.

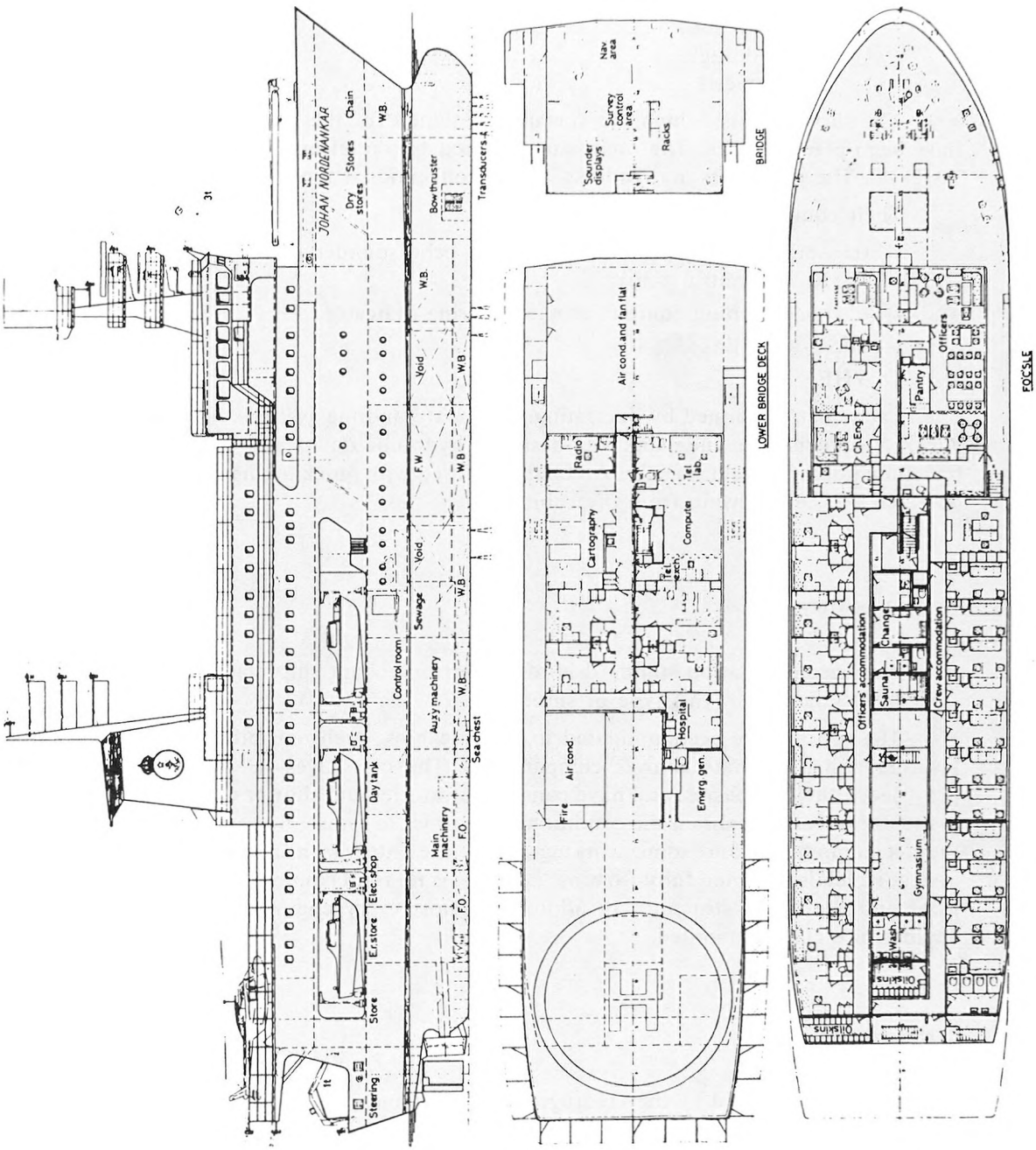
Accommodation standard

The accommodation standard is of modern merchant ship class, which is a very high standard for this type of ship.

The officers are accommodated in single cabins, each one provided with a lavatory and a separate shower compartment. The crew lives in double cabins provided with wash-basins, and have common lavatories and shower compartments at their disposal. The ship is air-conditioned. In order to reduce noise and vibration the accommodation and some working spaces are fitted with an elastic flooring system which is mounted fully-floating, i.e. there is no rigid connection between the floor and the ship's structure. In addition, almost every engine, even the main engines, are elastic mounted.

Crew

The ship is owned by the Hydrographic Department but it is manned by the Navy. The crew consists of 15 officers and 48 able seamen. The commanding officer, the first lieutenant and five of the officers are surveying officers. Some of the latter are often under training. The *Johan Nordenankar* as well as the other Swedish survey vessels has a double crew. One crew works for a fortnight while the other is off duty.


JOHAN NORDENANKAR
Dry stores
Stores
Chain
W.B.
Bowthruster
Transducers
Void
F.W.
Sewage
Control room
Aux'y machinery
Main machinery
Sea chest
Daytank
Elec shop
E/store
Store
Steering
F.O.
Sounder displays
Survey control area
Nav area
Racks
BRIDGE
Air cond and fan flat
Radio
Cartography
Tel lab
Computer
Tel tech
Air cond
Fire
Hospital
Emerg gen.
LOWER BRIDGE DECK
Officers
Ch Eng
Pantry
Officers accommodation
Change
Sauna
Crew accommodation
Gymnasium
Wash
Oilskins
FO'CSLE

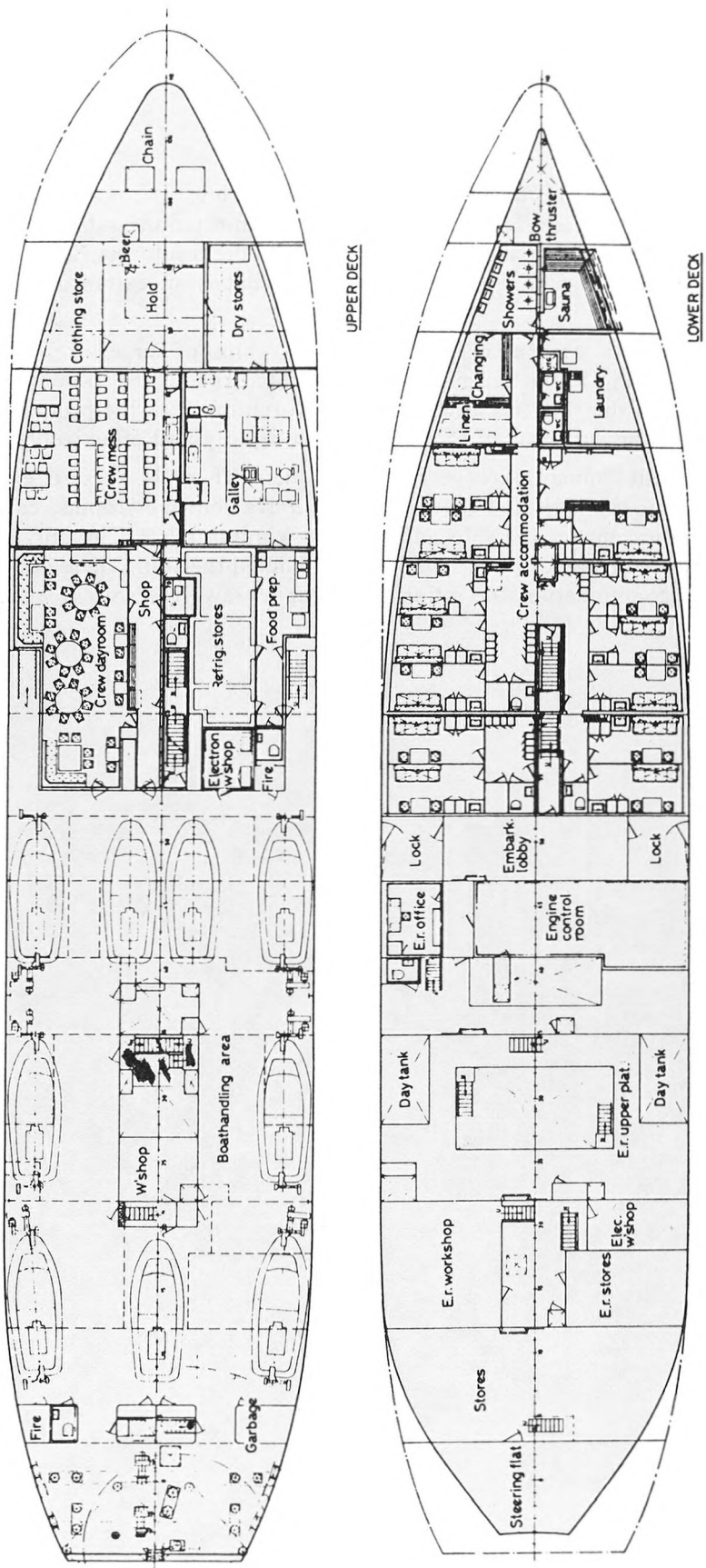


FIG. 3. — General arrangement of the *Johan Nordenankar*

Experience

HSwMS *Johan Nordenankar* has been working for the Hydrographic Department for five years. She has fulfilled our expectations satisfactorily. The production of survey data has increased and in 1983 the result was 72,878 surveyed kilometers plus many other small tasks. For us, that is an extraordinarily good result.

This ship can, compared with our former ships of large size, operate in rougher weather and has better manœuvrability. Thanks to close co-operation with helicopters, since the ship has a helicopter platform, many of the problems which earlier delayed the surveys can today be solved rapidly and effectively.

The facilities aboard are very well planned. There is a good ergonomic disposal all over the ship and that, added to convenient messrooms, cabins and hygienic facilities, makes the ship an attractive working place. The only thing we regret is our greedy way of thinking when we planned the ship. There should have been more accommodation for ratings in order to raise the ship's capacity still further.