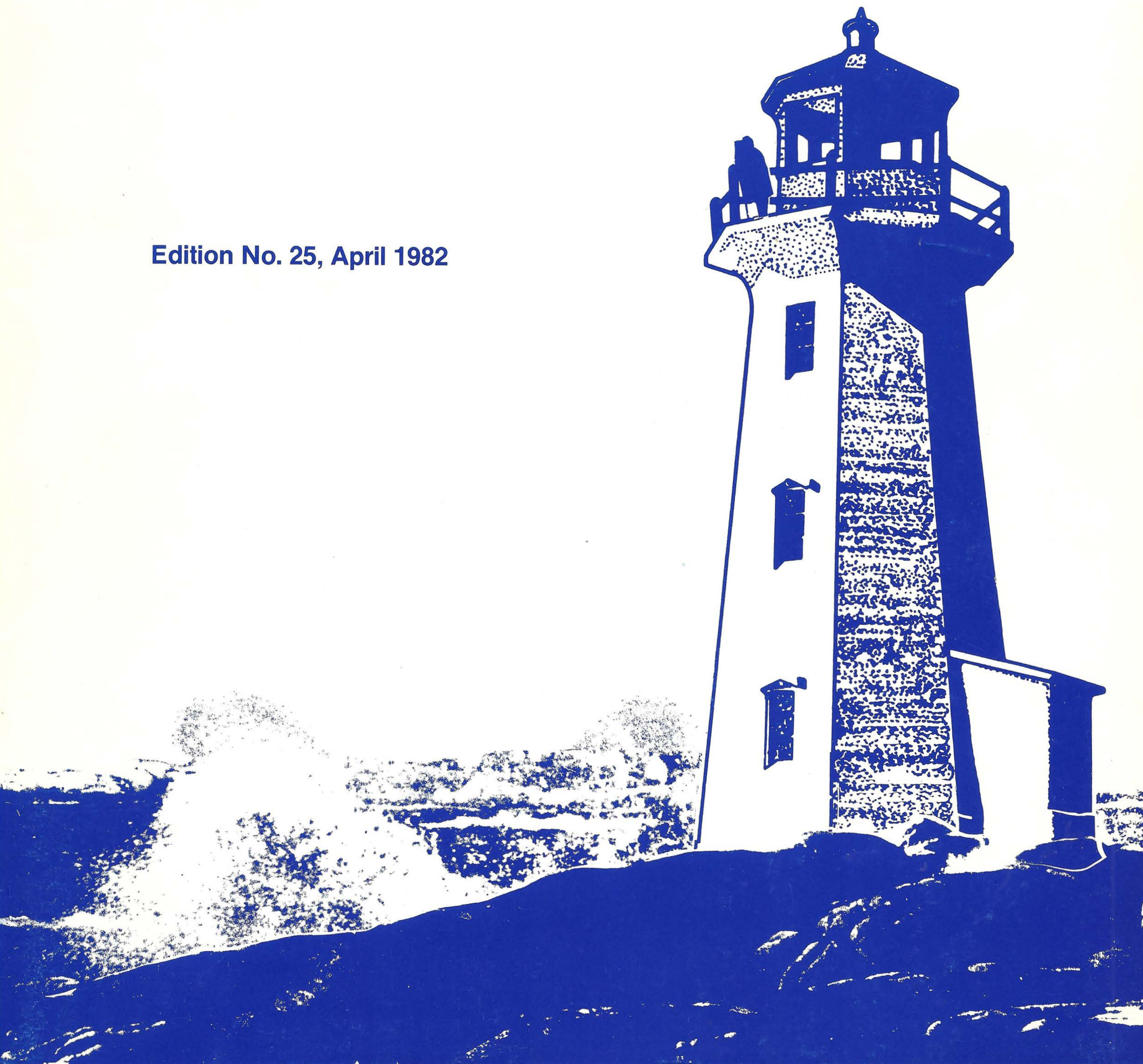
ISSN 0711-5628

Lighthouse

JOURNAL OF THE CANADIAN HYDROGRAPHERS' ASSOCIATION

Edition No. 25, April 1982



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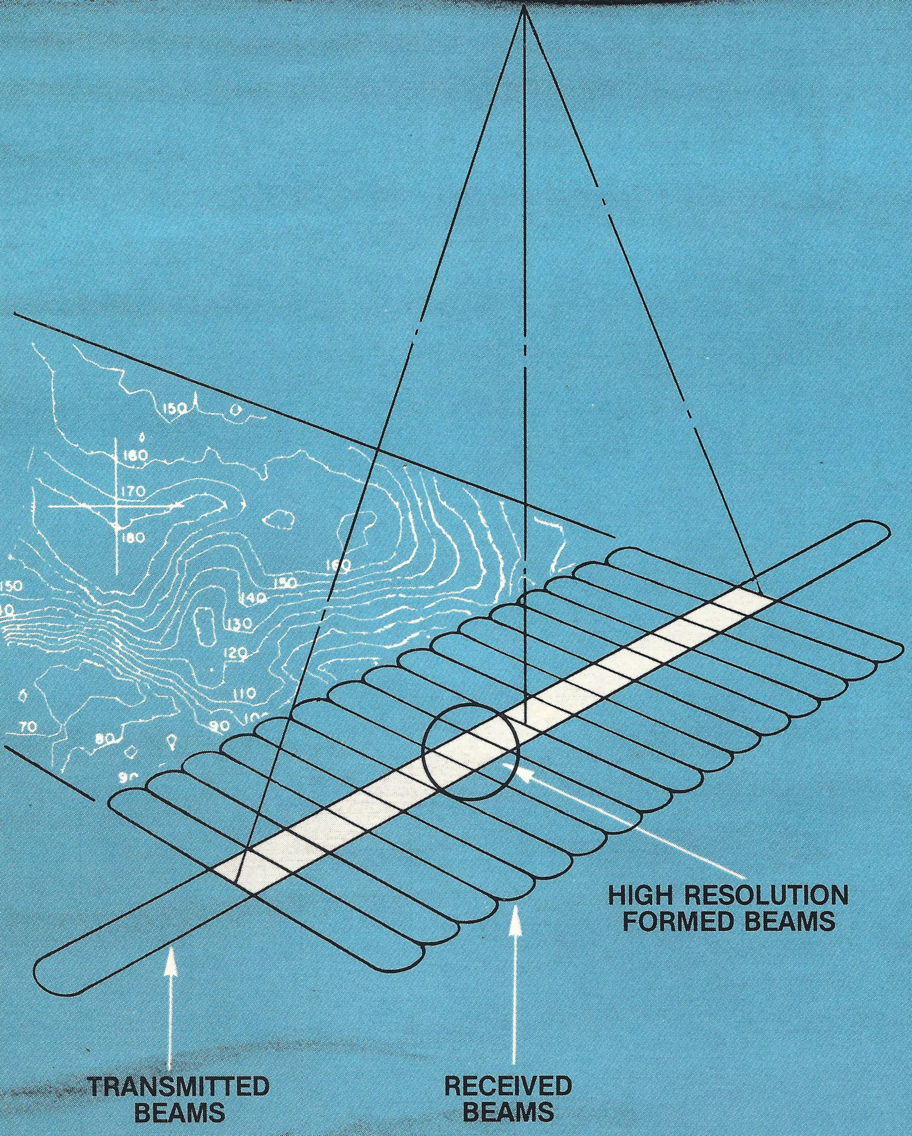

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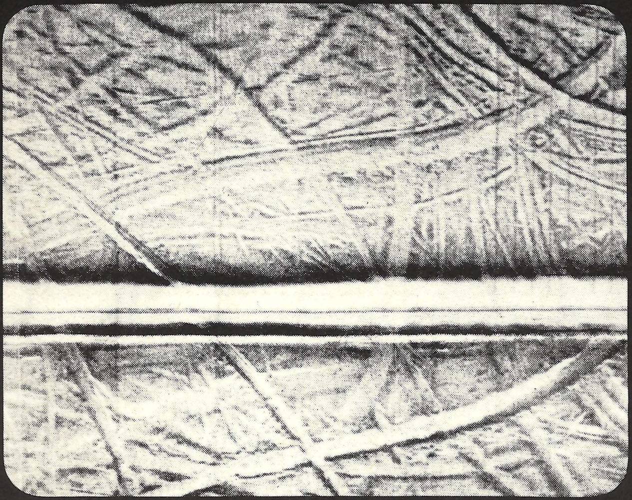

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Courtesy of the Geological Survey of Canada
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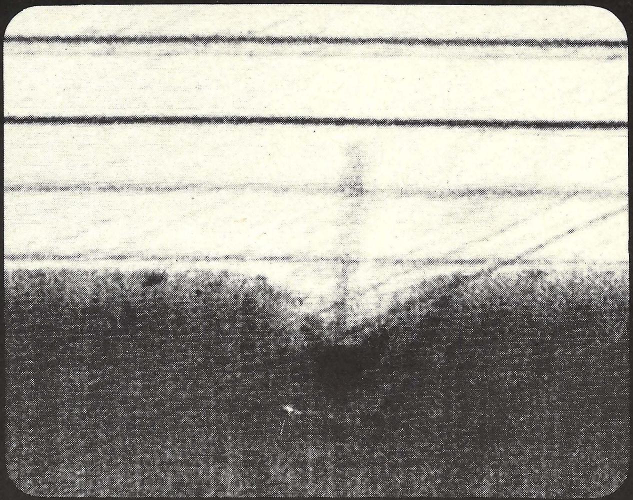

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Courtesy of Offshore Transportation and Services, Inc.
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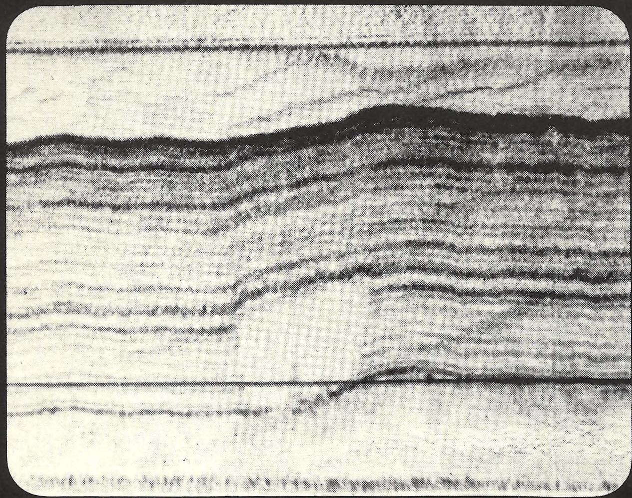

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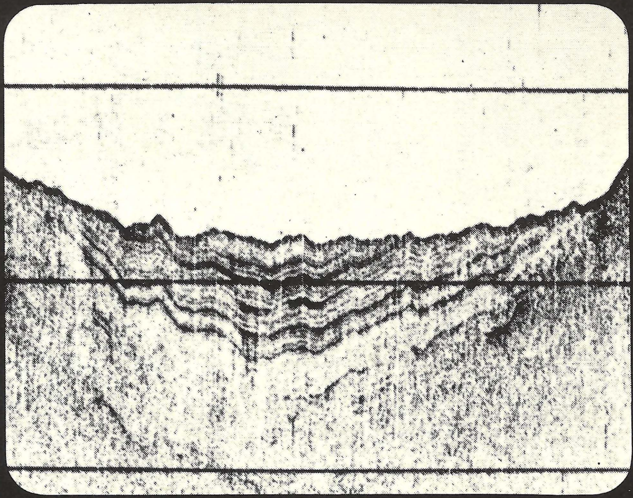

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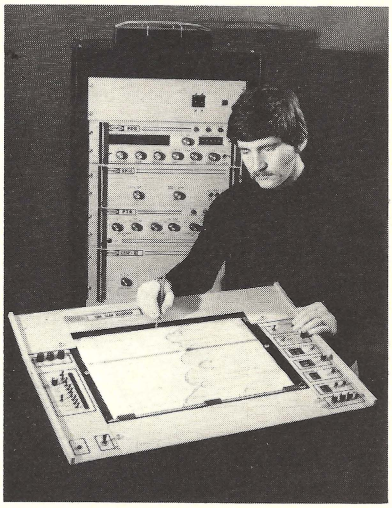

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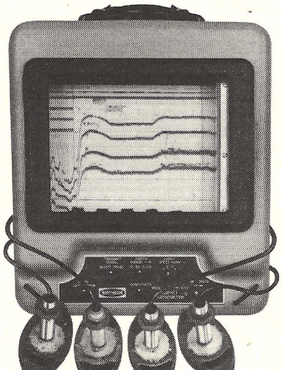

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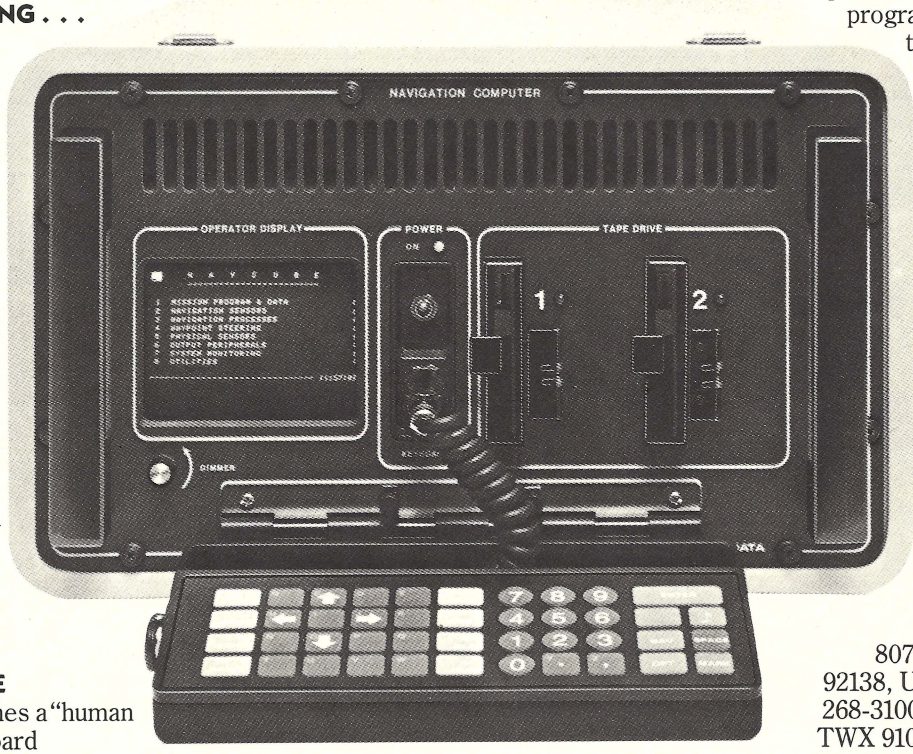

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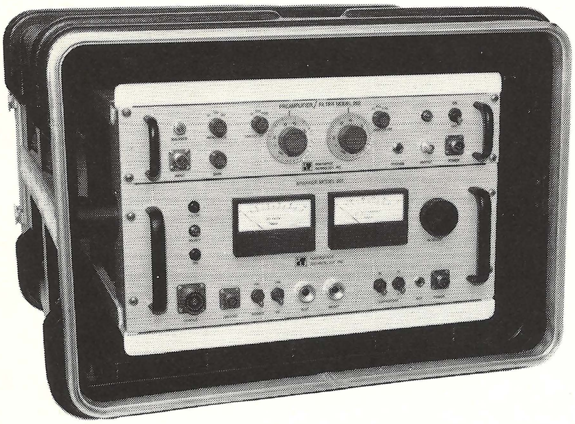

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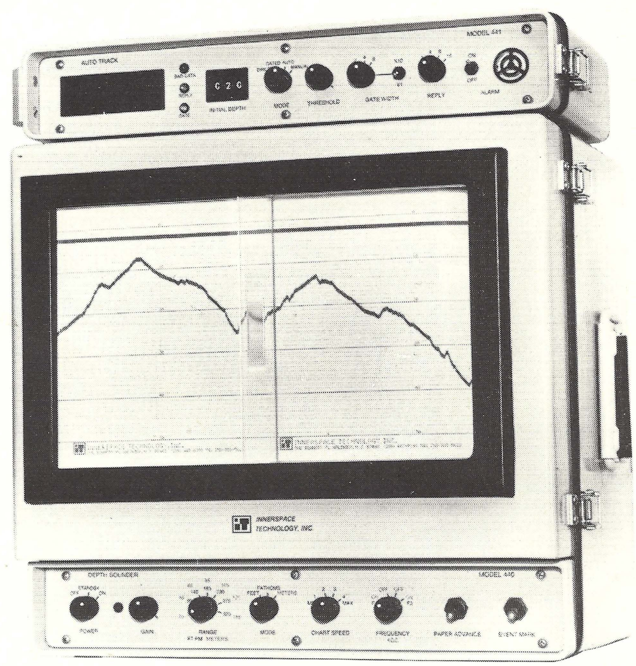

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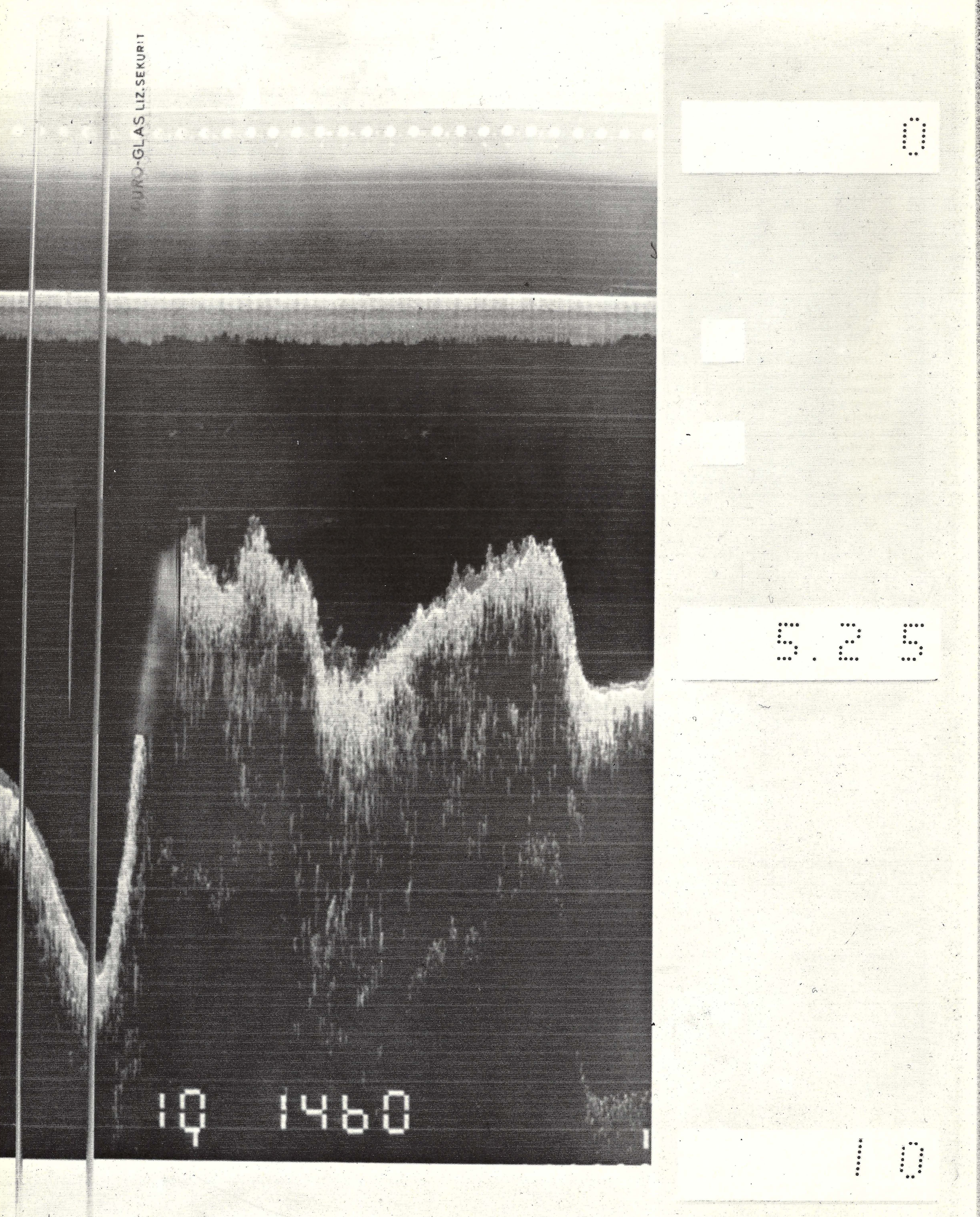
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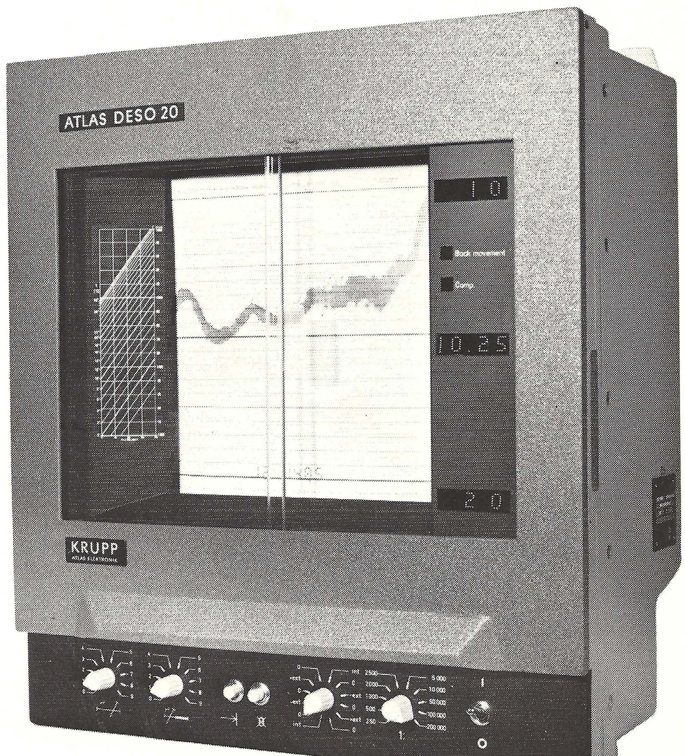

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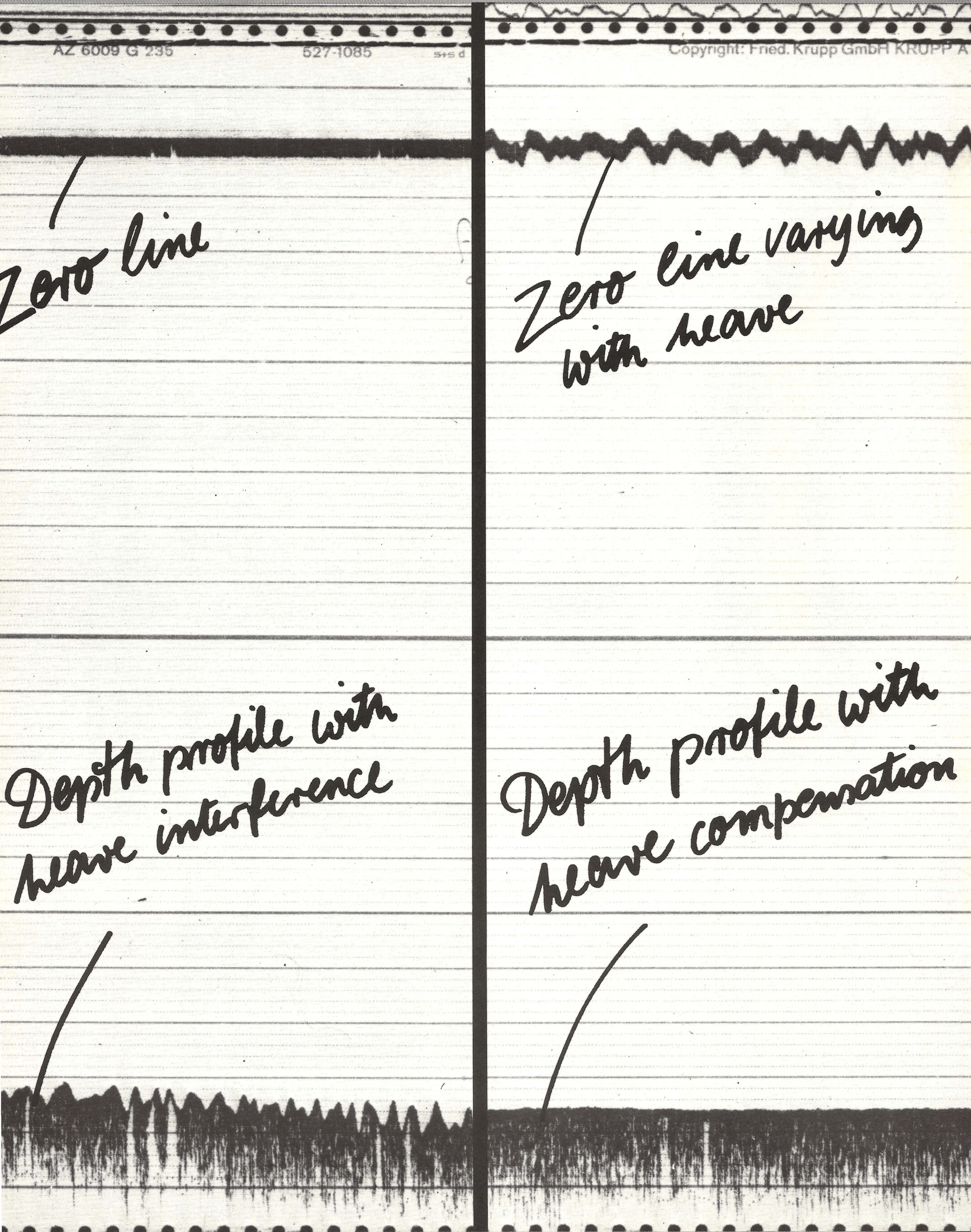
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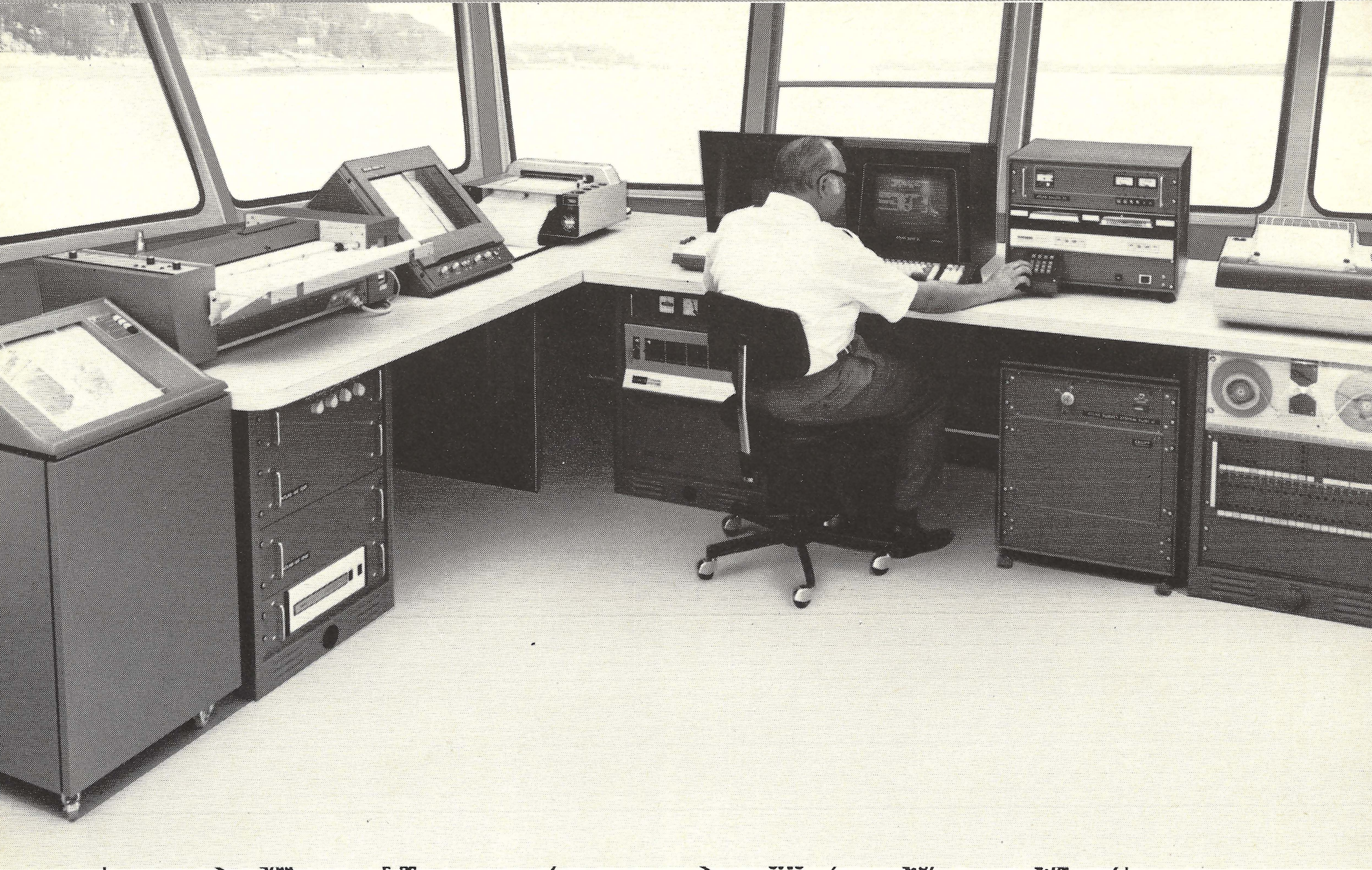

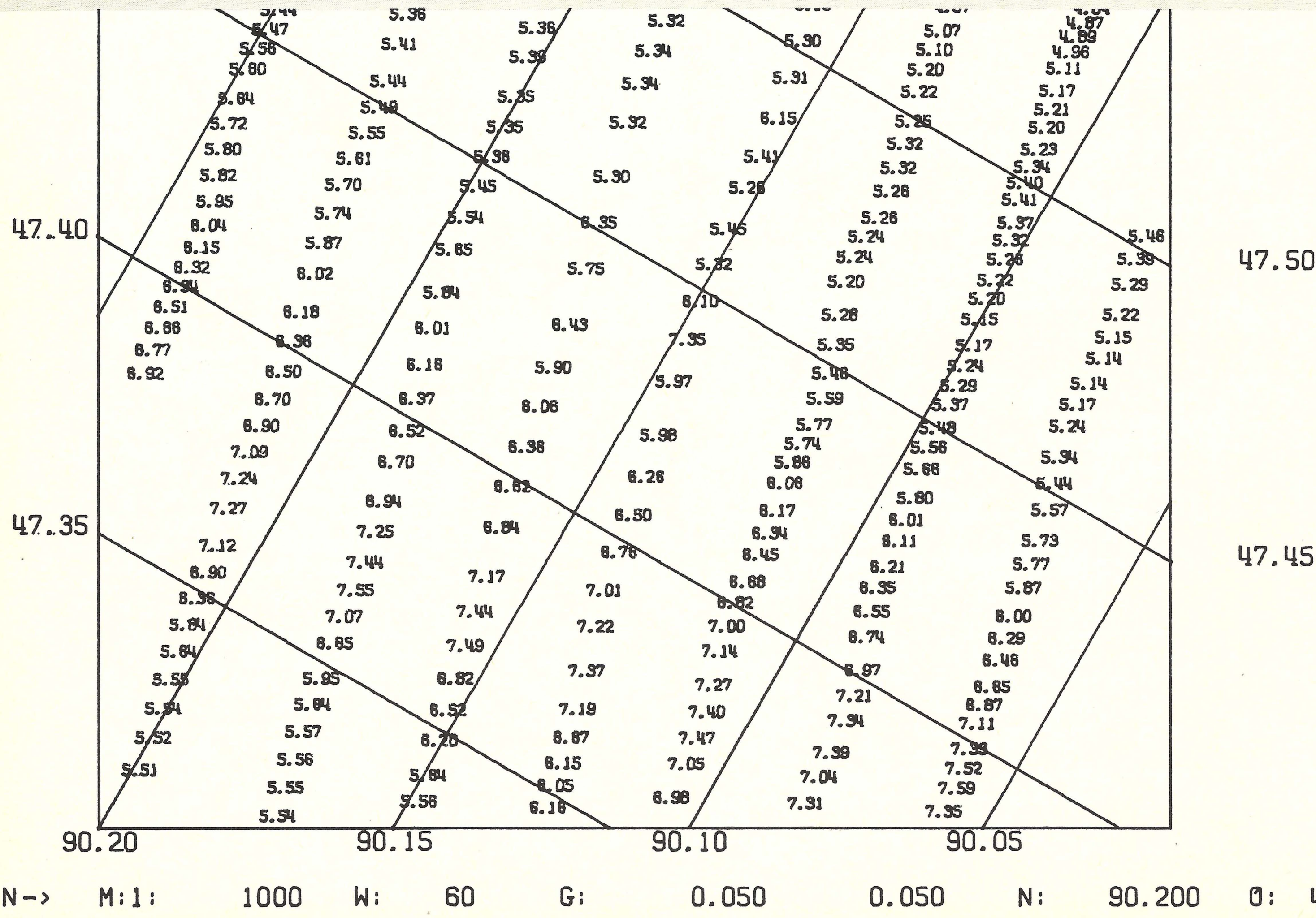

Depth data of survey track, sampled and processed with ATLAS-SUSY 30

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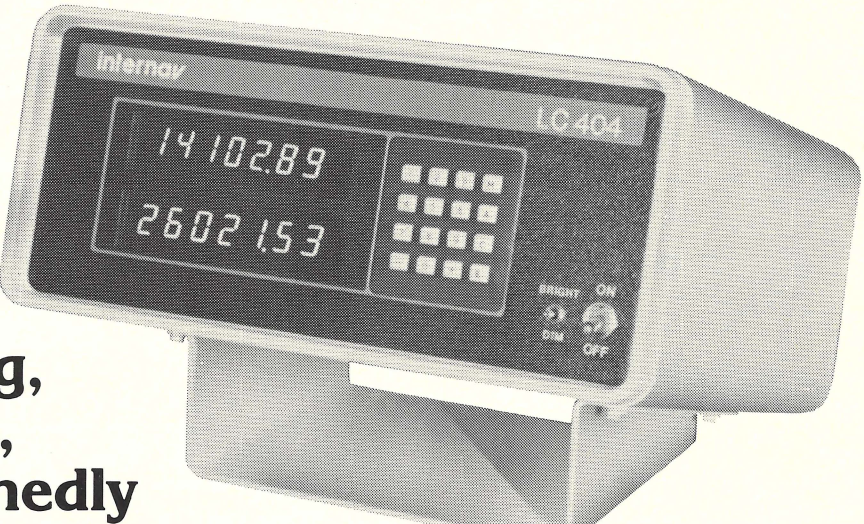
Internav LC-404



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Let's face it. Did we ever say we were bashful?

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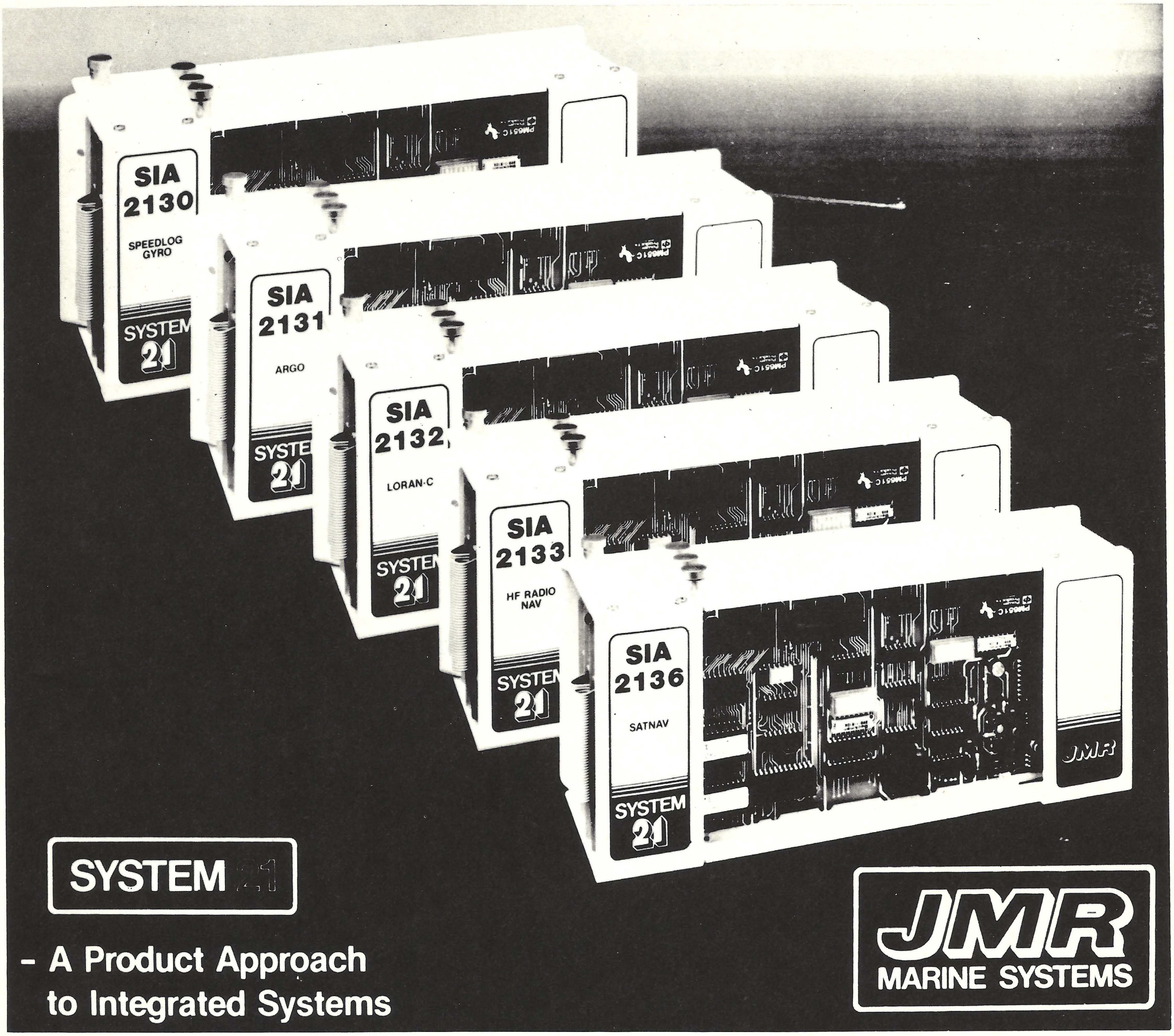

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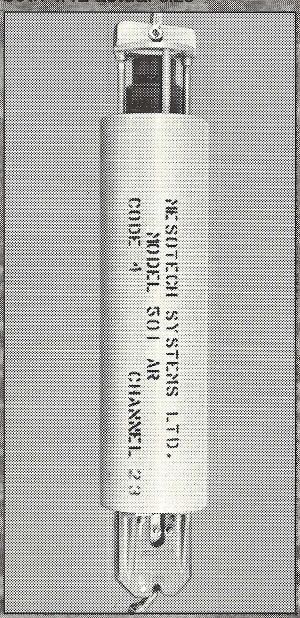

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- 1 year life*
- 32 unique codes
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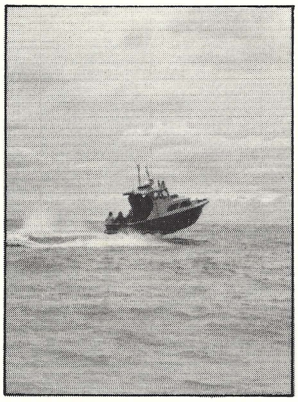

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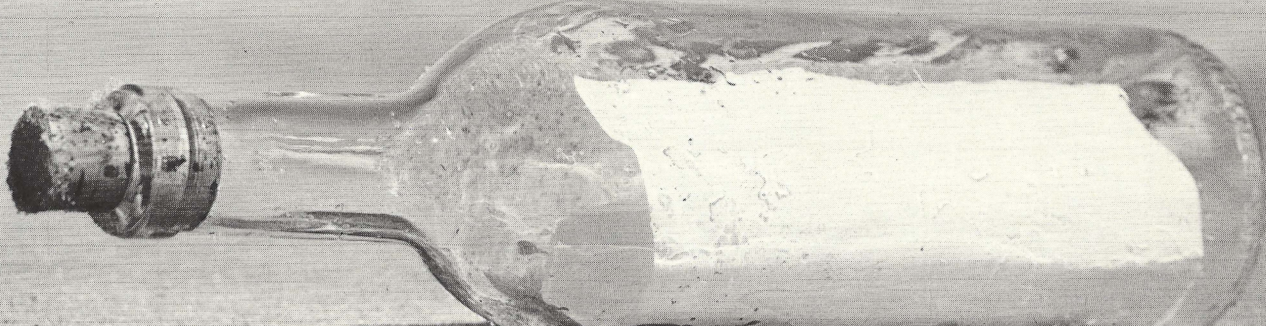

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LIGHTHOUSE

APRIL, 1982

JOURNAL OF THE CANADIAN HYDROGRAPHERS' ASSOCIATION

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All correspondence should be sent to the editor of **LIGHTHOUSE,** c/o Canadian Hydrographers' Association, P.O. Box 1006, Dartmouth, Nova Scotia, B2Y 4A2.

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EDITORIAL

Two centuries ago when some of the major hydrographic offices of the world were established. The reason for their existence was primarily in support of naval sea powers. It was noted that more ships were lost through grounding than by enemy action. Although for the major sea powers the military demand for charts may be of equal importance as the demands of merchant shipping, the majority of hydrographic offices carry out their work to satisfy the needs of the latter. In recent years yet another change has taken place and that is that hydrographic surveyors march to the drum beat of the oil industry. A whole field of commercial hydrography has grown up, and the government hydrographic offices themselves have become responsive to the requirements of the oil industry. Special surveys are needed for supertanker routes, for tow-out routes for oil platforms, detailed surveys for drilling sites and pipelines. While much of this work is associated with projects that end up as producing oil fields there are others which are speculative, and in the end a cap is put on the well and it will be set aside. Information has certainly been gained about the geology and maybe oil or gas has even been found, but the economic conditions are unsuitable for moving into the production stage. The question to answer is whether the work, including the hydrographic survey, was worthwhile, or whether some other work of a higher priority should have been done. After all, our knowledge of the world's oceans is still very limited. Many coastlines are still poorly charted, and there remain significant dangers of uncharted shoals and consequent loss of shipping. Hydrographic surveys are usually planned on a basis of technology and economics, and in the majority of cases while total seafloor coverage might be idealistic, economics dictate that the bathymetry is interpreted from sampling. That is, the line spacing is further apart than ideal. Yet, in some quite remote parts of the continental margins, surveys have been carried out that are extremely detailed with total bottom coverage and a detailed examination of the sub-surface sediments. In the Canadian Arctic, surveys of this type have been carried out in several areas as a basis for studying possible gas pipeline routes. Yet, these pipes may never be put in place. On the other hand, our general knowledge of the Arctic hydrography as it applies to the safe conduct of shipping remains very limited. There is probably no way to overcome this dilemma, and it is only for hydrographers to note that while all their work adds up to our general knowledge of the oceans not all can be followed through to some tangible goal such as a producing oil field or a safer shipping route.

HYDROGRAPHIC SCHOOL, VASCO DA GAMA

GOA, INDIA

Editor's note: In February this year the Hydrographic School at Vasco da Gama was the site of a meeting of the IHO/FIG Advisory Board on the Training of Hydrographers. The editor, as a member of that Board enjoyed three very pelasant days at the school and was able to see at first hand this fine facility. This was not the first visit by a member of the Canadian Hydrographic community as readers will recall in the 23rd edition of LIGHTHOUSE the description of a visit by George MacDonald. Warren Forrester, tidal expert, has also visited and lectured at the school.

1. **Introduction.** Institutionalised training in Hydrographic Surveying started in India at the Hydrographic Training Unit, Bombay in 1959. Later this unit was renamed as the Hydrographic School and was sited at Cochin along with the Navigation School. A permanent facility for the Hydrographic School was constructed at Alparqueiros Hill, Vasco da Gama in 1977. The site overlooks the picturesque harbour of Marmagao and the inland waterway of Zuari River.

2. **Role.** The school's role is to train personnel from the Indian Navy and maritime states of India in Hydrographic Surveying. Traditionally, training was also given to service and civilian personnel from developing countries of Africa and South East Asia. In 1978, the school was recognised as the Regional Training Centre for Africa and South East Asia at the 8th Cartographic Conference, Hong Kong. Consequently, the school has been aided by UNDP* funds to equip itself with modern hydrographic instruments and systems. The school runs courses for Surveyors and Recorders on a three-tier system as below:

Surveyors	Recorders
Basic 'H' Course (15 weeks)	SR 3 'Q' Course (12 weeks)
Long 'H' Course (40 weeks)	SR 2 'Q' Course (13 weeks)
Advanced 'H' (10 weeks)	SR 1 'Q' Course (13 weeks)

The strength of officers' courses is kept at a maximum of 12 and of sailors' courses at a maximum of 16 to ensure intensive practical training backed up by adequate theoretical background. The Surveyors' courses are also attached to the Naval Hydrographic Office for practical cartography, the Hooghly River Survey Organisation for river surveying, and to the Central Water Power and Research Organisation for studies in hydro and harbour engineering.

3. Since the formulation of the IHO/FIG** Standards of Competence for Hydrographic Surveyors, the syllabi for Officers' courses have been upgraded to enable achievement of Category 'A' knowledge on completion of the Long 'H' Course preceded by the Basic Course and 2½ years practical experience in surveying. Concurrently, the training syllabi for other ranks also have been upgraded to include essential training in modern surveying systems and methods.

4. The school has a staff of five Naval Hydrographic Surveying Officers headed by Cdr. V.S. Saptharishi (the Officer-in-Charge), two electrical officers specialised in electronics and surveying systems, one Education Officer, and two Cartographers specialised in Geodesy and Geophysics from the Naval Hydrographic Office. Since 1980, a number of visiting expert lecturers have been conducting short duration courses of one to two weeks in Law of the Sea, Tides, Terrestrial Surveys, and Automation in Marine Surveys. The school is being equipped with up-to-date modern surveying equipment, a well-stocked library, a number of training films, and other audio-visual training aids.

5. At present (February, 1982), the school is conducting a Long 'H' Course consisting of seven student officers and a Surveying Recorder III Class Course consisting of 22 members (17 I.N. sailors, two Srilanka sailors, and three civilians from the Oil and Natural Gas Commission, India). Six foreign officers are also undergoing educational orientation for the next Basic 'H' Course which commences in March, 1982.

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*United Nations Development Program

**International Hydrographic Organization/ Fédération Internationale des Géometres

ASSIGNMENT EGYPT
A Hydrographic Survey of the River Nile

By
G. E. Richardson

Institute of Ocean Sciences

In early 1981, a Canadian survey company, Kenting Earth Sciences Ltd. Ottawa, approached the Canadian Hydrographic Service looking for the assistance of an experienced hydrographer. I expressed an interest and Kenting made me an offer I couldn't refuse. I applied for, and was granted, leave without pay. At the end of April, after spending a week in Kenting's Ottawa office, I departed for Cairo and worked the next 3 months at several locations along the Nile River.

The Project

The area required to be hydrographically surveyed is that portion of the Nile River from the High Aswan Dam north to Cairo (over 900 kms) and the two main delta channels (about 200 kms each). All the data is to be logged on magnetic tape and returned to Ottawa for processing and plotting. The survey scale is 1:5000 with small areas around 40 ports and dams to be surveyed at 1:2000.

Narrative

On the evening of April 30 I arrived in Cairo and somewhat to my surprise was met by considerable indifference from the Egyptian airport officials. This may have been due in part to my luggage being lost somewhere between Ottawa and London and I therefore had no baggage for them to inspect. I was met by two Kenting employees who took me to an apartment in Maadi, a residential suburb in south Cairo. The company leased several apartments in this area for the 5 or 6 staff based in Cairo plus surveyors on R & R from the traverse party on the river.

The hydrographic work was under contract to Kenting by the Ministry of Irrigation of the Government of Egypt. A branch of this Ministry, called the Research Institute of the High Aswan Dam Side Effects, was to be the recipient of all data and were charged with monitoring the contract. Kenting had recently completed a topographic survey of the Nile River Valley. The shoreline detail from these maps will be used to help compile hydrographic charts in a strip format. This type of format, with a rectangular sheet oriented along the river and including overlap from sheet to sheet, was totally unfamiliar to the Egyptian Government officials. My first 3-4 weeks in Cairo was spent in numerous consultations with Dr. Shalash, the director of this Branch, explaining the value of this sheet layout over the precise block topo format. I believe that I made a significant contribution to the acceptance of this charting method by using as examples several American and Canadian river charts and also by redesigning much of the proposed charting format.

Driving back and forth to these meetings through Cairo traffic was an adventure everyday! The "stop" sign actually does not exist in Egyptian road signs. You must use your horn constantly. Pedestrians will not even look sideways unless they hear your horn. Every traffic light is controlled by a policeman. There does not appear to be a penalty for traffic violations but a policeman can record your number and when you come to renew your licence you may have to pay several fines. Regardless of how a roadway is marked, if it is possible to travel 5 cars abreast then that's how it is done. The numerous and always packed buses have the ultimate right-of-way and like sailing vessels tack from curb to curb, slowing only momentarily to drop off (literally) passengers or let others clutch for the handrails. There are surprisingly few lengthy traffic jams but I saw very few vehicles that didn't bear some combat wounds. Panel-beating (body work) has become a modern Egyptian art form.

The survey was to begin at the High Aswan Dam. Working in advance of the hydrographic survey was a horizontal and vertical control party. I worked along with this party for about 3 weeks covering the river from the dams to a point about 70 kms north of Aswan. I was able to assist this party to select traverse points that were also good transponder sites and to make sure there were sufficient stations to ensure good positioning system coverage anywhere on the river. Each point was marked by an iron bar with a stamped aluminum cap, and every 5 kms a pair of concrete monuments were built. Our accommodation here was a second-class hotel on the main street at Aswan overlooking the river. It was pretty basic lodging but fortunately we had air-conditioning. Each day was sunny with sometimes light cloud cover in the morning. Where Cairo had been warm (30°-35° C) we now experienced temperatures over 40° C. By mid-day there was little shade and everything dark coloured was too hot to touch. The humidity was low and the water temperature was about 20° which created a cooling breeze when travelling on the river. We operated from seven 14 ft open aluminum boats powered by 25 hp Mercury outboards of which we were able to keep at least 5 operational each day. A large number of Egyptians were employed as labourers, boat drivers, truck drivers, monument builders, back site men and surveyors. Occasionally we were invited to their homes or to join their after work activities, where we were served some indescribably good food or were asked to share a smoke from the "Hubbly Bubbly" pipe. The farmers along the river were also very hospitable particularly when we told them we were working for the Ministry of Irrigation. Several times each day while ashore a small boy would appear out of the bush bearing hot tea on a silver platter or a cold drink sometimes even with ice cubes!

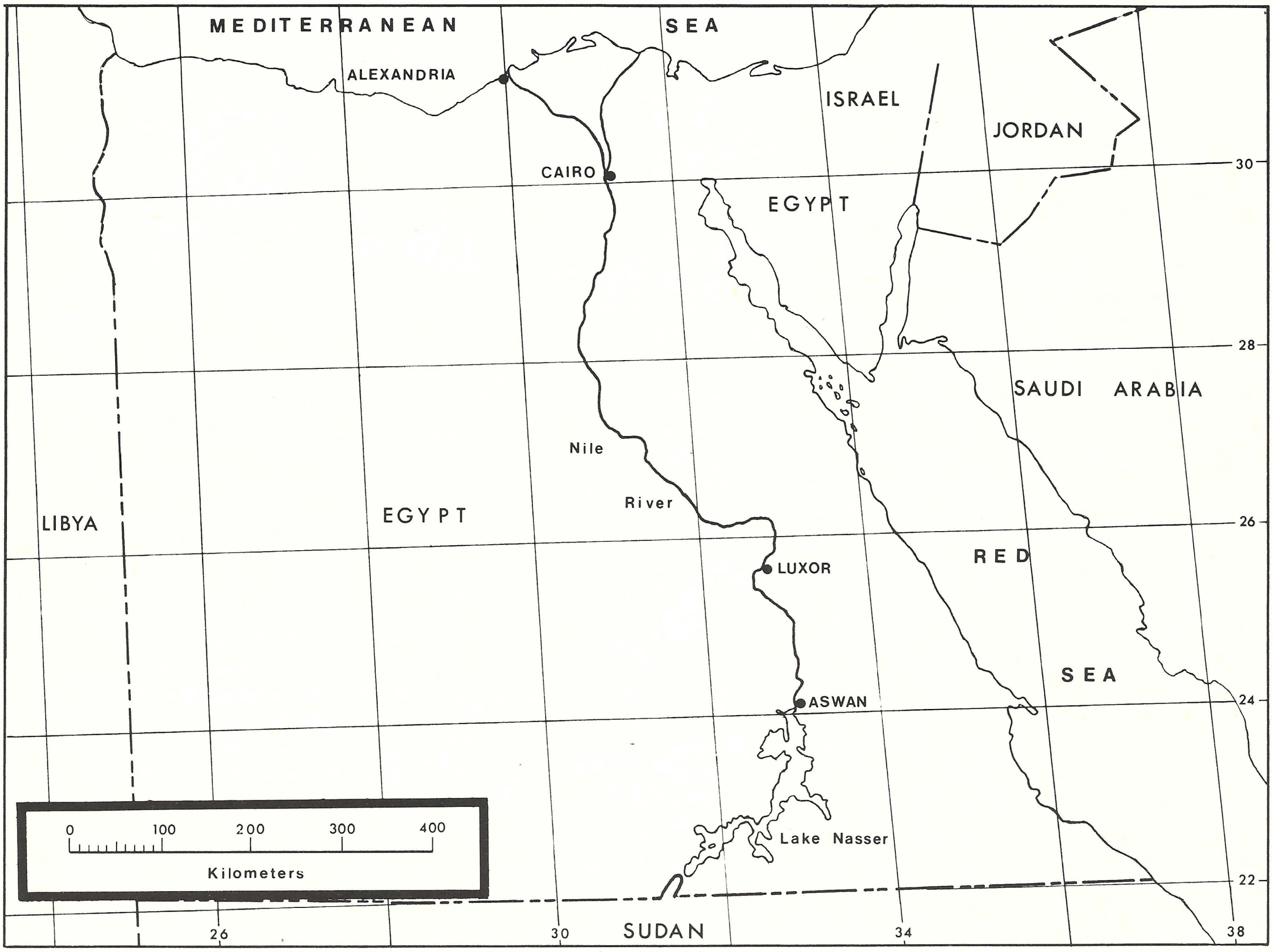
I returned to Cairo about mid-June as our main survey launches had left Italy aboard a cargo ship bound for Alexandria, however, it was not until July 1 that we took delivery in Cario — two months behind schedule! These two boats were 20 ft fibreglass with a slightly V-eed scow shaped hull. They were diesel powered with water jet propulsion. I made some minor repairs to the hulls, which were damaged in transit, before launching them and later on made some fibreglass modifications to the hulls in an attempt to relieve some of the aeration problems caused by the barge shaped bow. I also assisted in the location and construction of the fibreglass wells to house the dual transducers. Firing through a 1" thick, balsawood core hull the high frequency transducer gave excellent results but the low frequency gave just barely adequate performance. The performance of these boats was somewhat disappointing. The manufacturer's specifications said they would plane at over 20 knots with full fuel tanks and 3 people aboard. This speed was only obtained with absolute minimum load and dead calm sea conditions. With full crew and all the equipment top speed was 8-10 knots. However, because they rode so roughly this was as fast as one wanted to travel in anything more than a light chop. The Fiat engines seemed to have plenty of power but the Castoldi jet had inadequate thrust and the reversing was pitiful. Typical of "off the shelf" boats there were many "Sunday sailor" features that were already coming apart but the basic boat seems structurally and mechanically sound and should last out the project.

Regardless of any problems, these boats were what we had to work with. Several weeks were spent installing the Atlas sounders, a Trisponder positioning system, an HP 9825 computer, a video display for the coxswain plus various interfaces. My last week on the project was spent operating the boat and giving instructions on how to use visual aids in conjunction with the video information in order to steer straight lines. I also showed some of our methods of quality control when inspecting the data at the end of a day's sounding. All seemed to be working acceptably when I left.

I returned to Victoria on July 24th and was glad to be home. There were naturally good times and bad times but the experience of working in a foreign country was both rewarding and memorable. Kenting Earth Sciences Ltd. is a competent survey company and looked after me very well while abroad.

It is four months since I returned from Egypt. I understand that the paddle wheel houseboat KARIM chartered for the purpose of accommodation for staff and crew and the survey launches all arrived safely in Aswan after a very eventful trip. They have been working steadily and although not progessing as quickly as hoped, have suffered no major problems.

I wish the staff: Malcolm, Mac, Tom, Tony, Ian, Herb, George and the cast of thousands the best of luck and a successful completion to the project, EN SHALAH (if Allah is willing).



The Canadian Hydrographic Service Hydrography I and Hydrography II Courses

H. Furuya

Canadian Hydrographic Service, Headquarters

The Canadian Hydrographic Service has provided in-house training for its field hydrographers since 1953 when it was recognized that many of the field employees required training in order to effectively carry out the field survey computations. The requirements for training also gradually increased as technology advanced and the hydrography course grew to meet the needs. In the late fifties the in-house training course still devoted most of its time to field survey computations but the course had expanded to include subjects such as the operation of the Tellurometer and Decca positioning systems. The duration of the course at that time amounted to thirty-seven days. The in-house need for training continued mainly because the specialized knowledge could not be obtained from technical or academic institutions.

The training with the Hydrographic Service, Surveys and Mapping Branch continued into the sixties. The requirements were reviewed periodically and with the introduction of oceanography and inclusion of the Hydrographic Service within the Marine Sciences Branch of the Department of Mines and Technical Surveys the impetus for training increased.

The basic hydrography course from about 1962 was divided into two parts; about two months of classroom training and about two and a half months in the field on board a ship deployed for training. This arrangement for the Hydrography I course continued until 1971 when it was decided that Algonquin College would provide the classroom portion of Hydrography I in their survey course. The trainees from the Regions attended the Algonquin course from September to December and then the Hydrographic Service provided the practical field training from January to April.

In 1976 the entire Hydrography I course was once again reestablished within the Hydrographic Service as an "in-house" course. However, the efforts continued to have a technological institute undertake the entire course as one of their technical survey programs. This resulted in Humber College establishing their first Hydrographic Survey Technology program in the Fall of 1976.

Changes have been gradually made to the course from about 1977 in order to continue to provide knowledge and training required for the performance of all of the main tasks the hydrographic surveyor may be required to undertake from the first year of his service to the top working level. The more theoretical, in depth and related knowledge is provided in the Hydrography II course. The intent of the Hydrography I course is to train the new recruits so that they can immediately undertake survey tasks with a minimum of supervision. Furthermore, the notes and reference texts, etc. handed out during the course are useful guides to aid them when required. The course consists of ten weeks of classroom training in Ottawa and ten weeks of practical application of the classroom training in the field, that is, to provide some actual hands-on experience. A course of this duration can not give all of the conditions and variations therefore, training must continue on the job as the employee gains experience and progresses in his level of competence. The classroom portion is normally in session from the first part of January until the latter part of March. The field portion is usually conducted, at one of the Regions, from the beginning of April to the second week in June.

The Hydrography II course, first establsihed in 1968, is intended for employees who have gained actual experiences in most of the main hydrographic survey duties during four or five years of field work. These employees should be close to or at the highest working level classification, and ready to compete for supervisory roles such as taking charge of small surveys, sub-parties or second-in-charge of medium size surveys. The successsful completion of Hydrography II has been established as one of the qualifications that must be met in order to qualify for competitions above the top working level. The course takes place in the fall usually from near the end of October to the second week in December; six weeks in the classroom. Approximately twenty-three instructors, lecturers or speakers contibute their efforts and specialized knowledge to the course.

The course endeavours to provide a little more of the theoretical background and provides more in depth knowledge about some of the subjects given in Hydrography I. In addition, subjects that may be considered to be of peripheral interest are also given with the intent to enhance the employee's knowledge for better communication with others engaged in different disciplines especially on multiparameter surveys. The individual trainees are encouraged to contribute their views and relate the practices of their region for discussion and information. The course expects the trainees to have had a broad hydrographic survey experience, however, in case the experience of some of the trainees had been too limited because of their abilities in a specialized aspect of the field work, a pre-course reading list with some questions to answer are provided, well before the course commencement. These questions relate to the major areas of hydrographic surveys and they should aid the hydrographer lacking the wide experience to enhance or refresh his knowledge about the subjects or processes in which he had not had actual experience, so that, he would not be placed at too great a disadvantage on the course.

Examinations are given in both courses, but, the objective of the instructors is to make all efforts to aid the trainees to learn and understand the subjects given, and hence to pass the course, without sacrificing the course standards. Tests and exercises are also given in order to facilitate passing the course(40%), that is, passing is not dependent only on the final examination. The tests and examinations are set so that they are of medium complexity, unambiguous and as much as possible objective.

The 1982 syllabus for the Hydrography I course and the 1981 syllabus for the Hydrography II course are included. The general objectives and the purpose of each course is given at the front of the syllabi.

Hydrography I — 1982

Phase I — Classroom Portion — January 5 to March 11

SYLLABUS

SUBJECTS	SESSIONS
1. Commencement	2
2. Survey I	103
3. Hydrography	59
4. Electronic Positioning Systems	32
5. Tides, Currents and Water Levels	18
6. Projections	19
7. Computer Familiarization	31
8. Field Sheet Data Presentation	22
9. Practical Seamanship	20
10. Cartography	19
11. Resource Mapping & GEBCO	4
12. Critique	6
13. Study & Review, etc.	30
14. Final Examinations	19
TOTAL	384 or 48 days

Course Duration of Phase I	10 weeks
Class Starting time:	08:30 each day
Class termination time:	16:30 usually
Sessions per day	8, each session is 45 minutes with 5 minutes break between sessions

Objective
The main objective of the Hydrography I course is to provide basic training in hydrographic surveying. This entails training new employees on how to conduct the survey work that an assistant hydrographic surveyoer may be required to perform. The instructions are given not only in the classroom but also in the field in order to provide some practical experience.

Purpose
The purpose of the Hydrography I course is to enable new survey employees to articipate effectively and productively in hydrographic surveys soon after finishing the course. The course provides training in the application of land survey practices and techniques to hydrography as well as instructions in the survey processes that are primarily concerned with hydrography to all new survey employees.

The course results are used to aid in the determination of whether a new survey employee should be retained. The employee must take and pass the course during his probationary period as part of the requirement in the career development and progression plan of the Canadian Hydrographic Service.

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1. **COMMENCEMENT** — 2 Sessions
   - .1 Welcome — Dominion Hydrographer
   - .2 Instruction to course, etc.
   - .3 Details of course
   - .4 Administrative matters
   - .5 Assignment of equipment, etc.
   - .6 Time off to cash cheques, etc.

2. **SURVEY I** — 103 Sessions

.1 **Horizontal & Vertical Control** (12)
— principles, methods, quality
— datums, specifications
— stations, selection, recovery, description
— monumentation

.2 **Instruments** (32)
— theodolities T-2, T1-A
— levels N-2, NA-2
— EDM MRA-3, CA-1000, HP-3800
— sextant, stadia, subtense, gyro

.3 **Applications** (34)
— reduction of observations, spherical excess
— grid & geographic traverse
— UTM system, geographic forward & inverse
— quad. adjustment, resection, intersection, off centre
— elevation & heights, curvature & refraction

.4 **Astro Azimuth** (15)
— coordinate & time system
— zenith distance & hour angle solutions for sun & stars

.5 **Air Photos** (6)
— principles, scale, heights, identification, targets, shoreline

TESTS/REVIEW (4)

3. **HYDROGRAPHY** — 59 Sessions

.1 **General**
— purpose of a hydrographic survey, our products and customers
— areas of operation, requirements of a hydrographic survey
— development and procedures in a hydrographic survey
— chart users and their requirements

.2 **Sounding Line Patterns**
— direction, types — parallel, radiating, interlines, checklines
— in channels and rivers
— planning and running sounding lines
— sounding line spacing

.3 **Visual and Range Bearing Position Fixing**
— position lines — straight, circular (concentric, eccentric)
— by intersection, resection, range/bearing, other methods
— the sextant, description of
— horizontal sextant angles, inclined angles, angles to faint objects
— check angles, station pointer

— selecting the sextant fix, good and poor sextant fixes
— sextant sounding — note keeping, launch control
— plotting exercise
— conning the sounding vessel
— horizontal positioning errors
— radar, hydrodist

.4 **Depth Measurement**
— equipment and uses, armed lead, sounding pole, sounding machine, photobathymetry, sweeping, echo sounder
— sound, velocity of sound, nature of echo pulse, pulse frequency
— echo sounders, fixed and variable velocity
— propagation losses, frequency, pulse shape, beam width
— calibration, calibration equipment
— echo sounder specifications, sounding platforms
— apparent depth and true depth

.5 **Echograms**
— sources of errors, kelp and weed, deep scattering layer, hyperbolic effect, beam width, false echoes
— spacing of individual soundings, spacers
— dividing and scaling exercise
— reduction of soundings

.6 **Types of Surveys**
— standard
— revisory, reconnaissance and track line, over ice, range line, control, limnogeology, multidisciplinary, wharf
— wharf plan plotting, spacing, dividing, scaling exercise

.7 **Shoal Examinations**
— definition, sources, purpose of
— procedure, special cases
— detection by sweeping, vertical accuracy,
— symbology

.8 **Bottom Samples**
— definition, users, coverage
— samplers — types and uses
— classifications, symbology

.9 **Shorelining**
— definitions, methods

.10 **Aids to Navigation**
— definitions, purposes, types
— positions and characteristics, hazards
— the Canadian Aids to Navigation System
— Traffic Separation
— Danger & exercise areas

.11 **Notices to Mariners**
— N/M
— chart corrections

.12 **Digital Depth Data**
— acquisition
— processing

.13 **Sailing Directions**

NOTE: All relevant S.S.O'S. and Chart 1 will discussed in each section.

4. **ELECTRONIC POSITIONING SYSTEMS** 32 Sessions

.1 **Introduction**
— general
— why we use electronic positioning
— short history in C.H.S.

.2 **Preliminary**
— units of measurement used
— definition of basic terms

.3 **General Principles**
— electromagnetic radiation, frequency spectrum
— speed of light, refractive index, phase lag
— propagation of electromagnetic waves
— distance measurement
— lines of position
— classification of systems

.4 **Short Range Systems**
— general, frequencies, range
— Miniranger, limitations, calibration, range/range accuracy lobes
— Hydrodist, range/bearing

.5 **Medium Range Systems**
— general, frequencies, propagation
— hyperbolic positioning, lane expansion, accuracy lobes, lane ambiguity, calibration
— Hifix, Hifix/6, Minifix
— Decca

.6 **Long Range Systems**
— general, frequencies, land path, ionosphere, skywave
— Loran-C
— rho/rho Loran-C
— Satellite Navigation
— combined Loran-C and Sat Nav

.7 **Other Systems**
— Omega and differential Omega
— Global
— Maxiran
— Syledis

.8 **Lattices**
— range/range, hyperbolic, other
— hand and automated lattice drawing

.9 **Automation in Positioning**
— position logging and data acquisition
— integrated navigation, BIONAV

5. **TIDES, CURRENTS AND WATER LEVELS** 18 Sessions

.1 **Tides** (1)
— cause
  — moon, sun and earth relationship
— types
  — diurnal and semi-diurnal
  — inequalities in tides

.2 **Datums** (4)
— vertical datum
  — why a datum for hydrographic charts
  — selection of a datum

- chart and sounding datum
  - definition
  - difference between the two
- specific chart datums
  - tidal and non-tidal waters
  - what are elevations and heights
- recovering and establishing
  - by use of bench marks
  - by simple observations of past data
  - by datum transfer

.3 **Datum Transfer** (2)
- why a transfer
- conditions necessary
- required data
- computations

.4 **Cotidal Chart** (2)
- why a cotidal chart
- what is it
- how to construct one
- how to use one

.5 **Currents** (2)
- principles
  - centrifugal force
  - coriolis force
- effect of the above
- causes of currents

.6 **Tide Predictions**
- tide tables
  - what they are
  - information they contain
  - how to use them

.7 **Equipment** (3)
- Ott and Ottboro water level recorders
  - purpose
  - description and operation
  - installation and maintenance
  - comparison form
- staff
  - purpose
  - description
  - method of installation
- current meters
  - purpose
  - brief exposé on a few types — hand held
    — drogues
    — in situ

TESTS/REVIEW

6. **PROJECTIONS** 19 Sessions

.1 **Projections** (9)
- introduction
- basic problem and definitions
- introductory geodesy required for projections
- scale factor
- types of map projections
- description of projections
- loxodrome or rhumb line
- great circles
- cylindrical projections, e.g. mercator,
- T.M. and U.T.M.
- conical projections, e.g. polyconic
- azimuthal — e.g. Polar Stereographic
- general

.2 **Calculations & Plotting** (10)
- Mercator
- Polar stereographic
- U.T.M.

7. **COMPUTER FAMILIARIZATION FOR FIELD COMPUTATIONS**

.1 **Introduction**
- use of computers in hydrographic applications

.2 **General**
- principles of computers
- computer terminology
- binary and octal numbers
- machine language
- benefits of higher level languages
- algorithms and flowcharting

.3 **Fortran Language** 31 Sessions
- characters, variables, expressions, statements, sequence of execution, I/O functions and subroutines

.4 **Practice**
- PDP-11/34, RSX11M operating system
- editing
- task building and running Fortran programs
- exposure to remote batch card input to large system (cyber 74)

8. **Field Sheet Data Presentation** 22 Sessions

.1 **General:**
- introduction to sessions, data presentation, purpose
- care of documents, instrumentation, equipment
- neatness and cleanliness
- materials for field sheets, boat boards, sketches
- organization of materials and source data,
- field sketches (control, report, bench marks, rock posts, shoreline, etc.)

.2 **Field Sheets**
- purpose, uses, accuracies required
- general discussion of types of data to be presented
- various methods of presentation
- plotting — minor exercise
- foreshore, (between high and low water)
- depths and contours
- common mistakes (density of soundings, size, over doing it)
- flow of field sheet from planning to cartographer

.3 **Title Block:**
- standard format
- variations in format
- errors and omissions
- references and reference notes
- breakdown of title, by item
- exercise
- bar scales

.4 **Plotting**
- transferring information from other sources to boat boards, field sheets, plans
- general plotting with various small instruments (parallel rules and dividers, gerber scale, diagonal scale, station pointer . . .)

.5 **Data from Special Surveys:**
- revisory
  - maintenance copy
  - presentation of new data
  - title information and references
- reconnaissance
  - type of data to be presented
  - title information and references
- tracks
  - type of data to be presented
  - title information and references
- special purpose surveys
  - overlays
  - titles
  - references
  - additional data in red

.6 **Automated Field Sheets**
- examples and discussion
- overprints
- title blocks
- orientation of soundings
- squeezing and overcrowding of depth values
- absence of depth values

.7 **Field Sheet Checking:**
- standing orders
- reference documents and materials
- copies of field sheets for checking purposes
- field sheet check off list
- checking procedures
- a few basic rules to follow to detect errors or discrepancies

9. **ELEMENTARY PRACTICAL SEAMANSHIP** 20 Sessions

.1 **Practical Seamanship**
- nautical terms
- rope and knots
- wire
- rigging moorings
- knot exercise

.2 **Safety Afloat**
- explosions and fires
  - causes and prevention
  - fighting fires
  - classes of fires and extinguishers
- life rafts and equipment
- man overboard
- groundings
  - prevention
  - what to do when grounded
  - survival

.3 **Marine Radio Telephone**
- operation (general)
- regulations
- distress communications
- M.R.T. Handbook and License

.4 **Rules and Regulations**
- rules road Great Lakes
- rules road International
- lights carried Great Lakes
- lights carried International
- small craft regulations

.5 **Maneuvering**
- docking and coming alongside mother vessel
- anchoring
- boat handling (Adverse Conditions)
- dory and rowboats
  - towing
  - landing ashore
  - loading and unloading
  - rowing
- ice

.6 **Charts**
- usage
- reading symbols and abbreviations
- chart corrections from notice to mariners
- sailing directions (pilots) usage
- position on - off charts by geographic
- co-ordinates
- exercise

.7 **Compass**
- compass rose
- magnetic compass
  - deviation
  - variation
  - compass error
- gyro compass
  - compass error
- compass hints (Arctic)
- computing and plotting courses
- exercise

.8 **Electronic Aids to Navigation**
- radar
  - operation
  - radar and chart identification
- echo sounder
  - applications for piloting
- Decca and Loran A and C

.9 **Piloting**
- sailing directions
- dead reckoning
- position determination
- leeway
- tides and currents - prediction wheel
- piloting hints
- exercise

TESTS/EXERCISES AND REVIEWS

10. **CARTOGRAPHY** 19 Sessions

.1 **General**
- purpose course
- cartographic organization
- outline of chart production

.2 **New Chart Compilation**
- requirements — schemes, formats specifications
- sources
- projections, datums, control
- source reduction and mosaic preparation
- compilation manuscripts
- support areas and outside agencies
- checking and review procedures

.3 **Revision Compilation**
- maintenance procedure
- notices to mariners
- purpose and types of chart reprinting
- reprints
- new editions
- chart correction patches

.4 **Drafting**
- general reprographs terminology
- new chart drafting
- revision drafting
- automated cartography procedures

.5 **Tour of Chart Production Division Including Auto. Cart.**

.6 **Tour of Surveys & Mapping Photo Lab & Printing**

11. **RESOURCE MAPPING & GEBCO** 4 Sessions

.1 **Resource Mapping**
- objectives
- sources of data
- acquisition requirements
- compilation, interpretation
- drafting

.2 **General Bathymetric Charts of the Ocean**
- objectives
- sources of data
  acquisition requirements
- reduction of data
- copies to IHO

PHASE 2. **TRAINING IN FIELD**

Period: approximately 10 weeks
Starting: March 22
Termination: May 28
Location: Pat Bay, B.C.
Centre of Operation: Institute of Ocean Sciences
Canadian Hdyrographic Service
Sidney, B.C.

Hydrography II — 1981

November 2nd to December 11

SYLLABUS

Main Subjects	Periods
1. Hydrography	36
2. Acoustics: Theory & Devices	12
3. Surveying II	34
4. Radio Aids	32
5. Tides, Currents and Water Levels	8
6. Geodesy	12
7. Geoscience	18
8. Other Survey Systems	13
9. Cartography	12
10. Peripheral Subject	10
	187
Review and Study	20
Critique	5
Final Examinations	15
Commencement	1
Total Periods at 8/days for 28 days and 4 periods on last day.	228

Objective

The main objectives of the Hydrography II course are: to provide more of the theoretical background and principles to the processes involved in hydrographic surveys; to impart greater in-depth knowledge of particular aspects of hydrography, and to augment the knowledge concerning subjects that may directly or indirectly affect the conduct of hydrographic surveys, or that may be only of peripheral interest.

Purpose

The purpose of the Hydrography II course is to enhance the knowledge and techical competence of hydrographic surveyors in order that they may conduct more effectively hydrographic surveys as hydrographers-in-charge or as the second-in-charge. In addition, the successful completion of the course is a requirement to be met in order to qualify for positions above the working levels.

1. **HYDROGRAPHY** 36 Periods

.1 **Survey & Chart Requirements** (6)

.11 Planning, chart schemes and requirements for chart and surveys (2)

.12 Accuracy Requirements: soundings and (Horiz. & Vert.) charts, users & etc. (4)

.2 **Specialized Types of Surveys and Methods** (11)

.21 Sweeping, including side scan sonar, multiple arrays etc.; (2)

.22 Large Scale Surveys (2)

.23 Range Surveys (3)
Establishment, Horizontal Accuracy, Sensitivity and checking horizontal and vertical elements

.24 Revisory Surveys (3)

.25 Through Ice Soundings (1)

.3 **Field Sheets** (6)

— Completeness, inadequacies (recurring types)
— standards
— checking, inspection
— care

.4 **Automated Field Hydrography** (9)

— Various CHS Data Acquisition & Processing Systems (HAAPS, INDAPS, PHAS, NAVBOX)

.5 **Bottom Samples** (4)

— Types, Equipment, Methods and Coverage including some basic geology.

2. **ACOUSTIC: THEORY AND DEVICES** 12 Periods

— Propagation of Acoustic energy in water; salinity, temperature and density relationships affecting velocity of transmission in water
— velocimeters
— frequency characteristics, beam patterns transducer design
— echo sounder design, digitizers and correlators
— veritcal echo sounding and equipment in use; precision depth recorders
— horizontal echo ranging; equipment in use; multi-beam sweeping (also refer to specialized types of surveys)
— acoustic transponders; positioning with short and long baselines

3. **SURVEYING II** 34 Periods

.1 **Errors** (10)

— types, probability, random error distribution
— propagation of variance, analysis

.2 **Control Specifications** (10)

— horizontal and vertical control requirements
— concepts of "Specifications & Recommendations For Control Surveys" booklet
— Traverse Route Error Ellipses

.3 **Survey Topics** (14)

— planning
— matrix notation & manipulation
— iterative methods
— rotation of coordinate systems
— least squares, curve fitting

4. **RADIO AIDS** 32 Periods

.1 **Radio Theory:** (20)

— Electromegnetic waves: travelling waves, standing waves, dipole antenna, radiation from a dipole, travelling wave antenna, near field (induction field), polarization, reception using a dipole.
— Propagation: wave paths, refraction, reflection ionosphere, surface conductivity, phase lag.
— Signal types: pulsed signals, continuous waves, amplitude. Modulated waves frequency modulated waves, doppler effect. Lines of Position: geometric configurations, lattices.
— Accuracies: standard error, accuracy lobes, calibration pattern zeroing.

.2 **Radio Positioning Systems:** (8)

.21 Medium and long range systems: Minifix, Hifix, Loran C (rho-rho), Navigation Satellites, intergrated systems.

.22 Microwave Systems: (4) RPS, Miniranger, Trisponder.

5. **TIDES AND CURRENTS** 8 Periods

.1 **Principles**
- internal waves and tides
- types and causes of tides; distribution in Canadian water, measurement techniques and equipment.
- currents, natures and causes, detection, measurement techniques and equipment, hydrographic application.

6. **GEODESY** 12 Periods

.1 **Geodesy** **(10)**
- geoid; ellipsoid; gravity, equipotential surfaces
- meridian arcs, deflection of the vertical
- latitude and longitude, Laplace Equations, ellipsoid parameters & relations
- convergence, meridional arc, corrections
- direct & inverse cases

.2 **Nautical Geodesy** (2)
- functions, data banks, GALS

7. **GEOSCIENCE** 18 Periods

.1 **Geophysics** (6)
- earth's magnetic field and gravity measurements
- seismic profiling

.2 **Geomorphology** (6)
- sedimentary processes, interpretation of bathymetric data

.3 **Physical Oceanography** (6)
- definition — reason for study of oceans
- ocean statistics
- physical properties
- ocean currents (non-tidal)

8. **SPECIAL SURVEY SYSTEMS** 13 Periods

.1 **Remote Sensing** (8)
- aerial photo and laser bathymetry
- inertial platforms

.2 **Doppler Satellite Surveying** (3)

.3 **Inertial Survey Systems** (2)

9. **CARTOGRAPHY** 12 Periods

.1 **Compilation, Field Data** (4)
- compilation requirements, inadequate field data

.2 **Computer Aided Data Processing** (8)

10. **PERIPHERAL TOPICS**

(1) Canadian Maritime Jursidiction, CHS and Global Charting Perspectives.
(2) Legal Aspects of Offshore surveys.
(3) Roles of the Canadian Hydrographic Service.
(4) Law of the Sea.
(5) Charting Liabilities

NOTE

It should be noted that the minimum academic requirement for entry into the Canadian Hydrographic Service as a hydrographic surveyor is an interprovincial diploma in Technology or equivalent. The majority of the entrants possess the minimum requirement of a Bachelor's Degree in one of the Physical Sciences. The courses, therefore, assume a knowledge in Mathematics and in the Sciences at the technology level, and they do not attempt to duplicate the work of the academic and technology institutes but endeavours to improve the student's knowledge in Hydrographic Surveying and Marine Charting.

The composite knowledge base of hydrographers above the working level is therefore, Technology Diplomas and Hydro I and Hydro II or University Degree and Hydro I and Hydro II. This system is distinctly different than the system employed in some of the other Hydrographic Training Schools where the entrance requirement is similar to a University Entrance Requirement and where the curriculum offers all phases of academic training. This distinction should be borne in mind when considering participation in Hydro I or Hydro II because persons without the necessary math and science backgrounds will have difficulty with the course material.

Notes on the Bay of Fundy and Gulf of Maine Current Atlas

D. L. DeWolfe

CHS Atlantic

INTRODUCTION

The production of a current atlas usually starts with a very time consuming and expensive program of measuring the tidal current regime throughout the area. For local areas such as channels and harbours, the field work can be undertaken and completed in a relatively short time and can produce good coverage. To make a good atlas of large areas, such as the Bay of Fundy and Gulf of Maine, would be prohibitively expensive and time consuming.

There exists a small number of quite good hydrodynamic mathematical models which accurately re-produce both the vertical tide and the tidal streams. Once calibrated to fit existing data, they may be used with some confidence to produce either a cotidal chart or an output of the components of the tidal current.

Several years ago the Atlantic Region, Canadian Hydrographic Service, undertook to prepare an atlas of tidal currents of the Bay of Fundy and Gulf of Maine, using the currents as calculated from such a model, rather than from traditional methods such as by direct observation. This model, developed by Dr. D. A. Greenberg[1] of Coastal Oceanography at the Bedford Institute of Oceanography, as part of a Ph.D. thesis at IOS Bidston, U.K., was considered to be a valid base for a current atlas for two reasons. The first was the knowledge that the tidal regime of the Bay of Fundy and Gulf of Maine is almost totally dominated by the M_2 tide, and for this reason the tides are relatively simple to model. The second reason is that as a result of the extensive calibration work done to the model during the 1976-77 Tidal Power Review Board studies, the model very accurately reproduces both the M_2 tidal elevation and current throughout the area.

In designing the current atlas, reference was made to the recommendations of the 1979 CHS Working Group on Current Atlases with regard to format and presentation. The initial step was to decide on how we would present the information. After some thought, it was decided to present the current in three separate areas, being the Gulf of Maine, the central portion of the Bay of Fundy and the upper bays. The reference station was chosen to be the Saint John vertical tide. (This is a valid assumption because of the dominance of M_2). Each of the three areas would have twelve panels, commencing with high water at Saint John, and spaced one lunar hour apart. Lunar hours were chosen because twelve of them completely define a tidal cycle. By labelling the panels (or charts) in terms of hours before or after high or low water, the time error one incurs by using lunar hours instead of solar hours is at most 6 minutes.

The model grid layout was such that it was essentially divided into the three areas by the size of the model grid. The Gulf of Maine had a coarse grid of 22 km, becoming finer as it progressed into the Bay of Fundy.

It is obvious that in order to produce a current atlas, one must draw a lot of arrows, each one representing the magnitude and direction of the tidal current at a particular time. Recent advances in computer graphics has made it possible to easily write software to produce all the arrows and the necessary labelling for the text. This could be a real time saver by letting a computer draw the thousands of arrows rather than having a draftsman slowly go crazy doing the job. The drawing of the coastline by computer was also a possibility.

METHOD

The model was run to produce a tape containing the u and v components of the current at 15 minute intervals, starting with high water at Saint John. Every fourth set of u's and v's were used, being hourly. The "u" and "v" components were averaged across adjacent grid squares except for the outer boundary data which was not touched. To average these would produce u and v on the open boundary of ½ the actual. At this point, the u an v components were combined to produce a vector of rate and direction.

The computer plotting package, DISSPLA, was then called in to produce coastline, text and all the arrows. (see figure 1)

As can be seen from this figure, the arrows and text are of excellent quality but the coastline is rather rough. As the scale expands for the presentations in the upper reaches of the Bay of Fundy, there is no additional detail obtained in the coastline. It was therefore decided to prepare base plots of all the information, 36 pages, and opaque the coastline, substituting instead a properly scribed coastline.

A contract was let to Atlantic Air Survey in Dartmouth to prepare the coastline, clean up any bad arrows and delete a few that interferred with the coastline. The completion of this contract resulted in printing negatives for the printer.

DISCUSSION

The actual manpower effort required to produce this atlas was minimal, as a result of the use of computer graphics. About 1 man months was used to produce the 36 plots similar to Figure 1, and several man weeks of management of contracts, including the publishing. The result is a nice looking, accurate presentation of the current regime over a large area, with minimal cost and effort. Examples are provided in Figures 2-4.

REFERENCES

1. Greenberg, D. A., 1979: A numberical model investigation of tidal phenomena in the Bay of Fundy and Gulf of Maine. Mar. Geodesy, *2*, 161-187.

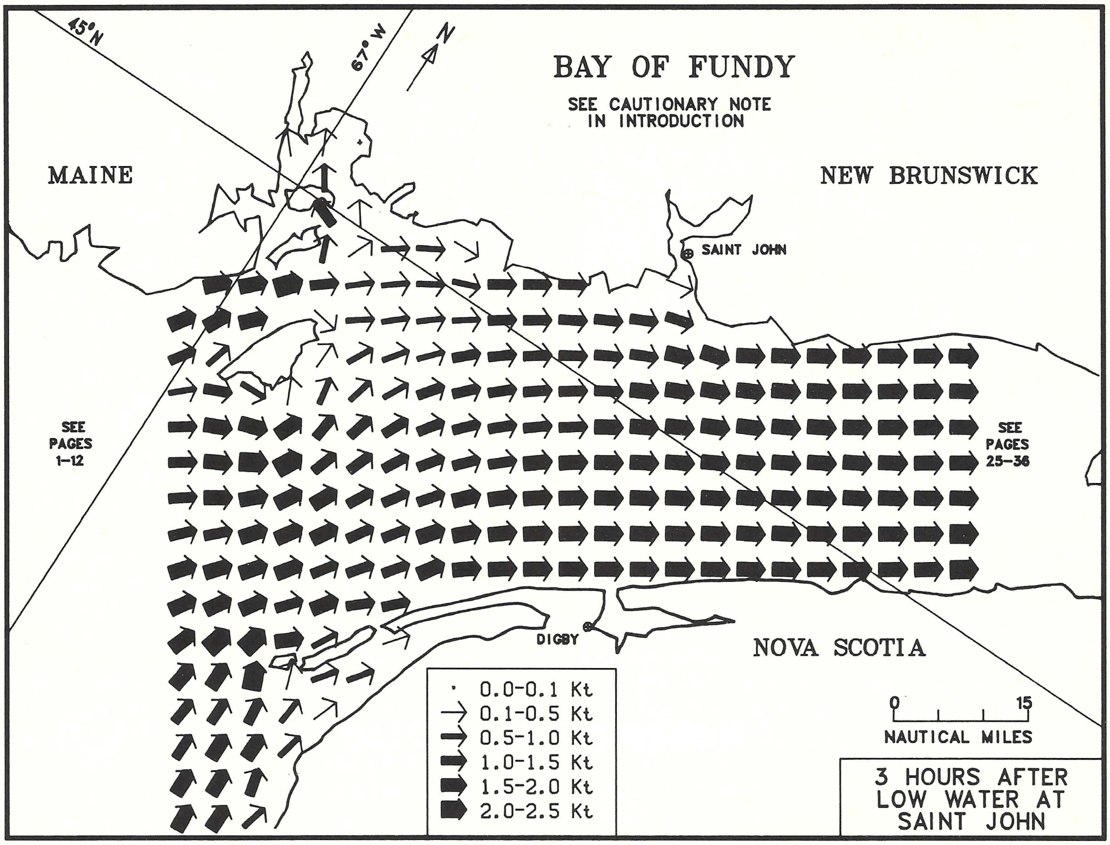

Figure 1

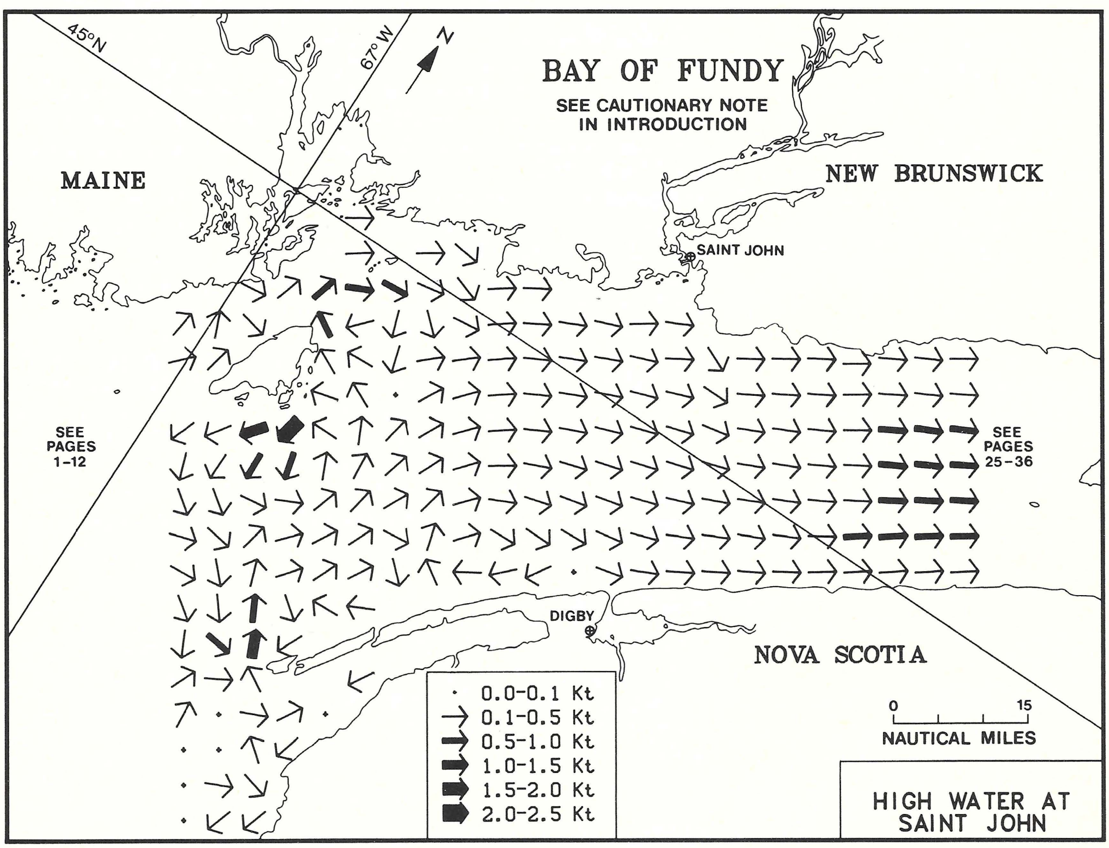

Figure 2

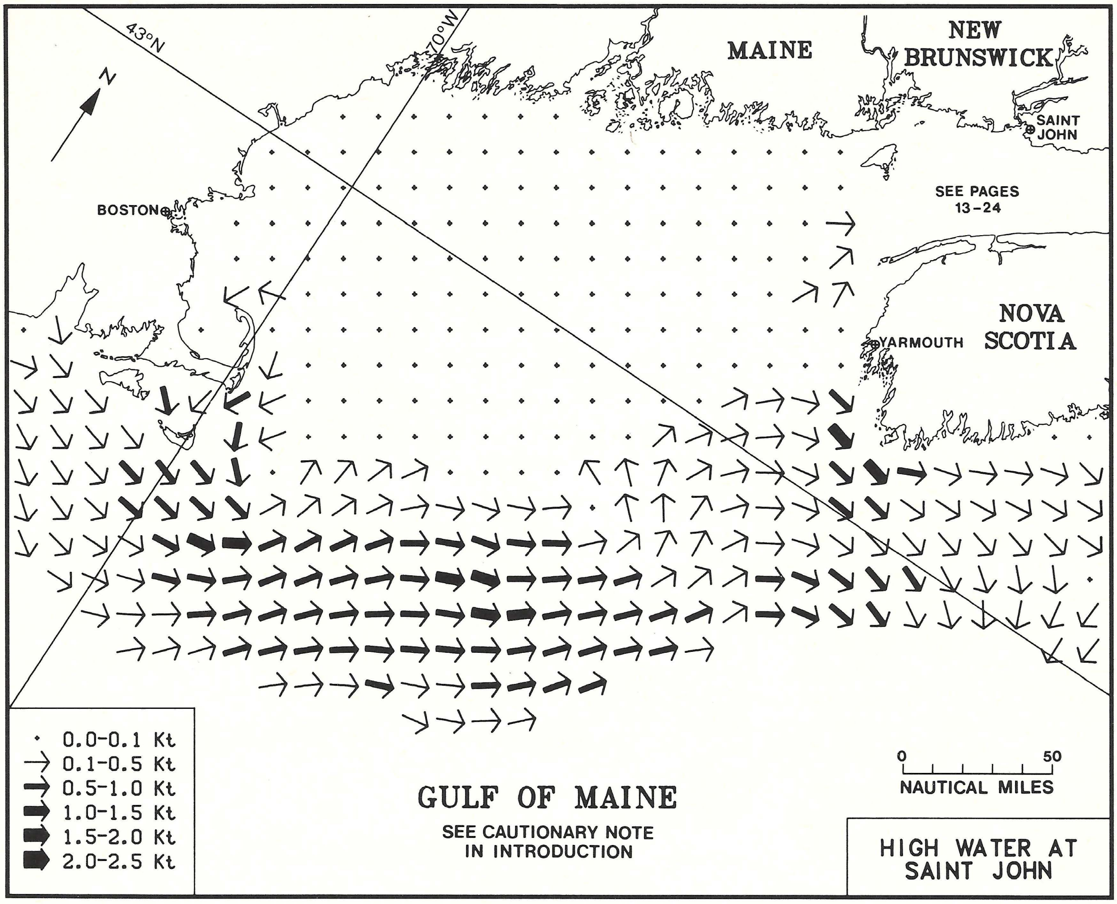

Figure 3

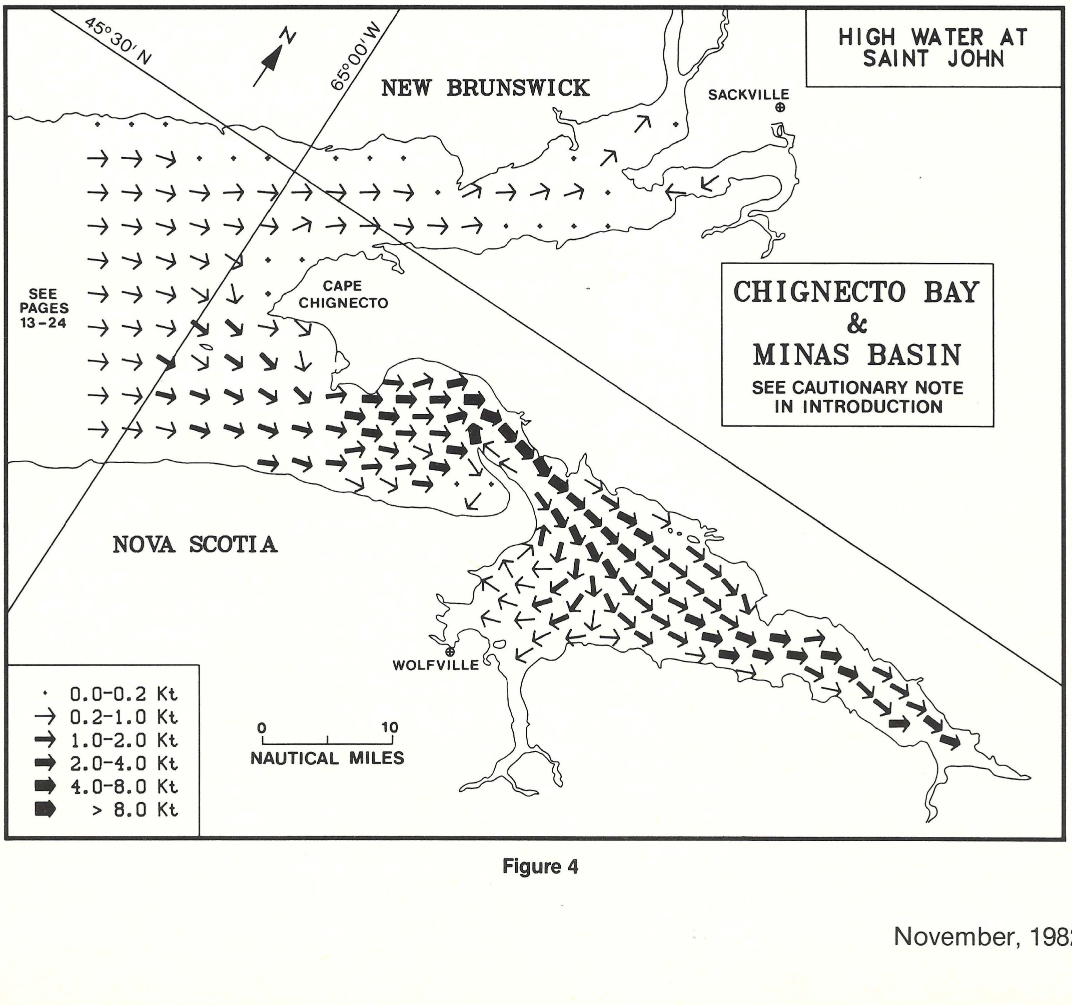

Figure 4

HYDROGRAHIC SURVEYING UNDER ADVERSE CONDITIONS

Alan D. Anderson, Lt. Cdr., NOAA*
Wayne L. Mobley, Capt., NOAA

This paper is a summary of the working conditions encountered by the NOAA Ship RAINIER during its 1980 hydrographic survey project off the southeast coast of the Island of Hawaii, and the methods used by the ship to survey under those conditions. The southeast coast of this island is relatively unique in that it contains an unusual number of environmental and geographic characteristics that routinely present difficult and often dangerous situations to hydrographic survey ships and their field personnel. This paper is presented for the information of those who might find themselves in similar situations in the future.

High winds of up to 40 knots and sea conditions of 10 to 15 feet along the southeast coast of Hawaii are generated as the trade winds funnel around this wedge shaped island. These conditions, combined with rugged terrain, the absence of shelter for the ship's small boats, and very precarious anchorages for the ship caused most of the operational problems the ship faced during its 1980 mission (Figure 1).

Figure 1: Trade winds and sea conditions along Southeast Coast of Hawaii Island

The problems the ship encountered during its 1979 Hawaii project, which junctioned with its 1980 work, were easily solved because the ship was able to anchor leeward of Ka Lae (South Point) where the winds were high but the seas and swells were minimal. Picking up the launches each day presented only minor problems. The launches worked each day on the windward side in rough water, but returned to the ship each evening with following seas (Figure 2).

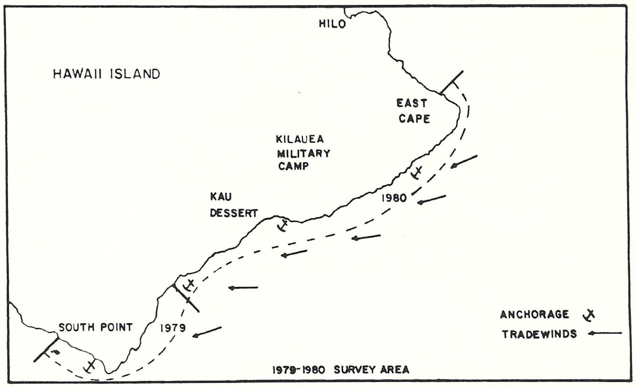

Figure 2: NOAA Ship RAINIER 1979 and 1980 project area. Southeast Coast of Hawaii Island

From the ship's 1979 experience, it was apparant that a different method would have to be found to deploy the launches in 1980. Because the working area was now too far from South Point to run the launches back and forth each day, two new methods of deploying the launches were considered. One was to devise a means of anchoring the ship in the working area to support the launches, and because of the dangerous seas, not to pick up the launches on a daily basis. The other method was to deploy the launches each day from the ship and require them to return to sheltered water at either South Point or Hilo for pickup. A distance one way to these areas from the project areas ranged between 20 and 50 nautical miles (nm). or 2 to 4 hours of running time in rough weather.

The first method was chosen as the safest and the most efficient. This method required minimizing the motion of the ship while at anchor, particularly the swinging and sailing motion generated by high winds; finding adequate anchorages for the ship on a very steep bottom without the benefit of an accurate chart, and mooring the launches alongside the ship without damaging them in the rough seas. Also, without sheltered water, it was not possible to put people ashore from the ship for shore support work. An independent shore camp was needed.

The first problem, that of minimizing the ship's motion in high winds and rough seas, was of major importance. When high wind and no current conditions are found in a working area, the ship's swing will exceed 180°. The wind drag, generated by this increased cross-section, and the momentum of the ship, generated while it is sailing in the wind, exert abnormal strain on the anchor and chain, oftentimes resulting in the anchor being dragged. Given that the launches would have to lie alongside the ship, the swinging would frequently put the launches upwind of the ship, driving them hard against the hull, and possibly doing serious damage to the launches and their automated systems. The motion from rough weather would also make it virtually impossible for the launches to come alongside the ship without starting the main engines and the bow thruster to maneuver the ship.

To reduce the ship's motion, a stabilizing sail designed and manufactured by Franz Schattauer, a Ballard, Washington, sailmaker, was purchased and installed. A drawing of the sail while unfurled is shown in Figure 3. Two locations for the sail were tried. The final

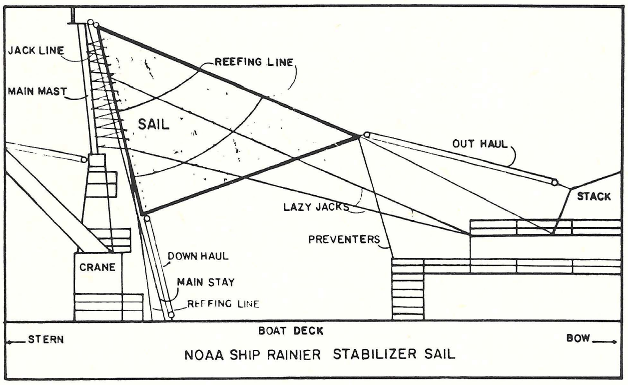

Figure 3: Stabilizer Sail plan for NOAA Ship RAINIER

location required modifications to the sail and its rigging by the ship's crew. The sail worked most effectively when it was secured between the main mass and the ship's stack in a manner similar to the stabilizing sail on small fishing boats (Figure 4). This configuration reduced the ship's swing to 40° with constant tension on the anchor chain. As a result, the rolling motion which at times could reach 25° while at anchor was minimized as the ship and launches were kept into the wind and seas. This method of reducing motion worked best when two anchors were deployed. Prior to anchoring during high winds, it was often necessary to maneuver the ship downwind to permit the crew to unfurl the sail.

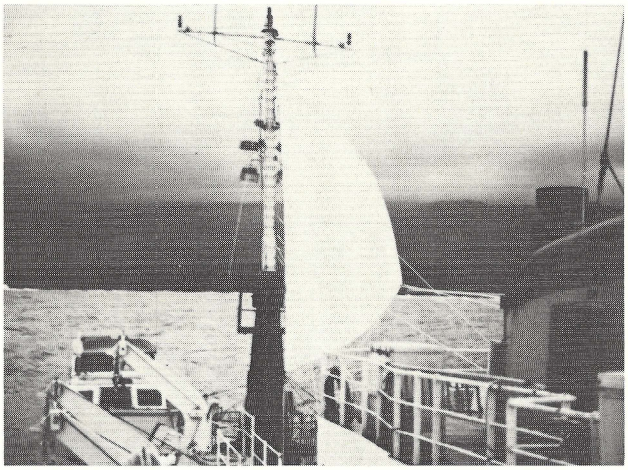

Figure 4: Stabilizer Sail in operation

The first anchorage was chosen at the project's southern limits in an area the ship surveyed in 1979. This was the only anchorage the ship had located that was characterized by a relatively shoal, sloping bottom. It was, however, necessary to anchor within 0.25 nm from the jagged shoreline in 25 fathoms of water. This close proximity to the shore allowed no margin of safety for dragging the anchor or parting the chain, as the trade winds were blowing ashore. For this reason both of the ship's anchors with seven shots to each were used. As the work progressed, the shop located three other anchorages. In these areas two anchors were also used whenever possible. The last two anchorages were in 40 to 60 fathoms and were less than 0.2 nm from the rocks. Although the wind in these areas was blowing and mostly alongshore (30° from the shoreline), the margin of safety was very small. These areas were chosen mainly to maximize the distance that the ship could be taken downwind before striking the shore should the anchors drag or chains part. The bottom slope in these areas was very steep; therefore, nine shots of chain were used. The holding power of the anchors in the anchorage areas with onshore winds were enhanced by the ship's having to drag the anchors up the steeply sloping bottom. Early in the project, only one dragging incident occurred. Two anchors with 9 shots to each were pulled free of the bottom while the ship was anchored in high winds in the lee of South Point. The ship was blown out to sea.

The next problem addressed was the method of mooring the launches alongside the ship in rough weather. The major concerns in mooring the launches were keeping them away from the side of the ship to minimize damage and reduce the force and frequency at which they surged on their moorings. The technique of using a boat boom was employed (Figure 5). The forward port deck crane

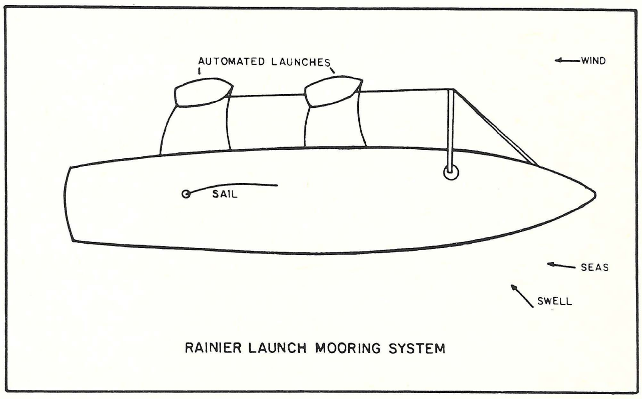

Figure 5: Launch Mooring Plan

boom was pressed into service. It was extended to its maximum limit, positioned perpendicular to the centerline and over the port gunwale, and then stayed forward with wire rope. A sea painter was led from the anchor windlass through a block at the end of the crane boom and secured to the forward starboard cleat on the forward launch. The sea painter was taken to the starboard cleat to hold the launch with the bow at a slight angle away from the ship. The wind and seas would then drive the launch away from the ship to the limits of its bow and stern lines. The second launch was trailed 40 to 50 feet astern of the first launch in a similar manner. This method of mooring resulted in the launches riding 20 to 30 feet off the ship and in line with their davits (Figure 6). Transferring

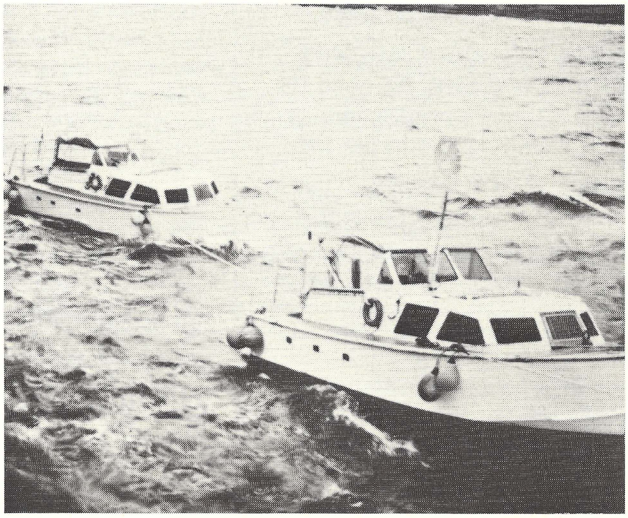

Figure 6: Launches moored alongside

personnel and equipment between the launches and the ship was the most hazardous operation. When the launches were pulled alongside the ship, timing became very critical, as the launches were heaving up to 10 feet, and the ship at times was rolling severely. It was not uncommon during a good blow for someone standing on a launch to be looking down at someone standing on the main deck of the ship. In spite of these conditions, there were no serious injuries to personnel and only minor damage to the stern railing of one launch. The damage occurred, oddly enough, when the winds became calm and there was insufficient wind force to hold the launches away from the ship while it was rolling in a swell.

Another major operational obstacle involved the very rugged and isolated nature of the shoreline and inshore terrain. No safe method of landing personnel and equipment existed in the majority of the project area. There were no roads over half of the area, which included the Kau Desert and part of Volcanoes National Park. The shoreline geography limited the survey method used during this project to range-azimuth position control which required frequent access to the entire shoreline. The horizontal control effort to provide control for range-azimuth observers was substantial. However, to help minimize the impact of the terrain on the overall project, and substantially reduce the need to transfer personnel and equipment between the ship and the shore, an independent shore camp was established at Kilauea Military Camp (KMC) located in Volcanoes National Park. This invaluable camp, staffed at times with up to 10 people, provided all logistical support for shore field operations, including efforts in horizontal control, field edit, tides, reconnaissance, range-azimuth support, and establishment and repair of electronic control stations. In addition to this, it proved a great asset in helping the ship with tasks that were more administrative than operational, including transmitting mail and pay checks, maintaining vehicles, performing routine public relations work, and acting as liaison in situations that required timely correspondence with the "outside". The camp was equipped with a local phone line and VHF radio base station to communicate with the ship. All necessary field equipment was transferred to the camp and later removed while the ship was alongside in Hilo. The KMC also operated a motor pool, which was utilized when necessary. The camp's charges for berthing and messing were minimal when compared with the reasonable alternatives. In addition, the KMC's helicopter pad came in very handy when trying to deal with the "rough terrain/no roads" problem. Out of necessity, commercial helicopters were used extensively for the work in the southern half of the project area for horizontal control, field edit, transporting range-azimuth observers, and installing electronic control stations.

Two other factors worthy of discussion in relation to this type of operation include the "modus operandi" of the range-azimuth parties and the safety precautions taken with the launches

For the range-azimuth operations, it was highly desirable to minimize the number of helicopter flight hours, minimize the idle time while the launches were on station, and to maximize the amount of sounding line data collected during calmer weather. These were difficult problems because local weather conditions often changed drastically within a few minutes, local weather forecasts were marginal, the helicpoters were based 0.6 flight hours away, all helicpoter arrangements had to be made several days in advance, and the best weather occurred early in the morning and late afternoon. To work toward the stated goals under these given conditions, the following steps were implemented. Observers were flown in to position at first light or camped overnight on station to be ready at first light. The maximum continuous stay on station was 3 days. All essential items used by an observer were doubled (i.e. gel cel batteries, radios, miniranger transponders). (Figure 7). Lastly, the launches departed the ship before sunrise to be ready for work on station by the first light, enabling them to take advantage of the early morning lull in

Figure 7: Range/Azimuth survey crew and equipment on station

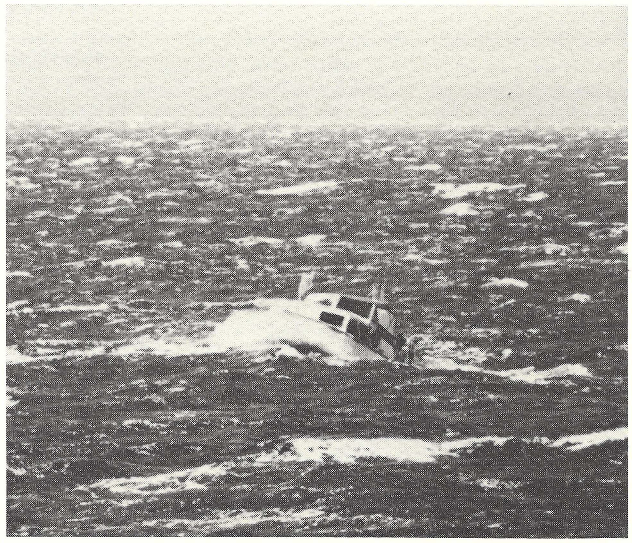

Figure 8: Launch Hydrographic operations

the tradewinds. Several times the launches were forced back to the ship by 1400 hours, with good progress, however. On days with reasonable weather all day, the workday sometimes ran to 11 continuous hours. The progress using these methods was quite rapid, completing 45 nm of hostile shoreline in 20 days during which launches could operate. Also contributing to this rapid progress were the short sounding lines resulting from the steep bottom contours and the relatively wide line spacing allowed by the 1:20,000 scale survey specifications.

Safety precautions taken during this project were more numerous than normally required. Launches were only deployed in pairs and were directed to work and travel always within sight of one another in case of emergency. The two major foreseeable emergencies were engine casualties, which could result in a launch being swept into the surf, or a launch broaching suddenly in large waves without time for a distress call. Sea anchors were placed on each launch to slow the speed at which a powerless launch would drift downwind. Copious amount of line were also added to extend the effective depth of the lauches regular anchor since, because of the steep bottom sloping away from the shoreline, anchorable depths were virtually in the surf zone. Jumper cables were placed onboard the launches to be used to take 12-volt backup power from the launches' 24-volt survey electrical system for the radio and engine's electrical system. Normally, without the cables, if the engine would die and the battery drain, all communications systems would be lost. The anchors and life rafts were rigged for rapid deployment in an emergency. Boat crews were chosen from experienced personnel and briefed covering several "what if" situations. Boat crews were rotated as needed to prevent fatigue and provide training.

In summary, the weather during the project was as expected, ranging from 0 to 45 knots of wind and from 3 to 15 foot swells. The average survey weather for the launch work was 15 to 30 knots (Figure 8). Excellent progress was made throughout the project in spite of the obstacles encountered. The work was completed early as compared to the time estimated using the other method discussed previously. This progress was attributed to the new sail, boat boom, shore camp, helicopter operations and little electronic downtime, as well as to modifications to the normal surveying routine to allow for the weather. It is estimated that the work was completed with a savings of 40 to 50 thousand dollars over the alternative method, assuming the other method could have completed the same amount of work in the same season. The big saving was in fuel cost for operating the ship and in reduction of helicopter time necessary for both methods.

A significant statistic involves safety. There were no serious work-related injuries and only 2 minor ones, although a rubber boat surveying inshore was flipped by a large wave. There was no noteworthy damage incurred or equipment losses sustained. The RAINIER is believed to be the first, and maybe the only, modern ship in the NOAA fleet to be under a sail (Figure 9).

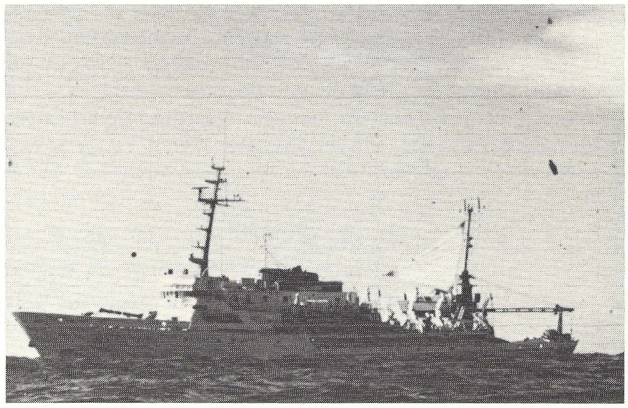

Figure 9: NOAA Ship RAINIER under sail

*National Oceanic and Atmospheric Administration.

Water Level Transfers To Determine Geodetic Elevations in Lake Ontario

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Cheyenne, Wyoming

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PREFACE

Since before the dawn of written history, man has *assumed* the "undisturbed surfaces" of bodies of water (lakes, seas, oceans, etc.) are *level surfaces*. This assumption, based upon the principle of hydrostatics (funamental hydraulics) was employed in constructing the extensive irrigation systems and water supply systems of the ancient world and navigation canal systems. In 1875 the U.S. Lake Survey instituted a program using the mean lake level gage readings between a pair of gages to transfer the elevation of a reference mark on one gage to establish the elevation of the reference mark of the second gage, which is called the *water-level transfer.*

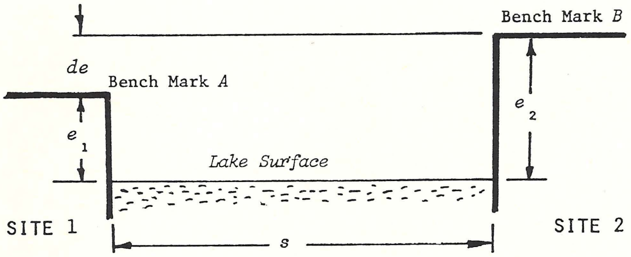

Figure 1 Schematic of Water Level Transfer Procedure

The U.S. Lake Survey investigation of the procedure (in 1875) indicated a difference of elevation of the lake's surface of 0.30 feet on "quiet days" between a pair of gages, which did not satisfy First-Order levelling specifications. This early study would indicate that a "long series" of observations could not be employed in differential geodetic levelling.

In 1890 Grove Karl Gilbert proposed use of lake level data to determine systematic crustal movement in the Great Lakes area. Since publication of this proposal, over one dozen investigations employing this concept and two elevation datum definitions have utilized the principle.

Each use of this principle has raised questions concerning the accuracy of the numerical results, and the validity of the principle. Until the 1970's there was insufficient data available to compare lake level gage readings directly to First-Order or Second-Order geodetic levelling.

This paper reports the results of an investigation of comparing lake level gage data to geodetic levelling, and the contributions of associated meterological and hydrologic factors.

INTRODUCTION

In 1967 a task committee prepared an International Cooperative program between the United States and Canada to study the hydrology, meteorology, physical limnology, and geology of one of the Great Lakes. This program, called the *International Field Year of the Great Lakes* (IFYGL), was developed and the data were collected in 1972. One proposed study for data collected was a "Lake Equation" task entitled *water transfer*. The purpose of the task objective was stated:

> To check the validity of the water level transfer across large bodies of water by studying the factors which affect the still water level. Comparison will be made with precise level lines run around the lake.

The agencies in Canada and the United States initiated a comprehensive data collection program in Lake Ontario. These data included meteorological data, lake surface levels, water temperature, and current velocity and direction, and were sampled at five minute to hourly intervals for over one year. These data were utilized in this investigation. Figure 2 illustrates the location of the various onshore and near-shore data collection sites around Lake Ontario.

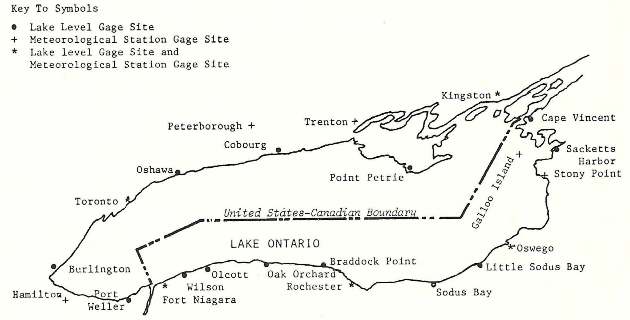

Figure 2 Location of Meteorological and Lake Level Observatories

GEODETIC LEVELLING

The first phase of the investigation was to obtain geodetic levelling data between all the lake level gages. In the 1960's the Geodetic Survey of Canada initiated a relevelling program in Southern Ontario (Lakes Erie and Ontario and the St. Lawrence River region). These observations were performed to First-Order specifications employing the "three-wire" procedure developed by Professor J. B. Johnson and John F. Hayford. In 1968, the U.S. Lake Survey commenced levelling utilizing the optical micrometer technique near the outlet of Lake Ontario (Cape Vincent), and observed differential levels along the easterly and southerly shore to the Niagara River. Both geodetic organizations observed differential levels from the level lines to the lake level gages.

Levelling was performed across the Niagara and St. Lawrence Rivers to connect the level lines. These interconnections of levelling made it possible to have a "closed loop", which provided a verification of the accuracy of the levelling. This combined level line was nearly 890 kilometers long. A detailed statistical analysis was performed. The classical analyses of geodetic levelling [algebraic sum of the accumulated partials; distribution of positive and negative partials; and distribution of the magnitude of the partials (regardless of algebraic sign)] were studied (both by geodetic organization and combined). Figure 3 is the graph of the accumulated partial for the level line. There is *no indication* that either organization's data or the combined data violate the normal law of distribution of accidental errors. The standard errors of the Canadian, United States, and combined level lines were ±1.32, ±0.96, and ±1.17 mm/$\sqrt{}$km. The misclosure of the combined level line was less than four centimeters. The *maximum* allowable First-Order misclosure was 11.9 centimeters, which is three times the actual misclosure.

After the analyses had been performed, the level line was adjusted by least squares. The elevations of the bench marks adjacent to the lake level gages were computed to determine the datum equation at a gage set between the "adjusted elevation" and the elevation used to set the reference mark for the gage readings. In several instances, double run spur level lines from the main level line were required. However, the complete analyses of these spur level lines reveal identical statistical values to those computed for the main level line.

LAKE LEVEL COMPARISONS

After the adjustment of the level line and calculation of the datum equation to translate the lake level gage readings, the comparisons of the lake level gage observations across Lake Ontario could be compared to geodetic levelling. For several decades the U.S. Lake Survey has employed the "four month" mean lake levels in the transfer of elevations between a pair of gages. The four month means were computed for the lake level observations recorded from 1 June to 30 September, inclusive. No attempt was made to correct data for meteorological influences.

There were nine gages that operated during the entire IFYGL. These were employed in the investigation. To evaluate the comparison of the difference in elevation between a pair of gages by geodetic levelling and water level transfer, the maximum allowable First-Order, Class I geodetic levelling misclosure was computed based upon the geodetic distance between the gages. A ratio (the difference in elevation by lake level gage data divided by the maximum allowable First-Order, Class I misclosure) was computed [hereafter called the ratio.]. Of the thirty-six comparisons for the year (four month period) *only one* ratio exceeded 0.60, and only three ratios exceeded 0.30. Because no ratio exceeded 1.0, it could be concluded that the four month mean lake level gage readings could be employed in lake level transfer.

To ensure the validity of the result, a nine year interval (1969 to 1977) was studied in the identical manner. The results were of the same magnitude. Furthermore, a nine year mean of the ratios, was computed for each pair of gages. The maximum mean ratio was 0.44.

The results of the analysis of *four-month mean lake level* gage data can be used to transfer geodetic elevations, *and satisfy* First-Order, Class I misclosures.

The first comparison between geodetic levelling and lake level gage readings evaluated the established practice of employing the four month mean to transfer elevations across the lake. Unfortunately, it may not be feasible to employ four months of lake level gage data for a water level transfer.

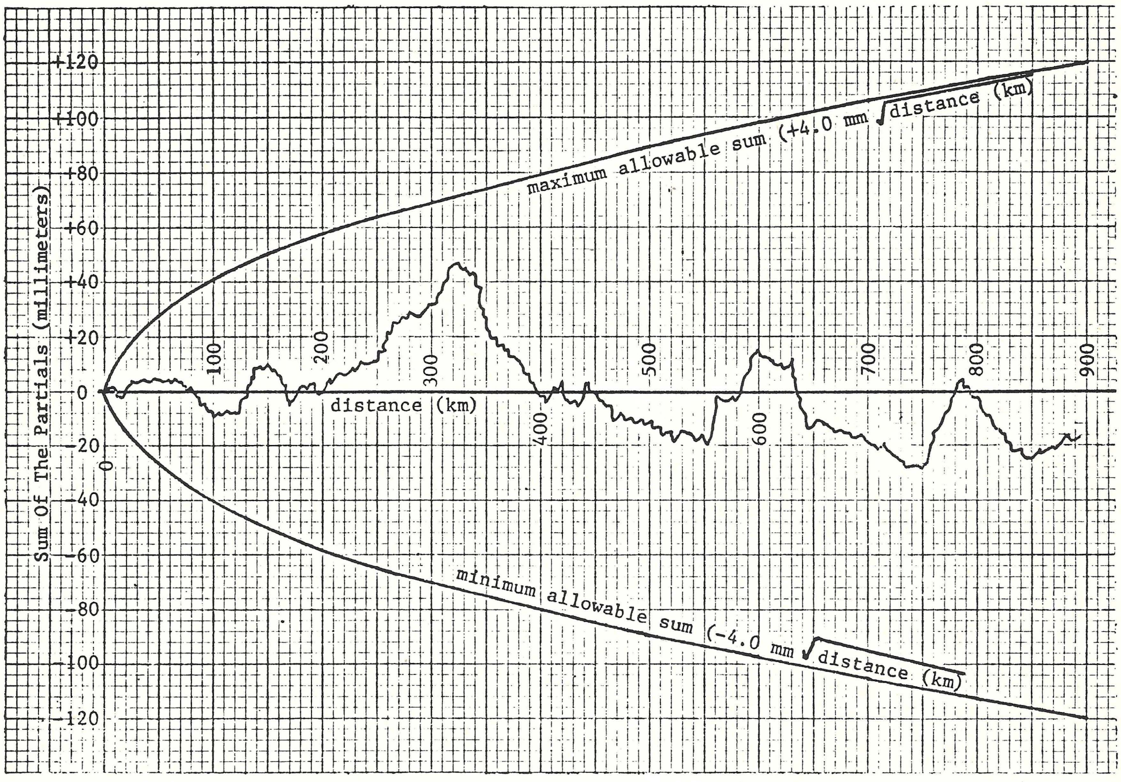

Figure 3 Graph Of The Accumulated Partials, Composite Level Line Around Lake Ontario

The second portion of the investigation was to evaluate the effects of various factors on the mean lake level. These factors are tides, seiches, wind set-up, differential barometric pressure, storm runoff, precipitation, compressibility, and evaporation. The current state-of-the-art and the effects of each upon the elevation of the lake's surface elevation were evaluated.

The tides have been theoretically computed and determined by observation. There is no evidence in either method that the *range of the tide* exceeds 0.12 feet.

The seiche is a periodic rise and fall which does not follow the laws of tides. These events are due to a sudden cessation of wind or sudden barometic pressure change or other sudden change in the normal forces on a closed or nearly closed body of water. Careful study of various bodies of water indicate that each body of water has its own characteristics with respect to the periods and behavior of seiches. The normal sampling of lake level data indicates that the mean of all the lake level readings differs from the "quiet" surface by an insignificant amount.

Wind set-up is due to a wind 'pushing' the water. The water reaches the end of the enclosure, and 'piles up'. The slope of the surface results. After the wind ceases, the force generated by the wind dissipates, and the water "flows" back to an equilibrium state (a seiche usually results). The wind speed and direction, distance across the water surface the wind blows, and the average depth of the body of water are required to calculate the set-up. Five wind gages associated with lake level gages were studied. The maximum four month mean wind speed was 6.3 km per hour, and the smallest was 1.7 km per hour. This means that the maximum long term set-up was 2.2 mm, and the smallest was 0.1 mm.

There are several formulae which could be employed to calculate set-up [Hellstrom, Hutchinson, Keulegan, Haurwitz, Hunt, and Saville]. The formula of Saville was employed as it was validated by comparison with other studies. Saville's formula is:

$$S = 1.165 {}^* 10^{-3} \frac{V^2 F}{D} \text{ N} \cos \theta$$

Where:
V = velocity of the wind (in miles per hour).
F = distance the wind blows (in miles).
D = average depth of the body of water (in feet).
S = amount of vertical setup (in feet).
N = a constant.
θ = angle between the axis of the wind vector and the line between the two points (gages) being studied.

The effect of differential barometric pressure is a well understood phenomena. If there is a difference in barometric pressure at two gages, then the difference in elevation of the quiet lake surface (fresh water) is:

$$z_2 - z_1 = -13.5856\,(h_2 - h_1)$$

Where:
z_1 and z_2 = the elevation of the "quiet" water surface at points 1 and 2, respectively.
h_1 and h_2 = the barometric pressure (in linear units) at points 1 and 2, respectively.

Note: the units of z_i and h_i are identical.

The difference in barometric pressures at a pair of gages indicates the maximum difference in elevation of the undisturbed free water surface between the two gages. The observed barometric pressures in 1972 indicate a long term difference in elevation of the free water surface of less than four centimeters. This difference in elevation of the free water surface is considerably less than the maximum allowable First-Order, Class I misclosures. Furthermore, the four centimeter difference in elevation means a 3 mm difference in barometric pressure (in linear units), which is about the uncertainty of the measurements made by the barometers.

The compressibility of water is about 0.03 percent of the original volume for a change in the original atmospheric pressure by a factor of six. Therefore, for the atmospheric pressure changes encountered at the surface of a body of water, the pressure changes do not affect the volume of water, and can be disregarded.

A similar analysis was performed for the change in water density due to the change in temperature. For the temperature range encountered in Lake Ontario (0° to 35° C), the density varies from 1.000 to 0.994. Because the temperature changes slowly, the relative change in density changes insignificant amounts, and was disregarded.

Two other factors which could affect the elevation of the free water surface are evaporation and precipitation. These factors contribute to the total water volume, but their effects are either manifested in seiches, or masked in the effects of wind set-up. It was assumed that the lake's surface responds to these factors in a very short period of time and that the observable effect at a gage is of the same magnitude as the sensitivity of the lake level gage (0.01 to 0.02 feet).

The one factor that has been considered a significant factor and has solicited considerable discussion is storm runoff. It has been thought that the large volume of water being discharged through a narrow orifice into the lake will have a "ponding" effect. On Lake Ontario most of the lake level gages are in harbors, which are usually the outfall of a river. In the past, at least one lake level gage has been moved because the sudden discharges at the Welland Canal affected the lake level gage readings.

Two of the lake level gages provided an opportunity to study the problem. The gages are located at Rochester and Oswego. The Rochester gage is located about four kilometers east of the outfall of the Genessee River. The Oswego gage is located inside the breakwater of the harbor, which is the outfall of the Oswego River. In 1972 during IFYGL, Hurricane Agnes passed over the Genessee and Oswego Rivers' drainage basin and the easterly third of Lake Ontario (about 22 - 23 June 1972). This storm was at least a 50 year storm, and is considered larger. At the Rochester gage the lake level rose 60 mm above the mean, and proceeded to return to about 5 mm above the mean before reacting the same as the other lake level gages. The oswego gage recorded a 65 mm elevation above the mean and a minus 20 mm the next day. Figure 4 illustrates the departure of the lake level from the mean lake level for the last ten days in June 1972. The various curves reflect the disturbance caused by the passing storm. The 22 - 24 June period of the curves indicates the passage of the storm over the lake. The 25 - 29 June period indicates the minor disturbances which follow the passage of a storm of the magnitude of Hurricane Agnes. The rise in the lake level with respect to the mean at Cape Vincent (St. Lawrence River), Oswego, Kingston (near the St. Lawrence River), Rochester and Coburg indicates the runoff from the adjacent land areas, and the outflow of additional water in Lake Ontario into the St. Lawrence River.

A complete comparison was made of the following few days, but the difference in elevation between a pair of lake level gages *did not* show a marked departure from the monthly and four month means.

CONCLUSIONS

This investigation studied the use of the four month mean (months of June through September) as a means of geodetic levelling across Lake Ontario. Although the procedure had been employed since the 1870's, it was only during the IFYGL that independent data were available to validate the procedure and substantiate the stated accuracies. It was found that First-Order geódetic levelling results could be achieved employing the hourly values of the lake level gages (the actual gage reading made on the hour) to calculate the daily mean, thus the monthly mean, and finally the four month mean. The observed meteorological factors of wind, barometric pressure, and precipitation were studied to determine their effects on the four month mean. The 1972 data indicate that there does not appear to be any systematic long term effect on the differences in elevation in lake level between gages. Furthermore, a major storm does not appear to have any long term effects on the differences in elevation of the water surface. Lastly, a nine year period of a four month means (1969 - 1976) were studied, and the results were identical to the results observed for 1972.

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COMMENT

The reference cited above contains a list of over three hundred references pertaining to all aspects of the material presented in this paper.

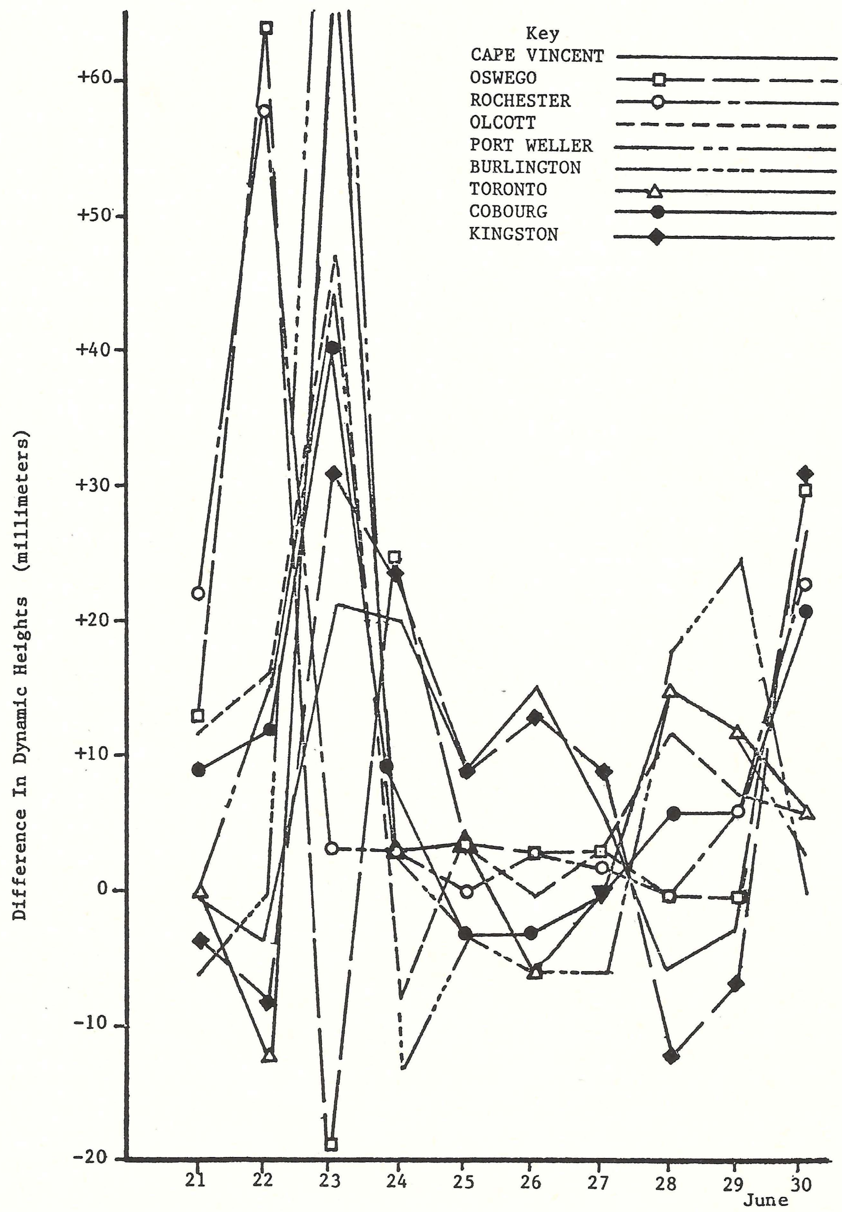


Figure 4 **Daily Differences In Lake Levels At Permanent Gages In Lake Ontario; 20 June - 30 June 1972**

Quick Loran-C to Geographic Conversions

by Langley R. Muir

Bayfield Laboratory for Marine Science and Surveys

INTRODUCTION

There are many applications in which the conversion of Loran-C co-ordinates to geographic co-ordinates must be done rapidly, even though geodetic accuracy is not needed. One of these applications is in offshore yacht racing in a limited area, although many other activities such as fishing, yacht cruising and small-scale surveying spring to mind. This paper will discuss the problem in terms of yacht racing, since it has been tested in this application.

The problem facing the racing navigator is to conduct a sailing vessel around a predetermined course of 50-150 miles in length in the shortest possible time. Races typically go around at least three buoys, whose position is known in advance, and at least one of the legs will be directly upwind. Since as little as ten minutes may separate the first and tenth place finishers, precise navigation is of utmost importance, but the determination of the quickest course to sail is complicated by present and predicted wind direction and strengths, surface currents, performance characteristics of the boat, and the effects of the racing rules. It is seldom the case that the quickest way around the course is the along the rhumb line and navigating a yacht race, then, involves a number of considerations which have little or nothing to do with position determination.

In the middle of a race course, the accuracy requirements are minimal and dead reckoning generally suffices. When approaching a mark, however, the position of the boat relative to the mark must be known with greater and greater accuracy and speed. In order to pick up advantages in the actual currents, to determine lay-lines accurately or even to raise marks which are obscured by fog or missing lights, the utmost accuracy is required and the speed of calculation of position, relative to the mark, must increase. When piloting to a mark, fixes may be taken every few minutes, and it is in these cases that the Loran-C can confer great advantages, if it is possible to quickly and accurately determine the course and distance to the mark.

EXISTING METHODS

The course and distance to a mark may be determined by any one of three existing methods. The cheapest and most popular method in civilian use is to use the existing Hydrographic charts which are over-printed with Loran-C lattices. However, present Hydrographic Service policy is not to provide charts at a larger scale than about 1:80,000, and this scale is clearly not large enough for accurate piloting within the last few miles. It is adequate in the middle of a leg, but so is dead reckoning so long as the wind has not been light enough to introduce large errors in the estimation of boat speed. The easiest and most expensive method is to purchase a Loran-C receiver with hardwired calculations. The Texas Instruments' 9800 is one such receiver, but its price is approximately $4500.00, while the simplest Texas Instruments' receiver, the Model 9000 which does not have conversions, costs only $2000.00. The third method is to use the simplest receiver and to use a preprogrammed, handheld calculator such as the Texas Instruments' Model 58. This third alternative is much cheaper than the second, while retaining the necessary accuracy.

The handheld calculator suffers from the disadvantage that it takes approximately 3-5 minutes to produce the necessary information, and this is too slow to be of much use. I have used this method for two seasons, and occasionally I have found that the tactical situation has changed considerably while I was down below trying to produce an accurate position. The calculator is certainly better than nothing and even better than using the latticed charts, but it is not as useful as the hardwired converter, even though it is $2,000.00 cheaper.

GEODETIC COMPUTATION

Given the latitude and longitude (ϕ, λ) of a known position as well as the positions of the master and the two slaves of a Loran-C chain, then the spheroidal distance between the known position and one of the stations on the reference ellipsoid is given by the Andoyer-Lambert formula (1) which is

$$d_i = a(u_i + \delta u_i)$$

where: d_i is the distance from the known position to the i'th station.
i refers to the master, m, or the slaves, i = 1, 2.
a is the semi-major axis of the ellipsoid, 6,378,135.0 metres,

$$u_i = \cos^{-1}(\sin\phi \sin\phi_i + \cos\phi \cos\phi_i \cos(\lambda - \lambda_i))$$

$$\delta u_i = \frac{f}{4}\left[\left(\frac{u_i + 3\sin u_i}{1-\cos u_i}\right)(\sin\phi - \sin\phi_i)^2 + \left(\frac{u_i - 3\sin u_i}{1+\cos u_i}\right)(\sin\phi + \sin\phi_i)^2\right]$$

and: f is the flattening factor for the ellipsoid, 1/298.26.

Given the distance, in metres, from the various Loran stations to the known position, it is then possible to calculate the ranges, in microseconds, using the phase correction due to propagation over a pure sea-water path, as

$$\rho_i = -0.2067 + (1 + 0.9091\times10^{-3})\frac{d_i}{v} + 0.79\times10^{-8}\left(\frac{d_i}{v}\right)^2$$

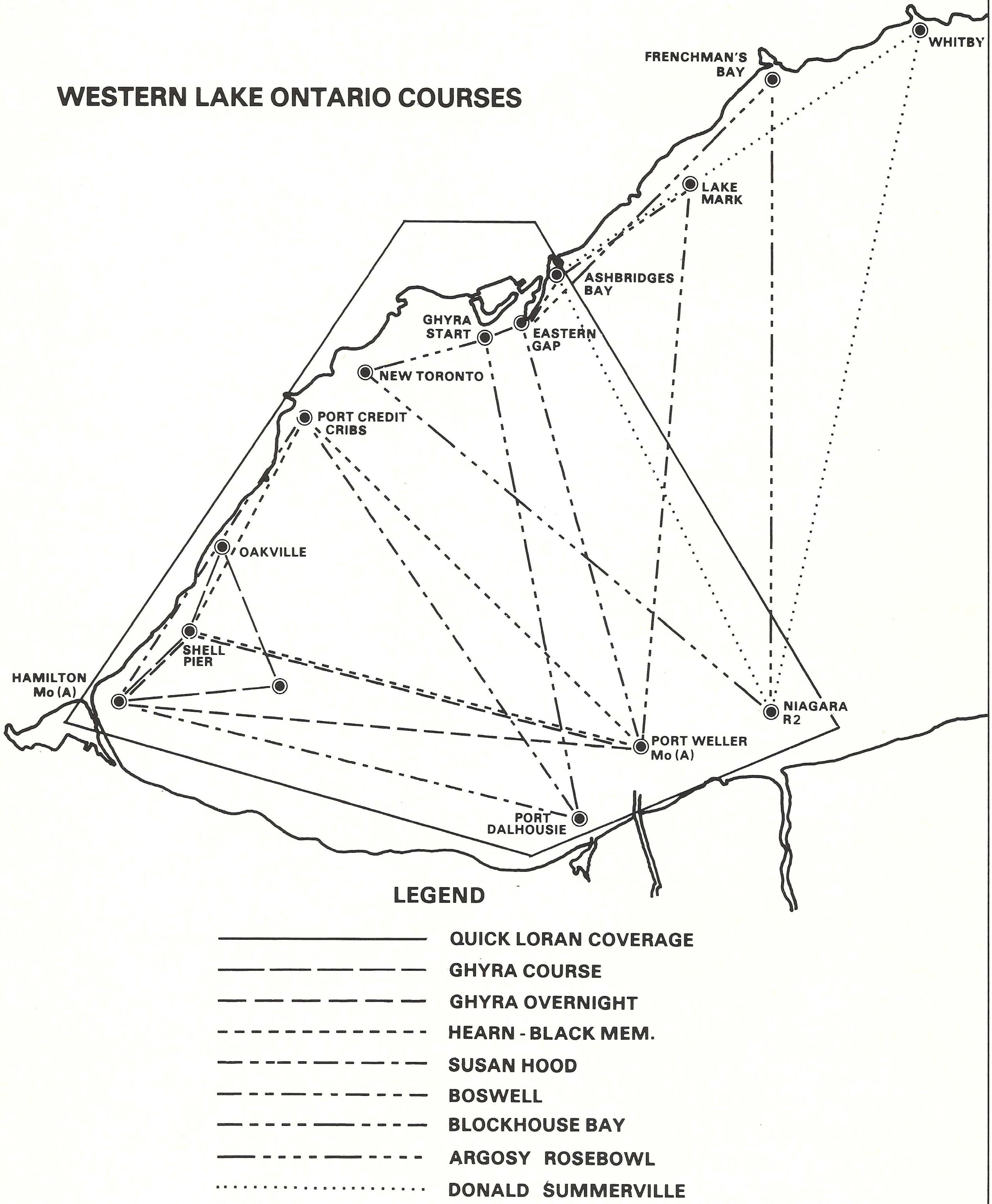
and so the theoretical time delays at the known position are given by:

$$T_1 = \rho_1 - \rho_m + \text{emission delay at slave 1}$$

$$T_2 = \rho_2 - \rho_m + \text{emission delay at slave 2}$$

Note that this formulation has assumed that the speed of light in a vacuum is constant ($v = 299.7925$ m/μ sec) and that the propagation path is purely over seawater. Hence these time delays will be different from those obtained in practice. The difference is known as the propagation anomaly and once it has been determined for a particular location, it will not change with time. For example, the propagation anomalies in the west end of Lake Ontario for chain

WESTERN LAKE ONTARIO COURSES



9960-WZ are approximately 2 μsec and 0.3 μsec respectively. The remainder of this paper will omit any discussion of propagation anomalies.

INVERSE COMPUTATION

Although the above computations are quite straightforward, it is the inverse computation that is generally required. That is, given the theoretical time delays, to calculate the position at which they were observed. The above set of equations is not only nonlinear, but also transcendental and it is not possible to obtain an explicit solution to them.

In order to solve the inverse problem, an iterative method such as Newton's method may be employed. This involves assuming a position, calculating the time delays at the assumed position, and obtaining corrections to the assumed position. If h_1, h_2 are the observed hyperbolic readings, and T_1 and T_2 are the theoretical time delays at the assumed position (ϕ,λ), then the corrections to the assumed position are given by:

$$\delta\phi = \frac{1}{a}\left[\frac{a_{22}w_1 - a_{12}w_2}{a_{11}a_{22} - a_{12}a_{21}}\right] ;$$

$$\phi\lambda = \frac{1}{a}\left[\frac{a_{11}w_2 - a_{21}w_1}{a_{11}a_{22} - a_{12}a_{21}}\right]$$

where: $w_1 = h_1 - T_1$; $w_2 = h_2 - T_2$

$$a_{11} = \frac{\delta u_1}{\delta\phi} - \frac{\delta u_m}{\delta\phi} \quad ; \quad a_{12} = \frac{\delta u_1}{\delta\lambda} - \frac{\delta u_m}{\delta\lambda}$$

$$a_{21} = \frac{\delta u_2}{\delta\phi} - \frac{\delta u_m}{\delta\phi} \quad ; \quad a_{22} = \frac{\delta u_2}{\delta\lambda} - \frac{\delta u_m}{\delta\lambda}$$

and the partial derivatives of the u_i are given by:

$$\frac{\delta u_i}{\delta\phi} = \frac{-\cos\phi \sin\phi_1 + \sin\phi \cos\phi_1 \cos(\lambda - \lambda_1)}{\sin u_1}$$

$$\frac{\delta u_i}{\delta\lambda} = \frac{\cos\phi \cos\phi_1 \sin(\lambda - \lambda_1)}{\sin u_1}$$

Since these are only first-order corrections, the procedure is to assume a position, calculate the corrections, use the new position to calculate new corrections, and keep on doing this until the corrections to the position are small enough for the purposes required (generally 10 - 20 metres). In most cases, less than four or five iterations are required, although it is obvious that the closer the initial assumed position is to the true position, the less iterations will be required. This is a time-consuming calculation to perform on a small programmable calculator, such as the TI 58, but does provide full geodetic accuracy, anywhere on the Loran chain.

QUICK LORAN APPROXIMATIONS

Razin (2) has shown that by approximating the reference ellipsoid by an osculating sphere, an explicit solution to the corresponding spherical system may be obtained. It transpires that this approximation has virtually full geodetic accuracy over the area covered by a single Loran-C chain; however, thirteen constants are required, they are difficult to compute and the resulting explicit solution is still none too simple for a handheld calculator.

In yacht racing, simplicity, relative accuracy, and speed are the prime requirements, while absolute accuracy is not. Since the great bulk of a season's racing will be held in a limited geographic area, a plane approximation will be shown to be adequate.

If the area of interest may be approximated by a horizontal plane, then the Loran lines of position may be thought of as slightly warped conic sections. In general, the latitude and longitude will be given by:

$$\phi = b_1 + b_2T_1 + b_3T_2 + b_4T_1T_2 + b_5T_1^2 + b_6T_2^2$$

$$\lambda = c_1 + c_2T_1 + c_3T_2 + c_4T_1T_2 + c_5T_1^2 + c_6T_2^2$$

where the constants b_i, c_i will be peculiar to each particular geographic area and Loran-C chain. For a particular racing season, a grid may be set up in which the Loran time delays are calculated for a number of positions and then a stepwise, multi-linear least-squares fit used to calculate the values of the constants.

In the area bounded by Toronto-Niagara-Hamilton (Fig. 1), the results for chain 9960-WZ are:

$$\phi = 1544.1317 - 0.09231519\ T_w - 0.024448241\ T_z + 0.000001506211\ T_w T_z$$

$$\lambda = 1376.5454 - 0.07221953\ T_w - 0.02188685\ T_z + 0.000001218056\ T_w T_z$$

where; T_w, T_z are the theoretical time delays on the W and Z slaves respectively. This model shows that the terms involving the squares of the time delays are not important in this area of chain 9960 WZ, where the Loran-C lines of position cross each other very nearly perpendicularly and are fairly straight. In the case of other areas, the additional terms may be important. The question immediately arises as to the number of points necessary to determine the coefficients, and the resulting accuracy of the approximation.

The formulae above were computed using 424 points evenly spaced in the area of concern. Figure 2 shows the absolute error in the terms of 0.01 miles for both latitude and longitude, and the area over which the fit was obtained is shown as a pecked outline. Since both the fitting and the fitted function are smooth curves, so is the error function. Using the formulae and the error charts, interpolation by eye will given an absolute position which is accurate to within ± 0.02 miles which is ± 37 metres, and this compares well with the resolution accuracy of the Loran receiver which is ± 0.1 μsec, or ± 21 metres, in the centre of the area of concern, if the propagation anomaly has been properly taken into account.

A set of 17 points, properly chosen, will give an absolute error which is about twice the above. This means that the least-squares fit could be carried out solely on a handheld calculator. The points chosen must be properly weighted to ensure that they do not give spatially skewed errors. In locations where the Loran position lines do not have much curvature, this may be ensured by choosing the points to represent equal areas, but in locations where the Loran lines are sharply curved it may be very difficult to avoid these spatially skewed errors unless a very dense grid is used for the curve fitting. The use of a dense grid, however, would make the use of a hand calculator very time-consuming.

DISCUSSION

The above approximation is perfectly adequate for many of the uses to which Loran-C is put, in that it will give an absolute position which is accurate to within twice the resolution error of the commercial quality receivers. However, the real value of the algorithm lies in piloting. In order to rapidly know the boat's position relative to a mark, a programme may easily be written which computes the course and distance to the mark by:

$$C_0 = \text{ATAN}\left(\frac{\delta\phi}{\delta\lambda}\right) + \text{magnetic variation} + \begin{matrix} 90 \text{ if } \delta\lambda < 0 \\ 270 \text{ if } \delta\lambda > 0 \end{matrix}$$

$$\text{dist} = 60\sqrt{(\delta\phi)^2 + (\delta\lambda)^2}$$

where:

$$\delta\phi = b_2\delta T_w + b_3\delta T_z + b_4\delta(T_wT_z)$$

$$\delta\lambda = (c_2\delta T_w + c_3\delta T_z + c_4\delta(t_wT_z))\cos(\text{mid. lat.})$$

and the operator δ means (boat time delay — mark time delay).

correctly, and so a fairly large amount of computing may be required to ensure that the constants give error charts that are symmetrical and of acceptable magnitude.

The third drawback is the very limited geographical nature of the approximations. Although the errors shown in Figure 1 and 2 are quite small, they build up very rapidly outside the area that was used for the fit. This would make it very difficult to publish constants for any given area of applicability and obtain absolute positions that were many miles in error.

These three disadvantages indicate that the method is of limited interest. It has proven to be extremely useful over the past seasons and on at least two occasions has resulted in winning races that would otherwise have been lost. It has also resulted in a $2,000.00

	Trial Position		Geodetic		Quick Loran	
	T_w	T_z	Lat.	Long.	Lat.	Long
a.	16,360.0	58,200.0	43 16.42	79 01.86	43 16.78	79 02.08
b.	16,260.0	59,050.0	43 35.51	79 21.43	43 35.58	79 21.48
c.	16,340.0	58,850.0	43 17.77	79 43.84	43 17.85	79 43.88

Table 1: Comparison of position calculated by Quick Loran method and the Geodetic position. Locations are: (a) Niagara; (b) Toronto and (c) Hamilton. Chain 9960-WZ.

Passage		Geodetic		Quick Loran	
From	To	M.Co.	Dist	M.Co.	Dist
Toronto	Niagara	151.1	23.86	151.2	23.47
Niagara	Hamilton	280.5	30.73	280.0	30.30
Hamilton	Toronto	50.7	24.15	50.5	24.03

Table 2: Comparison of magnetic course (degrees) and distance (miles) between marks calculated by Quick Loran and Geodetic methods. Chain 9960-WZ.

Table 1 shows a comparison of the positions of three marks calculated by the Quick Loran method and by a full geodetic computation. Even without using the error charts, the positions are quite close. Table 2 gives a comparison of the courses and distances between the same three marks and it should be obvious that these are well within any possible accuracy requirements for yacht racing.

The errors involved in the traverse table computation will decrease as the boat approaches closer and closer to the mark. At the mark, the error in position relative to the mark will be the same as the resolution error of the receiver, even though the absolute position of both may be considerably in error. Hence, the traverse table computation would be accurate for piloting up to within about ± 21 metres of the mark.

The difficulties with the approximation are threefold. First, it is necessary for each navigator to compute his own constants and hence, to have access to some sort of mini-computer system. In many cases, this is not particularly difficult given the proliferation of home-computing devices. Second, the least-squares optimisation can give very misleading results if the points are not weighted

savings since it made possible the purchase of a much cheaper Loran receiver than would otherwise have been the case. On the whole, however, the method will be useful only to those navigators who have a decided mathematical outlook and access to a small computer system.

ACKNOWLEDGEMENTS

I would like to thank Mr. S. Grant of BIO for his valuable discussions on the geodetic computations; Dr. P. Powles for the use of his boat as a trial horse; and Mr. H. Savile, for the use of his Loran-C receiver and TI58 calculator. I would also like to thank the Canadian Hydrographic Service for getting me interested in the problem of Loran to Geographic conversions generally and to the Bayfield Laboratory for the typing of the manuscript.

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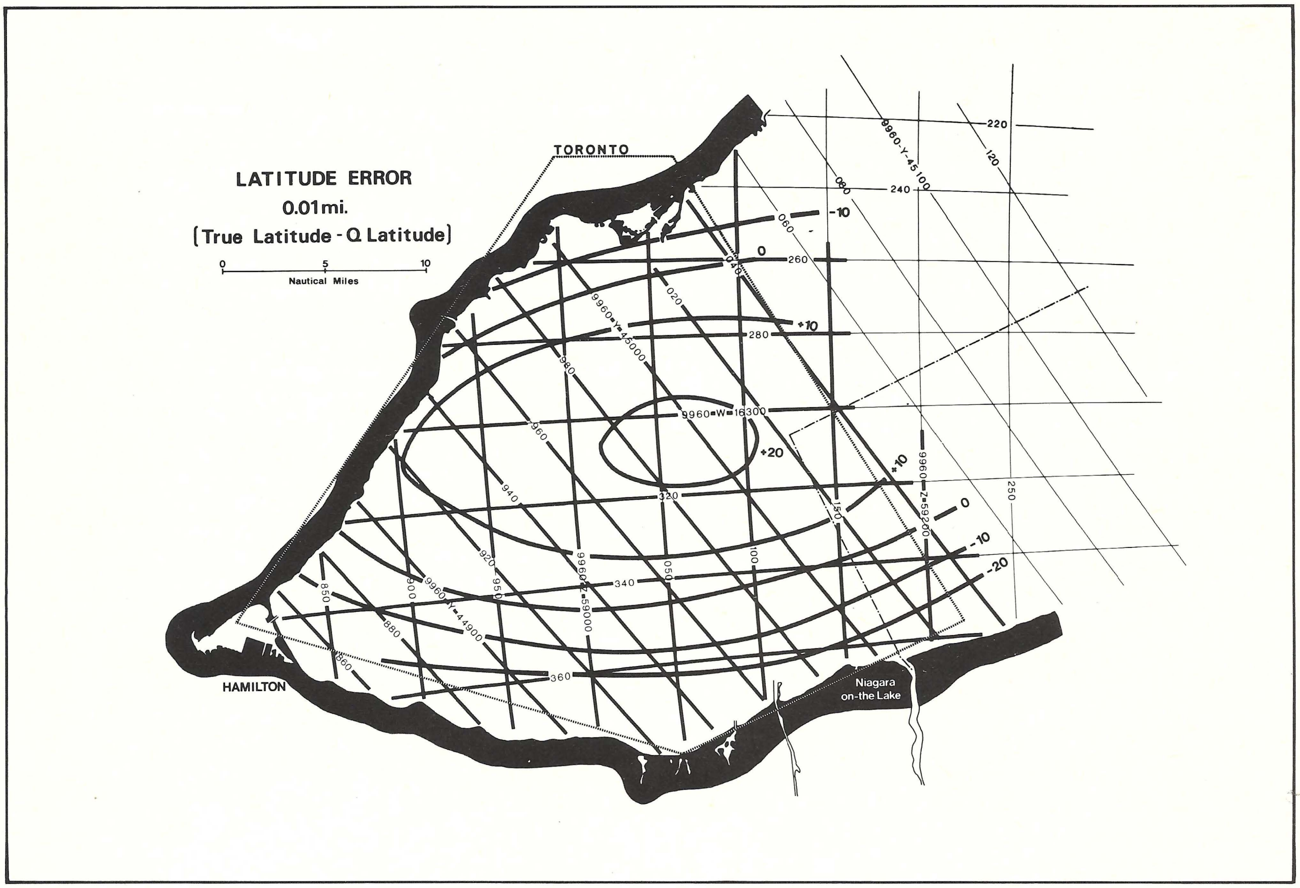
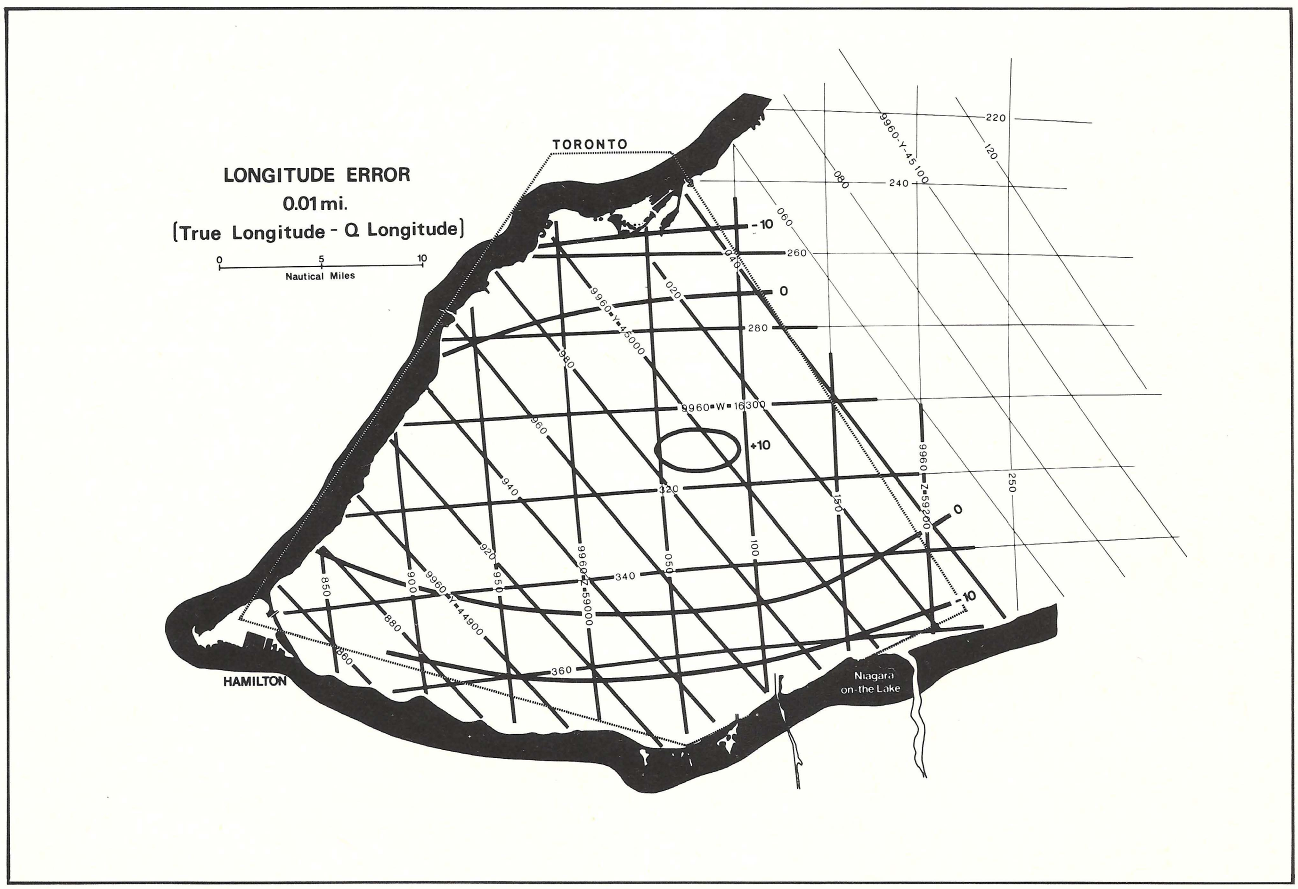

LATITUDE ERROR
0.01 mi.
(True Latitude - Q Latitude)
0 5 10
Nautical Miles
TORONTO
HAMILTON
Niagara on-the Lake
9960-Y-45100
9960-Y-45000
9960-W-16300
9960-Z-59200
9960-Z-59000
9960-Y-44900
+20
+10
0
-10
-20


LONGITUDE ERROR
0.01 mi.
(True Longitude - Q Longitude)
0 5 10
Nautical Miles
TORONTO
HAMILTON
Niagara on-the Lake
9960-Y-45100
9960-Y-45000
9960-W-16300
9960-Z-59200
9960-Z-59000
9960-Y-44900
+10
0
-10

Book Reviews

Oceanography of the British Columbia Coast

Oceanography of the British Columbia Coast is an excellent scientific text that is quite understandable to layman who work in the field of ocean sciences or hydrography. It deals with the physical aspects of the sea exemplified by the British Columbia coastal waters.

The book is divided into five parts — I. History and Nature of the Coast, II. General Physical Oceanography, III. Ocean Waves, IV. Oceanography of Inshore Waters, and V. Oceanography of Offshore Waters.

In Part I. the author discussed in an easy to read style the origin of the oceans and the changes that have taken place up until the present time. Part II. deals with the nature and measurement of tides and tidal streams, secondary currents and the causes and effects of upwelling. Ocean waves are defined, classified and discussed in Part III.

In Part IV. the author applies the concepts developed in the first three parts to explain the oceanography of the Strait of Georgia, Juan de Fuca and Johnstone Strait region.

Finally, Part V. the oceanographic processes of the exposed waters seaward of the British Columbia Washington Coast and the N.W. Pacific Coast are discussed. The Book includes a comprehensive glossary and is well illustrated with graphs and photographs.

Dr. Richard Thomson's book is worthwhile reading for practising hydrographers and ocean engineers and is an excellent reference and teaching aid.

S. B. MacPhee
Dominion Hydrographer
Canadian Hydrographic Service

Proceedings, Colloquium III on Petroleum Mapping and Surveys in the 80's

The intention of Colloquium III was to assess progress made in petroleum surveying techiques in the ten years since Colloquium II, and to discuss current developments and problems.

These proceedings bring out some unusual twists of surveying required by the Petroleum industry, such as engineering surveys for artificial islands, and the intriguing problem of finding out where the drill head is in a borehole. Otherwise, surveying for oil and gas covers just about the whole spectrum of the survey field, with the difference that the work is for high stakes, and is often done under tough conditions with stringent time constraints. Consequently, advanced techniques are often introduced on these surveys.

In addition to review papers on the status of mapping (and charting) and survey methods, the proceedings have papers on newly developed or developing techniques, such as inertial surveying, NAVSTAR/GPS, future databanks, and Kalman filtering. Of course with increasing exploration for offshore oil and gas, petroleum surveyors are doing more and more work at sea. One of the five sessions at the Colloquium was dedicated to offshore positioning, and here the emphasis was on offshore rig positioning and on the integrated survey systems that must be used in areas so far from shore that no one radio navaid alone will solve the positioning problem.

R. M. Eaton
March, 1982.

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The Hydrographic Survey of Fury and Hecla Strait

G. W. Henderson, C.L.S.

Canadian Hydrographic Service (Atlantic Region)

Introduction

With the exploration activities that have been taking place in the Canadian Arctic over the past number of years, the search for a reliable exportation route for liquified natural gas has been an ever increasing priority. While present plans for transporting liquified natural gas from the Arctic propose that tankers use a route through Lancaster Sound and Baffin Bay, political difficulties resulting from Greenland's concern over the environment have caused planners to consider the feasibility of alternative routes, of which Fury and Hecla Strait is one being investigated by Petrocan. Accordingly, the survey of Fury and Hecla Strait was assigned to C.S.S. "BAFFIN" for the 1981 field season, to be assisted by the M/V "POLAR CIRCLE" and C.C.G.S. "LABRADOR".

Planning and Preparation

Very early in the planning stage, it became quite apparent that little information existed regarding the Strait. Historically, Fury and Hecla Strait was first entered by Lt. William Parry in 1822 when his two ships, for which he named Strait, were stopped by heavy ice around Amherst Island in their attempt to follow the passage west from Foxe Basin. Attempts by Lt. George Back in 1837, by Peter Warren Dease and Thomas Simpson in 1839, and by Dr. John Rae in 1847 to reach the Strait overland were all frustrated, and the first non-Inuit to travel its full length was Charles Francis Hall in 1868, during his return to Igloolik from a dog sled journey to the west side of Melville Peninsula. Over 40 years were to elapse before the next visit.

In 1901, Joseph-Elzear Bernier sailed from Quebec in the Dominion Government Ship "ARCTIC" under orders to regulate and issue licences to whaling ships and to attempt to complete the Northwest Passage. Having reached the eastern end of M'Clure Strait he, like every other captain before him, found the ice impenetrable and returned to Arctic Bay on Baffin Island to winter. The following summer he sailed into the Gulf of Boothia, intending to return south by way of Fury and Hecla Strait, but was prevented from doing so by heavy ice in the Gulf off the western entrance to the strait.

In 1912, a private expedition organized by Captain Bernier sailed in the "MINNIE MAUD" to prospect for gold in the region of the Salmon River in northern Baffin Island. One of the party travelled by dog sled to Igloolik and between the 26 March and the 5 April went through the Strait twice, to Agu Bay and back.

The next expedition in the area was the Fifth Thule Expedition of 1912, led by Knud Rasmussen, whose members completed the mapping of the north side of the Strait from Adolph Jensen Sound to Cape Tordenskjold, and surveyed the area to the west of the entrance from Cape Hallowell to Agu Bay. There was no other scientific visit to the strait until after the Second World War when a rapid expansion of interest in the Arctic took place. In September 1948, the icebreakers USS "EDISTO" and the USCGS "EASTWIND" returned south, a week apart, from a supply mission to Resolute Bay, neither of them experiencing any difficulty in traversing the Strait. These were the first two ships ever to complete the passage of the Strait. In 1955-56 the Fisheries Research Board ship M/V "CALANUS" obtained some oceanographic data to the east of Labrador Narrows and in September 1956, the icebreaker HMCS "LABRADOR" made the first passage from east to west and obtained the first hydrographic and oceanographic data in the Strait itself.

The first comprehensive oceanographic study was conducted by H. E. Sadler, H. V. Serson and R. K. Chow in 1975-76, the results of which were published in a D.R.E.P. (Defence Research Establishment Pacific) report titled "The Oceanography of Fury and Hecla Strait" (Technical Memorandum 79-11)[1]. Other than a few radar-controlled track soundings, the only hydrography within the area was a small area surveyed by the "BAFFIN" in the vicinity of Purfur Cove in 1960, and the northwestern extreme of a survey in Foxe Basin conducted in 1975-76, again by "BAFFIN" (Fig. 2).

Both the D.R.E.P. report and the "Pilot of Arctic Canada", (Volume 2)[2] confirmed that strong tidal currents and heavy ice concentrations were going to be the major obstacles to conducting this survey. Consequently, all available historical data on ice concentrations and movement, along with meteorological data, were reviewed in order to maximize the chances of being in the area during an ice-free period. In addition, plans were made to conduct an extensive tidal and current survey in both the Strait itself and Foxe Basin, with the Marine Ecology Laboratory (MEL) participating in this portion of the cruise.

To provide flexibility under potentially adverse ice conditions, preparations were also made to extend corridor surveys further south into Foxe Basin and northeasterly into Steensby Inlet (Fig. 1).

From all of this, it appeared that the maximum likelihood of getting into Foxe Basin and being able to conduct the Fury and Hecla Strait survey would be between about August 20 and September 25. Consequently, the second half of the cruise was scheduled around this period, and all pertinent data on horizontal and vertical control, aerial photographs, previous field manuscripts, tide and current data, and existing charts and topo maps were collected and reviewed for laying out the survey strategy and alternatives.

The distances involved in Foxe Basin (upwards of 80 miles from the shore stations) showed that Hi-Fix 6, a medium frequency system of about 2 Mhz, would be the positioning system to be used, and in the hyperbolic mode to permit a multi-user operation. The smaller areas to be surveyed in Fury and Hecla Strait and Steensby Inlet would permit the use of the Motorola MRS III. In addition, the existing horizontal control permitted all of the hyperbolic lattices for Foxe Basin and most of the ranging lattices for Fury and Hecla Strait to be drawn up prior to departure for the field.

Due to the reportedly strong currents and abnormal tidal variations throughout the Fury and Hecla Strait/Foxe Basin region, a very comprehensive observation program for tides and currents, with the primary emphasis on the Strait itself, was planned.

In addition, MEL planned a series of tide and current meter moorings across the Strait, particularly in Labrador Narrows, in conjunction with their biological program.

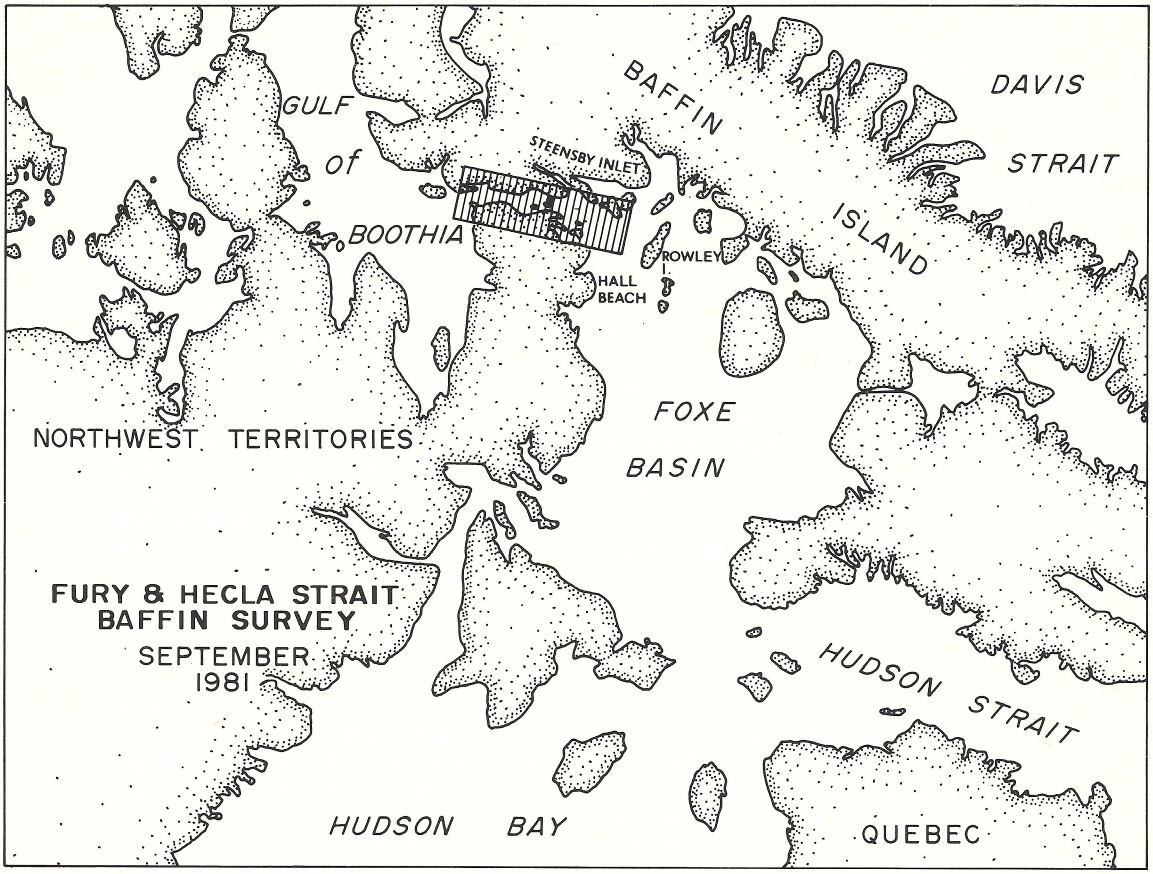

Figure 1

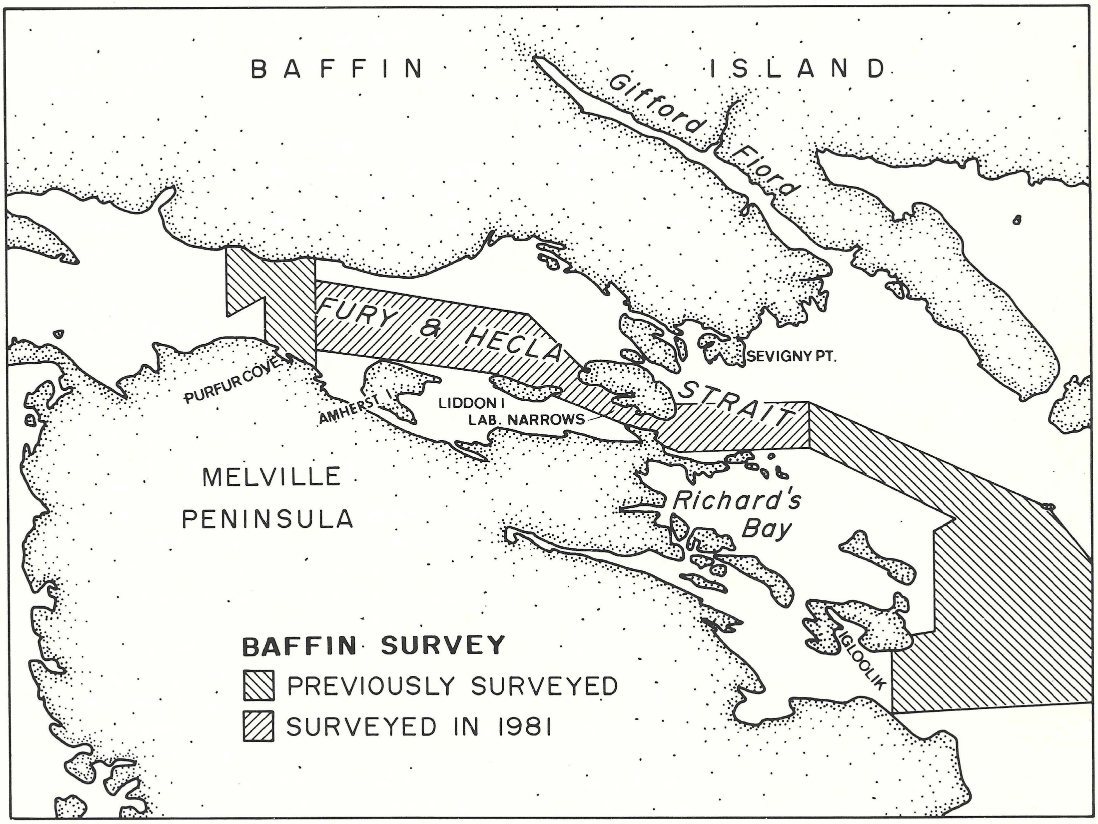

Figure 2

Operations
"BAFFIN" departed the Labrador Coast for Foxe Basin on August 13 and arrived off Rowley Island seven days later, encountering only a small amount of pack ice in the southern portion of the Basin. The following day, August 21, heavy pack ice was encountered about 10 miles east of Igloolik as the ship was proceeding to Sevigny Point to install an Ottboro (pressure sensitive) tide gauge and a Hi-Fix 6 secondary station. During the course of this work, an ice reconnaissance of Fury and Hecla Strait was carried out and showed continuous ice pack in concentrations of from 8/10 to 10/10 as far westward as was reasonable to look.

From this time to September 12 was spent conducting shoal examinations in the previously sounded area in northern Foxe Basin and extending the corridor survey southward past Hall Beach. Ice reconnaissance flights were conducted over Fury and Hecla Strait whenever weather conditions permited.

It was during this period that C.C.G.S. "LABRADOR" and M/V "POLAR CIRCLE" arrived in the area. Since the Strait was still full of ice, the "LABRADOR", with her two launches, commenced extending a corridor northeastward into Steensby Inlet. The "POLAR CIRCLE", having required launches with gasoline powered outboard motors for her previous project and beginning to run low on fuel for them, started extending the Foxe Basin Corridor survey southward, utilizing the ship on a twenty-four hour per day basis.

The next ice reconnaissance flight, on September 13, showed fairly large leads of open water developing on the western side of Labrador Narrows. Not wishing to pass up any opportunity to survey in Fury and Hecla Strait, both "BAFFIN" and "LABRADOR" curtailed the work progress, and the following morning passed through Labrador Narrows into the western portion of Fury and Hecla Strait (figure 2).

"BAFFIN" stopped north of Liddon Island and had MRS transponders deployed, launches sounding and a tide gauge installed by noon. C.C.G.S. "LABRADOR" proceeded farther west to better observe ice conditions overall, to install a tide gauge in Purfur Cove and to commence work as far to the westward as possible. Unfortunately, Purfur Cove was full of ice so no gauge could be put in place, and the "LABRADOR" commenced sounding at the edge of the heavy pack ice on the eastern limit of what was previously surveyed in 1960 (Fig. 2).

Although the launches were forced to work around strips of pack ice, often having to break their lines off short and go back to complete them after the ice had moved, the entire area from the eastern limit of the 1960 survey to the western end of Labrador Narrows was completely sounded by September 16, including the examination of two significant shoals and approximately 40 hours of current observations. It is worthy of note that during the course of this work, "BAFFIN" often had to break leads through strips of ice in order for the launches to get to their work areas.

It is interesting that the depth of water and prevailing ice conditions did not permit current measurements to be taken by conventional means. Instead, the carefully timed progress of drift poles over a measured distance was established using MRS, with observations being repeated as long as ice conditions permitted. In addition, when there was practically no wind, the ship was tracked by the same method, and whenever a launch had the opportunity, it would similarly log the progress of a large ice pan.

On September 17, both ships proceeded back through Labrador Narrows, the "LABRADOR" to resume her work in Steensby Inlet and the "BAFFIN" to continue extending the survey eastward through Labrador Narrows. It was on this day, as well, that one of BAFFIN's launches struck a small piece of ice, badly holing her port bow and putting her out of service for the remainder of the survey.

The next three days were spent running sounding lines and examining shoals in order to connect the survey with the 1976 work in the eastern portion of the Strait. On September 21, only a small amount of interlining and a couple of shoals remained outstanding, and when the launches departed to complete this work, they found Labrador Narrows rapidly filling up with ice, apparently having moved in from the heavy pack to the west. Fortunately, they were able to complete the remaining field work, progressing just ahead of the advancing ice front, but any hopes of getting current observations in Labrador Narrows were dashed. The following morning, the MRS transponders and the tide gauges were recovered and BAFFIN moved farther south into Foxe Basin, thus terminating the survey of Fury and Hecla Strait.

The following points are itemized to illustrate the vagaries of working in this area and in the Arctic in general:

1. This survey was conducted during a 7-day, relatively ice free window, the only one which apparently occurred throughout this summer season. In addition, the weather was extremely good during this period. Previous efforts to survey this area have not had this success.

2. Staff from MEL and a Tidal Officer from B.I.O. had been on board since August 26, hoping to get some work done in the Strait. They were scheduled to depart on September 9, but, due to weather, their flight did not depart until September 12, with (apparently) still no hope of getting into that Strait. On September 14, two days later, "BAFFIN" sailed through Labrador Narrows into the western portion of Fury and Hecla Strait. Conversely, a professional photographer arrived on board on September 12, with little hope of his trip being worthwhile, and was delighted with the material he was able to get.

3. The conditions under which the hydrographic staff worked tried their endurance and skills to the extreme. Under the ever present threat of ice filling up our work area, they often worked 17 or 18 hours per day, being ever watchful of not getting caught between the shore and an ice front or of damaging their survey launches in ice. Without their hard work and dedication, the survey would not have been completed in this seven day period.

Mention should be made of some of the equipment and methods used on this operation. As mentioned previously, MRS was the positioning system used to control the survey; however, it was used in conjunction with HY-NAV, a micro-processor based navigator and data logger. These units permitted straight lines to be run between given sets of coordinates with much better control than by conventional methods, especially when considering the strong currents encountered and the fact that the magnetic compass was useless. Sounding profiles were recorded in analogue form on EDO 9040 echo sounders and subsequently scaled on a semi-automatic chart scaler, which records corrected depths on a tape cassette for transfer to a disc file on the HP21MX-E computer. These methods constituted part of BAFFIN's semi-automatic data processing system. The files would then be merged with manually keypunched files of corresponding MRS fix readings to create a complete file of fix number, time, position and depth ready for further processing and plotting.

To put this process in perspective, if four launches came aboard at 10 p.m. with a good day's work (say 250 to 300 fixes each), there would be finished navigation plots and unreduced sounding plots ready to work with in planning the next day's operation by no later than 6 o'clock the following morning.

Results

Preliminary results of the crude current observations taken north and west of Liddon Island indicate maximum velocities in the order of about two knots in that area. Although no actual measurements were taken in Labrador Narrows, visual estimation of ice movements while transiting the Narrows by the ship placed its velocity at about 5 or 6 knots. Comparisons of radar fixes against the Doppler log tended to confirm this, and figures quoted in the D.R.E.P. report [1] are in the same order of magnitude.

However, it was observed while passing through this constriction that ice was moving easterly on the south side of the Narrows and westerly on the north side, was a terrific amount of turbulence and eddies in between. At other times, the complete reverse was seen.

Tidal observations recorded at each end of Labrador Narrows showed that the tide is mixed throughout, but that the semi-diurnal component becomes much stronger as one progresses westerly, and the phase angles on the eastern end lag behind the western end by approximately 30 minutes. This tidal data, along with that in Foxe Basin has been analysed for the construction of co-tidal charts that will permit us to reduce our soundings.

Soundings obtained within the area surveyed, including Labrador Narrows, portray a fairly deep but narrow channel bounded on both sides by dangerous shoals. A total of 19 shoals were reported through Notice to Mariners, and those were only the ones that could possibly constitute an immediate hazard to navigation.

Conclusions

In conclusion, it is my opinion that hydrographic survey of Fury and Hecla Strait has shown it to be a poor "last resort" option as an alternative LNG tanker route. The channel is fairly deep, but is narrow and confined, and bounded in numerous locations by hazardous shoals. This is further complicated by strong tidal currents, which are complex, confused and multi-directional, and the ever present concentrations of ice.

From the scientific viewpoint, however, the Strait offers an excellent opportunity for further tide, current and other oceanographic studies in a unique and complex Arctic Regime.

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The Joint Canadian-United States Beaufort Sea Expedition

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Survey of the Beaufort Sea and adjacent waters during the early 1950's represented a unique cooperative effort of the United States and Canada; not only were ships of the two countries involved as independent units, but Canadian and United States personnel in them served as members of the same scientific teams.

Until 1950 the hydrographic and oceanographic features of the southeastern Beaufort Sea were virtually unknown. Scattered soundings by explorers had indicated only the main features and the intention to study the area as part of the work of the Canadian Arctic Expedition was tragically frustrated in the loss of "Karluk". In recognition of the serious deficiencies which existed in knowledge of the area an ambitious program was initiated in 1950. It was proposed that United States icebreakers should undertake an orderly and detailed survey of the region accessible to them during summer. At the same time Canadian effort should concentrate on the inshore region adjacent to the mainland, with particular attention to the hydrography and oceanography seaward of the Mackenzie. The program was prosecuted vigorously; in 1950-1952 the USS "Burton Island" ranged widely over the area from Point Barrow to Banks Island and in 1951 and 1952 the CGMV "Cancolim II" surveyed the open water from Demarcation Point to northwest Banks Island and into Dolphin and Union Strait. Examination of the important passages of the Canadian archipelago was commenced in 1953. In that year M'Clure Strait, to the north of Banks Island, was marked for exploration by Canadian and United States scientists in "Burton Island". An important approach to this area, Prince of Wales Strait, was entered from the south and detailed hydrographic and oceanographic study undertaken; however, a severe ice season, coupled with the crippling loss of a propeller blade, prevented entrance to M'Clure Strait. In 1954 two United States icebreakers were available for a second attack on the area. USCGC "Northwind" moved northward along the west coast of Banks Island and into M'Clure Strait, while "Burton Island" passed through Prince of Wales Strait and moved west to meet the coast guard vessel. Several crossings of M'Clure Strait were made that season and an extensive region north of Victoria Island was explored. The United States vessels were joined by HMCS "Labrador" from the east and the three icebreakers moved westward making extensive forays into unsurveyed areas of the Beaufort Sea.

Although an electronic positioning system did not finally become available until 1953, "Cancolim" achieved many miles of track sounding and was able to delineate the edge of the continental shelf, including an important feature there, the Herschel Canyon. In addition, a number of potential harbours were given preliminary examination, including Wise Bay, Parry Peninsula and of course Cancolim Harbour, Banks Island, and tidal data were obtained at several sites including Tuktoyaktuk and Herschel Island.

"Cancolim" was operated by the Defense Research Board with support from a number of other Canadian agencies including the Hydrographic Service, Pacific Naval Lab, Pacific Biological Station, Institute of Oceanography of the University of British Columbia, Geodetic Survey, Meteorological Service and Pacific Oceanographic Group. The vessel began work west of Herschel Island on 16 August 1951 and operated to 19 September at which time preparations were begun for overwintering at Tuk. "Cancolim" cleared the harbour and began survey the next season on 18 July and eventually left for Esquimalt 31 August 1952.

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Letters to the Editor

Dear Sir:

I have read, with great interest, the article entitled 'Pavlov's Hydrographers', published in the November 1981 issue of LIGHTHOUSE. I must admit that I found it a little frightening to learn that we have reached a time when hydrographers are being run by computers.

The concept of a computer monitoring data is an excellent one. If the computer is properly programmed, it can provide invaluable assistance to the hydrographer. At the same time it can help the hydrographer keep the sounding vessel on line. The computer will only work well if it carries out the hydrographer's wishes. For instance, line-keeping and filtering parameters should be entered after being determined by a qualified hydrographer.

There is more to hydrography than monitoring data or keeping a vessel on-line. How close to run the lines to shore, where to run the next line, which shoals are important, whether extra lines need to be run, what does the shoreline look like, are there other interesting physical attributes (tide rips, currents, seaweed, rocks) to be noted: all these should be observed by the hydrographer.

If the computer detects an ambiguity in depth or position, it is up to the hydrographer to rectify the problem, by re-entering parameters, entering different parameters, slowing the survey vessel, retuning the sounder or positioning system, or any number of things that need to be determined on the spot.

Computer systems should be designed to assist the hydrographer. They should never be given the upper hand. Replacing hydrographers with pagers or casual labour is dangerous. Collecting hydrographic data, no matter what the survey, is nothing to be casual about.

Computers are having an impact on hydrography. New logging and processing systems have reduced survey costs while increasing survey accuracy and efficiency. Rather than eliminating the hydrographer, these systems have forced the hydrographer to learn new skills and techniques in order to make effective use of the new equipment. Many decisions, that require a hydrographer's training and instinct, cannot be left to a computer.

The goals we hope to achieve through automation will never be realized by enslaving the hydrographer or by training him to drool at the sound of a bell.

Yours truly,

George Macdonald

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Dear Sir:

With reference to Mr. Macdonald's letter on my recent article "Pavlov's Hydrographers".

It seems that we agree on the concept of the computer monitoring data, but Mr. Macdonald has missed the whole point of the article.

May I suggest that the pager is merely an extension of the computer and as such relieves the hydrographer, on a shipborne survey, of the tedious task of sitting at a data collection console waiting for an idiot light to tell him or her that a parameter has been exceeded.

I wonder how Mr. Macdonald got the idea from my article that I advocate having the computer decide how close to run the lines to shore, where to run the next line, which shoals are important, or where extra lines need to be run. I also wonder if he would have watchkeepers take those decisions, on line.

Ever since C.S.S. BAFFIN's skirmish with Black Rock, the ships Master has decided how close to run the lines to shore. The main sounding pattern is decided before the lines are run, and decisions on shoal examinations and interlines are made after the lines are run. The data monitoring system is employed between those decisions.

As for Mr. Macdonald's short lecture on basic hydrography, I defy even the most highly trained hydrographer, sitting at the data collection station illustrated in my article, to observe the "interesting physical attributes" Mr. Macdonald would have him observe. Even if Mr. Macdonald could accept the paging system for a moment and went on deck to look for the shoreline, tide rips, currents, seaweed and rocks he may find that its dark half the time.

May I further suggest that one measure of efficiency may be the number of person months that can be saved by collecting high quality data automatically.

In Pacific Region we have achieved the goal of completely automated data collection on some shipborne surveys, we have emancipated the hydrographer; drooling is still a problem.

Yours truly,

A.D. O'Connor

Dear Sir,

After having read "A Parable of Fishless Fishermen" by John M. Drescher and being part of the management team in CHS concerned with the downward trend in production, that is to say the end result which is basically the publication of nautical charts, I could not help but wonder how much of this parable is appropriate to our present day operation. For a number of years now we have heard the rank and file hydrographers question the wisdom of management and the need for so many of the various functions mentioned in Mr. Drescher's parable that I thought perhaps we/I would be wise to take a second look.

I would be grateful, Mr. Editor, if you would publish this parable in "Lighthouse", in that there may be someone else, not necessarily management, who may also wish to have a second look.

R. K. Williams,
Regional Director, Hydrography
Quebec Region.

A Parable on Fishless Fishermen

By John M. Drescher

Now it came to pass that a group existed who called themselves fishermen. And lo, there were many fish in the waters around. In fact the whole area was surrounded by streams and lakes filled with fish. And the fish were hungry.

Week after week, month after month, and year after year those, who called themselves fishermen, met in meetings and talked about their call to fish, the abundance of fish, and how they might go about fishing. Year after year they carefully defined what fishing means, defended fishing as an occupation, and declared that fishing is always to be a primary task of fishermen.

Continually they searched for new and better methods of fishing and for new and better definitions of fishing. Further they said, "The fishing industry exists by fishing as fire exists by burning." They loved slogans such as "Fishing is the task of every fisherman", "Every fisherman is a fisher", and "A fisherman's outpost for every fisherman's club". They sponsored social meetings called "Fishermen's Campaigns" and "The month for Fishermen to Fish". They sponsored costly nationwide and worldwide congresses to discuss fishing and hear about all the ways of fishing such as the new fishing equipment, fish calls, and whether any new bait was discovered.

These fishermen built large, beautiful buildings call "Fishing Headquarters". The plea was that everyone should be a fisherman and every fisherman should fish. One thing they didn't do, however; they didn't fish.

In addition to meeting regularly they organized a board to send out fishermen to other places where there were many fish. All the fishermen seemed to agree that what is needed is a board which could challenge fishermen to be faithful in fishing. The board was formed by those who had the great vision and courage to speak about fishing, to define fishing, and to promote the idea of fishing in far away streams and lakes where many other fish of different colors lived.

Also the board hired staffs and appointed committees and held many meetings to define fishing, to defend fishing, and to decide what new streams should be thought about. But the staff and committee members did not fish.

Large and elaborate and expensive training centers were built whose original and primary purpose was to teach fishermen how to fish. Over two years, courses were offered on the needs of fish, the nature of fish, where to find fish, and feed fish. Those who taught had doctorates in fishology. But the teachers did not fish. They only taught fishing. Year after year, after tedious training, many were graduated and were given fishing licenses. They were sent to do full-time fishing, some to distant waters which were filled with fish. Some spent much study and travel to learn the history of fishing and to see far-away places where the founding fathers did great fishing in the centuries past. They lauded the faithful fishermen of years before who handed down the idea of fishing.

Further, the fishermen built large printing houses to publish fishing guides. Presses were kept busy day and night to produce materials solely devoted to fishing methods, equipment, and programs to arrange and to encourage meetings to talk about fishing. A speakers' bureau was also provided to schedule special speakers on the subject of fishing.

Many who felt the call to be fishermen responded. They were commissioned and sent to fish. But like the fishermen back home they never fished. Like the fishermen back home they engaged in all kinds of other occupations. They built power plants to pump water for fish and tractors to plow new waterways. They made all kinds of equipment to travel here and there to look at fish hatcheries. Some also said that they wanted to be part of the fishing party, but they felt called to furnish fishing equipment. Others felt their job was to relate to the fish in a good way so the fish would know the difference between good and bad fishermen. Others felt that simply letting the fish know they were nice, land-loving neighbors and how kind they were was enough.

After one stirring meeting on "The Necessity for Fishing", one young fellow left the meeting and went fishing. The next day he reported he had caught two outstanding fish. He was honored for his excellent catch and scheduled to visit all the big meetings possible to tell how he did it. So he quit fishing in order to have time to tell about the experience to the other fishermen. He was also placed on the Fishermen's General Board as a person having considerable experience.

Now, it's true that many of the fishermen sacrificed and put up with all kinds of difficulties. Some lived near the water and bore the smell of dead fish every day. They received the ridicule of some who made fun of their fishermen's clubs and the fact that they claimed to be fishermen yet never fished. They wondered about those who felt it was of little use to attend the weekly meetings to talk about fishing. After all, were they not following the Master who said, "Follow me, and I will make you fishers of men?".

Imagine how hurt some were when one day a person suggested that those who don't catch fish were really not fishermen, no matter how much they claimed to be. Yet it did sound correct. Is a person a fisherman if year after year he never catches a fish? Is one following if he isn't fishing?

We would like to hear some news from all our non-CHS members.
If you have anything to contribute to our NEWS column, please write to:

The Editor, 'Lighthouse',
The Canadian Hydrographer's Association
Bedford Institute of Oceanography, P.O. Box 1006,
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Opinions

Smoothing and Multi-Ranging

R. M. Eaton

Canadian Hydrographic Service
Atlantic Region

There is discussion in the Canadian Hydrographic Service just now on the relative merits of smoothing and multi-ranging, based partly on the impression that they are alternative methods of doing the same thing. I do not believe they are alternatives at all; in fact — they have different primary purposes and they are complementary to one another. We need to use both. That is why this note is headed "smoothing AND multi-ranging", not "smoothing OR multi-ranging".

One analogy is with a traverse. At the very least, the surveyor will close the traverse back on the starting point. This gives a check on internal consistency, and adjusting the traverse by the misclosure improves the accuracy. However, it is no insurance against scale error due to uncalibrated measurements, or — lacking a check azimuth — an azimuth slew, or an error in the starting position. Closing on the starting point is analagous to smoothing alone. In fact, everyone accepts that it is better to close on another previously established control point, which not only gives a misclosure adjustment but also guards against almost all systematic errors and blunders. This is analagous to smoothing and multi-ranging. Both the measurements to the second control point in the traverse, and the extra range in multi-ranging are "redundant observations", in that they are more than the absolute minimum needed to fix the point.

In our job we position a ship or launch by radio navigation. In doing so we use smoothing, or more correctly, filtering, to pick out the equivalent of a mean reading from the string of noisy measurements made by the receiver. Figure 1 represents measurements made on one of the stations used in the fix, as the vessel steams along the survey line. There is a sharp jog near the start where the helmsman avoided a fishing net. The record shows a random scatter about the mean reading with plus and minus errors equally likely. Somehow we know the true reading in this imaginary case, and the record shows a systematic bias error, of unknown source, which for some reason increases with time (or with change of location). The filter aims to make a realistic reconstruction of the mean reading by smoothing out the random scatter. Obviously the filter must not be overdone or it will smooth out the real change in track at the fishnet as well. Note that the filter cannot see the systematic bias, and so of course it cannot correct for it.

A third measurement (providing a redundant position line, one more than the minimum needed for the fix), will nearly always detect a systematic error. This will not invariably be so, as the fix geometry may be such that the error lies along the third position line, but in the vast majority of cases it will work. (A fourth position line at a reasonable angle of cut makes error detection certain). A high residual in the multi-range fix signals trouble, and you then must stop and figure out what the problem is. Which is a lot better than going merrily along and not finding out that the fix was bad until hours later (or worse still, years later). Multi-ranging also somewhat strengthens and stabilizes the fix, but this is a secondary benefit compared with the assurance of detecting errors.

Colin Weeks puts it well in an article in the January 1982 Hydrographic Journal:

> "Of the three categories of error (random, systematic, blunders) only random errors follow the laws of probability and in general only these errors can be reduced by statistical methods. These errors, however, are by far the least significant in conducting a survey. If positioning data contains random error only, the left/right indicator will be difficult to follow and the track plot will be unaesthetic, but post editing will allow an accurate chart to be submitted to the client. An unsuspected blunder or systematic error may make the whole survey valueless — and in some circumstances extremely costly to the client."

(In the interest of declaring bias, this is one non-mathematician, Weeks, quoted by another non-mathematician, Eaton! A degree of filtering is essential, but I think Weeks put it in perspective.)

Some of the sources of systematic error are:

- Low signal strength errors in microwave systems. These we can and must detect with signal strength meters.
- Calibration errors. Frequent calibration checks help to control this.
- Wrong coordinates for transmitter.
- Wrong assumptions on propagation velocity, for example when using Hi-Fix over ice.
- Other sources you have not thought of. (Don't forget that we used Mini-Ranger for a decade before we discovered that low signal strength errors of tens and even hundreds of meters could exist, undetected.)

Traditionally, hydrographers have fixed using a bare minimum of two position lines. To measure a check sextant angle with only two observers meant stopping the launch, so this was normally done only when fixing a buoy or a shoal. Now, with radio positioning systems interfaced to microprocessors, it is feasible both to filter and also to record and use redundant measurements. The redundant observations can even come from another system, for example in using Loran-C to check out Arso lane-slip. There are some computation problems related to the time taken to filter and to calculate the multi-range fix in real time, but these will be overcome with program development and improved hardware. Meanwhile, Weeks suggests a temporary way around this difficulty in his article:

- Calculate the fix from the "Two Best Lines" (of position), and output the offset to the check lines to act as a danger flag.

In many cases our positioning set-ups will provide extra position lines as they are. All we need do then is make sure we acquire and record the redundant measurements. In other cases, measuring a third position line means putting out extra transmitters, which is expensive and time-consuming. Here it is worth thinking of redundant position lines as an insurance policy against unexpected errors. If the cost of the insurance is very high, or if the risk of unknown errors is negligibly small (which is never true), then you don't pay the insurance. Of course this means you accept the risk.

Oil company surveyors are practical people. Their surveys are going to end in a piece of hardware on the seabed, and if that hardware is in the wrong place, someone will very soon find out. Although they are profit-oriented, contract survey companies working with the oil industry seem to have no doubt about the need for redundant position lines. In the Canadian Hydrographic Service we take pride in producing accurate, reliable charts anyway. But we can face other versions of the truth, when it is good to have a check to know for sure that you are right. Our surveys butt onto those of other surveys, by our own field parties, or by private surveyors, or by the U.S. National Ocean Survey. We may also face court cases where it is not only important to be right but also to convince the court that you are right.

An astute lawyer for a shipping company taking an action against the Crown for a grounding might prepare his case by first asking an independent "expert witness" whether it was standard survey practice to take redundant measurements, and whether this was feasible at sea. If the answer given to both these questions was "yes", I would prefer not to be the next witness for the defense!

The diagram shows the change in one of the measurements providing a position line (e.g. a Mini-Ranger distance) as the vessel moves along a survey track. The jagged line represents the actual measurement, and the pecked line the filtered reading. The firm line is the true measurement, which we know in this imaginary case; there is a systematic error which increases with time (or distance) along the track.

The jog near the start of the track occurred when the helmsman altered course to avoid a fishnet.

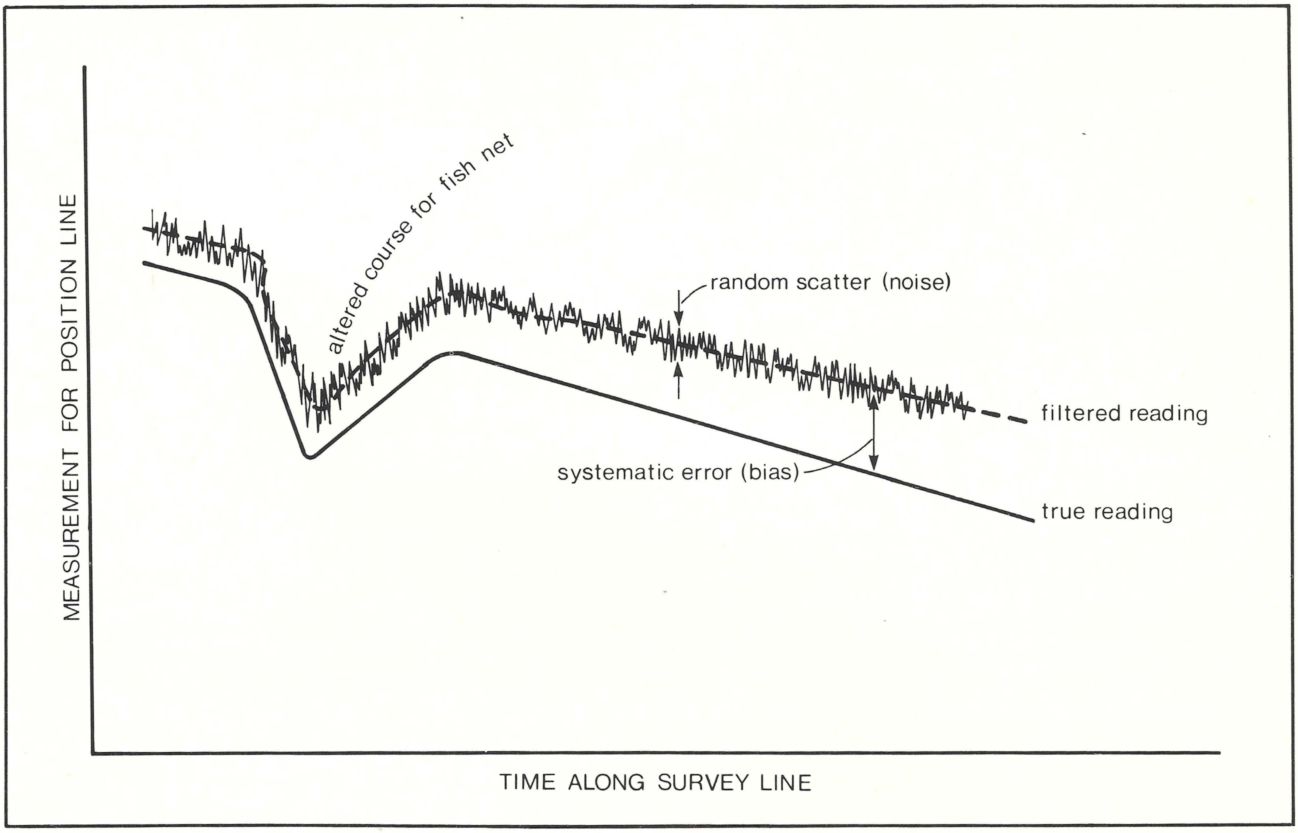

Figure 1. Measurement Errors and Filtering

Multiranging — An Expensive Solution To a Simple Problem

M. J. Casey

Canadian Hydrographic Service
Burlington, Ontario

By and large hydrographers are a rather quiet group. There are few real controveries in our profession. Generally if a new piece of equipment becomes available it is evaluated and, if useful, will find a place in our bag of tricks. Every once in a while, however, an issue arises which seems to polarize hydrographers into two distinct groups, the believers and the non-believers. I'm a non-believer in multiranging. In my opinion, it is an expensive solution to a problem which need not exist.

Consider the case of the Motorola Mini-Ranger System. This is a system which can easily (cheaply) be converted to a multiranging format. What would we hope to gain? Precision? Accuracy? Both? Let us see.

We know that the systematic errors in a MRS are caused by:

i) a zero error
ii) errors due to low signal strength.

The zero error can be calibrated out and experience has shown that a weekly check is sufficient in most cases to monitor any drift. The errors caused by low signal strength can be eliminated — providing you know that they exist. Signal strength monitors will tell you that and let you take the necessary corrective steps. So multiranging won't help us here.

We are left with two other error sources:

iii) random range errors including spurious range spikes caused by reflections, interference etc.
iv) external errors.

A well designed and implemented range filter can both reduce the range instability (due to background noise) **and** detect and delete the random range spikes. It is this latter ability which is of vital importance. We must have a fail-safe technique for spotting these large (kilometre scale) jumps. Can multiranging help us in this task? It can't by itself; it requires some filtering mechanism to gate out these spikes. For example, take the case shown in Figure 1.

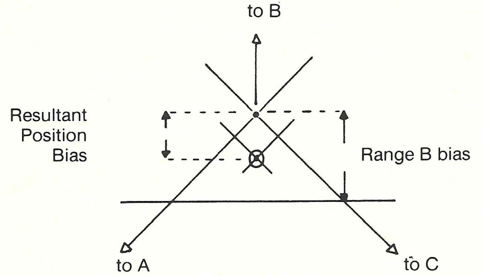

Figure 1

Here we have a launch located in the centre of an equilateral triangle of transponder stations at A, B and C. If range B is in error by an amount b, then the resultant fix will be biased by the amount b/2. Thus, if range B is out by 1000 m, then the least squares solution will be in error by 500 m. In this case an examination of the fix residuals will show very large values and this will indicate that something is wrong with this fix. It won't tell you **what** range is incorrect, only that the fix is poor.

A range filter however, **would** detect the spike, delete it and substitute either the next available range or the range prediction. Many filters exist which can tell the difference between a range spike and a legitimate range change due to a course or speed alteration. There is a compromise between dynamic response and rejection ability but filters do exist which can perform this function well. So we need not fear any flywheel effect or carry-on after a sudden launch manoeuvre.

If multiranging has any advantage, it is in the detection of external error. I define external error to include any of those factors which will affect the positioning but are not directly part of the navigation system. Like entering the wrong transponder coordinates in your processor or switching the channels A for B or errors in your control survey — all very real and important error sources.

Long ago when we did most of our positioning by sextant angles, it was common practise to stop occasionally and take check angles to ensure internal consistency. It was previously the custom to obtain an **independent** fix on a shoal buoy. Unfortunately we have moved away from that now — the need to check what we are doing. Multiranging provides a good modern analogy to the check angle. Recall that the check angle was never used in plotting the fix — it just told us all appeared to be well. We knew it wasn't foolproof but all the same it gave us some degree of confidence. So the check angle was a good check on external errors. It was only measured occasionally, however, and only if the geometry was appropriate.

Unfortunately the geometry is rarely appropriate for multiranging unless its use was incorporated into the original survey design. Tapping into another transponder might appear to be easily done but in fact can give poor results — especially if the redundant range comes from a transponder which is servicing a survey launch in an adjacent zone. Transponder pointing and elevation have been optimized for **his** use and the range **you** receive might suffer from some of the effects caused by low signal strength.

Multiranging is also expensive. Not only is extra hardware required but also about 30% more transponder locations have to be surveyed in. This means time and time is money.

Fortunately we can use conventional techniques to detect external error. If we are at the edge of a zone where transponders A and B have been used and are about to switch to B and C or C and D, then it would be good survey practise to stop and compare a number of positions taken using the two different sets of transponders. Large discrepancies will have to be explained.

The combination of range filtering and multiranging might appear to be an unbeatable combination. However, it is an expensive solution to a problem which most hydrographers should be able to solve using existing methods and techniques.

Dutch National Branch of Hydrographers Society Formed

The Hydrographic Society announces the formation of a Netherlands branch, the second national branch to be founded following the earlier establishment of similar facilities in the US two years ago.

The new branch will directly service the growing requirements of The Hydrographic Society's extensive membership throughout the Netherlands comprising leading individual, institutional and corporate representatives drawn from all sectors of hydrography, oceanography, geophysics as well as all branches of inshore and offshore engineering. The Society, which this year celebrates its tenth anniversary, has international headquarters based in London and an overall worldwide membership drawn from more than 50 countries.

In addition to providing a full range of services to members in the Netherlands, the branch will also provide facilities for the processing of new membership applications as well as admittance of Dutch-speaking Belgians. Elected officials are Mr G H Goldsteen, Netherlands Maritime Research Institute (Chairman), Professor J A Spaans, Delft University (Treasurer) and Ing D J Bakker, Rijkswaterstaat (Secretary). Administrative headquarters are based at Rijkswaterstaat, directie Noordzee, Koopmansstraat 1, 2280 HV Rijswijk, Postbus 5807 (Tel: 070-949500).

Editor: For further information please contact:
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23 Derby Avenue
London N12 8DD

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An invitation is extended to all to attend

The Canadian Hydrographic Service Centennial Conference

5-8 April, 1983

The Canadian Government Conference Centre
2 Rideau Street
Ottawa, Ontario
Co-Sponsored by the Canadian Hydrographic Service
and the Canadian Hydrographers' Association

Papers are sought, with emphasis on the history of hydrography in Canada or, future developments in hydrography. Program to include contributed papers, technical tours, displays and social events.

Abstracts are invited to be submitted by 30 September, 1982 to:

Technical Program Chairman, J. O'Shea
(613) 995-4329
Canadian Hydrographic Service Centennial Conference
615 Booth Street, Ottawa, Ontario, Canada
K1A 0E6

Papers are to be submitted by January, 1983 for pre-conference availability. Further information can be obtained from the Conference Manager.

Thank you in anticipation of your cooperation.

J. Warren, Advertising & Publications Chairman,
Canadian Hydrographic Service Centennial Conference,
615 Booth Street
Ottawa, Ontario
K1A 0E6
(613) 995-6179

LIGHTHOUSE AWARDS

Awards have been made recently for the best technical and non-technical articles published in Editions 23 and 24 as follows:

Technical

Improving the Performance of the Motorola MRS — M. J. Casey

Nontechnical

Charting the Beaufort Sea — R. W. Sandilands

It may also be of interest that all authors of articles published in LIGHTHOUSE receive an attractive pin with the LIGHTHOUSE insignia — clearly a status symbol!

CHA/CHS News

ATLANTIC REGION

PERSONALS

Welcome to Bob Pietrzak, our new Hydrographic Publications Officer. Bob was previously a Marine Traffic Controller at the Coast Guard Traffic Centre in St. John, N.B.

Congratulations to Chris Rozon and David Hughes on winning the two hydrography positions.

Two term cartographers, June Senay and Karen Coates, left on Feb. 27.

Patsy Meisner, Nick Palmer, and Doug Frizzle are attending the Carto 1 course in Ottawa. Gordon Stead has joined them for the drafting portion.

Gerard Costello will be going to U.N.B. for Survey Engineering next September.

Grant McLeod will be the first Atlantic cartographer to go to NOS Headquarters in Rockville, Maryland on the Technical Exchange Program.

Welcome to our new CHA member Fred Hutchinson, of F.C. Hutchinson Surveying Ltd.

Rick Mehlman will be returning from U.N.B. this spring with a new addition to his family — a son.

Congratulations to Bob and Gennevieve Burke on the birth of their son Jonathon.

Field hydrographer, M. Lamplugh announces the desire to enter into the bonds of matrimony. Interested parties please reply c/o Social News Editor, Lighthouse. Good looks not essential but a high salary an asset.

GENERAL NEWS

Adam Kerr, Gary Henderson, Charlie O'Reilly, Bob Burke, Marcel Chenier, Bert McCorriston, Herman Varma, Gerard Costello, and Paul Bellemare attended the Quebec Workshop. All report that it was extremely successful.

John Ferguson, Charlie Stirling, Bob Haase, Glen Rodger, and Ernie Comeau are attending course in preparation for writing Watch Keeping Mate's certificates.

Six people from CHS Atlantic are awaiting the results of the CLS exams. We wish them all the best.

Atlantic Region recently received some CHS blazer crests from Burlington Region. The crests were a big seller, and we are considering ordering more. For more information, contact Richard Palmer. Richard also has some full-back CHS brass buttons, large and small, for blue blazers. The cost is $0.95 apiece.

RÉGION ATLANTIQUE

AVIS PERSONNELS

Bienvenue à Bob Pietrzak, le nouvel officier régional des publications hydrographiques. Bob travaillait auparavant comme controleur du traffic maritime au centre de contrôle de la Garde-Cotière à St. John, N.B.

Félicitations à Chris Rozon et David Hughes qui ont remporté les concours pour les postes d'hydrographes permanents.

Deux cartographes à temps partiel, June Senay et Karen Coates, ont terminé leur terme le 27 février.

Patsy Meisner, Nick Palmer et Doug Frizzle suivent présentement le cours de cartographie 1 à Ottawa. Gordon Stead a également joint ce cours pour suivre la partie dessin.

Gerard Costello entreprendra un cours d'arpentage à l'Université du Nouveau Brunswick en septembre prochain.

Grant McLeod sera le premier cartographe de la région de l'Atlantique à participer à un programme d'échange de technologie avec les Etats-Unis. Il se rendra aux bureaux chef du NOS à Rockville, Maryland.

Bienvenue au nouveau membre du CHA, Fred Hutchinson, de F. C. Hutchinson Surveying Ltd.

Rick Mehlman sera de retour de l'Université du Nouveau-Brunswick avec un membre de plus à sa famille — un garçon.

Félicitations à Bob et Gennevieve Burke à l'occasion de la naissance de leur fils, Jonathon.

M. Lamplugh, hydrographe, désirerait contracter mariage prochainement. Toute personne interessée est priée de contacter l'éditeur des nouvelles du Lighthouse. Belle apparance non nécessaire mais hauts revenus requis.

NOUVELLES GÉNÉRALES

Adam Kerr, Gary Henderson, Charlie O'Reilly, Bob Burke, Marcel Chenier, Bert McCorriston, Herman Varma, Gerard Costello, et Paul Bellemare ont participé à l'atelier de travail tenu à Québec. Tous s'entendent pour dire que cet atelier de travail fut un plein succès.

John Ferguson, Charlie Stirling, Bob Haase, Glen Rodger, et Ernie Comeau suivent présentement un cours en vue de l'obtention du brevet de Maitre-Officier.

Six membres du SHC attendent impatiemment les résultats des examens du brevèt d'arpenteur-fédéral. Nous leur souhaitons Bonne Chance.

Le région de l'Atlantique a récemment reçu de la région centrale des écussons sur tissu à l'effigie du CHS. La demande pour ces écussons a été très forte et nous considérons en commander d'autres. Pour plus amples informations, contactez Richard Palmer. Richard a également reçu des boutons de veston en laiton également à l'effigie du CHS. Deux grosseurs sont disponibles au coût de $0.95 l'unité.

A hobby and craft show was recently held at BIO. It was a very successful event, and all the crafts entered from Hydrographic were most impressive.

A boat show is being held in Halifax March 18 — 22. CHS will have a booth there as well as a number of displays.

Peter Morton, Steve Forbes, Gary Henderson, and Adam Kerr recently gave talks at BIO review days.

Adam Kerr and Julian Goodyear were in Seattle for a National Ocean Survey workshop. Adam Kerr also spent some time in India with the FIG/IHO advisory board on training of hydrographers.

Steve Grant and Mike Eaton gave talks on navigation at BIO to the Company of Master Mariners.

Bob Burke was in Kansas and Denmark to investigate channel sweep systems.

EVENTS

The new Atlantic CHA executive is as follows:

Charlie Stirling — Vice-President
Richard Palmer — Secretary/Treasurer
Julian Goodyear — past Vice-President
Dave Blaney — Executive Member
Bruce MacGowan — Executive Member

A CHA dance is in the planning stages. It is hoped that the dance will be held before the field season starts.

Un salon d'artisanat a été organisé à BIO exposant les oeuvres du personnel de l'Institut. Ce salon fut un succès. Les oeuvres exposées par les membres du SHC étaient des plus impressionnantes.

Le salon nautique d'Halifax a lieu du 18 au 22 mars. Le SHC y tient un kiosque ainsi qu'un certain nombre d'exhibits.

Peter Morton, Steve Forbes, Gary Henderson, Adam Kerr et Steve Grant ont présenté des exposés lors de la revue annuelle de BIO.

Adam Kerr et Julian Goodyear ont participé à l'atelier de travail du National Ocean Survey group tenu à Seattle. Adam Kerr s'est également rendu en Inde pour assister à une réunioin de la FIG/-IHO du comité-conseil pour la formation des hydrographes.

Steve Grant et Mike Eaton ont présenté des exposé à la "Company of Master Mariners". Cette session s'est déroulé à BIO et portait sur la navigation.

Bob Burke s'est rendu au Kansas et au Danemark pour s'enquérir au sujet de systèmes acoustiques de balayage.

ÉVÉNEMENTS

Les membres du CHA, région de l'Atlantique, ont élu un nouvel exécutif:

Charlie Stirling — vice-président
Richard Palmer — secrétaire-trésorier
Julian Goodyear — ex-vice-président
Dave Blaney — conseiller
Bruce MacGowan — conseiller

Une soirée de danse est au programme des activités du CHA. Cette soirée aura lieu avant le début de la saison de levés.

CENTRAL REGION

PERSONALS

Bayfield Laboratory would like to extend a warm welcome to our new Tidal Officer, Rick Sandilands. Rick has a BSc in Geography from McMaster University and comes to us from Inland Waters Branch of the Department of the Environment. Rick's previous work was in sedimentology and geologic processes in the Great Lakes; but the tide has turned for Rick and for the Tidal Section in Central Region.

The Region would also like to extend a warm welcome to our newest hydrographer, Dan Chase. Dan graduated from the university of Waterloo with an honours degree in Environmental Studies. While still a student and continuing after graduation, Dan was employed with the CHS, first as a seaman, then as a coxswain for four seasons. Last fall, Dan decided he would like to become a hydrographer and set out to take the Hydrography Step 1 course on his own. After successfully completing the first half of the course in Ottawa, Dan joins our staff on a more permanent basis.

With the successful completion of the first part of their training, hydrographers Bruce Richards, Sean Hinds and Dan Chase are looking forward to the warmer climate in Sidney, British Columbia. Enjoy it while you can boys, because going into the field around here will not be as warm.

Well, the stork flew by March 1st with a little package for Raj and Rupa Beri, a little girl, Meera.

RÉGION CENTRALE

AVIS PERSONNELS

Le Bayfield Laboratory souhaite une chaleureuse bienvenue à Rick Sandilands, notre nouvel officier des marées. Rick détient un Baccalauréat en géographie de l'Université McMaster. Auparavant, il travaillait en sédimentologie et procédés géologiques des Grands Lacs à la section des Eaux Intérieures du ministère de L'Environnement. Mais la marée a tourné pour Rick ainsi que pour la Section des Marées de la région centrale.

La Région voudrait également souhaiter la bienvenue à Dan Chase, notre nouvel hydrographe. Dan a reçu un diplôme honorifique en études sur l'environnement de l'Université de Waterloo. Il travailla pour le S.H.C. lorsqu'il était étudiant et aussi après sa graduation. Dan débuta comme marin et par la suite devint chef d'embarcation pendant quatre saisons. L'automne dernier, il décida qu'il aimerait devenir hydrographe et entreprit de lui-même le cours d'hydrographie I. Après avoir complété avec succès la première moitié du cours à Ottawa, il joignit notre personnel sur une base plus permanente.

A la suite de la réussite de la première partie du cours, les hydrographes Bruce Richards, Sean Hinds et Dan Chase ont hâte de goûter au doux climat de Sydney en Colombie-Britannique. Profitez-en pendant que vous le pouvez, les amis, car sur les levés ici ce ne sera pas aussi chaud.

Le premier jour de mars, la cigogne passa chez Raj et Rupa Beri pour une livraison spéciale: une petite fille du nom de Miera.

For the "Group of Six" hydrographers, February 18th and 19th marked the termination of studies with the writing of the two CLS legal exams.

Last year, Bruce Richards switched from Cartography to become a field hydrographer, Well, the switch could go the other way soon. "MAYBE". Chris Gorski is presently attending the Cartography 1 course in Ottawa. Oh well, you win some you lose one. Best of luck, Chris!

Central Branch, CHA, is very proud of the CHA Film Club. The club's success is due solely to the efforts of Dan MacKenzie and Al Gris. The club has been providing a service to a large group of people here at C.C.I.W., and helps to sponsor a great deal of events as well. Thank you Dan and Al.

GENERAL NEWS
Central Branch's new executive is as follows:

Vice-president	— Dick McDougall
Secretary	— Bruce Richards
Executive	— Dennis St. Jacques
	— Mike Casey
	— Marty Fredericks
	— Brian Power (past vice-president)

This Region would like to congratulate our youngest Region, Quebec, for their excellent work in hosting the first CHS Workshop, which was a huge success and a model which will be hard to follow.

EVENTS
The Hydrographic Service still remains active in the Toronto International Boat Show. This year, Mr. Bob Marshall was the coordinator for the joint DFO/Environment display and, as in the past, the display was very successful. Each year, there is an enthusiastic response from hydrographers to man the display. The show provides an opportunity for CHS staff to meet with the public and hear their comments on the services we provide. It also provides the opportunity to see all those gorgeous models on opening day!

Deux examens légaux du C.L.S. tenus les 18 et 19 février marquérent la fin des études pour le "groupe des six" hydrographes.

L'année dernière, Bruce Richards transfera de la section de cartographie pour devenir un hydrographe. Cependant, le transfert pourrait se faire dans l'autre direction bientôt, PEUT-ETRE. Chris Gorski, hydrographe, suit présentement le cours de Carto I à Ottawa. Comme on dit: "Ça va et ça vient". Bonne chance Chris.

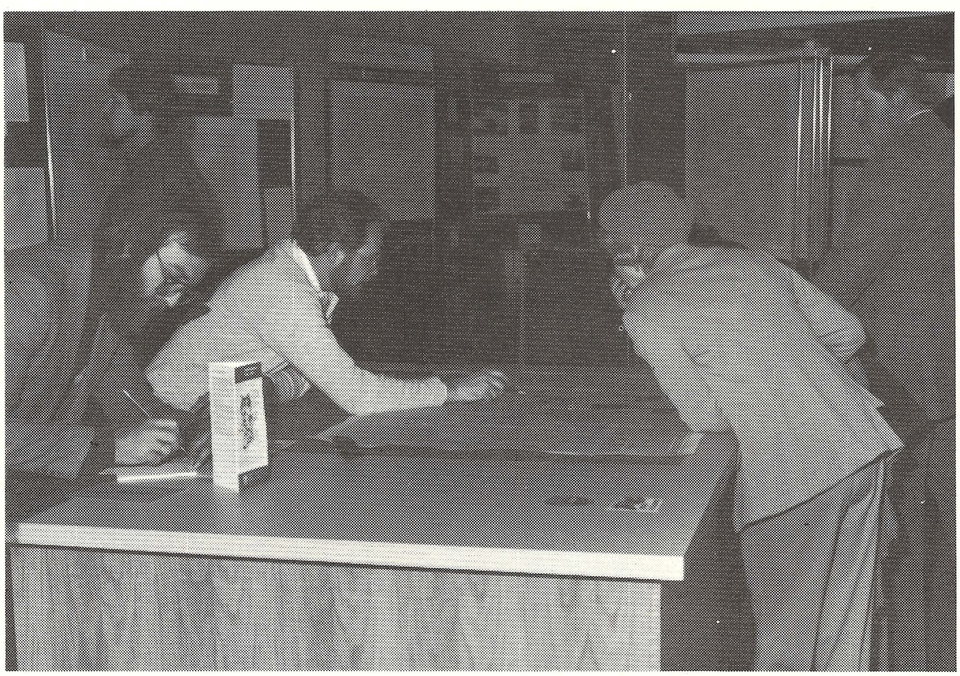
La section centrale de l'A.C.H. est très fière de son cinéma-club. Le succès de ce club est dû uniquement aux efforts de Dan MacKensie et Al Gris. Le club a fourni un service à un très grand nombre de personnes à C.C.I.W. et a été commanditaire pour plusieurs évènements. Bravo et merci à Don et Al.

NOUVELLES GÉNÉRALES
Les nouveaux membres de l'exécutif sont:

Vice-président	— Dick MacDougall
Secrétaire	— Bruce Richards
Exécutif	— Dennis St. Jacques
	— Mike Casey
	— Marty Fredericks
	— Brian Power (ex-vice-president)

Notre section aimerait féliciter la plus jeune de nos sections, celle de Québec, pour son excellent travail en qualité d'hôtesse lors du premier atelier de travail du S.H.C. Cet atelier de travail fût un immense succès et un précédent qui sera difficile d'égaler.

ÉVÉNEMENTS
Le Service Hydrographiqe demeure actif au Salon Nautique International de Toronto. Cette année, Bob Marshall était le coordinateur du kiosque regroupant le ministère de Pêches et Océans et celui de l'Environnement et, comme dans le passé, ce fût une réussite. Chaque année on retrouve un enthousiasme chez les hydrographes pour s'occuper du kiosque. Ce kiosque permet aux membres du S.H.C. de rencontrer le public et d'écouter les commentaires des utilisateurs de nos services. Il donne également l'opportunité de voir de ravissants modèles le jour de l'ouverture.



After last year's success story, the "CHA SHIP HEADS" are in training again for this year's 15 mile relay race. There is a rumour around that we may have some competition lurking in the shadows.

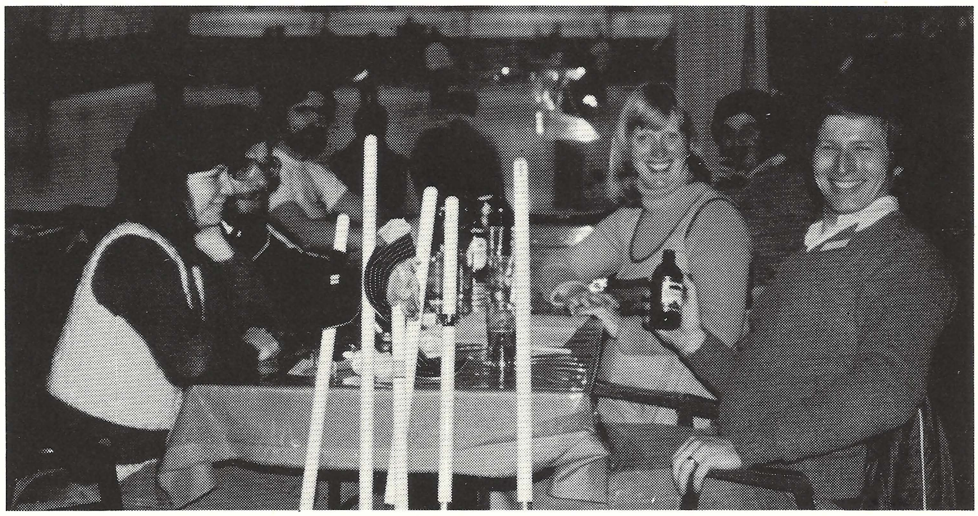
Broomball completed a successful season with a wind-up game on the large indoor ice. For the occasion, we had our first female player — Darryn Lloyd from Cartography. Congratulations to Darryn for coming out and to the guys for good conduct in the locker room.

H20 Bonspiel
On February 13th, avid curlers gathered at the Humber Highlands Curling Club to participate in the 11th anniversary of the H20 Bonspiel sponsored by Central Branch CHA. This year's bonspiel co-ordinator was Denis Pigeon. Many thanks, Denis, for a fine day of curling.

Après le succès de l'année dernière, les "C.H.A. SHIP HEADS" s'entrainent en vue de la course à relais de 15 milles prévue pour cete année. Rumeurs courent qu'il y aurait de la concurrence aux aguets dans l'ombre.

La saison de ballon-balai s'est terminée en beauté avec la partie finale jouée sur la grande patinoire intérieure. Pour cette occasion nous avions la première participante du sexe féminin, Darryn Lloyd, cartographe. Bravo à Darryn pour sa participation ainsi qu'aux autres joueurs pour s'être bien conduits dans la chambre des joueurs.

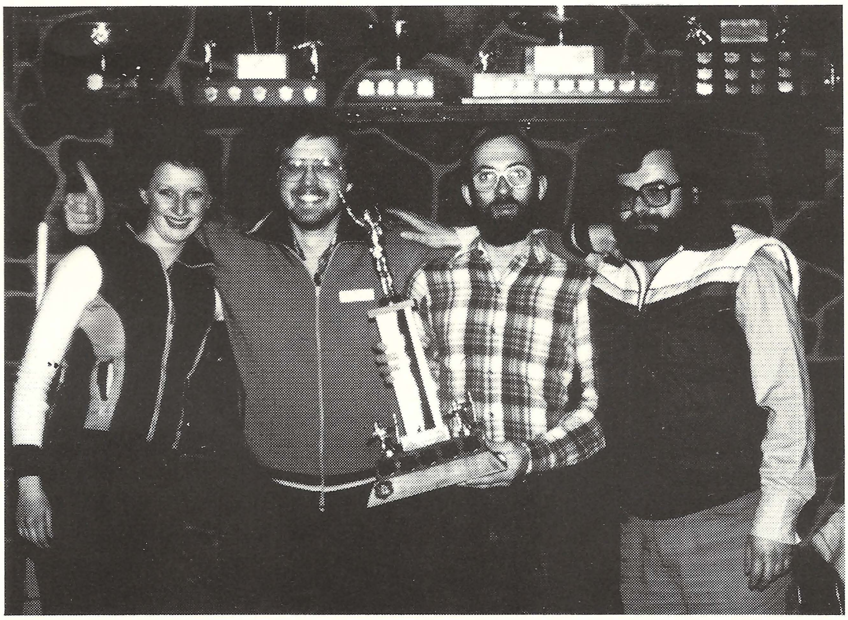
TOURNOI H2O
Le 13 février des joueurs de curling avides se rassemblairent au Humber Highlands Curling Club pour participer au 11ième anniversaire du Tournoi H2O parrainé par la branche centrale du CHA. Le co-ordinateur pour le tournoi de cette année était Denis Pigeon. Merci, Denis, pour une belle journée de curling.



Paul Warren, Kelly Elliott, Richard Tkacz and Bernie Eidsforth

The rink, dubbed "THE UNPREDICTABLES", skipped by Bernie Eidsforth, emerged as the winners of the 'A' event.

L'équipe, "THE UNPREDICTABLES" dirigée par Bernie Eidsforth remportèrent les épreuves de la classe "A".



Linda Fisher, Gerry Bengert, Dave Pyatt and Ken Kuntz

The 'B' event was won by Ken Kuntz' rink.

"HOG PRIZE"
This year, an award was presented for the person having the most "Hog Shots' during the course of the bonspiel. The recipient was Anna Power for having accumulated the most bacon.

Donations for this year's bonspiel were received from the following companies:

— Marinav Corporation, Ottawa, Ontario
— Wild Leitz Canada Ltd., Willowdale, Ontario
— Marshall, Macklin and Monaghan Ltd., Don Mills, Ontario
— Port Weller Dry Dock, St. Catharines, Ontario
— Tracked Vehicle Repair, Mississauga, Ontario
— Rapid Blue Print, Hamilton, Ontario
— Molson's Brewery, (Ontario) Ltd., Hamilton, Ontario
— J.M.R. Instruments Ltd., Calgary, Alberta
— Tele-fix Canada, Thornhill, Ontario
— Norman Wade Co. Ltd., Hamilton, Ontario
— Gentian Electronics Ltd., Stittsville, Ontario
— Digital Equipment Ltd., Burlington, Ontario
— Klein Associates Inc., Salem, New Hampshire
— CHA Film Club, Burlington, Ontario

Les épreuves de la classe "B" furent remportées par l'équipe de Ken Kuntz.

"PRIX HOG"
Cette année, on attribuait un prix à celui ou celle qui accumulait le plus grand nombre de coups traites. La titulaire de ce prix fût Anna Power.

Des donations pour le tournoi de cette année furent reçues des compagnies suivantes:

— Marinav Corporation, Ottawa, Ontario
— Wild Leitz Canada Ltd., Willowdale, Ontario
— Marshall, Macklin and Monaghan Ltd., Don Mills, Ontario
— Port Weller Dry Dock, St. Catharines, Ontario
— Tracked Vehicle Repair, Mississauga, Ontario
— Rapid Blue Print, Hamilton, Ontario
— Molson's Brewery, (Ontario) Ltd., Hamilton, Ontario
— J.M.R. Instruments Ltd., Calgary, Alberta
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— Norman Wade Co. Ltd., Hamilton, Ontario
— Gentian Electronics Ltd., Stittsville, Ontario
— Digital Equipment Ltd., Burlington, Ontario
— Klein Associates Inc., Salem, New Hampshire
— CHA Film Club, Burlington, Ontario

OTTAWA BRANCH

PERSONALS
Two new employees have recently joined the Canadian Hydrographic Service at Headquarters: Ken Khangura is assigned to Cartographic Development and Silvie Brissette is with Tides, Currents and Water Levels.

Brian Tait is on French training.

Terry Tremblay has been nominated to teach the compilation portion of the French Carto 1 course while Paul Guibord will teach drafting. This is the first French course being taught in the CHS. Michel Wolf is replacing Terry Tremblay as the Bilingual Specialist.

SECTION D'OTTAWA

AVIS PERSONNELS
Deux nouveau employés ont joint nos rangs au Quartier-Général du Service Hydrographique du Canada: Ken Khangura sera attaché à la section du Développement Cartographique et Sylvie Brissette travaillera à la section des Marées, Courants et Niveaux d'eau.

Brian Tait suit un cours de français.

Cette année, pour la première fois, un cours de Cartographie I du Service Hydrographique se donne en français. Terry Tremblay enseigne la partie du cours portant sur la compilation tandis que Paul Guibord enseigne le dessin. Michel Wolfe remplace Terry Tremblay en qualitié de spécialiste bilingue.

Cyril Champ is back at Headquarters after an absence of over 2 years. Cyril was on assignment with the ADM's office.

Cyril Champ est de retour au Q.G. après une absence prolongée de deux ans. Cyril était délégue au bureau du sous-ministre.

Doris Erwin returned to CHS headquarters after a 2 year assignment with Economic Programs Branch.

Doris Erwin est retourné au Q.G. à la suite d'une affectation de deux années à la division des programmes économiques.

Bob Farmer is the proud father of a baby boy.

Bob Farmer est fier d'annoncer la naissance de son fils.

Larry Murdock, Nick Cleary and Pete Richards wrote the CLS examinations but the final results are still to come.

Larry Murdock, Nick Cleary et Pete Richards se sont présentés aux examens du brevet d'arpenteur fédéral. Les résultats ne sont pas encore connus.

Tim Evangelatos was the successful candidate for the competition of the Chief, Cartographic Development.

Tim Evangeletos a remporté le concours au poste de Chef de Developpement Cartographique.

Fred Pittman has come back from retirement to prepare some reports for the IHO XII International Hydrographic Conference.

Fred Pittman est revenu de sa retraite pour préparer des rapports pour la XIIe Conférence hydrographique internationale de l'OHI.

Rolly Gervais has been assigned to Navigation Publications. He is busy with special projects and Chart Distribution.

Rolly Gervais fut nommé aux Publications nautiques. Il est occupé avec des projets spéciaux et la Distribution des cartes.

Ray Thomas retired last June after serving 30 years in Government service. Ray started in Drafting, served in the Armed Forces, then returned to Chart Revisions, Checking and Quality Control.

Ray Thomas se retira en juin après 30 ans de service pour le gouvernement. Ray débuta dans le dessin, servit dans les forces armées, puis retourna à la Revision des cartes, à la Verification, et au Contrôle de qualité.

Four staff members retired at the end of 1981: Larry Murdock, Phil Corkum, Don Gelineau, and Dalton McCauley.

Quatre membres du personnel prirent leur retraite à la fin de 1981: Larry Murdock, Phil Corkum, Don Gelineau, et Dalton McCauley.

Larry Murdock retired with 35 years of service, Larry started as a seaman, moved to hydrography, was in charge of major surveys, and was Head of Geoscience and Mapping before spending the last 6 years in Hydrographic Information.

Larry Murdock se retira après 35 ans de service. Larry débuta comme marin, joignit l'hydrographie, fût en charge de levés importants, et fut le chef de l'Unité géoscientifique et cartographique avant de passer les dernières six années à l'Information hydrographique.

Phil Corkum served 35 years with the CHS and retired in December. Phil started as a seaman. He later became a hydrographer-in-charge of major surveys. Since 1972 Phil was with Training and Standards.

Phil Corkum se retira en décembre après 35 ans de service avec le SHC. Phil débuta comme marin. Il est ensuite devenu hydrographe-en-charge pour des levés importants. Depuis 1972, Phil était avec l'unité Formations et normes.

Don Gelineau retired after 35 years of service. Don was Chief of Chart Distribution since 1961.

Don Gelineau se retira après 35 ans de service. Don était le chef de la distribution des cartes depuis 1961.

Dalton McCauley retired after 22 years of service in the CHS and was formerly with Chart Distribution. He had been associated with Technical Information for the past 12 years.

Dalton McCauley se retira après 22 ans de service dans le SHC. Il était auparavant avec la distribution des cartes. Il fut associé avec l'information technique pour les dernieres 12 années.

GENERAL NEWS

Marine Cartography has been re-organized into four sections:

1. Jim Bruce, Chief of Notices to Mariners, Reprints and Corrections, with three units — Notices to Mariners, Reprints and Chart Corrections.
2. Harold Comeau, Chief of Quality Control and Services which includes Quality Control, Production Monitoring, Nomenclature and Bilingual Specialist.
3. Dick Cashen, Chief of Computer-Assisted Production and Special Projects, which consists of the Automated Cartography Unit, the Reprographics Unit and the Special Projects Unit.
4. Tim Evangelatos, Chief of Cartographic Development, which consists of Cartographic Research, System Development and Applications, and Engineering Support.

NOUVELLES GÉNÉRALES

La cartographie marine a été re-organisée en quatres divisions.

1. Jim Bruce, Chef des Avis aux navigateurs, des Réimpressions et des Corrections, avec trois unitées — Avis aux navigateurs, Réimpressions et les Corrections des cartes.
2. Harold Comeau, Chef du Contrôle de qualité et des Services qui incluent le Contrôle de qualité, Le Contrôle de production, la Nomenclature, et le Spécialiste bilingue.
3. Dick Cashen, Chef de la Production assistée d'ordinateur et des Projects speciaux, qui consiste de l'unité de Cartographie automatisée, de l'Unité réprographique, et de l'Unité des projets spéciaux.
4. Tim Evangelatos, Chef du développement cartographique, qui consiste de la recherche cartographique, du développement de système et de mise en oeuvre, et du Support technique.

Geoscience Mapping and GEBCO have now completed the GEBCO series of 18 maps that cover the globe. These were started in 1975.

Headquarters is working on displays for the IHO Conference in Monaco and the CIS Conference to be held in Ottawa. Both of the conferences will be held the week of April 19th.

Video equipment has been acquired by the Training Section for future training purposes.

XII International Hydrographic Conference Monaco April 20-30, 1982

A number of persons in the CHS are currently preparing for participation in the XII Quinquennial Conference of the IHO to be held in Monaco, April 20-30, 1982. The CHS will be represented by S. B. MacPhee, N. M. Anderson, G. R. Douglas, and A. J. Kerr. G. N. Ewing will also participate as Chairman of the IHO/IOC GEBCO Committee. J. Ballinger, of the Canadian Coast Guard, will form part of the delegation as an advisor on buoyage, aids and other CCG activities. The conference will be an interesting one as it brings together hydrographers and cartographers from more than fifty countries. There will also be a major commerce exhibit and participation by a number of international organizations interested in hydrography and navigation. A report on this conference will be prepared for the next issue of Lighthouse.

PACIFIC REGION

PERSONALS

Tony O'Connor, CHA National President, has resigned from the Canadian Hydrographic Service to take up a position with Terra Surveys Ltd. We are happy to say that Tony will continue as CHA President, and we all wish him the best of luck in his new position.

This branch extends a warm welcome to its new members: Neil Fletcher, Mark Stronitharm, Philip Harrison and Terry Curran. We look forward to your continued presence and involvement within our membership.

Willie Rapatz, Sandy Sandilands, Stan Huggett, Jim Vosburgh, Graeme Richardson and Ian Campbell wrote CLS exams in February. This year's exams were described as "surprisingly different" but we're confident all six did well. Results will be known soon.

Congratulations to:

— Stan Huggett on being elected this branch's Vice-president for 1982.
— Tracy Collins on being the successful applicant for the position of Technical Records Clerk.
— Mike Woodward, Mike Ward and Ernie Sargent for successfully completing the Hydrography II course (once again West was best!).
— Alex Raymond, Jim Vosburgh and Mike Ward on the recent additions to their families.

Brian Watt has returned to Victoria from Antwerp, Belgium where he attended a three week photomechanical-cartographic course.

Robin Tamasi reports that life in Alberta isn't all that bad. We're glad to say Robin continues to be a member of CHA.

La cartographie géoscientific et GEBCO ont maintenant completé la série de 18 cartes GEBCO qui couvrent le globe. Celles-ci furent commencées en 1975.

Le Quartier général est à préparer des étalages pour la conférence de OHI à Monaco et la conférence du CIS qui va avoir lieu à Ottawa. Les deux conférences vont avoir lieu la semaine du 19 avril.

Du matériel vidéo a été acheté par l'unité de formation pour enregistrer les leçons pour usage dans des instructions à venir.

La XIIe Conférence hydrographie internationale de Monaco du 20-30 avril, 1982

Un groupe de personnes du SHC sont à se préparer pour participer à la XIIe Conférence quinquennale de l'OHI qui va avoir lieu à Monaco, du 20 au 30 avril 1982. Le SHC va être représenté par S. B. MacPhee, N. M. Anderson, G. R. Douglas, et A. J. Kerr. G. N. Ewing va également participer comme président du comité GEBCO de l'OHI/OCI. J. Ballinger, de la Garde côtière canadienne, fera partie de la délégation comme conseiller sur les bouées, les aides et les autres activitées de la GCC. Rassemblant des hydrographes et des cartographes de plus de cinquante pays cette conférence se veut des plus interessantes. Il va aussi y avoir une grande exposition commerciale et la participation d'un grand nombre d'organizations internationales interessées dans l'hydrographie et la navigation. Un rapport de cette conférence va être preparé pour la prochaine édition de Lighthouse.

RÉGION DU PACIFIQUE

AVIS PERSONNELS

Tony O'Connor, actuel president du ACH, a donné sa démission au Service Hydrographique du Canada pour occuper une position au sein de la compagnie Terra Surveys Ltd. Nous sommes heureux de savoir que Tony continuera à présider le ACH et nous lui souhaitons beaucoup de succès dans son nouvel emploi.

Cette branche souhaite une chaleureuse bienvenue à ses nouveaux membres: Neil Fletcher, Mark Stronitharm, Philip Harrison et Terry Curran. Nous espérons votre présence continue et votre participation parmi nos membres.

Willie Rapatz, Sandy Sandilands, Stan Huggett, Jim Vosburgh, Graeme Richardson et Ian Campbell ont écrit les examens du CLS au moins de février. Les examens, de cette année ont été décrits comme étant surprenament différents, mais nous sommes confidents que tous les six ont reussi. Les résultats vont être disponibles bientôt.

Félicitations à:

— Stan Huggett qui a été élu le Vice-président de cette branche pour 1982.
— Tracy Collins qui fut le candidat choisi pour la position de commis aux Records Techniques.
— Mike Woodward, Mike Ward et Ernie Sargent pour avoir complété avec succès le cours d'hydrographie II (encore une fois l'ouest est le meilleur!).
— Alex Raymond, Jim Vosburgh et Mike Ward pour les additions récentes à leurs familles.

Brian Watt est rétourné à Victoria après avoir a suivi un cours de trois semaines en photomécanique-cartographique à Antwerp, Belgique.

Robin Tamasi a fait rapport que la vie en Alberta n'est pas si pire. Nous sommes fiers que Robin continue à être un membre du ACH.

GENERAL NEWS
Members of this branch attended the NOAA Hydrographic Conference at Batelle in Seattle and our own workshop in Quebec City. Both of these meetings were reported to have been very enriching.

Chart Production this year is sending four cartographers into the field to work alongside the hydrographers to find out what goes on, on the other side of the coin. A cartographer will be on the revisory survey of the interior lakes of B.C., one on the first-time ever survey of the Seymour Inlet complex, one on the Skidegate Inlet survey and the fourth one, space permitting, on the Beaufort Sea Survey. Four cartographers are at present in Ottawa on the Cartography I course, and their return is eagerly awaited by the section.

In Field Hydrography, rotational assignments see Ernie Sargent in Cartography for the coming year and Barry Lusk heading south to spend some time working with NOAA.

Jim Vosburgh reports that a film of last year's hydrographic survey in the Beaufort Sea will be released soon. There is no truth to the rumour that Jim has been nominated for an Academy Award for his part in this picture.

NOUVELLES GÉNÉRALES
Des membres de cette branche ont assisté à la conférence hydrographique NOAA à Batelle, Seattle, et à l'atelier de travail à Québec. Ces deux réunions furent décrites comme très enrichissantes.

La section de production cartographique enverra 4 cartographes sur le terrain leur permettant de découvrir l'autre coté de la medaille. Les affectations sont reparties comme suit: un sur le levé des lacs de C.B., un sur le premier levé de la Baie de Seymour, un sur le levé de la baie de Skidegate et un, espace le permettant, sur le levé de la mer de Beaufort. Ces 4 cartographes sont présentement sur le cours de Carto I à Ottawa et leur retour est impatiemment attendu par la section.

Cette année dans le cadre des affectations de rotation, Ernie Sargent travaillera en cartographie et Barry Lusk. Ira Dans le sud pour passer quelque temps avec NOAA.

Jim Vosburgh fait rappport qu'un film du levé hydrographique dans la Mer de Beaufort l'été dernier va être disponible bientôt. Il n'y a rien de vrai dans la rumeur que Jim fut désigné pour un Oscar pour sa participation dans ce film.

QUEBEC REGION

PERSONALS

The new CHA executive for this upcoming year is:

Richard Sanfacon — Vice-President
Patrick Hally — Secretary-Treasurer
Claude Chantigny — councillor
Ronald Saucier — councillor

Patrick Hally has been appointed Acting Head of Development.

On March 19, Jean-Marie Gervais will be presenting an exposé on hydrography to geodesy and survey engineering students at L'Université Laval.

Diane DeMontigny and Guylaine Tessier are presently in Ottawa for the Carto 1 course. We all wish them good luck and congratulate the training section in Ottawa, since the course is being presented strictly in French for the very first time.

Jean-Yves Poudrier has been appointed Hydrographer-in-charge of the Richelieu River and Québec Harbour projects. Jean-Marie Gervais will be in charge of the Gaspé project.

René Lepage, Jean-Marie Gervais and Claude Chantigny attended a Staffing Course given by the Public Service Commission.

EVENTS
The Quebec Region was represented at the Montreal Boat Show (26 Feb. to 7 March) by Denis Trudel, René Lepage and Ron Saucier. From a CHS point of view, the show was a huge success based upon the number of boating enthusiasts who were made aware of the existence of nautical charts and related publications.

The CHA, Quebec Branch, for sake of simplicity and accuracy, has amended its name. In French, we will be known as "La section du Québec". The English version will remain "Quebec Branch".

RÉGION DE QUÉBEC

AVIS PERSONNELS

Voici le nouvel exécutif pour cette année:

Richard Sanfaçon — vice-président
Patrick Hally — secrétaire-trésorier
Claude Chantigny — conseiller
Ronald Saucier — conseiller

Patrick Hally a été nommé, de façon intérimaire, en charge de l'établissement de la section de développement.

Le 19 mars, Jean-Marie Gervais doit présenter un exposé sur l'hydrographie devant les étudiants en géodésie à l'université Laval.

Diane DeMontigny et Guylaine Tessier sont présentement à Ottawa pour le cours de "Carto 1". Nous leur souhaitons bonne chance et nous félicitons la section de formation à Ottawa qui présentera le cours en français pour la première fois.

Jean-Yves Poudrier a été nommé hydrographe-en-charge pour le projet de la rivière Richelieu et du port de Québec. Jean-Marie Gervais sera en charge du projet de Gaspé.

René Lepage, Claude Chantigny et Jean-Marie Gervais ont participé à un cours en dotation donné par la Commission de la fonction publique.

ÉVÉNEMENTS
La région de Québec était représentée au salon nautique de Montréal (26 février au 7 mars) par Denis Trudel, René Lepage et Ronald Saucier. Pour le service hydrographique, le salon fut un immense succès considérant le nombre impressionnant de personnes qui ont été informées de l'existence des cartes nautiques et des publications connexes.

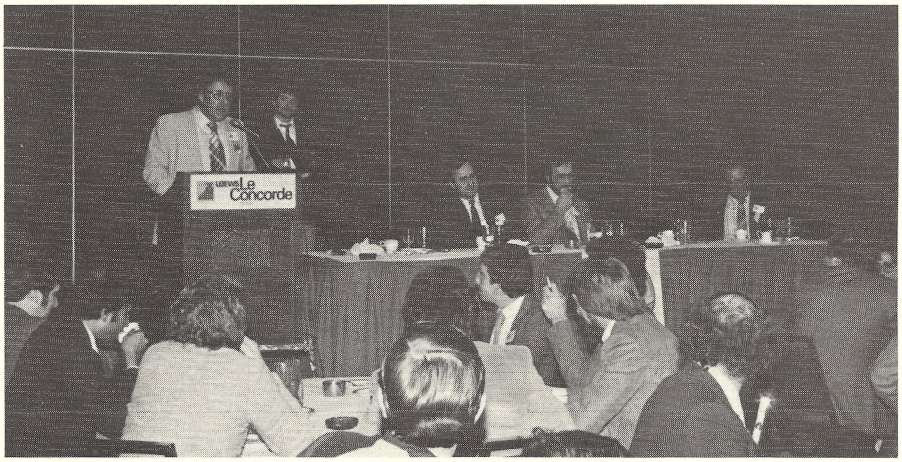
"La branche de Québec" de l'AHC, pour plus d'exactitude avec la langue française, sera dorénavant connue comme étant "La section du Québec". La version anglaise demeurera "Quebec Branch".

The organizing committee of the First Hydrographic Workshop wishes to thank all those people who sent us congratulatory notes. We are very pleased that everyone had a good time.

Ron Saucier has left CHS to join Marinav. We wish him the best of luck.

Le comité organisateur du premier atelier de travail sur l'hydrographie désire remercier toutes les personnes qui nous ont envoyé des lettres de félicitations. Nous somme très fiers de savoir que tout le monde a apprécié son séjour.

Monsieur Ronald Saucier a quitté le Service Hydrographique du Canada pour joindre la campagnie Marinav. Nous lui souhaitons le meilleur des succès.



Opening of the workshop
Ouverture des ateliers

Mr. Gervais presenting the "Honourable Hammer" to the host of the next workshop, Mr. Mike Bolton of Pacific Region.
M. Gervais présente l'honorable marteau à l'hôte des prochains ateliers, M. Mike Bolton de la région du Pacifique.

R. S. Sanfaçon (publications & information), J. P. Racette (technical program), J. M. Gervais (finance), R. Saucier (chairman), D. Trudel (social program).

Closing of the workshop
Clotûre des ateliers

News from Industry

MAGNAVOX
Magnavox Advanced Products and Systems Co. announces the appointment of David F. Siemens III as International Marketing Manager for Marine Products. David, a graduate of California State University and a veteran of the U.S. Navy, will coordinate the activities of international sales agents in 58 countries.

NEREIDES
Nereides, Office d'instrumentation hydrographique are introducing The WADIBUOY SYSTEM. The system enables determination of wave directional spectrum every 30 minutes. It is presented within two models:

1. WADIBUOY R
   Raw data are radio transmitted by VHF and processed onshore by means of a wave spectrum analyser.
2. WADIBUOY A1 and A2
   In this case raw data are processed onboard and wave directional spectrum is transmitted by ARGOS satellite and may be recorded on buoy.

The system is now used throughout the world at several depths and several sea states.

KLEIN ASSOCIATES, Inc.
Klein Associates, Inc. is producing a Minehunting Side Scan Sonar for mine hunting as well as channel conditions. It is approved for Service use and designated the MK 24 Mod 0 by the U.S. Navy.

The system consists of a Graphic Recorder, a 100 KHz Side Scan Sonar Towfish, a Tow Cable, and accessories. The MK 24 Locator is rugged, portable, easily operated and maintained, and operates from various AC and DC power sources. Various USA, NATO and other Navies are using the system now, while deliveries of several more are scheduled for this year.

Klein Associates also announces the successful mating of its long-range deep operating 50 KHz Towfish to Klein ocean-bottom mapping system, K-MAPS.

The 50 KHz Towfish includes variable-tilt transducers, especially useful in rugged terrain or steep-slope situations, and improved line driver curcuit for cables to 10,000 feet.

Models are available for depths of 1000 or 2300 meters as well as full ocean depth.

OCEAN RESEARCH EQUIPMENT, INC.
O.R.E. has expanded its MULTI-SCAN line of mulitplexed seabed survey systems with a new deep water, long range side scan sonar. The narrow beam 30 KHz transducers have a range of better than one kilometer to each side. A built-in responder and pressure sensor supply slant range and vehicle depth information which are displayed on O.R.E.'s new Model 460 TRACKPOINT receiver on ship. Bearing to the towfish is also displayed to an accuracy of $\pm$ 1.0 degrees.

MESOTECH
Mesotech announces a new "midi"-size Acoustic Release Transponder (ART) and an improved Navigation System.

Model ART526 weighs 7 kg. in air and can release loads up to 900 kg. from depths to 2,000 m.

The unique microprocessor coding rejects noise and interfering signals to provide reliable transponder replies and release action. A single transponder enables relocation of a point, while an array of 4 allows navigation with Mesotech's 411/12P. The release is instantly, externally resettable.

The performance of the Model 411/412 Navigation Sonar has been increased, particularly in shallow water, by boosting the effective power output of both the Base Unit and the Transponders.

In high noise situations, up to a tenfold range increase can be expected over the standard 412/501AR system.

Model 502AR is a dual acoustic release transponder with a 4,500 kg. book rating, and a two year battery life.

TELLUROMETER
A joint venture agreement for the worldwide marketing, distribution and servicing of total electronic automated survey systems for hydrographic application is announced by Krupp Atlas-Elektronik of Bremen, West Germany, and Tellurometer, a Plessey Company.

Under the agreement, both companies are to jointly market each other's hydrographic products and services as part of a series of integrated data acquisition and processing systems designed for all offshore, inshore, dredging and port survey applications. Equipments forming part of integrated configurations include Krupp's established dual-channel Atlas DESO 20 echo sounder, the new advanced Atlas SUSY 30 survey processing system, inclusive of peripherals and software, and the Tellurometer MRD 1 automated microwave, three range position fixing unit which requires no calibration and is capable of providing repeatable dynamic accuracies of better than 1 metre.

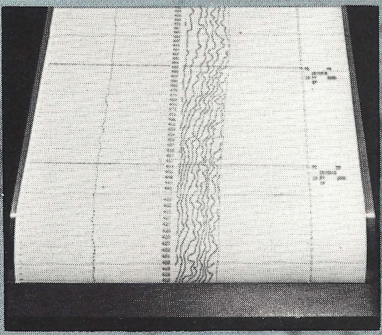
Custom-designed systems and associated support services are to be marketed throughout the world using common distributor networks now being established.

The co-operative venture between both companies has been established in response to growing worldwide requirements for integrated hydrographic survey systems already in widespread demand by, among others, offshore, dredging and port authorities.

from General Instrument...

HYDRO CHART

BATHYMETRIC SWATH SURVEY SYSTEM



REAL TIME, high resolution bottom contour mapping . . . to depths of 2000 feet!

Contour charts are generated by means of soundings from 21 contiguous, 5° beams positioned perpendicular to the ship's axis. The multiple-beam pattern covers a swath of the bottom equal to 2.5 times the vertical depth to 800 feet, and a swath equal to the depth to 2000 feet. The system can be adjusted to produce full bottom contours, or only shoaling contours.

General Instrument Corporation is the world's foremost producer of multi-beam bathymetric swath survey systems. For further information on Hydro Chart, contact Government Systems Division, General Instrument Corporation, Southwest Park, Westwood, MA 02090 (617) 326-7815

GENERAL INSTRUMENT