

SURVEY SHIP *CARL FR. GAUSS* TWELVE YEARS OF SERVICE

by Captain Dr.-Ing. Siegfried SCHIFFNER (*)

INTRODUCTION

The survey ship *Carl Fr. Gauss* was built for the Hydrographic Service of the German Democratic Republic (GDR) by the nationally owned shipyard VEB Peenewerft Wolgast. It was launched in 1975 and, in 1976, was commissioned by the Chief of the Hydrographic Service of the GDR. Since this time, it has been in active service and has been mainly engaged in surveying areas of the Baltic Sea: the Mecklenburg Bay and the Arcona Sea. The ship is named after the well-known German mathematician and surveyor Carl Friedrich GAUSS (1777-1855).

THE SHIP'S EQUIPMENT

For economical reasons, a mine-sweeper design was chosen and modified by the shipyard in close co-operation with the Hydrographic Service and especially adapted to hydrographic needs. Its main characteristics are shown in table 1.

The German Democratic Republic has a relatively short coastline, but the continental shelf and the fishery zone comprise about 12 000 square kilometres, with complicated oceanographic conditions, requiring frequent hydrographic surveys. In Wismar Bay, behind the Darss/Zingst peninsula and around the islands of Ruegen and Usedom, there are extensive shallow waters with many narrow channels and, last but not least, more than 120 ports, harbours and landing stages can be found in these waters. Consequently, the ship is equipped with a survey launch — named *Gauss I* —, a survey boat and a motor propelled rubber inflatable. Both positioning and sounding operations are based on electronic systems.

(*) Head of the Hydrographic Section in the Hydrographic Service of the German Democratic Republic, c/o Seehydrographischer Dienst der DDR, Dierkower Damm 45, Rostock 40, DDR — 2540.

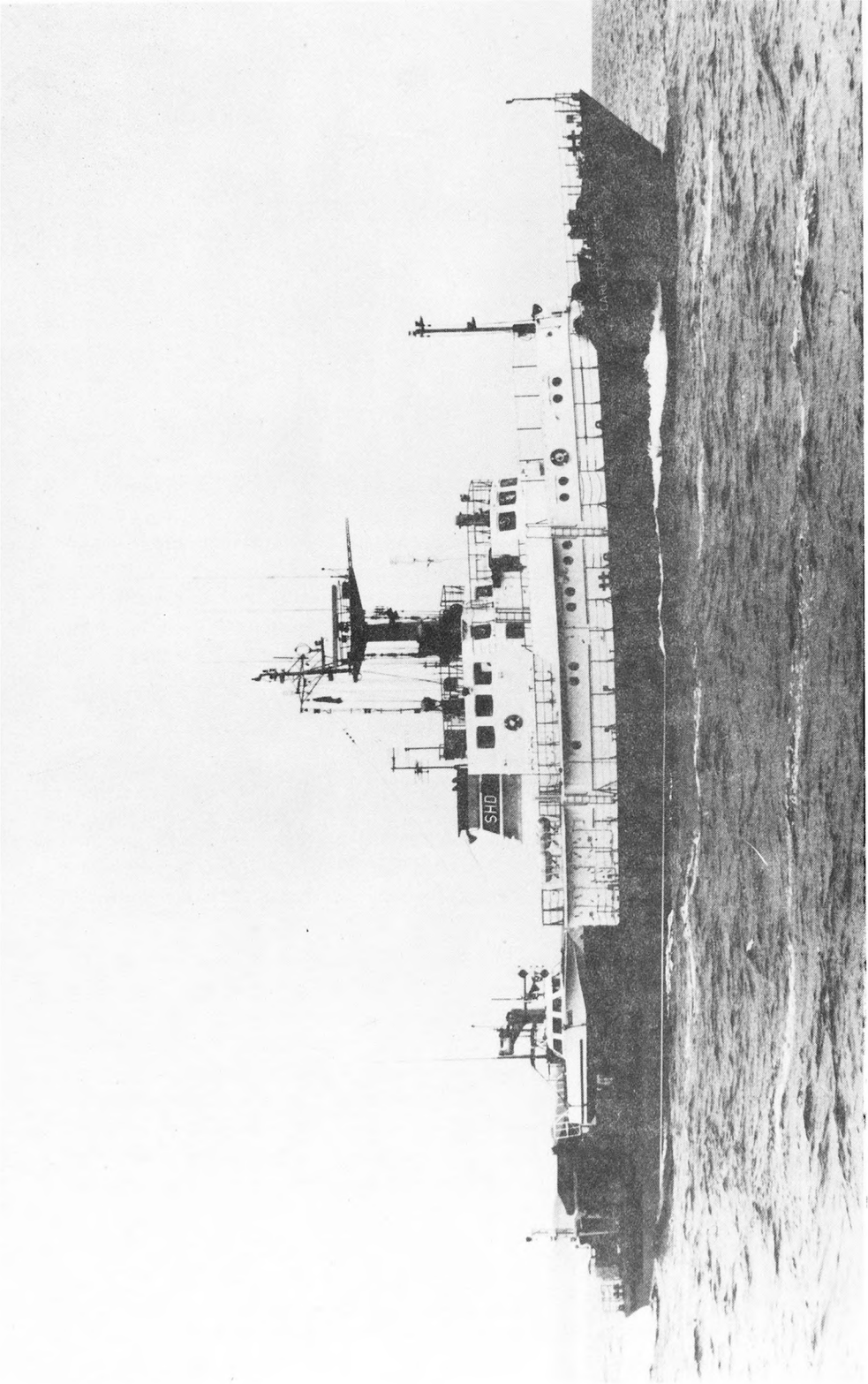


FIG. 1. — GDR Survey Ship Carl Fr. Gauss.

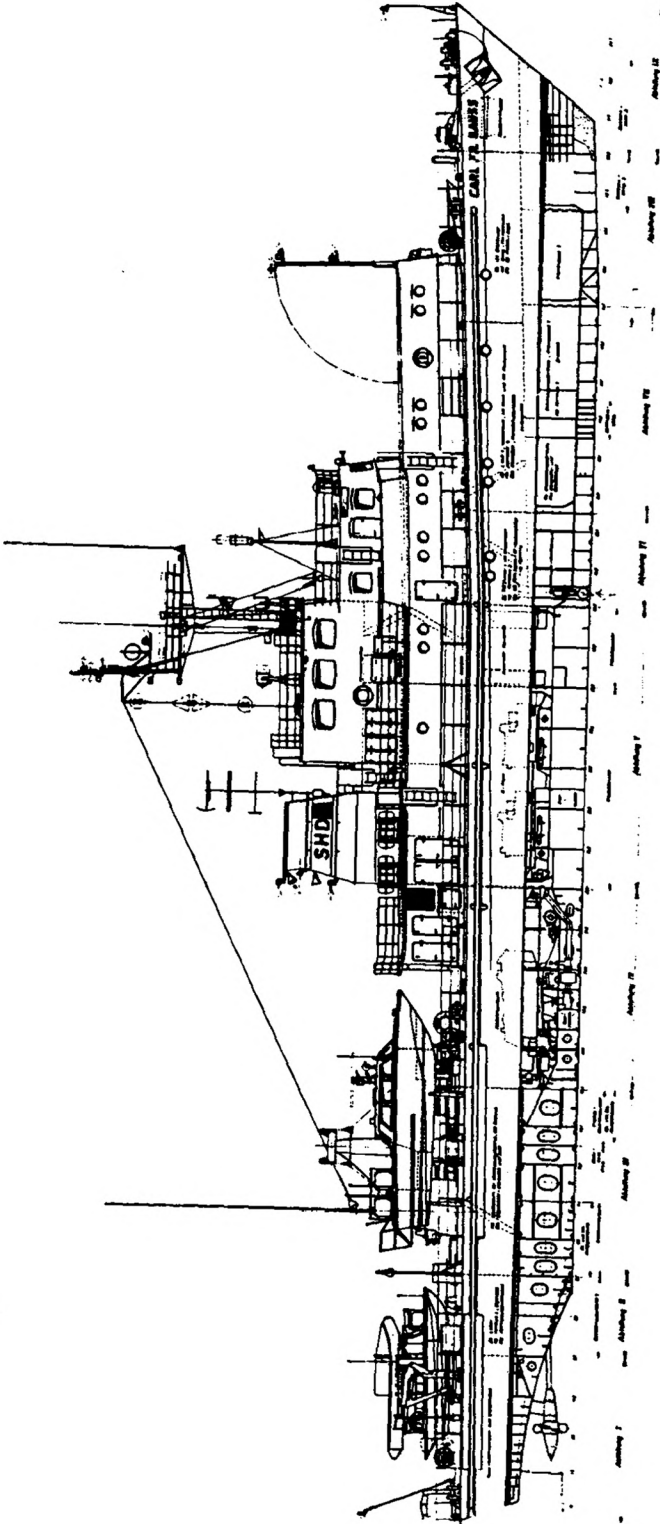


FIG. 2. — Side-elevation of the Carl Fr. Gauss.

TABLE 1

Main characteristics of *Carl Fr. Gauss*

Displacement	445 tons
Length overall	56.7 m
Length between perpendiculars	53.0 m
Breadth	7.2 m
Draught	2.3 m
Shaft horsepower	2 × 2 500 HP
Speed	19 knots
Crew	22 (8 officers, 14 crew)

The whole surveying process is supervised by the computer (PDP 11/05) for the data acquisition system Autocarta S. The electronic equipment of the survey ship *Carl Fr. Gauss* is shown in table 2.

TABLE 2

Electronic equipment of *Carl Fr. Gauss*

System	Ship	Launch	Boat
Decca Navigator Mk 21	1		
Hi-Fix-6 shore station	4		
Hi-Fix-6 receiver	1	1	
Autocarta S	1	1	
RALOG 20			1
DESO 10/AN 1021	1	1	1
EDIG 10/Az 6017	2	1	1

In the accommodation, the captain and the first surveying officer occupy single cabins and the other officers and the seamen live in double cabins. In order to reduce noise and vibration, the main and auxiliary engines are rubber mounted, and the accommodation and the survey room are constructed with acoustic sound dampening.

SURVEYING PROCESS

The survey ship *Carl Fr. Gauss* is fitted with an echo ranging device for wreck searching but is not yet equipped with sweep equipment. Therefore, the electronic survey system has to solve its task in a traditional manner and has to consider the strong correlation of the scale (1:M) of the survey plot, the accuracy (dRMS in metres) in positioning and the interval (D in metres) between the survey lines, according to the GDR Hydrographic Service's survey standards as shown in



FIG. 3.— The Survey Launch *Gauss I*.
 Length overall: 9.85 m; Breadth overall: 3.20 m; v_{\max} : 26 knots; v_{surv} : 8 knots.

table 3. Moreover, the scale of the survey plot has to be at least twice the scale of the planned navigational chart.

TABLE 3

Correlation of the surveying map's scale, the accuracy in positioning and the interval between the survey lines

1 : M	dRMS in m	D in m
1 : 1 000	1	10
1 : 5 000	5	50
1 : 10 000	10	100
1 : 25 000	25	250
1 : 50 000	50	500

By means of the electronic survey system, the surveyor fulfills three steps in the surveying process: the pre-survey preparations, the data acquisition and the post-survey processing. During the pre-survey preparations, the survey officer enters into the computer basic data such as geodetic datum, projection system, coordinates of the shore stations, limits of the survey area, start and end of the

survey lines and so on. This input programme has to be operated interactively with the computer. That is, the computer guides the survey officer from step to step in order to reduce the possibility of errors in this process. As a result of these preparations, the planned survey lines are plotted in consideration of the above mentioned correlation.

After these preparations, the second step may be started: the data acquisition on the planned survey lines. The ship's track is plotted and compared with the pre-plotted survey lines. The deviation from the pre-plotted lines will be calculated and indicated both on the bridge and in the chartroom and used to correct the ship's course. In parallel with the positioning, each sounding is put into the computer, controlled and edited. As a function of the scale of the survey plot, the positioning data and the sounding data are connected and stored by means of a magnetic tape. At the end of each working day or at other suitable times, the post-survey processing may be done. In this process, the raw survey data is recomputed and reduced, with sea level and pattern corrections. As a result, the surveying map will finally be printed out and the data tape may be stored in the record office.

CONCLUSIONS

The survey ship *Carl Fr. Gauss* equipped with a launch, boats and associated electronic equipment, provides a proven solution for the GDR's conditions. All kinds of hydrographic work can be carried out, from hydrographic surveys in the open sea to control surveying in harbours. For oceanographic surveys, the ship is equipped with a Lerok winch. By means of this electronic device, the surveyor is freed from much routine work and is now able to concentrate his attention on tasks requiring his competence and his decision. The present shortage of a sweep system will be remedied in future.