TECHNICAL REPORT

Compilation of Reports from the
Technical Development Groups
April-October 1972

CANADIAN HYDROGRAPHIC SERVICE
MARINE SCIENCES BRANCH
DEPARTMENT OF THE ENVIRONMENT
OTTAWA

INTRODUCTION

The objective of compiling these four reports that outline the work of the Technical Development Groups is to disseminate the information to those who may be interested in a compact and handy form.

I regret the extreme delay in providing this information to the Hydrographic Service but hope that it will be useful reading during the winter months.

A. J. Kerr

Ottawa December, 1972

Semi-Annual Report

September 1972

Hydrographic Development Group

Pacific Region

N.M. Anderson

Review of Pacific Regions

Hydrographic Development Group Program

1) Air photo interpretation: A second area of foreshore and shallow water air photo interpretation has been completed under contract by Airphoto Analysis Associates. The area which covers the west side of Haro Straits is part of a re-survey program. The air photo interpretation included the preparation of a controlled mosaic of the shoreline, the interpretation of the high water line, low water line, one fathom and in some sections the two fathom contour. The geomorphology of the foreshore is also outlined on the mosaic. After selected portions of the mosaic are field checked, it will be used as hydrographic data during the completion of the hydrographic survey now planned for the 1973 field season.

2) Photography: A contract has been granted to the University of New Brunswick to continue their investigation of stereoscopically measuring depth from aerial photographs using their analytically plotter. As has been outlined earlier, a fundamental requirement for photogrammetric measurements is the accurate knowledge of the position, attitude and altitude of the aircraft and, hence the camera at the time of film exposure. For regular land photogrammetry this information is computed by selecting photo identifyable ground points on the photograph

and tying these into a land survey network. For shore line and shallow water photography, this technique cannot normally be used unless land covers 60 to 80% of the photograph. For the UNB contract photographs were selected which had sufficient land and ground control was established for those photographs during this field season.

However, to use photogrammetric techniques or hydrographic surveys another method of photo control must be used. A second phase of the photogrammetric program is a project with the Canada Centre for Remote Sensing which will involve the use of the Lytton-51 Inertial Navigation System to provide attitude data at the time of film exposures. This project is now in the planning stages.

3) Side Scan Sonar: A Klien Ass. MK400 side scan sonar was purchased by Pacific Region. It had limited use on the Mackenzie River survey during June and July. Presently it is being used on a technique development program whereby three hydrographers who are also qualified scuba divers are interpreting bottom features from the sonar record and then checking their interpretations by sounding and scuba diving. This program will result in the development of operational methods of using side scan sonar data on regular hydrographic surveys. This application will include a pre-survey reconnaissance of the survey area, qualitatuil shoal evaluations and surveying.

4) R.P.S. Omnidirectional Antenna Evaluation: A quantitative analysis was completed of the range and accuracy limitations of the RPS positioning system using the 4db gain omnidirectional antenna aboard the launch instead of the 25db rotating antenna normally recommended with the system. Used with the directional horn antenna onshore, this configuration compares with the tests of the Trisponder system. A report of these tests have been prepared by A. Mortimer.

5) Mini-ranger Range Accuracy: A Motoroal Mini-ranger has been purchased by Pacific Region and a range-accuracy evaluation will be conducted during October and November. These tests will be patterned along the lines of the range accuracy tests of the other short-range positioning systems.

6) HAAPS: The HAAPS system with a single data acquisition system was used aboard the CSS PARIZEAU this year suring the Beaufort Sea survey. The hardware configuration for this survey utilized the Gifft transceiver and an Interspace digitizer.

7) Computer Programming: This year a computer terminal coupled to a Vancouver computer was installed in the Victoria office. All of the hydrographic computational programs written in Fortran have now been converted for use in this terminal.

SEMI-ANNUAL REPORT

OCTOBER 1st, 1972

ATLANTIC OCEANOGRAPHIC LABORATORY

HYDROGRAPHIC DEVELOPMENT

SECTION A

R. G. Burke

The activities of the Development Section have centered on two major projects, the Hydrographic Acquisition and Processing System (HAAPS) and the upcoming BO'SUN Multi-Beam Sonar Evaluation. In addition, two papers on the automation of Hydrography have been presented at conferences by members of the Section.

Hydrographic Acquisition And Processing System (HAAPS)

The Engineering Services Section will be assuming responsibility for the maintenance of HAAPS equipment this fall. Four man months of field support has been given to the system during the "phasing over" period. The objectives of the field support were:

1. To give hydrographers training in the use of HAAPS under actual operating conditions.

2. To give supplementary field training on the equipment to the technicians from Engineering Services.

3. Evaluate hardware and software modifications that resulted from experience gained during the 1971 Notre Dame Bay survey.

...../2

4. Gather statistics for a comprehensive appraisal of the system.

It appears that the recording problems encountered in previous years have been eliminated by the use of a better grade of magnetic tape. Two refinements on the data loggers, a bad depth data card and a bottom search circuit, are presently under evaluation.

The final test unit for HAAPS, a Hi-Fix simulator, has been designed and tested. It was used to spot and correct a wiring fault in our most recently acquired DCU. Normally, this would not have been discovered until the Hi-Fix chain was operational.

BO-SUN Multibeam Sonar Evaluation

A contract has been let to Harris ASW Division of General Instruments for the rental of a BO'SUN Sonar System from the 9th of November to the 6th of December. The evaluation will be carried out in Bedford Basin, the approaches to Halifax Harbour and on the Continental Shelf, time and weather permitting.

The BO'SUN System is a potential candidate for hydrographic survey work. The system measures and digitally records slant range information on magnetic tape. Software is available

...../3

to edit, process and plot the data in the form of a contoured nautical chart.

The BO'SUN System differs from conventional Side Scan Sonar Systems in that:

1. It may eliminate the need for intrepretation of analogue records.

2. Software is available to produce contoured charts from the raw data.

3. The BO'SUN Sonar is a measurement tool rather than a search tool.

The evaluation will consist of two phases. The trials this fall will be used in an overall appraisal of the hardware and to obtain sufficient survey data to test the software.

Funds have been made available in the '72-73 budget for data processing and further evaluations. However, the BO'SUN program hinges on the outcome of the initial testing.

Papers Presented By The Section

G. R. Douglas "The Design and Operation of an Automated Hydrographic Data Acquisition and Processing System," at the 1972 International Conference of Surveyors, Tel Aviv, Israel, May 29th, 1972.

...../4

R. G. Burke "HAAPS - A Hydrographic Acquisition and Processing System used by the Canadian Hydrographic Service," at the IEEE Conference on Engineering in the Ocean Environment, Newport, Rhode Island, September 14th, 1972.

27th September 1972

R. G. Burke

B.I.O. NAVIGATION GROUP - SIX MONTHLY

REPORT FOR DOMINION HYDROGRAPHER

March - September 1972

PERSONNEL

In April N. Stuifbergen joined R. M. Eaton and S. T. Grant in the Navigation Group.

RHO-RHO LORAN-C

The Institute's receiver/computer has performed well and has been found very useful by the two users, Ocean Circulation and Marine Geophysics. It is also to be the prime navigation for a joint Hydrographic-Geophysical cruise off Labrador this fall.

Grant has written the first program known to ~~exist~~ because to produce geographic position on-line from Loran readings, and has been developing operating procedures for using Loran-C either as stand-alone or in conjunction with satellite navigation, including programs to give fix accuracy information.

On a one month cruise this spring in the area between the Grand Banks and the Azores, Eaton and Grand found the combination with satellite navigation to be very effective, and were able to receive Loran-C groundwave at extreme ranges of up to 1,400 n.m. Skywave was also monitored, and showed promise of periods of stable signals between the dawn and dusk upheavals.

SATELLITE NAVIGATION

The Magnavox on-line program is very well designed, and is now thoroughly accepted by the ship's officers of "Hudson", who have been running it all summer.

The ITT on-line program is much less user-oriented, and is not yet fully implemented. However ship's officers in "Dawson" have been using it, and operation will be improved this winter with the addition of extra computer memory.

The trial in using satellite navigation for Decca Lambda lane identification was not conclusive because of receiver trouble and the short time available. However results indicate that Decca lane can usually be set correctly after one satellite pass and can be confirmed after two or three passes.

DOPPLER LOG

Eaton, in company with S. B. MacPhee, head of Engineering Services, saw a Sperry Doppler log in operation onboard the Woods Hole ship "Knorr", and from this and users comments judged it to be suitable for our purposes. The hull fittings have been installed in "Dawson", and we are awaiting delivery of one log in order to make sea trials in that ship. Should these be successful a second log will be fitted to measure the cross-track component of velocity as well as the along-track component.

OTHER ACTIVITIES

Preliminary trials on V.L.F. range measurement will be done in "Hudson" this fall.

At the invitation of Dabbs Control Surveys and Mobil Oil Canada Ltd. we took part in the calibration of their Doppler Sonar Navigator in Halifax Harbour. The Doppler speed measuring component appeared to match the accuracy of our sextant check-fixes, but errors of $\pm\frac{1}{2}^{o}$ appeared in the gyro alignment.

The "Kapuskasing" cruise to calibrate acoustic positioning and investigate Hi-Fix phase lags was cancelled as an economy measure. We plan to do the acoustic calibration in the Caribbean this winter if possible, and to do the phase lag experiment next summer.

Fire-Hall calls have included help to Earth Physics Branch in navigation for "Sackville"; advice to scientists on use and accuracy of conventional Decca; planning a "Navigation Centre for 'Hudson'"; writing a program to produce hyperbolic lattices on the computer centre's calcomp plotter; adapting D. E. Wells new and improved Satellite Alerts program to our computers; etc., etc.

R. M. Eaton

25 September 1972

CENTRAL REGION REPORT

ON

DEVELOPMENT ACTIVITIES

APRIL 1, 1972 - SEPTEMBER 30, 1972

This reporting period has been one of considerable field activity, mainly in the Killarney area of Georgian Bay and to a large degree as a result of the contract Hydrographic Survey undertaken in that area.

The Group undertook a number of development/ production projects in the Killarney area including, HAAPS, SONAR and LORAN C, in addition to monitoring the contract survey.

The period has been one of intensive data collection with much of the analysis and processing to be carried out during the coming winter months.

.....2

LORAN C

As part of the field activities in Georgian Bay, an Evaluation of Hyperbolic Loran C has been undertaken. To date, detailed observations have been made to correlate this summer's observations with those data collected on the Lower Great Lakes during a previous study conducted during winter months. To assist in this study a LORAN C receiving system was obtained on loan from the U. S. Coast Guard. This system, which comprised of a DECCA ADL-21 Receiver, H. P. 9100B calculator and plotter system, and a special COGLAD interface designed by Johns Hopkins University, was available for a six-week period and served very capably as a base monitor unit at both Burlington and Killarney.

A second receiver, an INTERNAV 101, has been rented for these trials. This receiver has been interfaced with a magnetic tape unit and detailed observations have been made. In addition to the normal operation of logging LORAN C signals, during a period of approximately one week, the system was compared with Mini-fix by the simultaneous recording of both systems. None of this data has been analyzed to date because of the continuation of other projects.

This system receiver and logging equipment has recently been installed in a van and is presently observing signals in Lake Superior where recordings for a period of 48 hours will be made at five widely separated locations. Following this period, two stations will be observed in Lake Huron to complete coverage of the Upper Lakes.

.....3

Through the co-operation of the Navigation Group at the Bedford Institute, our Hyperbolic LORAN C trials will be supplemented with trials in the RHO-RHO mode. It is anticipated that these trials will be carried out in November.

HAAPS SYSTEMS

Central Region presently owns the following equipments associated with HAAPS:

2	DSS-101	C-Tech Depth Digitizers
2	DC111	CDC Digital Couplers
2	1600	Kennedy Tape Recorders
1	AZ6017	Atlas Edig-10 Depth Digitizer
1	LPD401	Decca Digital Display Unit
1	PDP-8/E	Computer with Peripherals
1	563	Calcomp Plotter

During this reporting period, two HAAPS acquisition systems have been deployed in the field. These systems were used in widely separated geographic areas and in areas which had considerable difference in bottom topography.

The Atlas system was used exclusively on LIMNOS for the Bathymetric survey of Lake Ontario. This system has worked extremely well for us, mainly because of the reliability of the Atlas depth digitizer.

.....4

The second HAAPS system was deployed on a survey of approximately 40 square miles in north-western Georgian Bay. The equipment which comprised of the standard HAAPS components was installed in the 36-foot launch 'VERITY'. Considerable difficulty has been experienced with this system, mainly with regard to the depth digitization. Reasons for our problems are uncertain at this time and there is a possibility that most of the problems are due to inadequate installation.

The system will be further checked and tested in Lake Ontario during November to isolate the problems.

SONAR

As part of the field program during this reporting period, considerable effort was directed towards the evaluation of scanning sonars with potential for launch use on Hydrographic Surveys.

To-date, three sonars have been used on this project, KLEIN MK400 Side-Scan, E.G.& G. MK1A, and the C-TECH LSS-30. In addition, it is hoped that the latest model C-TECH will be available for trials later this fall.

All sonars were installed, at various times, on the modified barge 'SORA' and an area of approximately 1.5 square miles was traversed with closely spaced and overlapping lines. All shoal indications on the records

.....5

were examined by conventional means in order to produce an accurate contour plot of the area.

The analysis of bottom coverage, comparison of sonars and application techniques are not fully developed at this time. A detailed report covering the above will be prepared in the next quarter.

CONTRACT SURVEY

During this reporting period, a contract to carry out a complete Hydrographic Survey was awarded to Com-Dev Marine. The Com-Dev Marine Survey Party began operations in the survey area in mid-July and will remain in the area until late fall. The Development Group's responsibility in the field has been to ensure that specifications are met and generally to ensure that the survey is acceptable and complete and to provide consulting services when necessary. In addition, the development of effective means of monitoring future contract surveys has been considered. A report on this survey will be prepared upon termination of the contract.

HARBOUR AND RIVER POSITIONING SYSTEM

Early in June the group obtained on loan from SANDERS ASSOCIATES, a CODE-LITE angle positioning instrument. This CODE-LITE emits a visible fan-shaped beam using high intensity Xenon lamps. The beam is formed with three sectors with each beam encoded for visual

.....6

identification. The central beam can be adjusted from approximately 20 seconds to one minute of arc which makes it ideal for short range work.

This unit was tested and used on a local survey and found very useful and has subsequently been purchased by the Region.

To futher assist in positioning vessels within short range, an acoustic measurement system is being developed from existing digital echo sounders. Preliminary tests of this system have been successful in providing encouragement for continued effort.

DATA PROCESSING AND DEVELOPMENT

During the first two months of this period (April-May) extensive computer program development and re-writing by R. Tripe and C. Doekes took place. Revisions were undertaken on three HYPOS programs to improve their accuracy and reliability: a program to compute Northings and Eastings from Hydrodist data and plot the vessel track, a program to compute Northings and Eastings from R.P.S. data and plot the vessel track and a program which merges positional data with digitized sounding data. Program development centred around two more HYPOS processes: a program to plot the merged sounding data on the Gerber 22 and a program to create, update and edit a master file, on magnetic tape, which

.....7

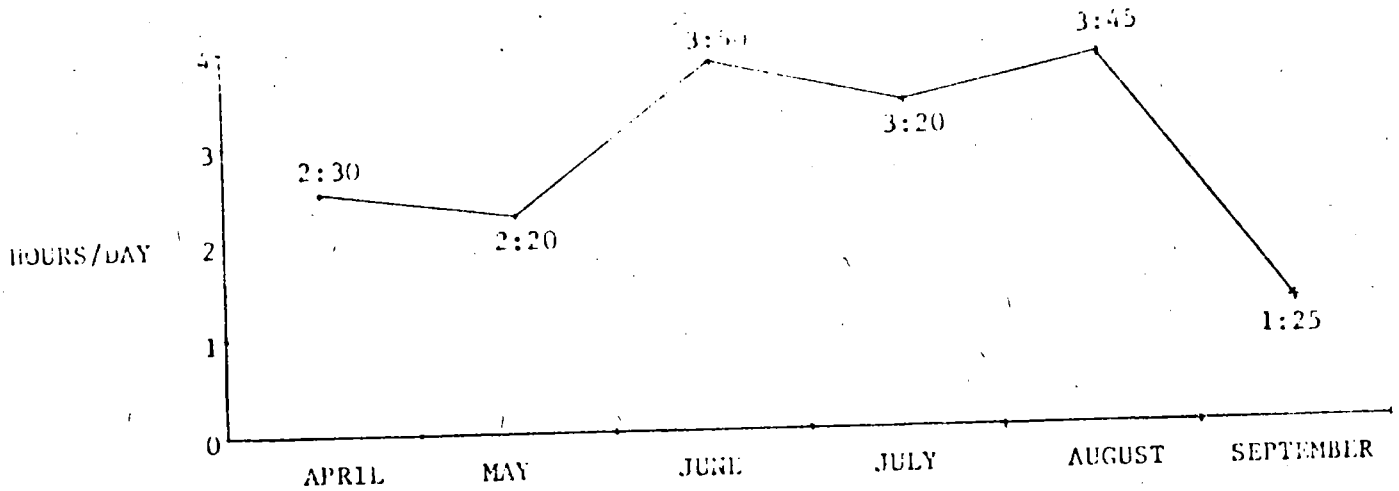
contains all the sounding rolls for a particular field sheet along with relevant field sheet information. Numerous program conversions were also necessitated when the group switched from the CDC6400 computer at McMaster to the CDC3300 computer at C.C.I.W.

HYPOS was again implemented this summer to support the lower St. Lawrence Survey Party. A summer student, Miss D. Sigvaldason, was taken on strength at the beginning of May to assist in the processing; for the most part digitizing sounding rolls. There were two major differences between this summer's work and that done previously. First, our digitizing accuracy was excellent with an average error rate of one sounding per roll (many were error free). This was attributable to improvements in the merge process and not attempting to digitize too many rolls at a time. Secondly, the soundings for each roll were plotted on the Gerber. This was time-consuming and caused our turn-around to deteriorate; however, the results were excellent. In future, our approach will have to be altered so that the PDP-8/1 Gerber system is not constantly used for plotting since our positional processing and digitizing require the PDP-8/1 as well. As each roll was processed and checked, it was edited and added to a master file on magnetic tape. This file will be plotted later in the fall to give an automated production of field sheet 3692 for comparison with the hand-drawn sheet. Miss Sigvaldason returned to McMaster University on September 11.

.....8

A program which plots HAAPS data on the Gerber was written and tested. Preliminary work on digitizing shorelines and plotting them on the Gerber was done, with encouraging results. This program could be used in conjunction with HAAPS and HYPOS programs to produce a more complete field sheet.

During this reporting period the Gerber plotter has been utilized extensively in field support. Field sheet bases (totalling 31 sheets) were plotted for most Central Region Parties. Decca lattices were plotted for the Beaufort Sea and the Magdalen Islands (a total of 11). Mini-fix lattices were plotted for James Bay and Georgian Bay (a total of 15) and three range-bearing lattices were plotted for the Lower St. Lawrence Party. Below is a chart showing total Gerber usage in terms of hours/day for the period.



TOTAL GERBER USAGE

Support was also given to various field parties and agencies by doing survey computations on the PDP - 8 computer.

PERSONNEL

The group as of September 1, 1972 consisted of:

E. Brown	Group Head
R. Bryant	Engineer
P. Millette	Technician
R. Tripe	Programmer
C. Doekes	Programmer
E. Thompson	Hydrographer
W. Silvey	Hydrographer (part-time)
K. Hipkin	Hydrographer (part-time)