

HYDROGRAPHY AT HAMBURG POLYTECHNIC

by Peter ANDREE (*)

1. INTRODUCTION

The worldwide challenge on hydrography in the seventies, documented by large scale and complex hydrographic surveys, as well as the endeavour of the community of nations for a new global Law of the Sea, led in 1977, among other matters, to a new definition of the term 'Hydrography' by a UN Expert Group:

'Hydrography may be defined as the science of measuring and depicting those parameters necessary to describe the precise nature of the seabed, its geographical relationship to the landmass, and the characteristics and dynamics of the sea.'

An international working group (International Advisory Board), consisting of four members each of the *Fédération Internationale des Géomètres (FIG)* and the *International Hydrographic Organization (IHO)*, formulated, in 1978, the *Standards of Competence for Hydrographic Surveyors*.

At that time, hydrographic services in Germany had already existed for 117 years. However, there had never been any training in hydrography in Germany. Engineers active in the field of hydrography had to acquire their knowledge and ability by studying two subjects, nautical science and survey engineering, as well as through training 'on-the-job'.

These difficulties, among others, led to a lack of competitiveness of German companies in international hydrographic projects. For this reason, the author took the initiative on the occasion of the 'Deutscher Geodätentag 1979' (Conference of German Geodesists) in Hamburg at the AK 'Hydrographische Vermessungen' of the DVW (German Society of Surveyors) to propose a training programme in hydrography. The German Society of Surveyors' (DVW) board of directors passed a unanimous resolution in February 1981: all appropriate universities in the Federal Republic of Germany were advised to establish a course of studies for hydrography. The Hamburg Polytechnic took up this recommendation immediately.

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2. THE FRAMEWORK OF CONDITIONS, CONCEPT OF OBJECTIVES, AND MEASURES OF PLANNING

Due to its geographical situation, a large numbers of maritime research activities are carried out in the area of Hamburg. In universities (Hamburg University, University of Technology, Hamburg Polytechnics), in the Federal Maritime and Hydrographic Agency (BSH), in the Water and Shipping Boards, and in the Department for waterways and harbour construction as well as in a variety of hydrographic orientated private enterprises (instrument producers and engineering companies), scientists and engineers are engaged in various hydrographic activities — more than anywhere else in the Federal Republic of Germany.

It was the prime concern of the Hamburg Polytechnic to make use of this unique potential for future hydrographic training. For this reason, a working group chaired by the author, was appointed in the spring of 1981 in order to set up a concept for an integrated course of studies consisting of survey engineering and hydrography, based on the international Standards of Competence for Hydrographic Surveyors.

Furthermore, the wish of the DVW to maintain uniformity in the professional training of the surveyor had to be taken into account.

All these considerations finally led to a course length of nine theoretical semesters and one practical semester, an exceptionally long duration of study. Therefore, it was not obvious that this concept would be fully supported by the presidency and all committees of the university. The following long drawn out negotiations with the Hamburg Ministry for Science and Research led, as a compromise, to a so-called consecutive course of studies Survey Engineering and Hydrography, which was started in the winter semester of 1985/86, but which was approved only in February 1986 by the then Minister for Science and Research.

After having presented a 300-page document, in English, to be examined by the International Advisory Board, the new study course was recognized in March 1990 and was awarded the highest grade level (A-level, academic recognition).

The above mentioned Standards of Competence should be regarded as the minimum requirements necessary. Teaching contents include geodesy and hydrography. The coupling of a course of hydrographic studies with survey engineering presented itself as the solution. Thereby two desirable effects were achieved:

- the extension of the professional field of the survey engineer, and
- to enable hydrographers to operate universally in all surveying tasks (land and sea).

Furthermore, the high percentage of practical training demanded by the Standards of Competence could be best achieved, compared to other nations, by the Hamburg Polytechnic in the consecutive study course 'Survey Engineering and Hydrography'.

3. THE COURSE OF STUDIES OFFERED BY THE HAMBURG POLYTECHNIC

The consecutive course of studies 'Surveying and Hydrography' is divided into three study sections, each of three semesters duration. The first study section (Survey Engineering), is identical for all students of the subject Survey Engineering and is completed with an intermediate examination.

In the second study section (Survey Engineering), the student is offered two possibilities:

- Students who only wish to study Survey Engineering leave the Polytechnic after four semesters, for a practical training semester (main practical training). Then, they continue to study for the 5th and 6th semesters, whereby in the 6th they have the choice to specialize in one of four directions (among others, Hydrography, see flow chart). After passing the special examination and successfully presenting their thesis the students will be awarded the diploma as 'Diplom-Ingenieur'.
- Students who choose at an early stage the consecutive course of study 'Survey Engineering and Hydrography' (KVH) complete the three semesters of the second study section without a main practical training. The choice of Hydrography as their special course in the 6th semester is compulsory and they must then pass successfully the examination in Survey Engineering. They have, therewith, fulfilled the entry requirements for the third study section.

In the third study section (hydrography), complementary basic hydrographic specific knowledge of mathematics and physics are covered as well as the subjects 'Measuring Instruments and Systems', 'Sea Surveying', 'Applied Geo-Science', 'Navigation', 'Law at Sea', and a profound knowledge of dataprocessing (among other, interfacing technics).

The six-month main practical training is usually completed after the 8th semester. The course of study is completed, following the 9th semester, by passing the special Hydrography examination and on successful presentation of the thesis — the Survey Engineering and Hydrography diploma is then awarded.

Students from other universities (Polytechnics, University, University of Technology) who have passed the intermediate survey examination may continue in the second study section. Certified surveyors may commence the course of studies with the third section, on condition that they complete the 6th semester covering specialized hydrography.

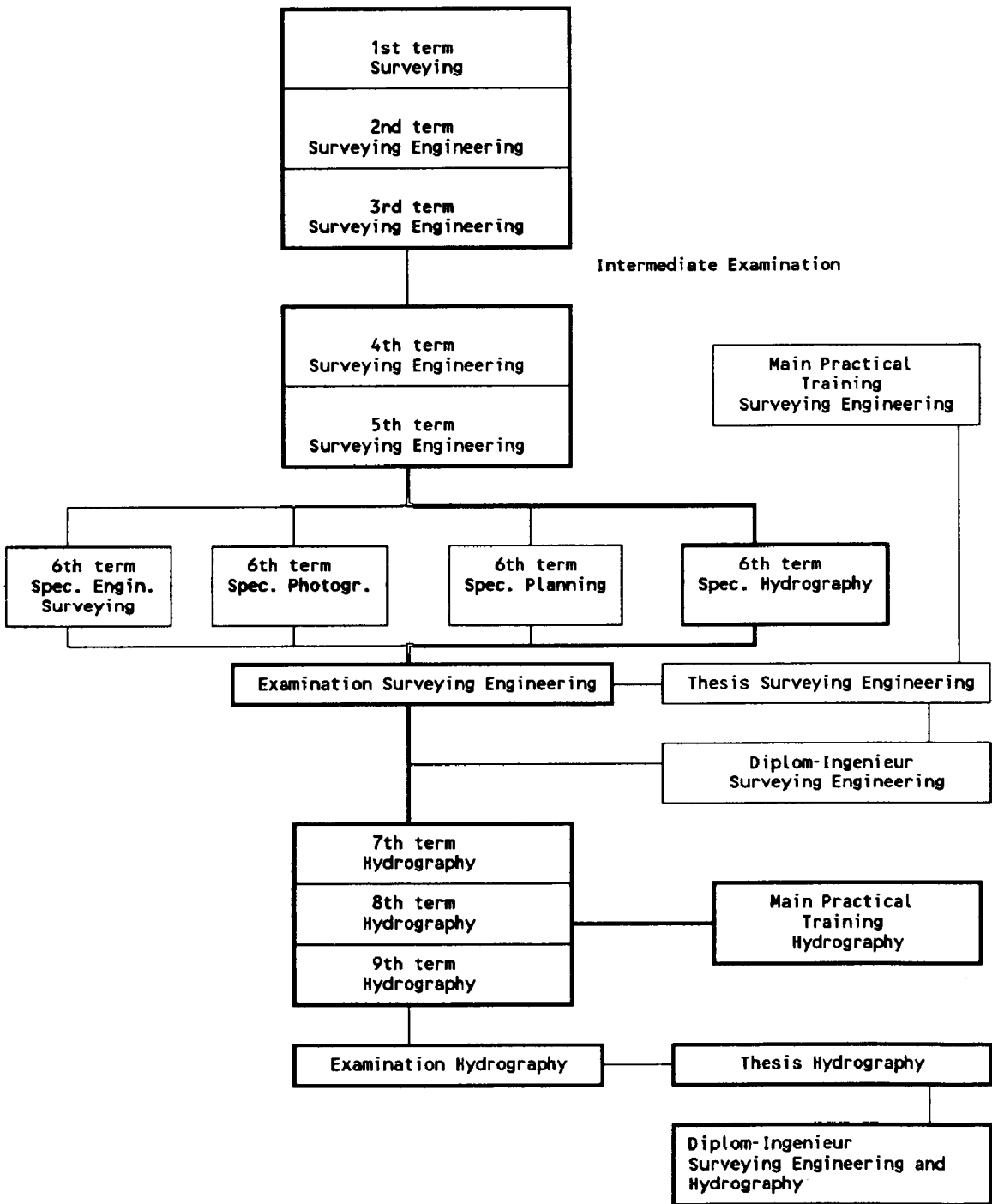


FIG.1.— Flow Chart of the Course of Survey Engineering with the Consecutive Course of Hydrography.

The teaching programme is offered in the form of seminars, of which a large part of the practical training is obligatory. The 27-m long survey ship NIGEWARK of the Waterways and Harbour Engineering Authority is available for the practical training programmes of the study course Survey Engineering and Hydrography (Fig. 2). The ship is stationed off Cuxhaven, and the practical courses are carried out from there. The third study section (7th semester and following) was offered for the first time in the summer semester 1986.



FIG. 2.— Survey Ship NIGEWARK.

The courses of studies offered were favourably accepted, however, the initially greater proportion of students from other Universities has decreased. Nowadays, the students of Hydrography are recruited mostly from the Hamburg Polytechnic and are obviously in a better position to benefit from this study course. So far, all certified engineers in Surveying and Hydrography have obtained appropriate employment.

4. TEACHING PERSONNEL, EXTERNAL TEACHERS, AND INSTRUMENT SYSTEMS

In the intensive Hydrography course from the 6th to the 9th semester, there are, altogether, 92 week hours per semester courses offered. Three professors of hydrography are at the disposal of the Polytechnic. Engaged in this task are the

professors Dipl.-Ing. Peter ANDREE, Dr.-Ing. Peter BRUNS, and Dr.-Ing. Delf EGGE.

Furthermore, a number of professors of the nautical and geodetic Faculties are participating in the hydrographic teaching tasks. In addition, specialists of the geo-science faculty of the Hamburg University are engaged. The teaching staff is most favourably complemented by commissioned lecturers of the Federal Maritime and Hydrographic Agency, the University and private companies.

A technical employee (Dipl.-Ing. Axel WRANG) experienced in hydrography is available as assistant lecturer and for maintaining and developing the equipment. Early planning of the necessary equipment made it possible to complete its acquisition during 1986-1989. Already in 1986, modest basic equipment was available. Besides excellent geodetic and photogrammetric instruments, the following hydrographic instrument systems are available:

POSITIONING SYSTEMS for kinematic/dynamic measuring:

1 Mini Ranger III with 4 reference stations, 1 Syledis SR 3,
1 Navitrack 2020, 1 Decca Navigator RS-4000. 1 SEL Globos GPS Navigator, 2 Ashtech LD-XII dual-frequency GPS-receivers for real-time navigation in differential mode, 1 IBEO Minifix.

ECHO SOUNDERS:

1 Dr. Fahrenholz computer echograph CPV (15 and 100 kHz), 1 Krupp Atlas Elektronik DESO 25 with integrated transducer (15 and 210 kHz), 1 portable echo sounder UW (200 kHz), 1 portable echo sounder Simrad EA 300P (200 kHz), 1 sound velocity meter UW.

SONAR SYSTEMS:

1 KLEIN Side Scan Sonar (4 channels parallel, 100 and 500 kHz), 1 KLEIN Subbottom Profiler (3,5 kHz), A DATA SONICS Bubble Pulser (about 400 Hz) with EPC thermo recorder.

TIDE GAUGES:

1 AANDEREA Offshore pressure gauge and temperature sonde including magnetic tape reader.

MAGNETOMETER:

1 Littlemore proton magnetometer (resolution 1 Nano, Tesla)

COMPUTER INSTALLATIONS

In addition to the main computer PRIME 750, 6 APOLLO workstations, 10 IBM PS/2, the following hardware is at the disposal of the students at the laboratory for hydrography:

1 HP 9000/360 CHX workstation, 2 HP 9000/310 workstations, 1 HP Vectra RS 20, 3 HP Vectra ES 12, 3 portable IBM-AT-compatible PCs, 5 laptops (Toshiba 1600), 1 Comflex 1020 (special fabrication for use in rough sea).

Printer/plotter/digitizer: 1 HP-Laserjet, 4 matrix printers, 3 HP-plotter (A1, A3), 1 ARISTO digitizer AO, A HP Scan Jet.

In addition, there are:

5 colour monitors (14"-19"), 2 monochromatic monitors, hard discs up to 300 Mbyte, streamers, different floppy disc drives and an HP 1600 bpi magnetic tape unit, as well as additional equipment like interface tester, language compiler for HP-Basic, Quick-Basic, C, FORTRAN 77, Pascal, etc.

Numerous software packages facilitate a detailed evaluation of the measuring data. A great part of the measuring instruments is installed in a specially developed container (Fig. 3) for use in the practical training. The 'survey container' can be transported by trailer or ship to Cuxhaven when required and can be installed within an hour on board the NIGE WARK. Since the summer semester of 1986, this container has been used successfully.

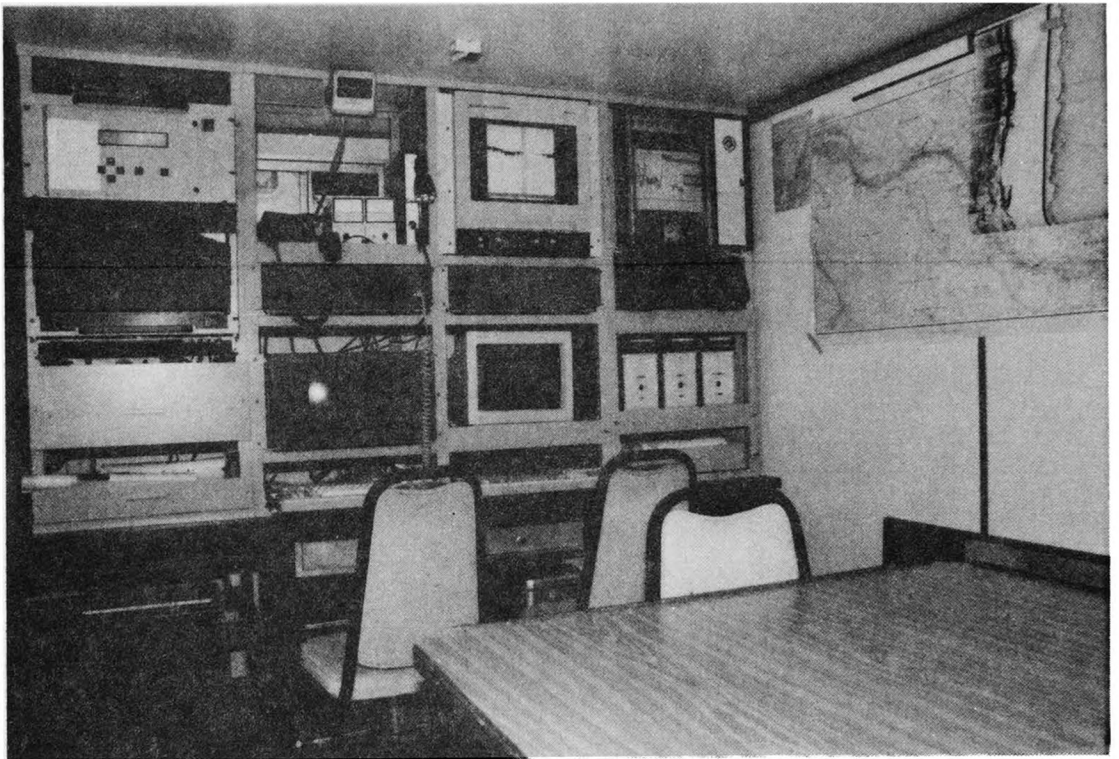


FIG. 3.— Container with surveying instruments.

5. FUTURE PROSPECTS

The study plan for the consecutive study course 'Surveying and Hydrography', since its initiation, has been subject to a continuous reform. In its present form, it passed the rigorous judgement of the International Advisory Board FIG/IHO and was approved for the highest international level.

The duration of the study course remains unsatisfactory, it is too long for a Polytechnic. This can be overcome only by effectively conceiving the study course from the 1st semester on, independently.

In addition to the existing consecutive study course Survey Engineering and Hydrography, a three-month course in English for Sri Lankan engineers was offered and successfully held for the first time in 1989. Based on the experience gained, Hamburg Polytechnic is encouraged to carry on in this direction nationally as well as internationally.

Bibliography

- [1] Documentation 'The Studies of Surveying and Hydrography at the Fachhochschule Hamburg', Hamburg Polytechnic, December 1989.
- [2] Peter BRUNS Hydrography — A New Study Offer of Hamburg Polytechnic, memorial paper '125 Jahre amtliche deutsche Hydrographie 1861-1986' (125 years of Official German Hydrography 1861-1986), issued by Deutsches Hydrographisches Institut (German Hydrographic Institute) and Deutsche Hydrographische Gesellschaft (German Hydrographic Society), Hamburg, September 1986.