LIGHTHOUSE

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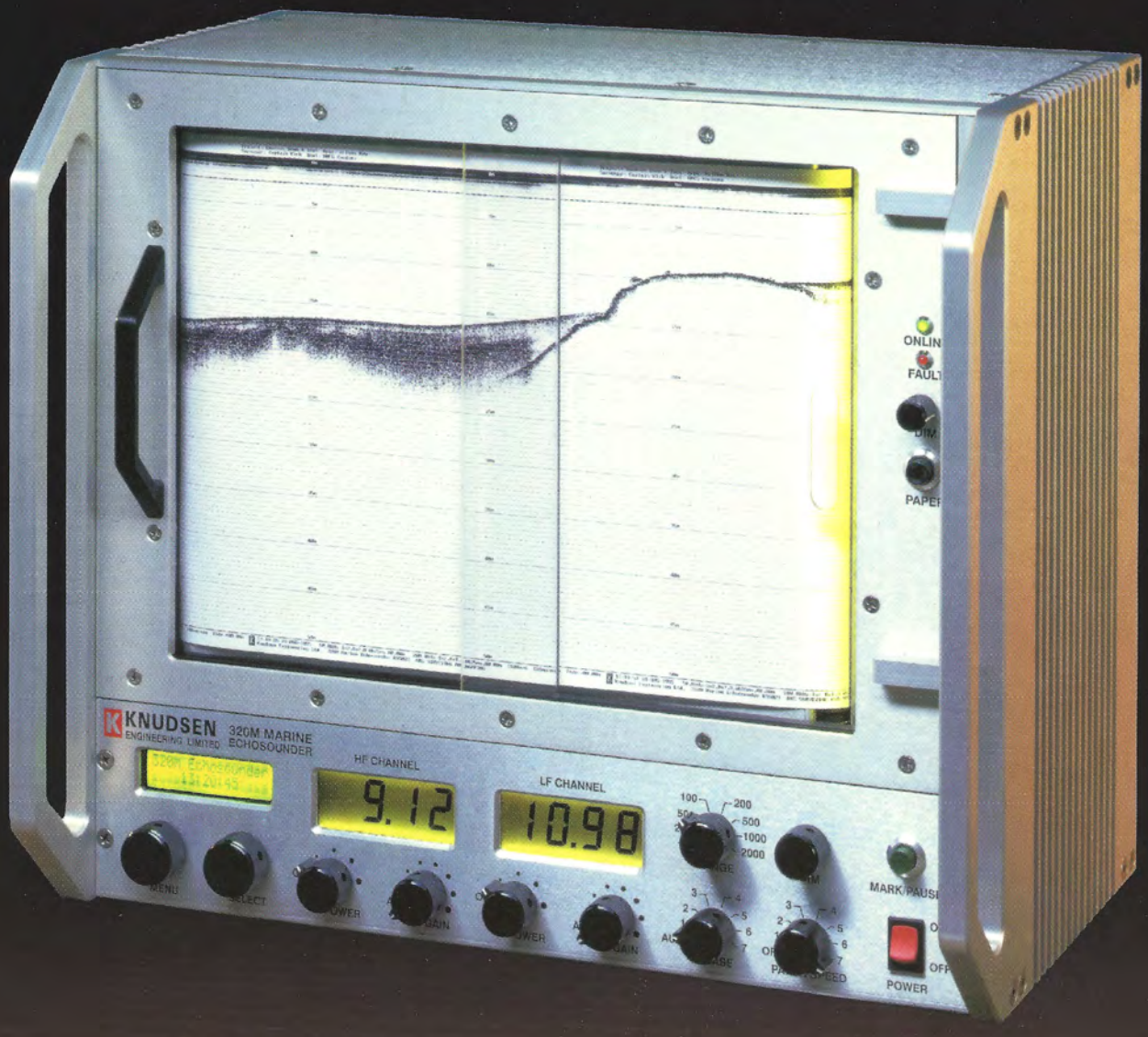

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Cover

Photograph Courtesy of C.A. Robinson

POINT PRIM LIGHTHOUSE
Point Prim, Prince Edward Island
46° 03' 01.2" N Lat. 63° 02' 20.7" W Long.

Built in 1846, Point Prim Lighthouse remains the only round, brick lighthouse in Canada and the oldest lighthouse on Prince Edward Island. Originally designed by Issac Smith, the same architect who designed Provincial House in Charlottetown, this 18.3 metre tall lighthouse features brick walls which are nearly half a metre in thickness. The white wooden shingle siding which now covers the structure was added two years later to protect the bricks from deterioration.

Point Prim is located on Prince Edward Island's south shore, on the Northumberland Strait, at the eastern entrance to Hillsborough Bay. Point Prim Lighthouse was fully automated in 1969 and is still in operation today as an aid to navigation (List of Lights ATL 983). In July and August, the small museum is open to the public and guided tours are available. A breathtaking view across the Northumberland Strait is the reward for climbing the steep stairway.

Prince Edward Island is very proud of its lighthouse heritage and tourists are encouraged to earn a certificate by visiting historical lighthouses and having their brochures stamped. More information on this program may be found at:

http://www.gov.pe.ca/visitorsguide

directors/directeurs

Editors' Note / Note des rédacteurs

We are pleased that *Lighthouse*, Edition 65 is ready in time to reach our members (regular and corporate), subscribers, advertisers and the participants from around the world at the 2004 Canadian Hydrographic Conference. We look forward to meeting our readers at the conference and to convince others that our journal is a "must" on the desk of all those who use the word "hydrography" in their resume.

We are proud to be part of this historically significant conference. The year 2004 marks the 100th anniversary of the Canadian Hydrographic Service, although from 1904 to 1928 it was officially known as the "Hydrographic Survey of Canada".

To honour this event in our history and to participate in the celebration, we have published several papers with a historical theme. We hope you enjoy these articles which reflect on the rich history of past years.

We look forward to the unique opportunity this conference provides to meet those in the hydrographic community. It will be a pleasure to talk directly to many members of our association, (regular, international and corporate) advertisers, subscribers and others who are or could benefit from becoming part of our journal and/or the Association. It will be of great interest to meet you and to discuss our mutual interest in maintaining the high quality of our journal.

It is important for us, as editors, and recipients of our journal, to be aware that the National office of the CHA recognizes that Lighthouse is an important and significant part of the association. The President of CHA recently corresponded with our corporate members and the following was part of his message.

"I would also like to remind you of our distribution and readership. Contrary to other publications who may boast a high distribution, *Lighthouse* focuses its bi-annual distribution of approximately 900 copies on those who actually want to read our product. Except for some promotional opportunities, to targeted groups, those who receive our journal must pay for it. We do not "flood the market". Here in Canada and in over 25 countries, our readers subscribe to *Lighthouse* because they value this exclusive approach and because they value our informative product. For over 35 years, we've taken a grass roots approach to the style of papers and articles we publish – we enjoy publishing "readable" works of research from our members and other authors in the marine, hydrographic and geomatics community."

With support and encouragement from CHA offices, we have some assurance that *Lighthouse* will remain healthy and continue to provide the hydrographic community with a journal that is a 'must have' product and one that we can refer to with pride.

We are pleased to announce that, beginning with this edition, Central Branch member, Jim Weedon, has assumed the responsibility of the layout for *Lighthouse*. Jim brings to the journal an excellent knowledge and considerable experience in the publication of a variety of digital products. Thanks, Jim, for assuming these duties which add to your list of volunteer projects.

Earl Brown and Paola Travaglini

Errata
There was an error in Edition 64 in the trivia article "DID YOU KNOW..." Page 16.
The distance from Ellesmere Island to the North Pole was incorrectly stated as 7200km. The correct distance is approximately 780km. This oversite was brought to our attention by John A. Elis.
Thank you John.

Message from the National President
Mot du Président national

In case you are confused by announcements of this being the centenary year of the Canadian Hydrographic Service, with references to The Chartmakers by Fillmore and Sandilands, I would like to offer a brief *Tale of Three Significant Centenaries:*

1883-1983
CHS's first centenary was celebrated in 1983 when one hundred years prior, the Admiralty, in conference with Canada's Ministry of Marine and Fisheries, dispatched Staff Commander John George Boulton, "an experienced naval officer and hydrographer" to Ottawa. That year, under Boulton's direction, A Canadian hydrographic service, "under the name of the Georgian Bay Survey... was born". Although funded by the government of the Dominion of Canada, the production and publication of charts from this survey were handled by the British Admiralty.

1904-2004
2004 marks the 100th anniversary of an Order-in-Council which the government of Canada amalgamated the hydrographic operations of the Department of Public Works, the Department of Railways and Canals and the Ministry of Marine and Fisheries into a Canadian (lower case h and s) hydrographic service. "The 1904 Order-in-Council broadened the service's responsibilities, but not its basic function, and changed its name to Hydrographic Survey of Canada." During that year, what is now known as Lake Winnipeg *Chart 6240* became the first chart to be engraved and published in Canada from *Canadian* surveys. On an interesting note about amalgamation, I recently saw a Public Works plan with soundings from the Canadian Hydrographic Service.

1928-2028
Centenary number three will be celebrated in 2028 (I hope to be retired by then), when the present name, Canadian Hydrographic Service, will be one hundred years old.

Canada Ratifies UNCLOS
While I am on the subject of significant dates, on November 6, 2003, Canada ratified the 1982 United Nations Convention on the Law of Sea (UNCLOS). While I doubt that this has (finally) occurred because we were on the eve of CHS's second significant centenary, one might speculate that our former Prime Minister Jean Crétien chose to add this to his outgoing legacy or that Ottawa just wanted to beat the US to the punch. What is for certain is that Canada's ratification of UNCLOS is due to the efforts of those who contributed to the preparation of an effective Memorandum to Cabinet. Perhaps the most significant international treaty to be signed and ratified in recent years, Canada has benefited from and contributed much to its development over the years. While the hydrographic and seismic surveys required to support Canada's Article 76 (continental shelf) claim will be administered by the federal government, a significant portion of the field work will be contracted to private industry. I would hope that Canadian industry will be up for the task.

Last fall in Calgary ....
At its last Strategic Planning meeting in October 2003, the Association of Canada Lands Surveyors (ACLS) Council decided to investigate the issue of hydrographer certification. The draft ToR includes the following: "Look into the IHO competency standards and what additional requirements are needed for ACLS to certify hydrographers. Develop a policy on affidavit requirements for hydrographers and offshore surveyors in line with section 52 of the [Canada Lands Survey] Act." The ACLS Offshore Issues Committee was charged with the task and has established a joint ACLS-CHA task force to study the matter. I agreed to chair the task force and at this time would like to hear from any member wishing to contribute to our efforts. For more information on the topic, I would encourage you to read my presentation which has been published in this edition of *Lighthouse*. FYI- Both the USA and Australia have national certification models for hydrographic surveyors.

For all you *Hydrogeomaticians* out there, the International Federation of Surveyors (FIG) Council will be presenting an updated version of the Definition of Surveyors for adoption by the General Assembly at Working Week 2004. The surveying profession is indeed multidisciplinary and has kept up with the times, as any profession should. For more details please turn to the Go FIGure page in this edition of *Lighthouse*.

I would like to take this opportunity to thank our editors Earl Brown and Paola Travaglini for their contribution as editors over the past 3 years as both will be handing over the helm following this edition of *Lighthouse*. As well as providing a good read for the hydrographic community, your efforts have brought a refreshing new look to our journal. I wish you luck in your new endeavours.

Andrew Leyzack

On the Development of an Integrated Navigational Chart System for Marine Navigation in Ice Covered Water

By: Ahmed El-Rabbany, Benson Agi, Mohammed El-Diasty, Ryerson University
George Dias, David Coleman, University of New Brunswick

In ice-covered waters, an integrated navigational chart system combining the ice information and Electronic Chart Display and Information System (ECDIS) is vital. In addition to enhancing the safety of marine navigation, this integration ensures that ship routes are optimally selected based on informed decisions. This paper develops a model for dynamic integration of ice charts into an Electronic Navigational Chart (ENC) system, which takes into account the variations in the ice conditions over time. A prototype implementation of the proposed model is discussed. Technical issues associated with the integration process are addressed in details.

Introduction

The use of ECDIS as a stand alone information system would not provide sufficient information for safe navigation in ice-covered waters. Shipborne radar may be used to detect the navigation hazards, e.g. icebergs, which could be superimposed on the ECDIS display (Randell et al., 1998). Although this may improve the safety of navigation in open waters, it is of limited use in ice-covered waters as the coverage of the shipborne radar is limited to the radar horizon. Safe and efficient marine navigation requires that comprehensive and timely information on the ice conditions be available over a region extending well beyond the shipborne radar horizon (El-Rabbany, 2000). Validation experiments have shown that radar remote sensing, particularly RADARSAT, has the capability of providing such comprehensive information. The ScanSAR modes of RADARSAT are recommended for comprehensive monitoring of the sea ice conditions. The Canadian Ice Service (CIS) is primarily using these modes, along with other sources of information such as airborne and other satellite remote sensing, for extracting the sea ice information in the form of daily ice charts (Ramsay et al., 1998; Canadian Ice Service, 2002). Ice charts contain information such as ice concentration and type, ice edge location, icebergs and open leads. The total concentration of the sea ice is the most important element of ice information required to support vessels with no ice capability (Haykin et al., 1994).

Ice charts, although highly useful in providing comprehensive ice information, may not fulfil the requirements for safe and efficient marine navigation, even if they are used side-by-side with ECDIS. For example, a route may be identified as an ice-free or least hazardous through an ice chart, while it may not necessarily be a suitable route for marine navigation due to, e.g. shallow water depth. This suggests that, in ice-covered waters, an integrated navigational chart system combining the ice information and ECDIS is vital. This paper develops an integrated navigational chart system, which enhances the safety of marine navigation in ice-covered waters. The components of the developed system are shown in Figure 1.

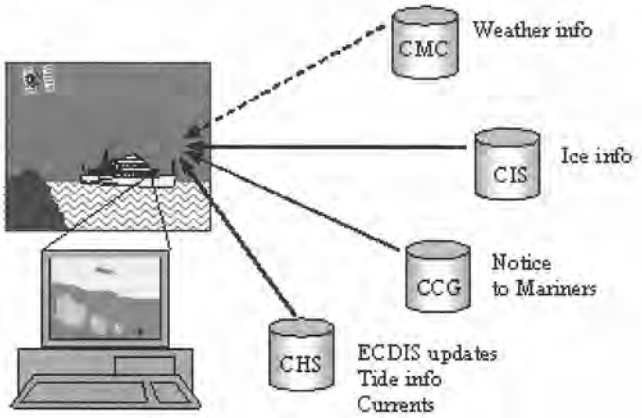

Figure 1: The Proposed Integrated Navigational Chart System.

As indicated by CIS (2001), ice information is always out of date, which makes it unsuitable for integration with ECDIS. To overcome this problem, a neural network-based model is developed to sequentially predict the sea ice condition (concentration) over time. A modular, three-layer feedforward neural network trained using the backpropagation algorithm is used for this purpose.

The training was carried out using the CIS's ice charts of the Gulf of St. Lawrence over 11 years. Two approaches were then followed to dynamically integrate the "updated" ice information into ENC: CARIS Hydrographic Object Manager (HOM), which is commonly used for ENC production, and ESRI ArcGIS, which is used for producing the ice charts. In both approaches, the integration was based on the proposed CIS's ice objects catalogue (Canadian Ice Service, 2001).

Production and Format of Ice Charts

CIS is responsible for providing the ice information in the Canadian waters, mainly through its daily ice charts. To do this, the CIS uses various space-borne and airborne remote sensing sensors, shore station observations and shipboard ice observations (Canadian Ice Service, 2002). The charts use the North American Datum 1927 (NAD 27) and the Lambert conical projection. The World Meteorological Organization (WMO) symbolization for ice information, frequently referred to as the "Egg Code", is used to describe the ice conditions (Figure 2). Boundaries are drawn around the ice areas with different concentrations; each is represented by an egg code (Canadian Ice Service, 2002).

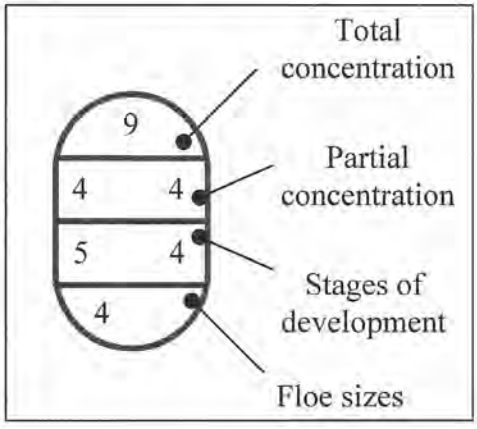

Figure 2: An example of WMO symbolization for ice information - Egg Code.

An egg code is an oval shaped symbol, which contains three parts that describe the concentration of the ice, the stage of development (age) of the ice concentration and the predominant form of ice (floe size). These are expressed by up to 12 numerical values. The concentration of the ice represents the ratio between the area of the water surface covered by ice and the total area, and is expressed in tenths. The value of the ice concentration varies from 10/10 for consolidated ice to 1/10 for open water. The single uppermost parameter in the egg code represents the total concentration, which includes all stages of development. The second row in the egg code matrix contains the partial concentration for the thickest (left), the second thickest (middle) and the third thickest (right) ice types. The partial concentration field may contain two numbers if only two ice types are present in the area. If there is only one ice type, the partial concentration field will be left blank, as the concentration of the ice will be presented by the total concentration (Figure 2). The third field in the ice code contains the stages of development (age) for the ice types reported in the partial concentration field. Thicker ice refers to older ice, and vice versa. Various codes are used, depending of the stage of development. For example, a code of "1" is assigned to the new ice (less than 10 cm in thickness), while a code of "9" is assigned to the second stage thin first-year ice (50-70 cm in thickness). Medium/thick first-year ice as well as old ice are assigned a dot (•) as part of their code. The last field in the code represents the predominant forms of the sea ice (floe sizes) corresponding to the stages of development identified in the previous field. Various codes are given to various floe sizes, which vary from "0" for the pancake ice to "7" for the giant floe (width greater than 10km). Fast ice and icebergs are given the codes of "8" and "9", respectively. Undetermined ice form, unknown or no form is assigned the code of "X".

Sea Ice Concentration Prediction Using Artificial Neural Networks

Artificial neural networks (ANN) were used to build our computational model for the ice concentration prediction because of their ability to learn from examples and "generalize" on these examples. We selected the three-layer feedforward neural network structure trained using the backpropagation algorithm for this purpose. The backpropagation algorithm uses gradient descent in weight space to minimize the output error. The backpropagation algorithm can be summarized in three steps as follows (see El-Diasty and El-Rabbany, 2003 for more details). The first step is to propagate the input forward through the network. The neurons in the first layer receive external inputs:

$$a^0 = p \tag{1}$$

$$a^{m+1} = f^{m+1}(W^{m+1}a^m + b^{m+1}), \text{ for } m = 0, 1, \ldots, M-1 \tag{2}$$

Where M is the number of layers in the network. Equation (1) provides the starting point for equation (2), and the output of the layer m is the input to the layer $m+1$. The outputs of the neurons in the last layer are considered the network outputs:

$$a = a^M \tag{3}$$

The next step is to calculate the output error and back-propagate it to calculate the sensitivities (s values).

$$s^M = -2\dot{F}^M(n^M)(t-a) \tag{4}$$

$$s^m = \dot{F}^m(n^m)(W^{m+1})s^{m+1}, \quad \text{for } m = M-1, \ldots, 2, 1 \tag{5}$$

Finally, the weights and biases are updated, based on the calculated sensitivities, using the approximate steepest descent rule:

$$W^m(k+1) = W^m(k) - \alpha s^m(a^{m-1})^T \tag{6}$$

$$b^m(k+1) = b^m(k) - \alpha s^m \tag{7}$$

Where α is the step size. The three steps are repeated until the error reaches a minimum; hence, the calculated weights of the connections would represent the solution network.

Initially, the training was carried out using a batch model, which predicts future ice concentration values over a full year in a batch mode. However, this model was found to be inefficient when abrupt changes in the values of the ice concentration were encountered. Therefore, a second model was developed, which predicts the ice conditions sequentially. With the sequential approach, the immediate past values of the ice concentration and stages of development records are used as input to the network, while future records are used as the desired output. In the subsequent epochs, the training patterns are time-shifted (El-Diasty and El-Rabbany, 2003). Several tests were conducted to optimize the number of test points, which would be used in training the neural network. It was found that a weak solution is obtained when the number of test points is either too few or too high. The best results were obtained when the 200-point study area (i.e., in the Gulf of St. Lawrence) was divided into 7 sub-regions; each containing a number of points that varied between 25 and 35. Figure 3 shows the actual versus ANN predicted ice concentrations at a randomly selected point within the test area. It can be seen that ANN can effectively be used in predicting the total ice concentration for a given region when trained using multiple-year ice concentration readings.

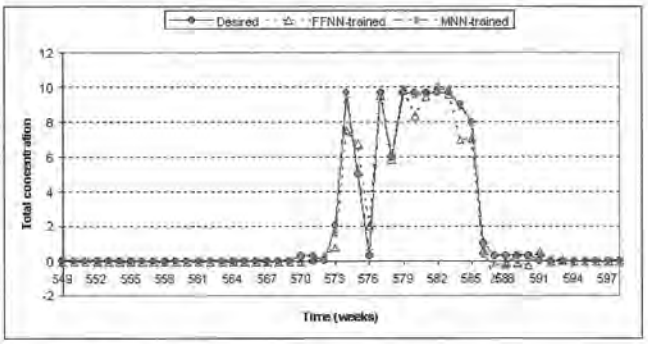

Figure 3: Actual versus predicted ice concentration values at a randomly selected test point in the Gulf of St. Lawrence.

Building the Integrated System

An ideal model for integrating ice information into an ENC system is one that takes the ice information in its native format (as a digital chart, with or without an attribute database) and automatically converts it into the S-57 ice objects, and integrates it into the ENC database. This would ensure that ice information could be displayed simultaneously with other navigational information in an ECDIS, and enable a more comprehensive and accurate system for the analysis and planning involved in safe navigation. Such a model should also incorporate the dynamic nature of ice conditions.

The implementation of a model for integrating ice information into ENC data involves processing of the ice charts that depends on the GIS format (platform) used. This is because of the lack of a single standard for the various GIS platforms coupled with the fact that mariners may not use the same platforms and techniques. As such, implementation of an integration model may involve data conversion to the format of the particular GIS that is employed locally in an ice service region. Figure 4 shows a model in which spatial data stored in an interchange format using one system, System A - an external system, is imported into another system, System B – the internal system, used by the mariner. Some technical issues could arise as a result of importing data from another format. This could include some loss of data, naming convention and symbol translation. As such, care should be taken in making sure that data integrity is maintained, and correct mapping of corresponding information maintained. This is the approach used in the implementation of a prototype using CARIS GIS and CARIS HOM (see subheading CARIS HOM solution). On the other hand, implementation utilizing the same GIS environment used for organizing the original data is less involving, as there is reduced need for pre-processing. This scenario is described for ESRI ArcGIS in the section subheaded by ESRI solution.

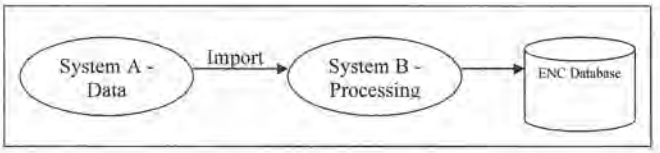

Figure 4: Importing Chart data from an external format.

CARIS HOM solution

Implementation of the integration process takes into account available technologies used in specific regions of the world. This is because of differences in the representation and display of ice information in various regions of the world, for example, while the CIS uses the Egg Code symbolization (Canadian Ice Service, 2002), the German Ice Service uses the 'WMO Sea Ice Nomenclature' with fill patterns and additional symbols (Moggert, 2000). Our solution here is based on the practice of the Canadian Ice Service. Ice charts have been used side by side with ECDIS. The challenge is to integrate the ice information into the same system that is based on S-57 (IHO, 2000) and S-52 (IHO, 1998) specifications, so that ice information can be simultaneously displayed with other navigational information. Another aspect of the challenge is the ability to refresh the dynamic ice information as new time-dependent charts (produced or predicted) are received. The prototype implementation diagram is shown in Figure 5, while the processing interface is shown in Figure 6.

A preliminary stage is to define ice objects and attributes (Canadian Ice Service, 2001) in the S-57 Catalogue. An example of the resulting ice objects is the SEAICE (Sea Ice) object, with various attributes ranging from total

concentration of ice to partial concentrations, stages of development and size of ice. With the experimental recognition of ice objects in S-57, a prototype system has been developed to import the ice chart data and process it in CARIS GIS and HOM, for the integration with ENC. This system also provides the tool for refreshing the ice information based on the time-dependent nature of the data. The components of the system consist of:

a. Ice Chart Database – a database that receives input from an external source. E.g., an input E00 file name can be used as the primary record for the input data in this database. The database is updated for new data file names, and the program searches this database to trigger the processing of new ice information. This takes care of the time-varying nature of the ice information.
b. Import Chart – a process that starts the import of ice information from the ArcGIS format to the CARIS format, based on availability of new information in the Ice Chart Database.

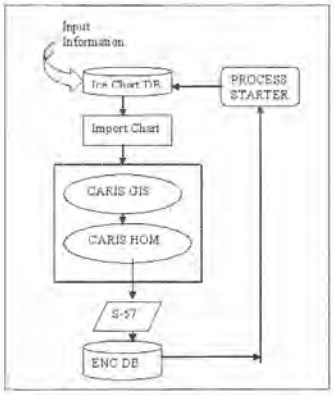

Figure 5: CARIS solution.

c. CARIS GIS and CARIS HOM constitute the intermediate component that is used in the pre-processing.
d. S-57 ENC Database – a conversion to the S-57 ENC compatible and the storage of the processed ice object/attribute information in a database.
e. Process Starter – a functionality that checks the initial database and triggers the processing of new data sets.

Figure 6: Processing Interface.

The issues involved include determining when a new ice chart (produced or predicted) is available, so that the ice information is refreshed (Step 1 in Figure 6); the importing of an ArcGIS Interchange (E00) file, containing digital ice chart, into a CARIS GIS environment (Step 2 in Figure 6); editing and pre-processing the ice chart to comply with the S-57 standard (Steps 2 and 3 in Figure 6); forming S-57 compliant ice objects and integrating the ice objects in ENC (Steps 4 and 5 in Figure 6). These processes have been fully automated, with minimal user interaction, and all carried out within the CARIS environment. This cuts down on user time, skill requirement, resource cost, and at the same time, enforces consistency.

The result of our experimental integration of ice information into ENC can be seen in Figure 7. This is a display in CARIS EASY-ENC Viewer. The ice objects are displayed with dashed lines and the Question Mark sign ("?"), symbolizing "UNKNOWN" object, as there is still no compatible S-52 definition for displaying ice objects.

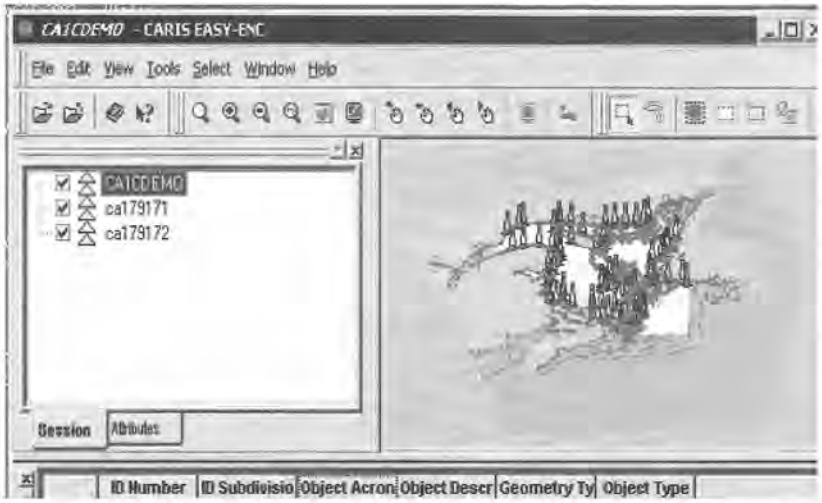

Figure 7: Ice information displayed with an original ENC.

ESRI solution

Because ArcInfo comes with a program, ARC2S57, which converts coverages to S-57 cells, converting a daily ice chart from an ArcInfo coverage to an S-57 cell is conceptually simple. For ARC2S57 to work, the input coverage must contain specific Info files and fields, and the geographic objects that make up the coverage must also be formatted in a specific way. For a daily ice chart to be converted, a great deal of pre-processing is required. As with the CARIS approach, ice objects and attributes must be defined in ArcInfo for the ARC2S57 to work. This is done by adding entries to Info tables that the converter uses.

A GUI-based tool was created to make the conversion of a daily ice chart in ArcInfo coverage format to an S-57 cell as simple as possible (see Figure 8). Minimal input is required from the user, and once the required information is entered, the conversion process is entirely automated and takes between five and ten minutes to run, depending on the complexity of the coverage. Since all the processing is done using an Arc Macro Language (AML) script, the tool requires ArcInfo to be installed.

Figure 8: Processing interface for ESRI approach.

Figure 9 illustrates the workflow for this solution, with the components of the AML script highlighted briefly.

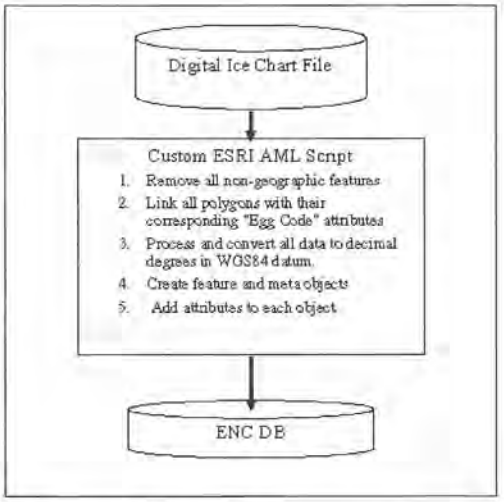

Figure 9: ESRI Solution workflow.

The daily ice charts contain both geographic and symbolic features (Canadian Ice Service 2002). The non-geographic features (such as leader lines, arrows indicating flow direction, and symbols indicating strips and patches of ice) are first removed. Since polygon topology does not exist in the original ice chart, feature codes (land, open water, or type of ice) for each polygon (and their egg codes if applicable) are then copied from the associated point coverage using a point-in-polygon overlay.

Unlike CARIS, ArcInfo does not have built-in tools for ENC creation. It is therefore necessary to alter the coverage to conform to S-57 3.1 specifications. As indicated above, the daily ice charts currently refer to the NAD27 datum. Therefore, the coverage must be reprojected to refer to the WGS 84 datum. Since all S-57 cells must be rectangular, a bounding rectangle is then added to the coverage.

For feature and meta objects, ARC2S57 requires that all non-point objects be assigned to either a route (for lines) or region (for polygons). All same-typed objects are assigned to the same route or region group. For example, all polygons that are sea ice are placed in the SEAICE region group, each polygon becoming an individual region. This is done because the same lines and polygons in an S-57 cell can be part of many different objects. Each point, node, arc, polygon, route, and region are then assigned a Record Identification Number (RCID), a unique identifier for all vector records in the cell. A-type attributes, those that are unique to the object-type, are then added to the feature and meta objects. This includes the values in the egg codes. B- and C-type attributes, the ones that are common to all feature types, are added to a separate INFO table.

All the allowable Data Set description fields are then added, except for the Data Set History (DSHT) and Data Set Accuracy (DSAC) fields. These are also not created because there appears to be a bug in ArcInfo's conversion program that makes the conversion fail when these fields are included. The catalogue (CATD) file is created last.

The coverage is finally converted to an S-57 cell using ARC257. The actual conversion is very fast. The bulk of the tool's processing time is in pre-processing. After the conversion is completed, a simple report is displayed showing the number of objects created for each object type. The S-57 file can now be viewed in any ENC viewer.

Conclusions

An integrated navigational chart system, which combines sea ice information and ECDIS, has been discussed in this paper. A neural network-based model was firstly developed to sequentially predict the sea ice concentration over time. It has been shown that the model is capable of modeling and predicting the ice concentration with high accuracy and reliability levels. Two approaches were then followed to automatically integrate the "updated" ice information into ENC: CARIS HOM, which is commonly used for ENC production, and ESRI ArcGIS, which is used for producing the ice charts. In both approaches, the integration was based on the proposed CIS's ice objects catalogue.

This integration with commercial GIS packages has the potential to both speed up production processes, produce new products for mariners, and create digital daily records of ice coverages which are already in a state suitable for GIS-based time series analysis. Work is now well underway to formally describe the revised workflow and to estimate savings in production times.

Acknowledgments

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Dr. Coleman has authored numerous papers on land information networking, operations management, and emerging national and global spatial data infrastructures. He is a past president of the Canadian Institute of Geomatics, has been a member of several national and international advisory bodies involved in geomatics, and has consulted to organizations on four continents.

The Canada Lands Surveyor Commission- A Proposed Role in the Certification of Hydrographers and Offshore Surveyors

By: Andrew Leyzack, President, Canadian Hydrographic Association

This paper will identify the past and present status of IHO/FIG/ICA accredited training programs in Canada, the certification gaps that exist, and the role the Canadian surveying profession could play in certifying the competence of hydrographic/offshore surveyors.

The scope of hydrography is international and it is practiced according to international standards. The absence of internationally accredited hydrographic training programs within Canada has compromised our position with respect to our historical and highly-regarded reputation in the field of hydrography. As a leader in technology and expertise, without internationally accredited programs we may slip into the depths from prominence in the international hydrographic community. Until such time as our educational institutions get their programs back on board with international accreditation, the profession has an opportunity and in the author's opinion, a role in the certification of hydrographic surveyors.

Should the Canadian Hydrographic Service's statement on *Future Directions* hold true and with Canada's ratification of UNCLOS, the demand for qualified hydrographic personnel in the Canadian private sector and academia will see an increase. The ACLS by way of the CLS Commission could provide for a national certification for hydrographers. By focusing the syllabus towards a hydrographic specialisation and with the introduction of an experience log, an internationally recognised certification might be realized.

The CLS Commission could serve both private sector and federal government surveyors:

1. As a national certification for hydrographic surveyors in the present absence of accredited training programs.
2. As a recognized part of a career progression program, for surveyors wishing to enter the federal government's EN-SUR (Engineering Survey) classification stream.
3. As a standard by which individuals with varied academic backgrounds could be brought on par academically.
4. As a standard against which in-house training courses could be measured. For example, passing the CHS Cartography course would qualify a candidate for exemption from the CLS examination on Cartography and Map Projections.
5. As partial fulfillment of certification of competency for hydrographers.

List of Acronyms Used

ACLS – Association of Canada Lands Surveyors
ACSM – American Congress on Surveying and Mapping
CHA – Canadian Hydrographic Association
CHS – Canadian Hydrographic Service
CLS – Canada Lands Surveyor
CPD – Continuing Professional Development
IAB – International Advisory Board on Standards of Competence for Hydrographic Surveyors
ICA – International Cartographic Association
IFHS – International Federation of Hydrographic Societies (formerly The Hydrographic Society)
IHO – International Hydrographic Organisation
FIG – International Federation of Surveyors
NOAA – National Oceanic and Atmospheric Administration (USA)
THSoA – The Hydrographic Society of America
UNCLOS – United Nations Convention on the Law of the Sea

Incentives for Certification in Canada

I. Certification as applicable to the federal government (CHS) career development program

CHS staff may find inspiration in the *Future Directions* commitment to develop and maintain internal highly qualified expertise in state-of-the art technologies in the core fields of hydrography.[1] In its final report on the Review of the CHS Multidisciplinary Hydrographer (MDH) Program, prepared by Eduvision Inc., the CHS Human Resources Committee emphasized that, "Much was made of the fact that, without a degree or certification, MDH'ers cannot aspire to supervisor or manager classifications [in the Engineering Survey] (EN-SUR) [classification stream]." The report recommended that, "This reality should be understood by all who enter this program".[2]

CHS employees were apt to view this as creating two classes of employees.[3] If the classes were to be identified as that of a technical versus a professional level then, taken as a positive, progression from one class to the next could be considered an integral part of the CHS's Career Progression program. Employees should not view this as a career *dead-end*, but as an opportunity which exists beyond present EG-05 (technical) working level. The fact that CHS has, both in the past and the present, supported and encouraged its staff to earn a university degree and/or to challenge the CLS exams is an opportunity which wasn't mentioned in the HR Committee's Final Report.

II. Incentives for the Private Sector

Furthermore, the impending ratification of the UNCLOS – 1982 may hold significant opportunities for the private sector. In order to acquire and analyze data in support of Canada's claims to the continental shelf, a significant amount of funding will have to be allocated by the federal Treasury Board. In reference then to the CHS *Futures Directions* statement, one can anticipate that a large amount of this funding would make its way to private sector contracts.

III. "Future Directions" further defines the need for certification

Following its recent certification under the ISO 9001:2000 quality system standard, the CHS, in January 2003, published a statement entitled *Future Directions* which affirms its role as "the official provider of national hydrographic information" while identifying a realignment of its activities.[4] The Future Directions statement contains several points identifying how the CHS would follow through.

Of particular interest to the private sector are the following three points stating that the CHS will:

- Increase reliance on external data collection, product development and dissemination.
- Grow an external qualified Canadian hydrographic community (academia, private) to meet domestic needs and to compete in international markets.
- Support and promote innovation; partner and leverage for all research and development requirements to meet domestic needs.[5]

Hydrographic vs. Offshore Surveyor

While the author recognizes the distinction between the traditional role and duties of the hydrographer as applicable to surveys for nautical publications, and that of the offshore *industrial* surveyor, for the purpose of this work, the words hydrographer or hydrographic surveyor or just surveyor may be used as a compromise to identify both. By offering this distinction, I would like to identify those practicioners who as offshore surveyors, consider themselves to be a breed apart from hydrographers. In doing so however, I would like to draw the reader's attention to the relationship between the hydrographic and offshore surveyor as defined by the FIG/IHO International Advisory Board (IAB) on Standards of Competence for Hydrographic Surveyors. The Standards of Competence for Hydrographic Surveyors defines offshore, seismic and [offshore] construction surveying as "optional units"[6] or "specialisms"[7] within the discipline of hydrographic surveying. To further illustrate the roles and duties of the hydrographic surveyor, Kerr and Kapoor offer: "Hydrography has been defined as the science of measuring and depicting those parameters that are necessary to describe the precise nature and configuration of the seabed, its geographical relationship to the landmass and the characteristics and dynamics of the sea. The parameters encompass bathymetry, geology, geophysics, tide, currents, waves and certain other properties of sea water."[8] As a specialist, the offshore surveyor conducts surveys "in the support of the exploration for and exploitation of the natural resources located on or under the seabed of offshore waters".[9] The IFHS publishes a document entitled Hydrographic Surveying as a Career (Special Publication 3) which I would recommend as a source for further reading on the nature of the profession and opportunities within its specialisms.

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[1] Canadian Hydrographic Service, Statement on Future Directions, (Fisheries and Oceans Canada, 2003).

[2] EduVision Inc., Final Report for the CHS Human Resources Committee, Review of the Multidisciplinary Hydrographer Program, (2002), p. 14.

[3] ibid.

[4] Canadian Hydrographic Service, Statement on Future Directions, (Fisheries and Oceans Canada, 2003).

[5] ibid.

[6] FIG/IHO/ICA International Advisory Board on Standards of Competence for Hydrographic Surveyors, *Standards of Competence for Hydrographic Surveyors*, 9th ed., (Monaco: International Hydrographic Bureau, 2001) Publication M-5, page viii. Hereinafter Standards.

[7] Standards, 8th ed., page vi.

[8] D.C. Kapoor and Adam J. Kerr, *A Guide to Maritime Boundary Delimitation* (Toronto: Carswell, 1986).

[9] B. Calderbank, "Legal Responsibilities of the Offshore Surveyor" *Geomatica*, Vol. 47, No.2, Summer 1993, p. 139. Calderbank expands upon and effectively describes the specific duties and roles of the offshore surveyor.

A Brief History and Current Status of Internationally Accredited Training in Canada

Countries with marine interests have continued to develop internationally accredited training programs for hydrographic surveyors. Canada – a nation with one of the most extensive inland, coastal and offshore areas, a nation that has played a significant role in contributing to and promoting the UNCLOS 1982 – has seen its accredited training programs lapse. As of 1992, the IHO recognized nine (9) Canadian training courses in hydrography of which two, offered by the CHS, entitled *Hydrography – Field Surveys and Hydrography – Marine Cartography*, were fully accredited in Category A. (See table below)

Within the scope of the Standards of Competence for Hydrographic Surveyors, hereinafter referred to as the Standards, there are three categories for hydrographic personnel,[10] Category A, Category B and Unclassified. Category A defines a program which provides a comprehensive and broad-based knowledge in all aspects of the theory and practice of hydrography and allied disciplines for individuals who will practice analytical reasoning, decision making and development of solutions to non-routine problems.

Category B defines a program which provides a practical comprehension of hydrographic surveying for individuals with the skill to carry out the various hydrographic surveying tasks. The term Unclassified serves to identify programs of training for support personnel employed in hydrographic operations. Such programs are defined according to local requirements and are not intended for international recognition.

By the time of publication of the 4th edition of IHO S-47 (1992), the Survey Technologist Program at Humber College, Toronto, which saw its peak enrollment in the late 80's, had already been discontinued. This course, which offered a Category B (recognized) specialisation in Hydrographic Surveying, was developed by the late (Senior Hydrographer) Gerry Wade to help serve the recruitment needs of the CHS and private industry. Unfortunately, with the number of new hires to CHS diminishing and little activity in the domestic offshore private sector market, low enrollment forced an end to the program.

However, less than a decade earlier, the situation was quite different. The table on the next page serves to illustrate the mid 80's peak and subsequent decline of activity in the Canadian offshore:

Training Courses in Hydrography and Nautical Cartography – 1992: (IHO S-47, 4th ed.)[11]

Level of Competency	Institution	Course Title
Cat. A	Canadian Hydrographic Service	Hydrography - Field Surveys
Cat. A	Canadian Hydrographic Service	Hydrography - Marine Cartography
Cat. A (Academic)*	University of New Brunswick	Certificate of Academic Competence in Hydrographic Surveying
Cat. A (Estimated)**	University of Toronto	Surveying Science Specialist (Hydrography)
Cat. B (Estimated)	Institute Maritime du Quebec	Hydrography
Cat. B (Estimated)	Cabot Institute (Newfoundland)	Surveying Engineering Technology
Unclassified	British Columbia Institute of Technology	Surveying and Mapping
Unclassified	University of Calgary	Hydrographic Surveying
Unclassified	Marine Institute of Fisheries and Marine Technology (Newfoundland)	Navigation Officer

* (Academic) - No practical training offered

** (Estimated) - Course evaluated by IAB but not officially certified

[10] Standards, 9th ed., page viii.

[11] International Hydrographic Organisation, *Training Courses in Hydrography and Nautical Cartography*, 4th ed., (Monaco: IHB, 1993), Special Publication No. 47.

Offshore Platform Distribution – Canada (Including Artificial Islands, Floating Ice Platforms and Caissons)

Location	1980	1985	1989-90	1995	1999
Scotian Shelf	1	10	-	1	1
Grand Banks	5	12	2	-	-
Labrador Shelf	5	1	-	-	-
Gulf of St. Lawrence	2	-	-	-	-
Hudson, James and Ungava Bays	-	2	-	-	-
Beaufort Sea	6	14	3	-	-
Arctic Islands	2	2	-	-	-
Totals	21	41	5	1	1

Source: National Energy Board. These figures are derived from activity during selected years only.

1980's - During the mid-80's, recruitment and training were at their peak in the federal government, as illustrated in the Dominion Hydrographer's address to the 1985 Canadian Hydrographic Conference: "The training staff continued the cartographic and hydrographic courses and in collaboration with CIDA [Canadian International Development Agency] and CIS [Canadian Institute of Surveying], a training program was held in Jamaica. In addition, five hydrographers and two cartographers are attending university on a full-time basis and approximately 20 hydrographers are completing the examinations to earn CLS commissions."[12]

It was over twenty years ago that the CHS began to look to the CLS Commission as means of introducing a professional designation for hydrographers. Initially, a number of hydrographers took advantage of a grandfathering program and were *grandfathered-in* after writing two or three entrance examinations. The three-year program ended in 1982 and in the post-grandfathering years, candidates seeking a CLS Commission were required to submit their academic qualifications in order to earn exemptions from writing those examinations assigned by the ACLS Board of Examiners. In the latter part of the 80's, during his tenure as Dominion Hydrographer, Steve MacPhee sought "to continue and bolster CHS's *in-house* training programs so that they could be used to reduce the number of courses hydrographers, with Hydro I and II [training], had to pass to qualify for a Commission. In fact, at the time, we [CHS] provided Hydro I and Hydro II syllabi to the Board of Examiners to assess their content against the CLS syllabus."[13] Former Dominion Hydrographer, Ross Douglas has stated (to the author) that Hydro II was eventually dropped in favour of the CLS Commission, a designation that was considered to be the academic equivalent of the CHS Step 2 [Category A] program.[14]

1990's - Subsequent to the publication of the 4th Edition of S-47 (1992), the CHS allowed its accreditation to lapse and by 1994 the manner of training had changed as the CHS had adopted a "Just in time" approach to *in-house* training.[15] Although there were still a number of colleges and universities offering IHO/FIG recognized courses, these institutions were faced with increasing challenges in maintaining satisfactory enrollment in these highly specialized programs. Funding freezes in the federal government had impacted the number of new-hires while affirmative action staffing policies further reduced enrollment in what were then generally male-dominated areas of study. To add further injury to enrollment, in recent years the CHS has taken on fewer and fewer graduates from survey schools striving to offer FIG/IHO recognized programs and more graduates from schools of geography and other disciplines.[16] With the government monopoly on *traditional* hydrographic surveys further weakening an otherwise slow domestic private industry demand, the employment for graduates from these programs was far greater overseas than at home. Despite the fact that a high percentage of those graduating were finding gainful employment in their chosen careers overseas, survey departments were unable to justify maintaining expensive accredited programs which were sending their graduates abroad.[17] Add to this a general slowdown in the land survey market and some institutions, such as the University of Toronto and Humber College have been forced to shut down their surveying programs altogether.

Present - In 2002, the Annual IHO Register of Recognized Courses listed 41 courses worldwide, none of which were in Canada. Only courses which have been recognized within the previous ten years are listed in the Register and to remain on the Register; beyond ten years, courses need to be resubmitted against the current Standards.[18] (See Appendix A) The 5th Edition of IHO S-47, February 2003, lists 25 countries offering recognized training courses in Hydrographic Surveying and Nautical Cartography in which Canada is still not a participant.

[12] Personal correspondence with Steve MacPhee, 24 January, 2003.

[13] Ibid.

[14] Personal communication with Ross Douglas, February, 2003.

[15] Personal correspondence with Steve MacPhee, 24 January, 2003.

[16] The author is aware that a recent hire came from a background in nursing.

[17] Various colleagues, employed in the overseas private industry have informed the author that Canadians are considered to be best in offshore surveying and are highly sought after, not only because of their training and expertise, but because of their attitude and a lack of political baggage which, in the international community, carries a lot of weight.

[18] Standards, 9th ed., page xii.

Identifying the Need for Certification

During a panel discussion held at the 2002 Canadian Hydrographic Conference, about 40 participants, representing a good cross section of the conference delegates, discussed various current issues within the hydrographic community. In response to one of the questions which recognized the absence of accredited hydrographic training in Canada, it was agreed that "the concept of certification is important for the field of hydrography in general and that if our agencies are to rely more and more on contractors, we need the confidence that the contracted work was being done to recognised standards".[19] This statement implies that in order to perform a task to recognized standards, the competence of the individuals executing the task should be measured according to a recognized certification criterion. Of significance to the private sector is an acknowledgement that in future, there may be greater reliance on contracted hydrographic surveying services. If the private sector is to build a capacity and competence in hydrographic surveys, there will have to be significant contracts awarded to the private sector.

The Urban and Regional Information Systems Association (URISA) 2001 statement on its proposed GIS certification program provides a good overview of the meaning of management, maintenance and benefits of certification: "Certification is career recognition through the evaluation and approval of individuals engaged in a specific occupation or profession. Professional certification has expanded significantly over the past decades. Certification as a general practice is offered by national membership associations representing a particular career. Certification can provide recognition and satisfaction for a lifetime in a career activity. Individuals can advance through various levels of certification, receive honors and recognition, at the same time improve their performance, and increase customer or client satisfaction. Through preparation, instruction, procedural guidelines, and ethics statements; individuals with certification improve themselves and create more productive careers. Most certification programs also have renewal requirements that include continuing education to ensure that participants remain current in their field. In addition, once certification is received it can indicate certain capabilities to clients and customers".[20]

In a recent interview with *Hydro International*, Svante Astermo, former Hydrographer of Sweden and Chairman of the IAB on Standards of Competence for Hydrographic Surveyors, stated that while the IAB does not provide recognition of individuals, "it encourages institutions in each country to provide individual recognition to those who have completed a programme recognized as outlined in the Standards and have at least two year varied field experience in hydrographic surveying."[21] However, national certifications are not integrated in the IAB's certification. In recent correspondence with Capt. Hugo Gorziglia, Director of the International Hydrographic Bureau, the author was informed that "[in] regard to individual recognition, we know that there are a couple of countries that have worked that issue [:] Australia, UK and USA".[22] The United States presently has a national certification for hydrographic surveyors that is managed and administered by the American Congress on Surveying and Mapping (ACSM) with support from The Hydrographic Society of America (THSoA).

The ACSM Certification of Hydrographers

In contrast to the current situation with hydrographic surveying in Canada, in the United States of America, hydrographic surveys for the purpose of nautical publications are, under federal supervision, largely contracted out to the private sector. This approach has resulted in a strong private sector capacity to conduct surveys in support of traditional hydrography as well as offshore *industrial* surveys. As a national certification, the ACSM Hydrographer Certification is well-recognized and considered by many Federal, State and local agencies, as well as private firms seeking subcontractors when evaluating technical proposals for marine engineering, surveying and construction. These include port authorities, NOAA and the US Corps of Engineers. The certification program is also endorsed by The Hydrographic Society of America which provides financial support through annual contributions.[23]

Applicants are required to meet an experience requirement of five (5) years in hydrographic surveying, submit a 1,000-word essay on the fundamentals of hydrography including the applicant's qualifications, submit references and pass a 3-hour multiple choice examination. Examination topics include depth measurement, vessel positioning, horizontal and vertical control, tides and water levels, survey planning, nautical science and general marine science. Questions from related fields such as cartography and photogrammetry may also be included.[24] There is no education requirement and with regard to international accreditation, "a person completing an IHO/FIG/ICA Category A course would be granted 3 years against this 5 year requirement and a Category B course graduate would be credited with one year of experience. The only other connection with the IAB Standards is that the questions on the examination are roughly based on the categories in M-5".[25] "Certification as a Hydrographer is official recognition

[19] Earl Brown, "CHC2002 Toast and Topics", *Lighthouse*, Edition 62, Fall/Winter 2002, p. 32.

[20] URISA, Statement on Certification, *GIS Certification Program Update*, URISA website *www.urisa.org/certification/*

[21] Svante Astermo, "A Triptych on Standards of Competence", *Hydro International*, Vol 7, No. 7, September 2003, p 36.

[22] Personal correspondence with Capt. Hugo Gorziglia, 28 January, 2003.

[23] ACSM, ACSM Hydrographer Certification, ACSM website www.acsm.net/hydrocert.html

[24] ACSM Hydrographer Application and Program Details, *supra*

[25] Personal correspondence with Jerry Mills, THSoA, NOAA, October, 2003.

by ACSM that a person has demonstrated to the satisfaction of the ACSM Hydrographer Certification Board that he or she is minimally competent to conduct both inshore and offshore hydrographic surveys. Certification is voluntary, and it does not substitute for registration ..."[26]

On the subject of certification versus registration, Jean-Claude Tétreault, Executive Director of the ACLS has stated to the author that while the ACLS "believes that [the term] certification may be misleading to the public because it will not be able to readily discern the difference between voluntary certification and mandatory licensure, [we] agree that the CLS Commission should be recognised for certifying hydrographers."[27]

On a further note, in addition to their national ACSM certification program, the US hosts three recently renewed, internationally accredited, hydrographic training programs. (See Appendix A).

The CLS Commission as a certificate of competence for Hydrographers

In the absence of accredited training in Canada and until such time as our educational institutions get back on board with accreditation, the geomatics profession has an opportunity and in the author's opinion, a role in the certification of hydrographic surveyors. The field of hydrographic surveying is recognized by the ACLS wherein the scope of work includes surveys of offshore Canada lands. While a number of exams are relevant to hydrographic surveying, one may argue that an equal number are not. To the hydrographic surveyor, these subjects can serve to give a broader appreciation of other surveying and geomatics disciplines.[28] The CLS Commission, as a means of certifying hydrographers, can accommodate the multidisciplinary nature of today's hydrographic surveyor. The CLS exam subject matter dealing with topics such as Canadian government structures and Aboriginal government issues is particularly useful in a hydrographic industry, which can be dominated by government administration and policy. In the course of conducting surveys, especially in the north, hydrographers may find themselves surveying on or adjacent to Aboriginal Treaty Lands. In these cases it is beneficial that the surveyor have an understanding and appreciation for the systems of administration and defacto self-government as they exist on Treaty Lands. Furthermore, while it may seem that subject matter relating to surveys for mining claims may not hold much relevance to the field of hydrographic surveying, the candidate should consider these "off-topics" (albeit part of the overall Acts and Regulations for Surveys on Canada Lands), as matters of interest to all surveyors.

It is the author's opinion that the process of examination by the ACLS Board or Examiners effectively serves to level–in a benchmark for those who enter the program with various academic backgrounds, credentials and experience. To qualify as a candidate for a CLS Commission, the applicant must meet a minimum education and experience requirement. Under present guidelines, a candidate may be required to write as many as sixteen (16) exams plus a technical project. In the present-day CHS, an organization which recruits individuals from schools of surveying, and experience in geography/GIS, civil engineering, nautical science and even non-geomatics fields, the CLS Commission could serve to provide a standard for which individuals with varied academic backgrounds could be brought on par (or filtered out) with regard to the academic side of surveying. Experience has shown that a candidate with a 5-year degree co-op degree in Civil Engineering may end up challenging nearly as many CLS examinations as a candidate challenges with a 3 year diploma in Survey Technology. Conversely, a candidate who has graduated with a 4-year Survey Engineering degree would be exempt from writing significantly more CLS exams than the Civil Engineering grad or the Survey Technologist (as few as only three or four exams with no requirement to submit a technical project).

Can the CLS Commission satisfy International Standards?

To answer this would require an extensive review of the CLS syllabus, which is beyond the scope of this paper and a task best suited to the IAB. The following table serves only to illustrate similarities and deficiencies between the ACLS Board of Examiners and the IHO/FIG Standards of Competence for Hydrographic Surveyors subject matter and does not imply equivalency.

In reference to the table on the next page, note that the last three subjects are not included in the CLS syllabus. Given that the IAB will grant recognition to a programme (or appropriate combination of programmes) which satisfies the minimum Standards,[29] these subjects would either have to be added to the ACLS syllabus or taken as prerequisites. It is also obvious by this comparison that the CLS syllabus includes a number of examination subjects that are not applicable to the Standards of Competence for Hydrographic Surveyors.

If Cadastral surveyors are concerned that hydrographic CLSs might attempt practice in cadastral surveying and vice versa, perhaps the above illustration demonstrates a requirement to create a distinct commission or specialist certification for the hydrographic CLS. Perhaps a more

[26] ACSM Hydrographer Application and Program Details, *supra*

[27] Personal correspondence with Jean-Claude Tétreault, ACLS January, 2003.

[28] Perhaps a general misconception is that the CLS Commission applies only to land surveying professionals. The CLS profession is truly multidisciplinary because the CLS Commission not only applies to land surveyors but photogrammetrists, hydrographers, geodesists and land information specialists. In addition to its survey curriculum, the CLS candidate syllabus includes five examination subjects relating to GIS/LIS: 'Cartography and Map Projections', 'Land Information Systems', 'Land Use Planning', 'Spatial Database Management Systems (Informatics)' and 'Remote Sensing and Applied Photogrammetry'.

[29] Standards, p. x.

CLS Commission versus the IHO/FIG Standards of Competence for Hydrographic Surveyors

ACLS Board of Examiners	IHO/FIG/ICA International Advisory Board	
ACLS Exam Title[30]	Standard	IHO/FIG Subject[31]
'Mathematics'	Basic 1	Mathematics and Statistics
'Least Squares Estimation and Data Analysis'	Basic 1	Mathematics and Statistics
'Advanced Surveying (including Survey Astronomy)'	Essential 3	Positioning
'Remote Sensing and Applied Photogrammetry'	Option 6	Remote Sensing
'Spatial Database Management Systems (Informatics)	Basic 2	Information and Communication Technology
'Map Projections and Cartography'	Option 1	Nautical Charting Hydrography
'Cadastral Studies'		
'Geodetic Positioning'	Essential 3	Positioning
'Hydrographic Surveying and Oceanography'	Essential 1 Essential 2 Essential 4 Essential 5	Bathymetry Water Levels and Flow Hydrographic Practice Hydrographic Data Management
'Survey Law'		
'Land-use Planning and Environmental Management'		
'Land Information Systems and Management'		
'Business : Law, Administration and Economics'	Essential 7	Legal Aspects
'Acts and Regulations		
'Property Rights Systems on Canada Lands'	Essential 7	Legal Aspects
'Government Structures and Aboriginal Gov't Issues'		
'Professional Affairs' (Eliminated and integrated with other CLS exams by March 18, 1999 Regs.)	Essential 7	Legal Aspects
'Project' (See Footnote 26)	Suggested	Project Report in Support of Log Book
	Basic 3	Physics
	Basic 4	Nautical Science
	Essential 6	Environmental Science

focused approach would help provide the ACLS Board of Examiners with a means to develop a hydrographic syllabus which would align more closely with the IHO/FIG Standards. A more focused CLS syllabus for hydrographic surveyors might encourage more hydrographic surveyors to participate in a CLS certification program.

In order that the certificate identify field proficiency the IAB suggests the use of a log book to legitimize completion of at least 24 months of supervised field experience. The IAB further suggests that students submit a project report to support the log book. This would be in line with the CLS Schedule IV-2, *Technical Project* requirement.[32]

Can experience and education alone create competency? The Role of the Association

In the private sector, employees have no choice but to join a professional association in order to:

- use a professional designation...
- prove that their educational standards have been met ...
- guarantee educational standards and work ethics... [and]
- join the group life and liability insurance offered by that association to protect its members.[33]

Competency, to remain valid, especially in today's ever-changing technological market, must be maintained. So while the ideal professional association may offer all of the above, it will have to help maintain its members' competency profiles by keeping them as current as possible with developing trends through training courses, attending seminars and conferences and by reading technical and professional journals.[34]

[30] ACLS Board of Examiners, Information for Candidates, (September 2001).

[31] Standards, 9th ed.

[32] Earlier CLS Regulations accepted the submission of a hydrographer's Final Field Report in fulfilment of the 'Project' requirement.

[33] Treasury Board of Canada Secretariat, Employee Policy on Membership Fees and Professional Designations, available online at *www.tbs-sct.gc.ca*.

[34] B. Calderbank, "Legal Responsibilities of the Offshore Surveyor"

APPENDIX A - LIST OF RECOGNIZED COURSES (At September 2002)

COURSE	Category of Recognition	Specialism or Options	Initial date of recognition Edition of Standards	Date of re-recognition Edition of the Standards	Language	Date Recogn. expires
1. Port Hydrography Course of Bordeaux University, France.	B	Op. 2	1989 5th	2001 8th	French	2011
2. Course Programme in Geomatics and Hydrography of the Hamburg University of Applied Sciences	A	Op. 1	1990 5th	2001 8th	German	2011
3. L'Ecole Nationale Supérieure des Ingénieurs des Etudes et Techniques d'Armement (ENSIETA) of the "SHOM" France.	A	Op. 1 & 5	1980 1st	1991 5th 2001 8th	French	2001
4. Australian Navy Course for Surveying Assistant Fourth Class (H4)	B	1	1981 2nd	1991 6th	English	2001
5. Specialization Course in Hydrography of the Chilean Hydrographic and Oceanographic Service.	A	1,2	1991 5th	2000 8th	Spanish	2010
6. Course in Hydrography for Naval Officers of Brazilian Navy	A	1	1992 5th		Portuguese	2002
7. Specialization Course in Hydrography of the Portuguese Naval Hydrographic Institute	A	1, 2	1983 2nd	1993 6th	Portuguese	2003
8. Course Submission of "l'Ecole des Hydrographes" of the "SHOM", France	B	1	1983 2nd	1994 6th	French	2004
9. Intermediate Hydrography and Oceanography Course of the Hydrographic Institute of Portugal.	B	1, 2	1984 3rd	1994 6th	Portuguese	2004
10. Course in Hydrography for Naval Officers of Indonesian Navy (SEHIDRAL)	B	1, 2	1993 6th		Bahasa Indonesia	2004
11. Course in Hydrography for Naval Officers of Peruvian Navy	B	1	1994 6th		Spanish	2004
12. Basic Hydrographic Course at the Royal Naval (UK) Hydrographic School, HMS Drake.	B	1	1994 6th		English	2004
13. Coastal Zone Management Hydrographic Survey Diploma. Chilean Maritime University. UMACH	B	2	1994 6th		Spanish	2004
14. Course in Hydrography. International Maritime Academy of Trieste, Italy.	B	1	1994 6th		English	2004
15. Specialization Course of the Spanish Hydrographic Institute.	A	1	1985 3rd	1995 7th	Spanish	2005
16. Course in Hydrography (HYDRO I) of the University Teknology Malaysia.	B	2	1995 7th		English	2005
17. Course in Hydrography for Naval Officers of the Argentine Navy	B	1	1996 7th		Spanish	2006
18. Course in Hydrographic surveying of the Department of Geometrics & Geomatics of the University of Melbourne (Australia)	A	1	1996 7th		English	2006
19-Year Course Programme of "Hogere Zeevaartschool", Amsterdam.	A	1, 2, 3	1982 2nd	1997 7th	Dutch	2007
20. Specialization Course of the Italian Hydrographic Institute.	A	1	1986 4th	1997 7th	Italian	2007

COURSE	Category of Recognition	Specialism or Options	Initial date of recognition Edition of Standards	Date of re-recognition Edition of the Standards	Language	Date Recogn. expires
21. Hydrographic Course of the Japanese Maritime Safety School.	B	1	1987 4th	1997 7th	Japanese	2007
22. Course in Hydrography for Petty Officers of the Spanish Hydrographic Institute	B	1	1997 7th		Spanish	2007
23. Course in Hydrography of the "Academy Admiral Makarov, Russia"	A	Sp. 1, 2 ,3	1997 7th		Russian	2007
24. Basic/Long Hydrographic Specialist Course of the Indian National Hydrographic School, Goa	A	Sp. 1, 2, 3 Op. 1,2,3,4	1982 2nd	1997, 1998 7th, 8th	English	2008
25. Group Training Course in Hydrographic Survey, Japan.	B	1	1988 5th	1998 7th	English	2008
26. Course in Hydrography from the University of Technology of Malaysia (UTM)	A	Op. 2, 5, 7	1998 8th		English	2008
27. Course in Hydrographic Surveying of the University of Plymouth , U.K.	A	Option 1	1987 4th	1999 8th	English	2009
28. Advanced Course in Hydrography of the Maritime Safety Academy, Japan.	A	Option 1	1989 5th	1999 8th	Japanese	2009
29. Basic + Long Hydrographic Courses at the Royal Naval (UK) Hydrographic School, HMS Drake.	A	Op. 6	1993 6th	1999	English	2009
30. Free Course in Hydrography of the National Hydrographic School, Goa, India	B	Op. 1, 2, 3 and 5	1999 8th		English	2009
31. International Hydrographic Management and Engineering Program of the Naval Oceanographic Office (USA)	B	Op. 1	1999 8th		English	2009
32. Course in Hydrography of the St. Petersburg Naval Academy (Russia)	A	Spec. 1	1999 7th		Russian	2009
33. Joint International Hydrographic Applied Science Program of the University of Southern Mississipi-NAVOCEANO (USA)	A	Op. 1 and 5	2000 8th		English	2010
34. Harbour and Coastal Management addressed to Harbour and Coastal Surveyors of the International Maritime Academy (IMA), Trieste.	B	Op. 2	2000 8th		English	2010
35. Hydrographic Surveyors Programme of the Naval Academy of Colombia	A	Op. 1	2001 8th		Spanish	2011
36. MSC in Hydrographic Surveying of the University College of London/ Port of London Authority	A	Op. 1 & 2	2001 8th		English	2011
37. Graduate Programme in Ocean Mapping of the Joint Hydrographic Center/ University of New Hampshire (UNH) and National Oceanic and Atmospheric Administration (NOAA), USA	A	-	2001 8th		English	2011
38. LSGI Hydrographic postgraduated Diploma of the olytechnic University of Hong-Kong	A	-	2001 8th		English	2011
39. Hydrographic Education Programme of the University of Otago (New Zealand)	A Pending confirmation		2002 9th		English	2012
40. Programme for Bachelor of Engineering Degree in Hydrography of the Dalian Naval Academy (China)	A	Op 1,2,3 Pending confirmation for 5 and 6	2002 9th		Chinese/ English	2012
41. Royal Australian Navy H2 Hydrographic Surveying Course	B	Op. 1 & 6	2002 9th		English	2012

Ideally, the Association would:

1. Recognize and certify professional and technical designations and associated multidisciplinary specialisations.
2. Be self regulating with practice review and disciplinary mechanisms; its members bound to a Code of Ethics and Code of Professional Practice.
3. Foster mandatory Continuing Professional Development.
4. License its practioners.
5. Offer various group insurance services.

Conclusion

There is a need for continuing education and certification for hydrographers in Canada. However, there are gaps between Canadian needs and international certification realities. The Association of Canada Lands Surveyors has via the CLS Commission, demonstrated both the desire and the capacity to address those gaps, and in so doing, serve the interests of its members, the Canadian Government, and the private sector as well. In the process, the ACLS can help us regain the respect and high standing which Canada has long held within the hydrographic profession. Subsequent to the presentation of this paper, last fall at the ACLS Offshore Consultation Workshop in Calgary, Alberta, the ACLS and CHA formed a joint task force to further examine the issue of a national certification for hydrographers. With regard to the status of accredited training programs in Canada, the author has been informed that the with support from CHS Pacific Region, the British Columbia Institute of Technology (BCIT) have instituted a Cat B- accredited hydrography course. The University of New Brunswick, the Centre of Geographic Sciences in Nova Scotia, Ryerson University in Toronto, the Institut Maritime du Québec in Rimouski and the College of the North Atlantic in St. John's Newfoundland have the potential to go for accreditation. The US and Australian Hydrographer certification models observe both the academic knowledge and practical experience earned through Cat A and B- accredited training programs. A Canadian certification model would most certainly recognise and complement the merit of these programs.

About the Author...

A graduate of Humber College's, Hydrographic Survey Technologist program, Andrew has been surveying for 15 years with varied experience in topographic, cadastral, offshore industry, and hydrographic surveys. He is presently employed as a hydrographer with the Canadian Hydrographic Service, Central and Arctic Region. As President of the CHA, he also serves as the technical councilor for hydrogaphy in the Canadian Institute of Geomatics (CIG) and as the Canadian National Delegate to FIG Commission IV.

CSS ACADIA - the Grand Old Ship of the Canadian Hydrographic Service

By: Earl Brown, Hydrographer (retired)

The purpose of this article is to record some history of the Canadian Survey Ship '*CSS ACADIA*' and to recognize the significant contribution she made to Canada and Canadian hydrography. Special recognition is deserved by the many good officers and crew who served proudly aboard her for many years and contributed quietly but most effectively to the success of many hydrographic programs. I also wish to acknowledge, with appreciation, the significant work done by the Maritime Museum of the Atlantic, in preserving the vessel and initiating activities to perpetuate her history.

This brief account of the history and work of the *ACADIA* will be augmented by my personal experiences aboard the ship as a junior hydrographer during the survey seasons of 1962 and 1963.

The impetus for this article was the *ACADIA*'s 90th birthday celebration, in Halifax, Nova Scotia in July 2003, as well as the 100th anniversary celebration of the Canadian Hydrographic Service (CHS), in 2004. (The name was changed from "Hydrographic Survey of Canada" to the "Canadian Hydrographic Service" in 1928).

"*The ACADIA has a noble and splendid record of service*" states the 50th anniversary (1963) brochure for the *ACADIA*, and it goes on to call her "*the grand old ship of the Canadian Hydrographic Service*". Because she had shouldered so many arduous and difficult tasks, she became known as "*the workhorse of the Canadian Hydrographic Service*". She was also described in other documents as "*this handsome old ship*", "*a jewel in the CHS fleet*" and "*the grand old lady*".

All of the above accurately describe this grand old ship, and are part of the reason why so many individuals are proud to be part of what the Maritime Museum of the Atlantic refers to as the "*mystique*" of the *ACADIA*.

"*Throughout their careers, some vessels acquire a certain mystique that sets them apart from other ships. CSS ACADIA, the Maritime Museum of the Atlantic's Canadian Scientific Ship, is one such vessel.*" From: *http://museum.gov.ns.ca*

CSS ACADIA, October 2, 2002

Photo from the collection of the Maritime Museum of the Atlantic, Halifax, NS.

With the exception of her time in the Navy during both World Wars, and two years out of service due to a lack of funds, the *ACADIA* was an active hydrographic ship for 56 years; many more years than any other in the Canadian fleet. She made a significant contribution to the charting of Canadian waters, and those who had the good fortune of working and living aboard her developed a unique bond to the vessel and crew. I was fortunate to have been assigned to serve on the *ACADIA* as a junior hydrographer for two consecutive seasons and am very proud that I had the opportunity to play a small part in her many years of service to the marine community. I have many fond memories of the *ACADIA*, and am so very pleased that she continues to be meticulously maintained by people that care.

It is to be noted that throughout this article I refer to the *ACADIA* as the *Canadian Survey Ship (CSS) ACADIA*. However, for most of her years she was officially known as a *Canadian Government Ship (CGS)*. She was also unofficially referred to as the *Canadian Hydrographic Ship (CHS)*.

It is believed that the *ACADIA* became *Canadian Scientific Ship* in 1962 when the Hydrographic Service became a division of the newly created Marine Sciences Branch in the Department of Energy, Mines and Resources. Hydrographers, however, never fully accepted the word "Scientific" particularly for vessels such as the *ACADIA* and referred to her as Canadian "Survey" Ship.

The Ship

The *CSS ACADIA* was launched in England, on May 8, 1913, at the Newcastle-Upon-Tyne shipyard of Swan, Hunter and Wigham Richardson Ltd. On July 8, 1913, she arrived in Halifax.

The ACADIA, with ornate teak carvings on her bow and original bridge.
Photo courtesy of Ross Douglas.
Photo credit Milton Hempbill.

She was the first northern survey vessel designed and built for the Canadian Hydrographic Service. Hydrographic staff were eager to serve aboard her as she was built during an era when the hydrographers were considered the elite aboard the vessel. The accommodations for the officers and hydrographers were excellent. Beautiful mahogany and oak paneling and fine brasswork were to be found throughout the survey staff and officers' accommodations. The quarters for the Hydrographer In Charge were particularly spacious and elegant. It has been estimated his quarters represented 20% of the total accommodation space on the ship. He had a double berth and a private bathroom complete with the only bathtub on the ship. The Captain's quarters were spartan by comparison.

"The *CSS ACADIA* is a steel, single-screw vessel, 51.8m long, 10.2m beam and 6.4m draught, built at a cost of $330,000. She has a displacement of 1,700 tons. Her original speed was 12.5kts. Designed and built for work in northern waters, the *ACADIA* has 7/8 inch iron plating and heavier than normal framing. She was further strengthened against ice in 1914. Her total complement was 60, of which 10 were hydrographic staff." From: *'http://www.canfoh.org'*

The *ACADIA* was propelled by a triple-expansion steam engine with two coal-fired marine boilers. At average speed, the *ACADIA* consumed thirteen tons of coal a day. Her bunkers held 250 tons of coal. During her early years of service it was customary to supplement her bunkers with bagged coal on deck. Simple mathematics suggests that her duration at sea was very limited. However, it should be noted that the *ACADIA* was used primarily as a mother ship, with the bulk of the hydrography being collected by launches that were carried on deck. As a result, her duration at sea was not a major concern. She carried three or four launches for most of her survey activities. The *ACADIA* was easy to spot on the horizon with the unmistakable trail of black smoke.

Major alterations and extensive repairs were made to the ship in the mid 1950's. Almost all of her superstructure above the main deck was rebuilt, including the wheelhouse and bridge, and the hydrographic chart room was also extensively modified. The original teak deck was replaced with a new 2¾ inch douglas fir deck and the intricately carved teakwood plaques on her bow were removed.

The Ship's Bell is well polished and hangs proudly.

In my mind, it is somewhat difficult to accept that the *ACADIA* was a "*modern*" hydrographic ship, but indeed she was. The *ACADIA* was equipped with the most modern navigation and survey equipment. New innovations such as the gyrocompass, echo sounding devices, radar and electronic positioning systems were pioneered and got their first tests aboard the *ACADIA*. Statements were made that "the *ACADIA* carries the most modern survey and navigation equipment available."

ACADIA's early years

After arriving in Canada on July 8, 1913, the *ACADIA* did not spend a whole lot of time in her home port of Halifax. On August 5 she was on her way for a long cruise to Hudson Bay. On this, her maiden voyage, Captain F. Anderson was Officer-in-Charge, with hydrographic assistants E.B. MacColl, R.L. Fortier, H.M. Teed and L.C. Prittie. First Master of the *ACADIA* was Captin S.W. Bartlett.

The 1913 program for the ACADIA was to continue hydrographic surveys of Port Nelson and approaches that had been started by Henri Parizeau during the two preceding seasons, in 1911 and 1912. It was the Government's objective to chart the safest marine route for transportation of grain from western Canada to Europe. Port Nelson and Churchill were the two areas considered for a deep water port. At that time, the construction of a railroad from the prairies to the shores of Hudson Bay was contemplated.

The *ACADIA* spent the survey seasons of 1913 and 1914 collecting hydrographic data in this area of Hudson Bay. It is not clear why the surveys were terminated, but they were, and she spent the next two years conducting surveys on the coast of Nova Scotia.

During *ACADIA*'s 56 years of service she had several "time outs" from survey work. She served our country proudly as *HMCS ACADIA*, with the Royal Canadian Navy, during both World Wars.

From 1916 to 1919 she served as a Naval patrol vessel, patrolling the waters off Halifax Harbour, the Bay of Fundy and the Gulf of St. Lawrence.

The *ACADIA* survived the 1917 Halifax explosion while serving as a guard ship and naval signal vessel at Bedford Basin. At the time of the explosion, she was anchored approximately where the Bedford Institute of Oceanography pier is today, and as the signal vessel, she gave the IMO the all clear Customs signal to proceed to sea. She survived the explosion because she was around the corner from the actual site and out of the way of the blast and tidal wave.

The HMCS ACADIA during WWII

Photo from the collection of the Maritime Museum of the Atlantic, Halifax, NS.

The *ACADIA* was a versatile vessel and before the war ended, she was selected for an experiment in the use of balloons for spotting submarines.

After the interruption of surveys by the Great War, the *ACADIA* resumed surveys off Nova Scotia. Then, following a few years when the vessel was idle due to a lack of funds, she resumed surveys in Hudson Bay, this time in the Churchill area which was considered to have far greater potential than Port Nelson as a safe port.

It is significant to note that in 1931, when the first cargo of grain was carried from the port of Churchill, by the *SS FARNSWORTH*, the charts in use were compiled from the information collected by the *ACADIA*. As I grew up as a farm boy on the prairies, I was aware of grain being shipped through Churchill, and I now find this link to the *ACADIA* of particular interest and noteworthy.

Another very positive and good news story of the *ACADIA*'s early surveys was the work carried out on the north shore of the St. Lawrence River. The charts that were constructed from surveys carried out by the *ACADIA* allowed the mining and safe shipment of ore from the extensive bodies of iron ore of northern Quebec.

She saw the interruption of surveys again with World War II, during which time she was used as an anti-submarine patrol vessel as well as for gunnery training. On various occasions, she was also used as an anti-aircraft and navigational training ship.

Shortly before and following 1949, when Newfoundland entered confederation, the *ACADIA* did a lot of work charting the shores of that province. Over the years, *ACADIA* surveyed hundreds of miles of Newfoundland's rugged and shoal infested coastline. The *ACADIA* and Newfoundland were synonymous. I would suggest that any hydrographer alive today who spent time on the *ACADIA*, also spent time in Newfoundland. The port of St. John's was like a second home for the vessel and probably one of the most surveyed harbours on the east coast, perhaps with the exception of Pictou, *ACADIA*'s home port for several decades. Hydrographic staff needed work while the ship was readied for the survey season and while she took on coal or had her boilers repaired. The *ACADIA* was a welcome visitor at the many small coastal communities where she spent time over many years.

My years on the *ACADIA*

I first set foot on the *ACADIA* on May 13, 1962 - that's just about 42 years ago. It does not seem like that long ago, as many memories are relatively easy to recall.

Like many hydrographers before me, I joined the *ACADIA* at Pictou, N.S. where she was based for many years. At the time there was no base for hydrographic staff in the Maritime provinces; no Bedford Institute of Oceanography (BIO) at Dartmouth, Nova Scotia; no Maurice Lamontagne Institute (MLI) at Mont Joli, Quebec and no hydrographic presence in Newfoundland. Staff for all hydrographic surveys, with the exception of Pacific Region, were based in Ottawa. The *ACADIA* was berthed at the shipyard of Ferguson Industries Limited in Pictou.

As I recall, in 1962, there was great controversy in the Pictou area because of rumors that the base of the *ACADIA* as well as that of the *CARTIER*, was going to be permanently moved from Pictou to Halifax. The Bedford Institute of Oceanography was being created at that time.

It was inevitable that the ships would move to the new institute in Dartmouth, but it was not without a fight by the political forces in the Pictou area. The loss of the *CARTIER*, and then the *ACADIA*, was significant to the Pictou community. The *ACADIA* had made Pictou her winter home for 18 years, so she was considered part of the community. The town Council, as well as the Pictou Board of Trade, strongly protested the proposed move. Many of the officers and crew of the vessels lived in Pictou or the surrounding area, so a permanent move from the area was traumatic. Newspaper reports suggested "*there were 50 to 60 families whose menfolk work on the two boats*".

My first few nights in Pictou were spent at the Braiside Inn. On May 13, when I moved aboard the *ACADIA*, I was greeted and showed around by the second steward, Norman Gillis. Norman, as he was known to all of us, had the responsibility to cater to the needs of the hydrographic staff and maintain the Hydrographers' wardroom. He treated us well. On my first day aboard the *ACADIA*, Norman found a place where I could store my Volkswagon Beetle, with which I had just driven from Ottawa. My VW would be put on blocks in a barn in Norman's mother's backyard.

Norman Gillis, second steward and Mr. Goodwill, Hydrographer-In-Charge in the hydrographers' wardroom on the ACADIA.

Note the brass lamps and polished mahogany paneling - November, 1962.

In 1962, Mr. J.E.V. (Vic) Goodwill was the Hydrographer-In-Charge and Jerry Shreenan was second in charge. Other hydrographers were Gerry Wade, Don Snodgrass and Ron Wallis. Rolly Hamilton and Ray Thomas, cartographers from Ottawa, also spent time on the *ACADIA* that summer, to get an understanding of "life in the field". We also had a young engineering student, Rod Desborough with us for the summer. After a career in an unrelated field, it is good to see Rod back volunteering on the *ACADIA*, spending some of his retirement time in restoration/preservation work, guiding below deck tours and in promoting the work and history of the great old ship. Rod spent one summer in the seaman's mess and a second in the wardroom during his University years.

Vic Goodwill was a very meticulous hydrographer and a good person to work for. As junior hydrographers, we did not see much of him as he spent most of his time in the large office space adjacent to his luxurious cabin. We also seldom got invited to share this space with him. As was standard procedure on hydrographic programs during those days, Mr. Goodwill delegated the day to day hydrographic operations to his second in charge. He seemed to enjoy the life of a hydrographer, but Vic's real passion was bird watching. He was seldom seen on deck without his binoculars and his expensive movie camera. During his occasional trips to a survey station or to participate in any aspect of the survey, his bird - watching equipment was with him. His occupation as a hydrographer and his love of feathered creatures was an excellent mix, but the Newfoundland contingent of the *ACADIA* crew had a lot of difficulty understanding Mr. Goodwill's obvious passion for bird watching.

The ACADIA anchored in St. Georges Bay, Newfoundland - October, 1962.

The 1962 survey season was a typical year for the *ACADIA*. Surveys were scheduled in Nova Scotia with the Pictou Harbour being first on the list. In the immediate area, a survey was also carried out of the river from Trenton to New Glasgow. The survey then moved to Victoria Harbour, PEI and continued the charting of the northeast coast of the island. The next move was to Newfoundland where we spent most of the season. I fondly remember time spent in Long Pond, Conception Bay and Carmanville on the east coast. Each of the communities brought unique experiences that bring back pleasant memories of young men seeking good times and a break in the routine of long working hours and life confined to a ship.

Like many before us, and some after, we also spent time in the area from Cape Freels west to Fogo Islands. The old linen-backed field sheet of Cape Freels was the combined work of many hydrographers and often referred to as the "million dollar field sheet".

The monthly trips to St. John's were a necessary break from our long hours of work routine, and the visits to the city were very interesting, most of the time. During these visits we surveyed all of St John's harbour and like many before us, we bar-swept Merlin Rock, at the harbour entrance, a number of times.

Many of those days of surveying St. John's harbour were carried out with a number of the hydrographers suffering with headaches. The brandy which some thirsty individuals were able to acquire from neighbouring Portuguese fishing vessels was very potent. As a matter of fact, it was really awful! I recall someone commenting that it tasted as if it had been bottled at the local gas pump.

I also remember 1962 well, because at that time, the CHS wanted hydrographers to know something about navigation and ship operations. During the winter of 1961/62, Ralph Merideth, a hydrographer with a maritime background, gave a few junior hydrographers classroom

instruction in Navigation and Seamanship. This was to be followed by 80 hours of watch time on the bridge of a ship. My watch time was to take place on the *ACADIA* in 1962. I was fortunate to be assigned to join the second mate on his 12 to 4 watch. Harold Martin, the second mate, treated me well, was patient and taught me a lot. Mr. Martin was a native of New Zealand and had spent many years at sea. He had many good stories to tell and enjoyed telling them. As I recall I did a lot of listening.

Left to Right: Hans Pulkkinen, Ed Banks, Vic Goodwill, Gerry Wade, Leo MacIntyre, John O'Shea and Earl Brown - Afterdeck of the ACADIA - 1963

Note the binoculars and movie camera in Mr. Goodwill's possession.

I enjoyed my time on the bridge of the ship and in particular some of the midnight to 4 in the morning watches. I recall some very relaxing nights standing on the wing of the bridge, when the seas were calm and the moon and stars shone brightly. With most lights off and most of those aboard in their bunks sleeping, the *ACADIA* would be slipping through the waters with just the slightest noise and gentle movement. She was a very quiet ship. Those wonderful nights are part of my very fond memories of my time aboard the good ship.

Not all nights were as peaceful and romantic as I have just described.

On some nights and days, the wind blew very hard, along with fog, mist and rain. A good number of nights were spent without any sleep because of the severe motion of the ship.

Life on *ACADIA* was just about always good. We worked hard and at times played hard. The hours were long and overtime was never even thought about. We worked because a job needed to be done. There were no computers – not even calculators! We had log tables and complex computation forms. There was healthy competition to see who could get the most number of sounding fixes during a day or who could do the greatest number of "Geodetic" calculations. All notes and calculations were done twice, as a check. Today, the CHS has internationally recognized Quality programs, but is it better.... I wonder!!

My recollection of the food on the *ACADIA* is that there was lots of it, but it was a very basic menu. Many of the meals were cooked by the steamer in the galley, as steam was readily available. At times, one could bite into a potato, carrot or turnip and they all tasted the same. Often, when we were out in the launches and we missed the scheduled supper hour, the pork chops were turned up on the edges after sitting around for a few hours. There are also rumors of pork chops being used as hockey pucks on the ships deck.

The *ACADIA* was welcomed by most of the Newfoundland coastal communities. Locals would often come to visit. Occasionally, a movie would be projected from the ship to a screen set up on shore or on a dockside building and members of the community would join the ship's complement in watching the show.

There are many good stories of the men of the *ACADIA* integrating with people of the coastal communities. I remember visiting local retail establishments, on occasion going fishing and berry picking and other such activities. There were also rumors of men from our good ship seeking companionship from locals of the opposite sex. There were no females on the *ACADIA* (officers, staff or crew) or on any other ships used for hydrography during her era.

Ron Wallis, Rod Desborough, Gerry Wade and Don Snodgrass on deck of ACADIA, 1962.

Some of us heard, because of these alleged activities, that the welcome sign was not always out. In ports where the *ACADIA* was a repeat visitor, there were stories of the ship being met by irate fathers who suspected that someone from our ship was messing around with their daughters.

I'm sure there are many interesting stories that could be told, but generally, the ship was well known and greatly respected by the people of the coastal communities.

Because *ACADIA* often worked in remote areas, she was frequently called on to assist in rescue missions. There are many positive stories recorded of her exceptional service to people and communities.

When I joined the *ACADIA*, one of the traditions that had me puzzled was the very obvious class distinction aboard the ship. Hydrographers were clearly in first class, with some exceptional quarters, and the ships crew in less than tourist class, with some in the bowels of the vessel. The crew were not allowed in the hydrographers' quarters and fraternizing was discouraged. These "rules" were strictly enforced. This clear and so very obvious distinction between groups of people was accepted as the way things were to be; it was not questioned. As a young lad, not too far removed from the farm on the prairies, and where I was taught to treat my elders with respect, this new way of life was a difficult adjustment. I'm glad that those days are long gone, as when my thoughts drift back to my days on the *ACADIA*, one of the first things that comes to mind is the very good people, in every classification of the ship's complement.

Captain Taylor in a familiar pose on the bridge of the ACADIA.

The officers I remember – Captain Taylor, First Mate Ray Gillis, Second Mate Harold Martin and Third Mate Mr. Shepherd, as well as the crew, were all very fine people. The coxswains of the day Tommy Richard, Howard Freake and, at the time, the young Bill Hart, as well as the many seamen, were all very kind to me and I remember them with a great amount of respect. They were all exceptionally good and hard working people.

Norman Gillis, the Second Steward, treated us very well in our wardroom and seemed to always be there at our service.

The ship's officers and crew tended to stay with the ship for extended periods of time, in fact it was a career for many of them. The Petty Officers, quartermasters, cooks, oilers, coxswains, bosun, carpenter and gas engineers were the most stable of the crew. Many served 10 to 12 consecutive years and many occupied the same berth year after year. As a result, they knew the ship and their jobs very well, and it was the crew members that would show the hydrographers how to build a station and carry out other repetitive activities that needed to be done year after year.

Captain Taylor, master of the *ACADIA* for eleven years, is quoted as follows in The Chartmakers:

"They'd come back in the Spring, say "hello" at the gangplank to the officer of the watch and go immediately below deck to their quarters. Each man, with his seabag and one suitcase, would go right to the bunk he'd had last season, unpack, and start a conversation with his buddy, just as if they hadn't been apart from each other at all. They were all working together....shared the same job, sure..... but it was more than that. They were family."

Left to Right: Bert, Howard Abbott, Tommy Richard at the wheel, and Ron Wallis.

Launch "Red Head", October, 1962.

The hydrographers of the day, and the CHS in general, owe a lot to the dedicated crew of coxswains, seamen, stewards and others that worked hard to see that our work was carried out safely and properly, and that our life was made as comfortable as possible. As young hydrographers, we had complete trust in the coxswains to safely run the launches, in all kinds of weather, and many times in shoal infested waters. Out trust was in good hands.

The very capable seamen would row us ashore in a dory and then tell us when to jump for the rock just exposed by a receding wave. Those crew, almost exclusively from the Maritime provinces, made our job as hydrographers so much more effective. We owe that group of people a very large vote of thanks. The coxswain for "my launch", the Red Head, was Tommy Richard. Tommy was a very quiet person, but a real gentleman and an excellent coxswain.

The duration of the 1962 survey season was a little longer than anticipated. The field activity was to have been completed by October 20, however the powers that be in Ottawa extended the season, by adding an extra project and as a result, we remained on the ship until mid November. Remember, there was no overtime, no mid season break, no third week-end travel home and there was no telephone communication from the ship. As I recall, there was some tension building with some, but generally, that's the way it was!

At the 2nd Annual Canadian Hydrographic Conference in December 1962, which was essentially a meeting of all senior staff of the CHS, the following exchange of information took place:

"Mr. Bolton (Staff Training *C.S.S. "CARTIER"*) addressed a question to Mr. Goodwill on the nature of the weather he encountered in November. Mr. Goodwill replied that out of the thirteen days he worked at the beginning of the month, he had two days' good weather. He considered that the work assigned to him after the official closing date of the season, viz. 20 October, could have been deferred to 1963. He regretted to make this statement, but the effect on his being the only ship and party working after the other parties had been returned to base had an adverse effect on morale. Mr. Charles assured him that this would not occur again, and in future years this would be taken into consideration."

On reviewing this discussion it would appear that Mr. Bolton and Mr. Goodwill may have set up this question to get a point to the management of the day. I don't remember a longer season, so perhaps the point was made!

ACADIA assumes a new role

After 56 years of service, the *ACADIA* was decommissioned in 1969. Because of her record and length of service, she was not immediately scrapped, but remained berthed at the Bedford Institute of Oceanography. Plans were being formulated to preserve her. We, members of the hydrographic community, past and present, owe a great vote of thanks to those who had foresight at that time.

Too often, items that have aged and, in the minds of many, serve no more useful purpose, are tossed aside or discarded.

After a decade of remaining idle and tied up at the Bedford Institute, the *ACADIA* was declared of national historic significance. What a proud day for the vessel and all those that had served on her. In 1982 she was moved to the Maritime Museum of the Atlantic. This was a great achievement for the hydrographic community and what a wonderful new opportunity for the Maritime Museum.

CSS ACADIA at the Maritime Museum of the Atlantic, July 5, 2003.

Note: Retired hydrographer, Ken Dexel relaxing in the foreground.

Photo courtesy of Ross Douglas.

ACADIA fully dressed in celebration of her 90th anniversary - July 5, 2003.

Photo courtesy of Bill Covey.

The Museum staff has done a marvelous job of preserving the *ACADIA* and in making her part of living history. It is obvious that the *ACADIA* is an integral part of the Museum's collection as she continues to be well maintained and new programs are being developed to encourage visitors and educate the public about her significant work, particularly in Atlantic Canada

.

The Museum staff are to be thanked for their proactive work in jogging the memories of those who served aboard her, and recording events that occurred during her many years of service.

The Museum staff are also to be applauded for celebrating anniversary events and organizing several reunions for those that served aboard her at any time during her years of service.

The first of these "events" was the celebration, on May 8, 1988, of the 75th anniversary of her launching. A giant birthday cake was served in the foyer of the Museum.

A reunion of former crew members and hydrographic staff, as well as a "Crew's Supper", to further celebrate this occasion, was held on July 9 and 10, 1988. The supper featured a meal of corned beef and cabbage and a reprinted menu from the *CSS ACADIA*, July 9, 1968. The Museum invited as many people who served on the vessel as they could locate. It is my understanding that approximately 100 people were invited and well over half attended. It was a superb function and an excellent means for the Museum to add to their collection of memories of the *ACADIA*, by way of photographs and stories related to the vessel and associated activities.

The next significant event, orchestrated by the Maritime Museum of the Atlantic, was a weekend celebration of the 90th anniversary of the launching of the *ACADIA* on July

5 and 6, 2003. I was pleased to be invited and asked to participate in this very pleasant and laudable event. It was indeed a great pleasure to meet up with my good friend Ross Douglas in Halifax and spend the few days meeting officers, crew and hydrographers who had spent time on the *ACADIA*. There were many interesting stories shared and a lot of reminiscing about the good old days. Time spent with staff of the museum was also most interesting and worthwhile.

It is of interest to note that the staff of the museum took the initiative to document, by videotape, stories and memories of those who wished to share their experiences aboard the good ship *ACADIA*. Many took advantage of this opportunity, and the stories collected add to the pool of information that is available to the museum and to be shared, as appropriate, with the public.

It is recognized that those who served on the vessel are diminishing in numbers and with each gathering or formal reunion, the numbers get fewer.

Cliff LeBlanc and Ross Douglas cutting the ACADIA's 90th anniversary birthday cake.
Photo courtesy of Ken Williams.

The 90th birthday party was well attended with a good mix of officers, crew and hydrographers. The oldest guest was Cliff LeBlanc, who served aboard the *ACADIA* as a seaman during her surveys in Hudson Bay during the early 1930's. I will leave it to you to do the math!! Mr. LeBlanc shared the honour of cutting the birthday cake with Ross Douglas, who was a junior hydrographer on the *ACADIA* in 1960, and later, as Dominion Hydrographer, responsible for hydrography in Canada.

On the evening of Saturday, July 5, 2003, the museum hosted a reception and a "Crew's" dinner to which all reunion participants were invited. The menu for the supper was identical to that which was prepared on July 5, 1968 with the entree being "Grilled Hamburg". While I had no complaints about the food on the *ACADIA*, I can assure you the "Hamburg" we ate in 2003 was far superior to that which was served in 1968.

The reception and dinner was an excellent event and I was greatly honoured to be one of the speakers during the evening. It was an event I shall remember very fondly for a life time. My experiences with the *ACADIA*, all of them, are cherished memories of many fine people. People that I met the first day I walked on the ship in 1962, to the last day I spent aboard her on July 6, 2003. An assignment on the *ACADIA*, particularly as a junior hydrographer, was a good experience.

The Museum staff, and in particular Lynn-Marie Richard, Assistant Curator, did a fine job of ensuring the event was "eventful". Many interesting things took place in both formal and informal settings and all in an appropriate relaxed atmosphere. As guests of the museum, we were treated well. The Maritime Museum of the Atlantic is a great organization and is doing good and the proper things for the Atlantic Provinces and for all of Canada. They deserve a lot of thanks and support from the Canadian hydrographic community.

While at the dock of the Museum, every five years, the direction of the *ACADIA*'s hull is rotated, to facilitate work on different sides and to even out the weathering process.

The photo below was taken on her most recent rotation in 2002. The tug moving her is on the starboard side and hidden in this picture. She appears to be under her own power!

ACADIA, with tug on starboard side - October 2, 2002.
Photo from the collection of the Maritime Museum of the Atlantic, Halifax, NS.

As a closing note, it is appropriate to quote from a press release prepared by the Maritime Museum of the Atlantic in 1988. It reads as follows: "The last sentence of the 1980 telegram announcing the gift of the *ACADIA* to the Province of Nova Scotia for the Maritime Museum shows the feeling about her: "*It is of great satisfaction to know that this grand old ship will be maintained in perpetuity for the people of Canada*".

Acknowledgments

The author wishes to thank Paola Travaglini and Rod Desborough for their generous comments and suggestions. Thanks also to Rod for his work in seeking approval of the Maritime Museum of the Atlantic for use of photographs from their collection.

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About the Author...

Earl Brown began his career as a Public Servant on May 24, 1960 in Ottawa, as a Technical Officer in the Hydrographic Branch of the then Department of Mines & Technical Surveys. He held various positions in his 37 years with the Canadian Hydrographic Service, including the position of Regional Director of Central and Arctic Region. He retired from that position on May 30, 1997. In retirement, Earl continues to spend considerable time volunteering for the Canadian Hydrographic Association, primarily in support of *Lighthouse* and the heritage launch *Surveyor.*

Appel de candidatures

Président National, ACH

Les mises en candidature sont maintenant ouverte pour le poste de Président National de l'Association canadienne d'hydrographie. Le poste de Président National deviendra libre le 31 décembre 2004.

Le Président National est le chef exécutif du conseil de la Corporation. Il préside toutes les assemblées générales de la corporation et les réunions du bureau de direction. Il est responsable de la gestion générale et active des affaires du bureau de direction de la Corporation. Il s'assure que toutes les ordonnances et résolutions du bureau de direction soient mises en application.

Le Président National sera élu pour une période de trois (3) ans et sera rééligible pour un mandat subséquent.

La mise en candidature pour ce poste fermera le mardi 31, août 2004 à 24 heures.

Le bureau de direction formera un comité d'élection pour recevoir les candidatures, informera les membres et tiendra une élection. Les candidatures peuvent être envoyées aux Vice-Présidents des Sections ou au Secrétaire National.

Les candidats seront annoncés dans l'édition d'automne du *Lighthouse.*

Call for Nominations

National President, CHA

Nominations are now open for the position of National President of the Canadian Hydrographic Association. The National President's position becomes available on December 31st 2004.

The National President is the chief executive officer of the Corporation. He presides over all general meetings of the corporation and of the board of directors. He is responsible to the board of directors for the general and active management of the affairs of the Corporation. He ensures that all orders and resolutions of the board of directors are carried into effect.

The National President will be elected for a period of three (3) years and will be eligible for re-election to one (1) additional term of office.

Nominations for this position will close on Tuesday, August 31, 2004 at 24:00 hours.

The board of directors shall appoint an elections committee to accept nominations, inform the membership and conduct the election. Nominations should be sent to the branch Vice-Presidents or to the National Secretary.

Candidates will be featured in the fall edition of *Lighthouse.*

CCGS AMUNDSEN: A New Mapping Platform for Canada's North

By: Jason Bartlett, Canadian Hydrographic Service
Jonathon Beaudoin, Ocean Mapping Group
John Hughes Clarke, Chair, Ocean Mapping Group

Introduction

In 2003, through a joint Canada Foundation for Innovation (CFI), Natural Sciences and Engineering Research Council of Canada (NSERC) funded program, the decommissioned 1200 class icebreaker *CCGS SIR JOHN FRANKLIN* (now *CCGS AMUNDSEN*) was brought back into service as a multidisciplinary science platform for research in the Canadian Arctic. As part of this, the ship was equipped with a variety of acoustic and supporting survey instruments to make her capable of state-of-the art seabed mapping.

She went into service in August and is currently frozen in for the 2003-2004 winter in Franklin Bay, NWT as part of a year-long observation program. Her current work is as part of the Canadian Arctic Shelf Exchange Study (CASES) program which finishes in 2004, but she is the mainstay for ArcticNet that will be running for up to the next 14 years.

CASES is a multi-disciplinary project, which encompasses a large variety of scientific research in order to better understand the Mackenzie Shelf, and more generally the Western Arctic ecosystem. This research focuses on the effects of global warming on the biological and physical processes that make up this ecosystem. ArcticNet is a newly funded National Centre of Excellence that will continue Science in the Arctic, focusing on pan-Arctic issues associated with the predicted retreat of the polar ice cap as part of modeled greenhouse gas response.

A sub-purpose of both these studies is to examine the geology of the polar shelves and then relate it to the overall purpose of the project. Along with physical sampling of sediment, acoustic imagery was collected to support this effort. This imagery was used to determine optimal sampling locations, create a detail picture of the seabed morphology and seafloor reflectivity characteristics, and provide general safety of operations information. The different types of acoustic data/imagery collected were the bathymetry and backscatter from the Kongsberg-Simrad EM300, and sub-bottom profiles from the Knudsen 320R. Discussing the sonar systems and their data will be the main focus of this paper.

The paper describes in detail the different instruments and platform used in the collection of this data. There will be discussions on the efficiency and quality of this system as a surveying tool, operational and processing hurdles that had to be overcome, and the future use of this platform.

CCGS AMUNDSEN

The primary collection platform for the sonar equipment is the newly outfitted *CCGS AMUNDSEN* (formerly *CCGS SIR JOHN FRANKLIN*). The ship is a 98 metre 1200 class ice-breaker completely rigged for various scientific activities and capable of extended stay in the Arctic. The vessel is equipped with two different sonars for both geological and bathymetric mapping: the Kongsberg-Simrad EM300 (EM300) multibeam and a Knudsen 320R (K320R) sub-bottom profiler.

Knudsen 320R

A prime requirement of the CASES and ArcticNet programs was to be able to delineate the thickness and acoustic character of surficial sediments to depths of at least 50m where possible. Although, towed high bandwidth boomers and chirp systems were initially considered, the reality of Arctic operations meant that there would be limited opportunity to safely deploy such a towbody. Thus a hull-mounted system was chosen to ensure data collection, even if at slightly lower resolution at full ship speed (up to 16 knots) during routine transit operations and even whilst breaking ice.

Subbottom profilers in the 3.5 kHz range have been used routinely by research vessels for the past 40 years. Such systems rely on either a continuous wave or correlated pulse (chirp) and traditionally the topside electronics has been all analog. Excellent quality records have been derived by using large format electrostatic plotters. The trends in the last 10 years however, have been towards increasing the use of digitization and digital signal processing. As part of this, the majority of the US research fleet have upgraded their topside electronics for 3.5 kHz to use the K320R chirp electronics. This was chosen for the *CCGS AMUNDSEN* and the system is entirely digital without any real time hard copy paper records.

The K320R sub-bottom profiler is a chirp sonar system that sweeps through a band of frequencies between

2-7 kHz with a nominal frequency of 3.5 kHz. This particular system employs a total of 16 transducers (Massa TR-1072's) to make a single 10 kW source with a beam width of 30°. This system is capable of full ocean depths and can obtain sediment penetration up to 70m in soft sediments.

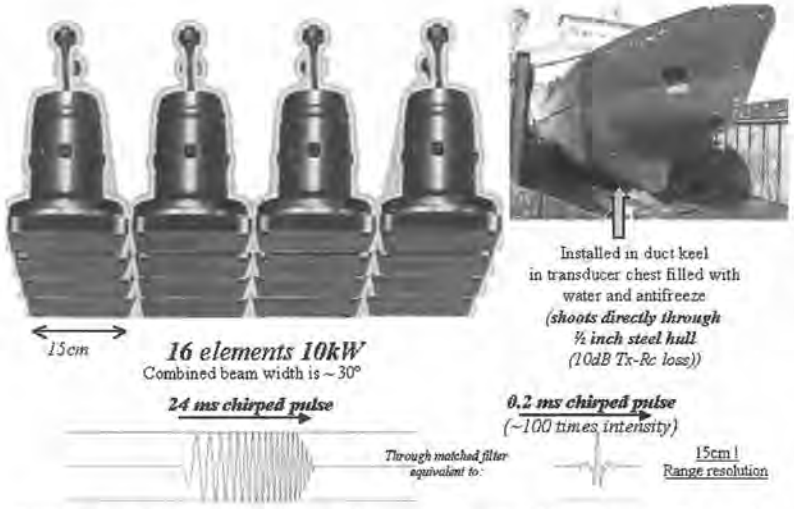


Figure 1: K320R array configuration and location onboard CCGS AMUNDSEN.

Ideally, an ice-reinforced acoustic window could have been used. However, to save costs and for simplicity, this sonar actually shoots through ½ inch of steel inside the hull of the vessel, creating a 10dB Tx.-Rc. loss. The 16 elements are mounted in a 4x4 configuration immersed in a transducer well filled with glycol and water and with a 10m stand pipe to minimize cavitations (see Figure 1).

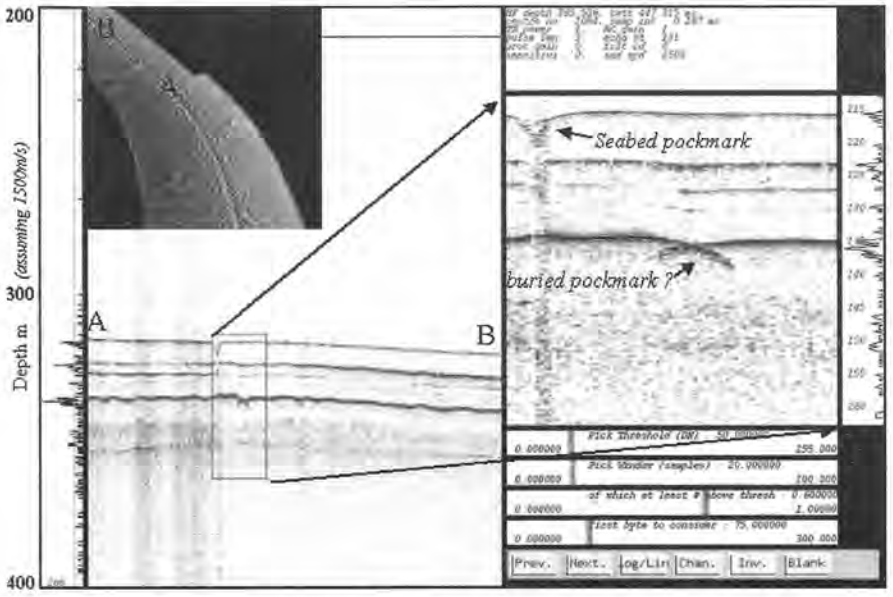


Figure 2: Illustration of data support from the K320R.

The example above (Figure 2) shows an oblique run of EM300 data extracted from a swath corridor that indicated the presence of surface pockmarks. The 3.5 kHz data support that interpretation, indicating the maximum likely depth of the origin of the gas (to shallowest unperturbed reflector). Since the data is completely digital, the image can be interrogated interactively (University of New Brunswick (UNB) in-house tool shown in Figure 2).

EM300

Based on the experience of the Canadian Hydrographic Service (CHS) and the Geological Survey of Canada, it was considered essential that the ship be equipped with some form of swath sonar system. The choice of system was a compromise. The required range of depth operations to meet the needs of CASES and ArcticNet could have been met with a 100 kHz system. However, such sonars would have had to be mounted on a retractable ram (all systems on the market today are either curvilinear arrays or tilted pairs). This would have added extra expense and prevented the system being used, should ice breaking be likely. Furthermore, all though not an immediate requirement of the polar shelf project, the vessel would be transiting through greater water depths and possibly used in the open Beaufort Sea. Thus, a capability that at least allowed some bottom tracking to ~2500m was considered an advantage. A flush-mounted system was required, that was planar and did not require any protrusions. Systems in the range of 30-50 kHz were considered the optimal compromise and a Kongsberg-Simrad EM300 was ultimately chosen.

The EM300 is a shallow to mid ocean depth system (nominally 10m-5000m), though further into this discussion we will show how this may not be achievable given this type of installation. This system has a nominal frequency of 30 kHz and the transmit fan is split into several frequency coded sectors ranging from 27-34 kHz. There are 3 or 9 sectors depending on the operating mode, which is depth dependant. These sectors are transmitted sequentially at each ping. The system accuracy is stated to be in the order of 17cm or 0.2% of water depth RMS whichever is greater, considering that the system is fully corrected in real-time for sound speed effects and vessel motion. (Konsberg Simrad AS)

The advantage of having a multi-sectored system like this, is that it allows for active motion compensation on all three axes, i.e. pitch, roll, and yaw. The benefit is that each sector can be independently steered based on vessel motion to maintain uniform sampling perpendicular to the direction of the survey line, or more generally, the traveling direction of the vessel. The *CCGS AMUNDSEN*, being an icebreaker hull, is not the most stable open water vessel and this capability provides a significantly improved coverage. Figure 3 illustrates the multi-sector/ yaw compensation situation.

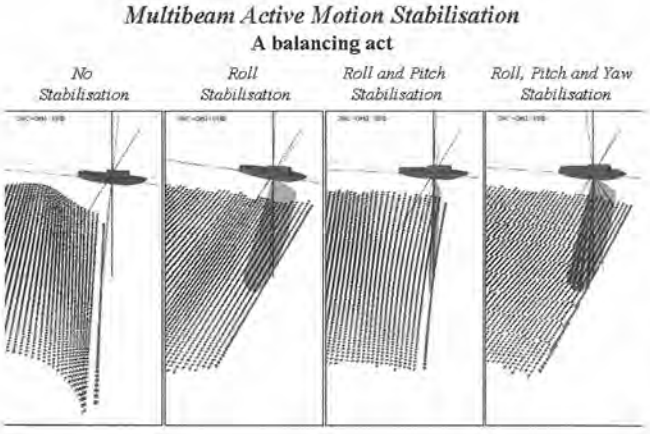


Figure 3: The result of stabilization on all three motion axes.

Installation Complications

One of the major concerns for a swath system on the *CCGS AMUNDSEN* was survivability. Ice reinforced windows would be required and the installation would have to be essentially flush. Traditional all-titanium windows have significant attenuation problems that would drastically reduce the range performance of the 30 kHz system. To get around this, new titanium–polymer windows were acquired which are designed to have only a ~10dB net loss over the combined Tx. and Rc. (Figure 4).

Figure 4: Ice window constraints on the Transmit array.

These windows again come as a compromise. Both the Tx. and Rc. arrays have to be set back, away from the hull surface and thus, both are physically masked from achieving the designed angular sectors. That, combined with known refractive effects of the windows themselves, resulted in an expected loss of achievable angular sector.

In addition to the limited angular sectors, the available keel space on the *CCGS AMUNDSEN* is not flat and the arrays could not protrude, therefore the receive array is forced to be tilted ~6° to port. As a result, the achievable sector is actually offset this same amount. It was found that 65° to port and 60° to starboard were the practical operational limits (Figure 5).

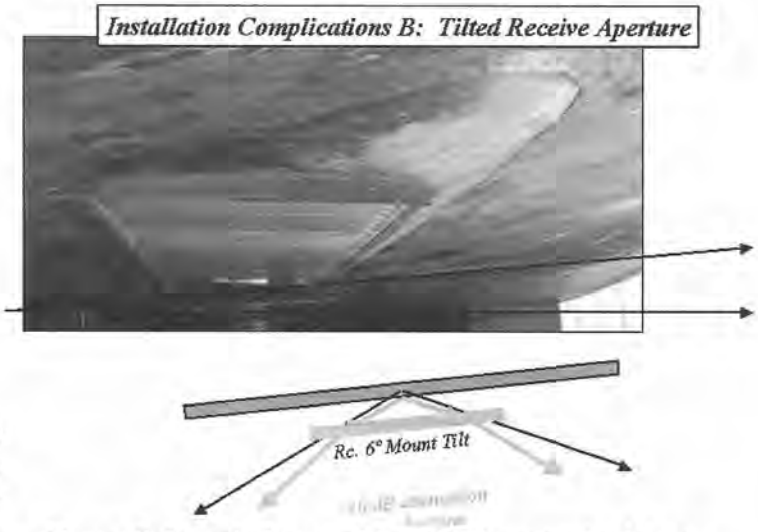


Figure 5: Ice window and installation constraints on the Receive array.

Furthermore, increasingly linear T arrays are being mounted on gondolas to place them away from the hull and relatively immune to bubble washdown. As an example, the figure below shows the installation of an identical EM300 on the *R/V OCEAN ALERT* which proved to provide usable data up to seastate 6. In contrast, the EM300 on the *CCGS AMUNDSEN* must be flush and the low inclination of the icebreaker profile of the hull almost guarantees bubble washdown. Furthermore, the arrays were unavoidably installed to the rear of a large moonpool door so that, even when fully closed, it is potentially a site of turbulence generation.

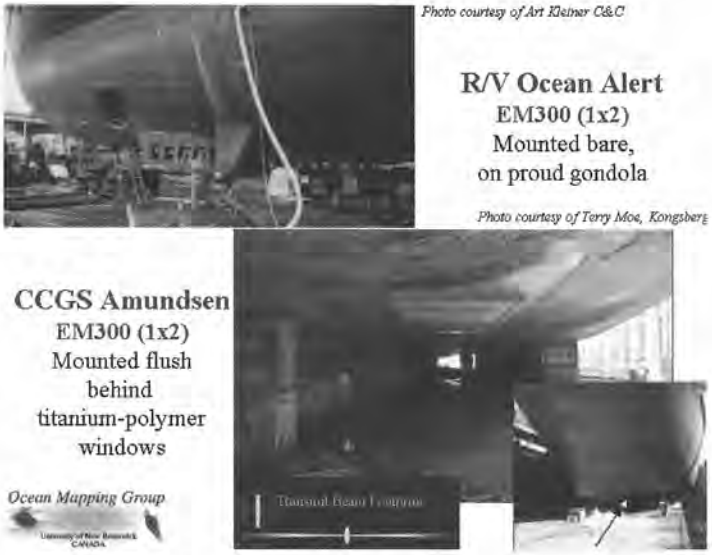


Figure 6: Comparison of installation between two different vessels.

Nevertheless, in low seastates (less than 2) excellent data was acquired at speeds up to 16 knots, indicating that flow and propulsion noise was not a barrier. But, as discussed below, at higher seastates, where pitching was pronounced, the mount proved less successful. Fortunately, the main area of predicted ship operations is the protected waters of the Canadian Arctic Archipelago.

Horizontal and Vertical Positioning

The vessel is also equipped with all the peripheral devices to make the entire system fully compliant with ocean mapping standards. The positioning system is a globally differentially corrected position C-Nav (C&C Technologies) from which we were able to obtain stable corrections at all times, including up to 74° north (Resolute). The C-Nav system also performed well inside a fjord on Baffin Island, despite 1000m+ near vertical rock faces that demonstrates the capability of the vessel exploring these features that are common on the Arctic East coast, and still maintaining an accurate position. We intended to also test the Can-DGPS service, but it was not available in real time for the first vessel transit.

The C-Nav system provides additional promise as a source of vertical control. With the lack of available tidal information in the archipelago and the imperfect modeling of the tidal phase and amplitude variability, a means of tidal constraint is sorely lacking, especially for a vessel that is usually transiting and would not have the time or equipment to set up multiple tide stations. C-Nav is one competing product that is currently claiming decimetre level ellipsoid height accuracies on a global basis. To assess the feasibility of C-Nav as a source of tidal control, an experiment was underway (16th Feb-28th March) whilst the *CCGS AMUNDSEN* is frozen into landfast ice. For that 40-day period the elevation of the vessel was being precisely monitored using echo sounding, whilst simultaneously running the C-Nav. The tidal ranges in the area are remarkably small (< 50cm) yet, with filtering, convincing M2 and K1 signatures are already being recognized (Wert et al., 2004).

If this proves feasible, together with an ellipsoid-geoid separation model for the archipelago, a stable vertical reference might be usable for all *CCGS AMUNDSEN* operations.

Orientation

Based on CHS's successful experience with the system, the ship has an Applanix POS/MV 320 system onboard to fully capture the vessel motion history and have that properly applied to the sounding data from the EM300.

For the initial transit, a Seatex MRU-6 was provided by UNB as a backup, should there be initialization problems, but fortunately, this was not necessary. The vessel also has twin gyrocompasses for heading and these are interfaced to the Kongsberg-Simrad system as a backup.

Processing Software

The multibeam and sub-bottom data was processed to completion onboard, utilizing Ocean Mapping Group's (OMG) SwathEd software, which includes a full suit of data cleaning and visualization tools.

Water Column Control

The vessel is equipped with a BOT (Brooke Ocean Technology) MVP-300 (Moving Vessel Profiler) that is capable of being towed behind the vessel and with a dipping motion, constantly collects water column information, along the travel path of the vessel. The original idea was that this instrument was to be used ubiquitously and we would import new profiles constantly into the system as they were collected, or, at least, at some pre-defined time period. This would eliminate, in real-time or in post-processing, the effects of refraction and to a smaller degree, scaling problems.

The reality of the first transit operations was that the crew was concerned for the safety of the system (despite several deployments). A secondary issue became a critical factor however. As the system is fitted with a glass conductivity cell (part of a Seabird 911 CTD) for precise oceanographic observations, it cannot be allowed to fill with fresh water (common at the sea surface on recovery) or else it would freeze and destroy the sensor. This problem is handled, with respect to the static winch CTD's, by immediately bringing the rosette into a heated garage on recovery. As a result, until a thermal storage mount is obtained, this will limit the use of the underway CTD operations. Another approach would be to use a sound speed and temperature probe (ideal for hydrographic but less than optimal for oceanographic work).

Operational Survey Procedures

The EM300 equipped *CCGS AMUNDSEN* has the capability of being Canada's premier ocean mapping platform, up to its capable operating depth. The full capability of the system has not yet been investigated due to logistical constraints such as time, sea state, and speed. However, small surveys and tracklines were conducted in the Beaufort Sea and Amundsen Gulf, which gave a preliminary look at its capabilities and effectiveness.

At this time, no leg is dedicated to seafloor mapping. Because of the wide range of scientific programs ongoing, every leg is over staffed and multi-mission. As there is such poor knowledge of seafloor morphology in the archipelago, at this time, almost anywhere the vessel steams, it provides insight into hitherto unknown seabed character. Because of the limitations of berthing, one key personnel runs the EM300, the K320R and all peripheral systems, 24 hours a day. For the first operational leg in 2004, this model proved feasible with all systems (except the MVP for reasons stated above) operating in automatic mode (bottom tracking, depth gating, source level and pulse length selections). For the first 20 days, experiments were conducted with 3 staff on board, but for the last 20

days a sole operator was responsible. With fore-planning, the operator could arrange to be awake when station keeping was conducted, to start and stop the system. Windows of opportunity prior to station experiments were used to conduct local multiple pass surveys over the area to optimize the location of the experiments. During transit, the instruments were usually unattended. With the exception of significant ice-breaking, data was acquired in this manner very efficiently. A single operator processed the data successfully in the field. Because of the likelihood of accessing water column data several hours after completion of oceanographic stations, non-standard processing procedures were implemented to allow for full reprocessing of the data after the fact (see below).

Should the vessel be used for sustained systematic survey, however, rather than transit operations, at least two and preferably three people would be required.

Archipelago Operations

To examine the vessel's capabilities and efficiency, we are going to look at two areas that show its potential for effective ocean mapping. The two areas are the Mackenzie Trough (~70.5° N, 138.8° W, 500-1300m), and the Amundsen Gulf (~70.6° N, 123.0° W, 400-700m). Using these two areas we will examine in general, the efficiency and quality of the data in terms of data resolution, swath width, and survey speeds.

Looking first at the Mackenzie Trough area, the data was collected while steaming off and around the shelf break from ~500m to ~1300m. In 1300m of water we were achieving a swath width of 3.5km to 4.0km at a speed of approximately 10 knots. The quality of the data was exceptional as we found what appears to be an underwater landslide at approximately 1100m water depth. Looking at the image below (Figure 7) one can notice that the resolution is high enough to show the debris flow from the slide. The image was gridded at 25m and that also shows that even at these depths, the data density is sufficient enough to provide an accurate depiction of the sea floor.

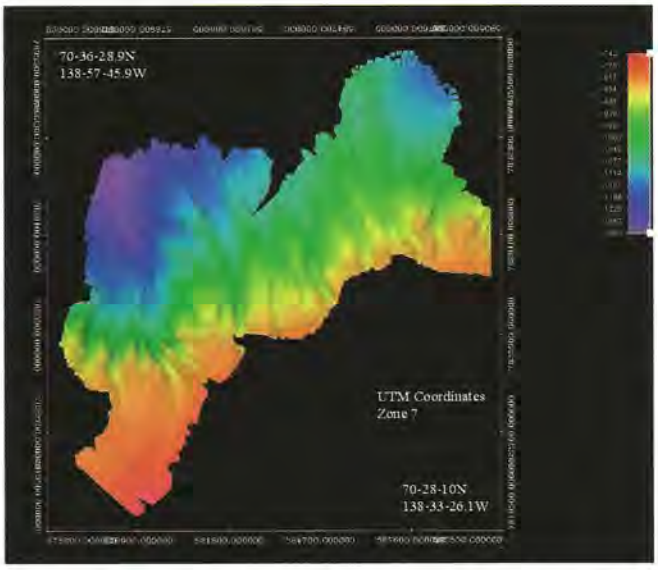


Figure 7: Shelf break in Mackenzie Trough. Notice what apperas to be an underwater

The survey conducted in Amundsen Gulf is a very good example of the efficiency and quality of this system from a practical standpoint. The survey consisted of 8 lines approximately 10km long and was conducted at a speed of 10 knots. The survey was conducted to achieve 200% bottom coverage to acquire the appropriate redundancy for certain processing requirements. The total area surveyed was ~90km² and total survey time was ~6hrs. The ~line spacing was 900m to achieve the 200% coverage, so one could see if the coverage was reduced, a greater area could be examined in the same amount of time. The system can also provide adequate backscatter measurements to aid in the determination of some the characteristics of the seafloor sediment. Figure 8 shows the bathymetry of CA-18.

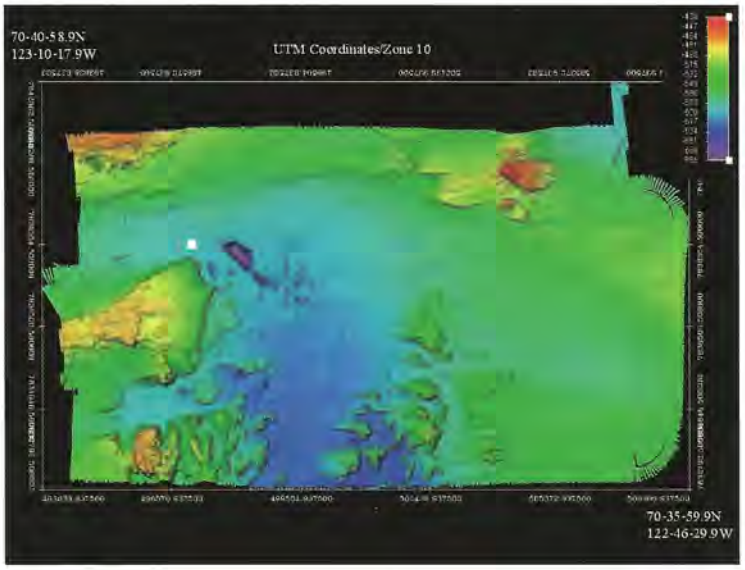


Figure 8: The survey at CA-18 (Amundsen Gulf). The white dot represents the location of a sediment sample.

Specific to the *CCGS AMUNDSEN*, we also incorporate the Knudsen 320R in the data product. The sub-bottom information collected can give somewhat of a 3D cube perspective of all areas surveyed. In conjunction with the backscatter from the EM300, it provides further information into the seafloor type and aids in sediment classification. Figure 9 illustrates how we have incorporated all data into one product.

Although the system was operated satisfactorily in depths as shallow as 10m under the keel, it is clear that the system is really most efficient in 50m+. In the Archipelago, the usual maximum depths of 500m provided optimum performance of the sonar (within the restricted angular sector imposed by the ice windows).

The complete data set acquired from Pond Inlet to the Mackenzie Trough is available online at :

http://chamcook.omg.unb.ca/~local/nwp2003

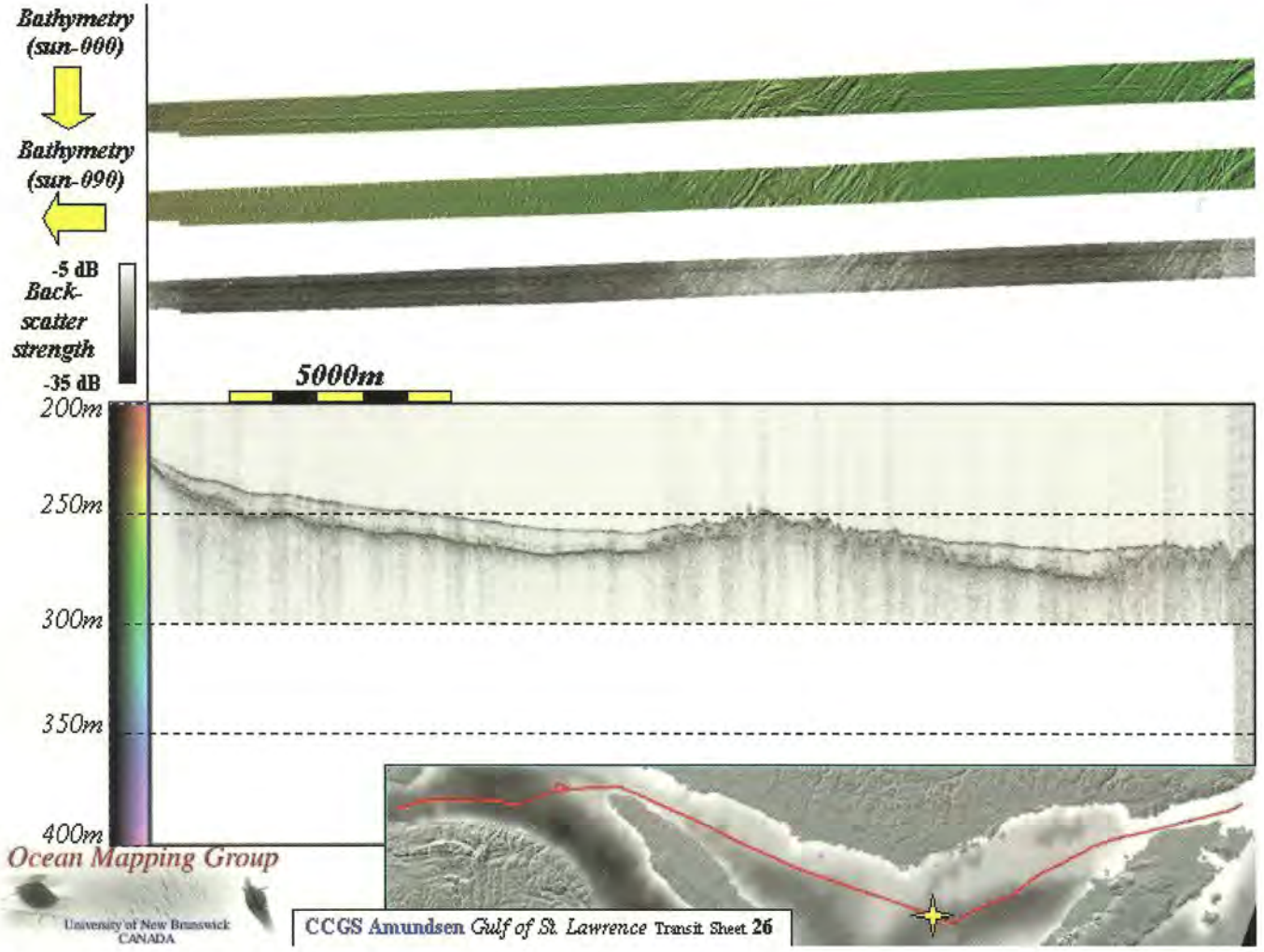


Figure 9: Example of how data from both sonars are combined to give a 3D perspective. Though this image is from the Gulf of St. Lawrence, all data from the Arctic transit is compiled the same way.

The data is presented deliberately in a transit model where 25km long sections of data are provided in which two orthogonal sun-illuminations, the multibeam backscatter and the corresponding co-registered subbottom profile are shown superimposed (Figure 9). The presentation model differs significantly from that usually used for systematic area-based surveys (for example examine the Shippagan Bay dataset at: *http://www.omg.unb.ca/Projects/Shippagan*, which contains exactly the same data types but acquired as multiple parallel offset lines). The aim of this transit model is to allow the scientific user the freedom to browse in space or time along the available transects, to examine seabed geomorphology and subbottom structure.

As site-specific systematic surveys are collected, they will be presented in the more traditional manner. In addition to the *AMUNDSEN* data, the multibeam and subbottom data collected in Canadian waters by the *USCGS HEALY* and Japanese *RV MARAI* will be presented in the same manner. It is the intent of the ArcticNet 1.6 project (managed by UNB's Ocean Mapping Group), that all data collected will be made freely available on the web, to all interested scientific parties, both nationally and internationally.

Open Water Operations

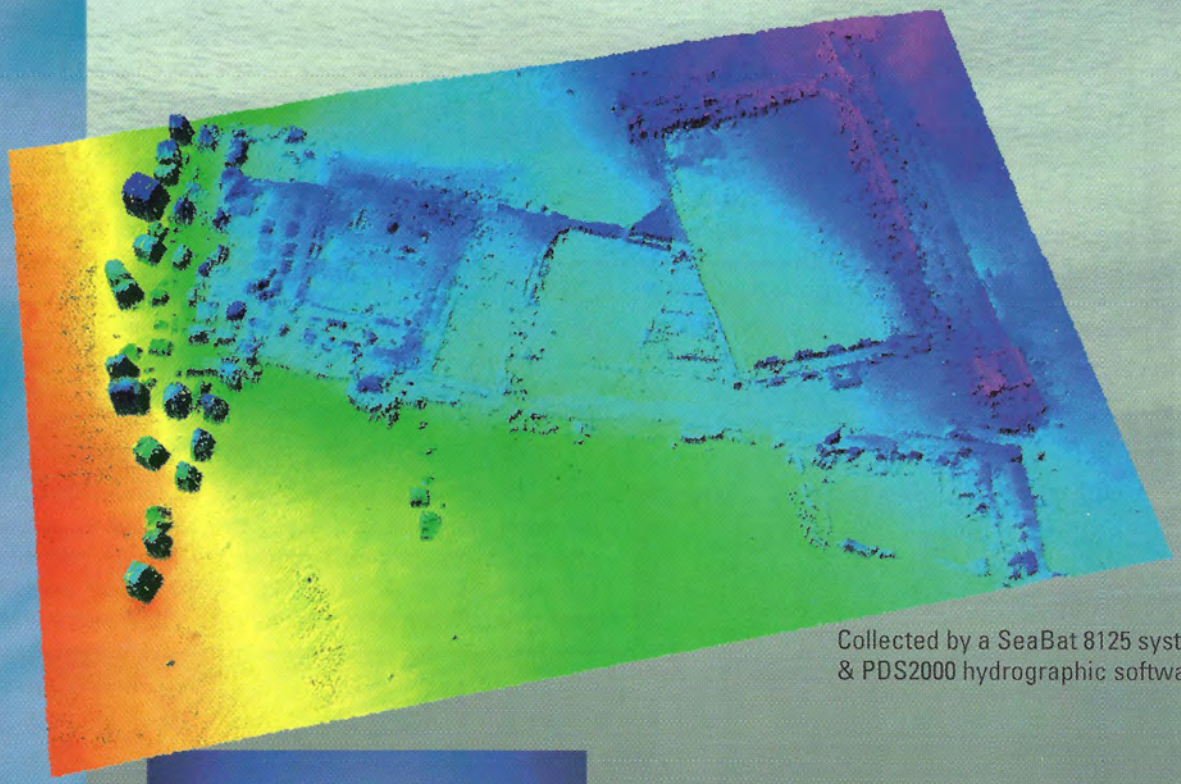
A brief test of the system was done at transit speed (14 knots) through the Labrador Sea. This proved less successful anytime the vessel would pitch more than ~2 °. This was the case until vessel speed was brought below 8 knots. It is clear that the compromise implicit in the flush mounting and the icebreaker hull profile provide a high potential for bubble wash down. Further testing of this capability will be performed in Oct-Nov 2004 as she transits home. But at this time, the system should not be committed to open water operations (none are planned for the 2004 field season anyway, and the archipelago is almost always sheltered from fetch).

Processing Considerations

Certain logistical constraints produced collection anomalies that had to be handled in post-processing in addition to the regular data cleaning and presentation. The biggest one was the inability to collect frequent water column information to derive the sound speed profiles so the system could properly account for acoustic ray-bending effects.

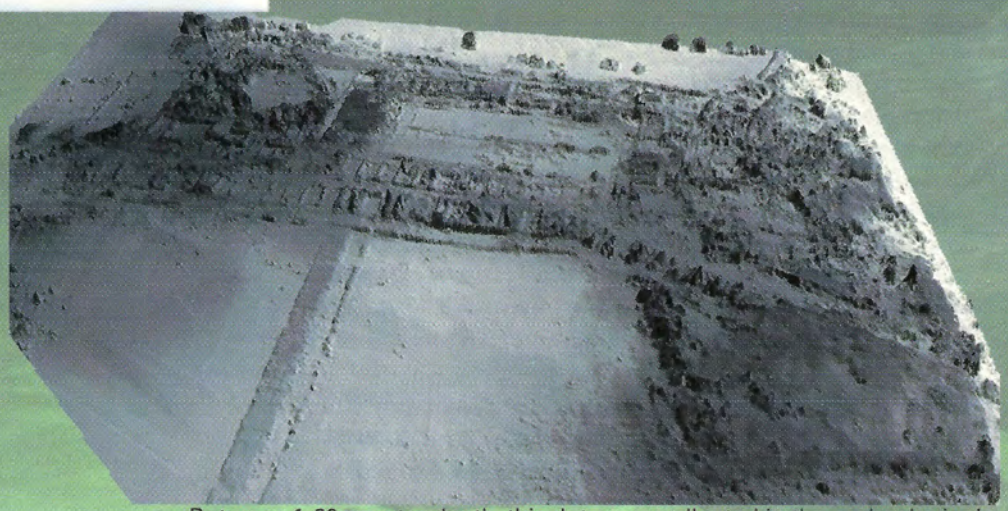
Precision Survey

SeaBat 8125: Ultra-High Resolution Focused Multibeam Echosounder System



Collected by a SeaBat 8125 system
& PDS2000 hydrographic software.

- Highest resolution multibeam echosounder
- Accuracy exceeds highest IHO standards
- Portable, easy to install and operate
- Reliable performance
- Worldwide acceptance



Between 1-20m water depth, this data was collected in the archeological area of Baia, Naples, Italy. Courtesy of the Societa' Consortile Baia Flegrea.

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The underlying problem was that, due to extensive ice cover, this instrument could not be safely deployed and operated. In its absence, the only full water column information we were able to obtain was when the vessel stopped at the location of an oceanographic mooring deployment and a CTD rosette was performed. The vessel is also equipped with a sound speed probe that is mounted to the hull to provide real-time transducer surface sound speed to ensure that proper beam steering was performed.

UNB developed code and procedures for coping with the lack of water column information. The procedure is a multi-step process that starts by ensuring that the surface sound speed is accurate by analyzing the raw data from the probe located on the hull. In areas where the surface sound speed probe supplies grossly erroneous data, the beams have to be re-pointed based on an estimate of the correct surface sound speed. After the re-pointing of the beams, the orientation is re-applied to the transmit and receive beams that finally allows for a re-raytrace of each individual beam through the new water column. The water column is derived through interpolation between each collected profile. Ideally, one would like to have continuous sampling or at least a higher frequency of static samples to compute an accurate solution. These ideas and procedures will be presented as a paper in the upcoming Canadian Hydrographic Conference 2004 in Ottawa.

The sub-bottom processing involved creating usable imagery to be used in conjunction with the EM300 data. In areas with multiple survey lines (systematic survey of parallel lines), this entails the creation of stack or fence diagrams of all the profiles existing in the survey. The Knudsen parameters were set to be constant because in real-time we are only interested in looking at the sediment penetration to view sub-bottom stratification or anomalies (buried rock outcrops etc). These parameters now need to be compensated for in order to remove certain problems in the raw data, most noticeably water column noise.

In order to remove the water column, software was developed by the Ocean Mapping Group to merge parameters from the EM300 into the Knudsen data. These parameters include the bottom track, difference in sound speed, attitude (mainly heave), draft, and computer time delay. By supplying these parameters to the Knudsen data one can now see the true bottom as determined by the EM300. This was important since, due to such a low frequency signal, the digitized bottom track was often a sub-bottom layer, which provided a stronger echo return than the true bottom. With the true seafloor now present, the software will now allow you remove anything above this defined bottom, creating a cleaner image for interpretation.

The Future

Starting in the fall of 2004, the vessel will be funded for use in the ArcticNet project, which is the integrated natural/health/social study of the changing coastal Canadian Arctic. Part of the project is studying the natural and physical effects of global warming which in turn is causing a reduction in coastal sea-ice. This sea-ice reduction will cause increase intercontinental shipping by dramatically decreasing the sailing distance between the east and west coast of North America. With this increase in shipping, there will be increased challenges related to Canadian sovereignty and security in the high Arctic. (*www.arcticnet.ulaval.ca*)

The sonar equipment is going to be used in project 1.6 of theme 1 of ArcticNet. The project is called the Opening of the Northwest Passage and involves mapping the bottom topography and geological structure of the passage and other Arctic regions as a step toward managing increased ship traffic and resource exploration. The data will also provide information toward assessing the economic/ sovereignty, and security implications of an ice free Northwest Passage. (*www.arcticnet.ulaval.ca*).

Though ArcticNet is the immediate and most prioritized in the future, there is time every year to possibly utilize the vessel and its sonar for other applications. Of the ~180 days it is available for science, currently only 75-80 days are allocated to ArcticNet. The vessel will be available already deployed in the Arctic, for the summer, for other operations either nationally or internationally. Possible other uses could include the Canadian Hydrographic Service conducting dedicated hydrography in high priority areas of the Arctic or mainland. Similarly, Natural Resource Canada may be interested in its use for resource management, Environment Canada for environmental monitoring, Foreign Affairs for sovereignty and Law of the Sea issues or the Department of National Defence may have a need for Route Survey or other strategic operations.

One of the major projects under ArcticNet is project 1.2 Coast Vulnerability in a Warming Arctic, which has a requirement for inshore mapping outside the practical range of the *CCGS AMUNDSEN*. For this project, it is conceivable that survey launches could be put onboard and in areas of high priority have the launches do the shallow inshore mapping, while at the same time utilizing the EM300 to map the deeper offshore areas. This would provide an abundance of data relevant to transportation and science, in those high priority areas.

Conclusion

The *CCGS AMUNDSEN* is Canada's newest mapping platform for the country's Arctic region. It employs two different acoustic surveying systems to fully support bathymetric and geological mapping. These systems come fully equipped with all peripheral devices so that it can fully compensate for vessel motion and position.

Data from both systems did not come without some installation and logistical constraints that had to be

recognized and handled in post-processing if applicable. One such problem was lack of water column information. This can be handled with procedures and code developed by the Ocean Mapping Group.

The sonars also proved that they could map the seafloor (<1300m) efficiently and with high quality in low sea states and ice-free waters. They potentially can be used for mapping in deeper waters, but the open water performance of these systems has not been fully explored and their maximum capabilities are not yet known.

Data products have been created and are available online where scientists and researchers can view the transit and determine where they may want to conduct further studies. This product combines all the acoustic data into one product giving the viewer access to all the data in a single image.

The future of this platform and its acoustic equipment is contained within the ArcticNet project but there is room for other agencies to acquire the vessel for more dedicated mapping projects.

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Wert, T., P. Dare, and J. Hughes Clarke (2004). "Toward Real-Time Tides from C-Nav GPS in the Canadian Arctic." Paper submitted to the ION GNSS 2004 Conference, Long Beach, CA., U.S.A., 21-24 September.

About the Authors...

Jason Bartlett is a graduate of the Geodesy and Geomatics Engineering program at the University of New Brunswick. From June 2003 to March 2004 he was employed with the Canadian Hydrographic Service to work on *CCGS AMUNDSEN* and the CASES/ArcticNet projects. He is currently employed by the Ocean Mapping Group to continue working with the ArcticNet project. He has experience in both seismic surveying and hydrography which are both integral to these Arctic projects.

Jonathon Beaudoin is a graduate student studying at the University of New Brunswick in Fredericton, New Brunswick, with his main research interest being acoustic imagery calibration for RESON multibeam echosounders. In addition to being a student in the final throes of his thesis, Jonathan is the OMG's dedicated research assistant associated with the ArcticNet project, which sees him involved in all stages of arctic mapping operations. His background in Computer Science and Geomatics Engineering is put to good use through involvement in post-processing software design in virtually all fields of research currently being pursued by the Ocean Mapping Group.

John Hughes Clarke is the Chair of Ocean Mapping at the University of New Brunswick. He has 20 years experience working with swath sonar systems. He has degrees in geology and oceanography from Oxford, Southampton and Dalhousie and has been a post-doc at BIO and at James Cook University (Queensland). He has been at UNB for 13 years, working with and now leading the Ocean Mapping Group.

An Updated Version of the Definition of Surveyors

FIG Council has decided to propose the new version of the definition of surveyors to the FIG General Assembly in Athens in May 2004 for its adoption. The new definition recognises the rapid changes in the technology and environment in the surveying profession. The new definition better covers all the aspects of surveying, like modern instrumentation and technology, and their use (e.g. acquisition and use of spatial information from close range, aerial and satellite imagery and the automation of this process). It better addresses the field of cartography and the use of GIS. In the original definition, some of the traditional surveying disciplines like geodesy were not fully covered.

Prof. Holger Magel, President of FIG considers the updated definition as "FIG's response to the requirements from the modern society for surveyors", and he further believes that "including the scientific aspects of the profession will encourage academics in the developed world to participate even more actively in the work of FIG... FIG's Definition of Surveyors will now cover the full spectrum of the surveying profession."

A surveyor is a professional person with the academic qualifications and technical expertise to conduct one, or more, of the following activities: to determine, measure, evaluate and represent land, three-dimensional objects, point-fields and trajectories; to assemble and interpret land, geographically and economically related information, to use that information for the planning and efficient administration and management of the land, the sea and any structures thereon; and, to carry out urban and rural development and land management; to conduct research into and develop such practices.

The surveyor's professional tasks may involve one or more of the following activities, which may occur either on, above, or below the surface of the land or the sea and may be carried out in association with other professionals:

1. The determination of the size and shape of the earth and the measurement of all data needed to define the size, position, shape and contour of any part of the earth and monitoring any change therein.
2. The positioning of objects in space and time as well as the positioning and monitoring of physical features, structures and engineering works on, above or below the surface of the earth.
3. The development, testing and calibration of sensors, instruments and systems for the above mentioned purposes and other surveying purposes.
4. The acquisition and use of spatial information from close range, aerial and satellite imagery and the automation of these processes.
5. The determination of the position of the boundaries of public or private land, including national and international boundaries, and the registration of those lands with the appropriate authorities.
6. The design, establishment and administration of geographic information systems (GIS) and the collection, storage, analysis, management, display and dissemination of data.
7. The analysis, interpretation and integration of spatial objects and phenomena in GIS, including the visualisation and communication of such data in maps, models and mobile digital devices.
8. The study of the natural and social environment, the measurement of land and marine resources and the use of such data in the planning of development in urban, rural and regional areas.

In the application of the foregoing activities, surveyors take into account the relevant legal, economic, environmental and social aspects affecting each project.

In total, there are eleven tasks identified. For more complete details please visit:

www.fig.net/figtree/news/news_2003/new_definition_2003.htm

En Francais:
www.fig.net/figtree/news/news_2003/definition_final_fr.pdf

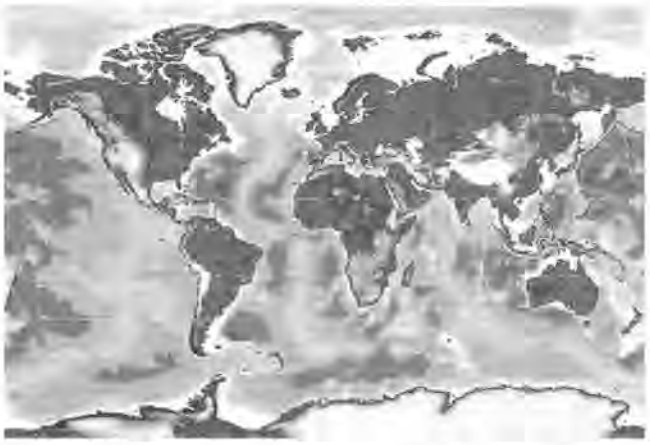
GEBCO's Second Century

Looking ahead for the General Bathymetric Chart of the Oceans

By: David Monahan, Canadian Hydrographic Service

The General Bathymetric Chart of the Oceans (GEBCO), the archetype of Ocean Mapping at a world ocean scale, celebrated its Centenary last year with the release of an updated and greatly enhanced Digital Atlas. This CD contains gridded soundings and contours culminating one hundred years of successful blending of hydrography and oceanography, both organizationally by the International Hydrographic Organization and Intergovernmental Oceanographic Commission working together, and at the individual level, by hydrographers, geologists and geophysicists working side by side contributing their different skills. This major accomplishemnet is also the first step into the next hundred years.

In this paper, the new chairman of the GEBCO Guiding Committee attempts to envision how upcoming changes in science and technology, organizations, and society, as well as some conceptual shifts, will influence GEBCO, and indeed all sea floor mapping, in the next few years.



Map of the world created from the grid of depth values in the GEBCO Digital Atlas.

Data Collection

Data will continue to be collected from surface ships and to some extent by submarines. Estimates are that even with the swath widths afforded by MBES it will take some 800 ship-years to cover the entire seafloor from the 25m contour to the deepest ocean. For multi-disciplinary cruises, bathymetry will seldom be the high priority: indeed, there are cruises on which the only sounder operated is the ship's navigation sounder. There is a move away from "expeditionary" style cruises to repetitive measurements of the same point to collect time series; the later will not produce much new bathymetry. Some deep-water data collected by military vessels during the Cold War has been released to the public domain, and there is hope that this will continue. Robots, tethered and autonomous, are already being used for detailed surveys and the use of drifters, floats and *in situ* sensors is increasing.

Positioning

The incorporation of GPS means that positioning of the research vessel on the face of the earth is no longer an issue. There will be a transition period, hopefully short lived, where mapping areas of the ocean will require a combination of pre- and post-GPS positioned data.

Data base / Data centre

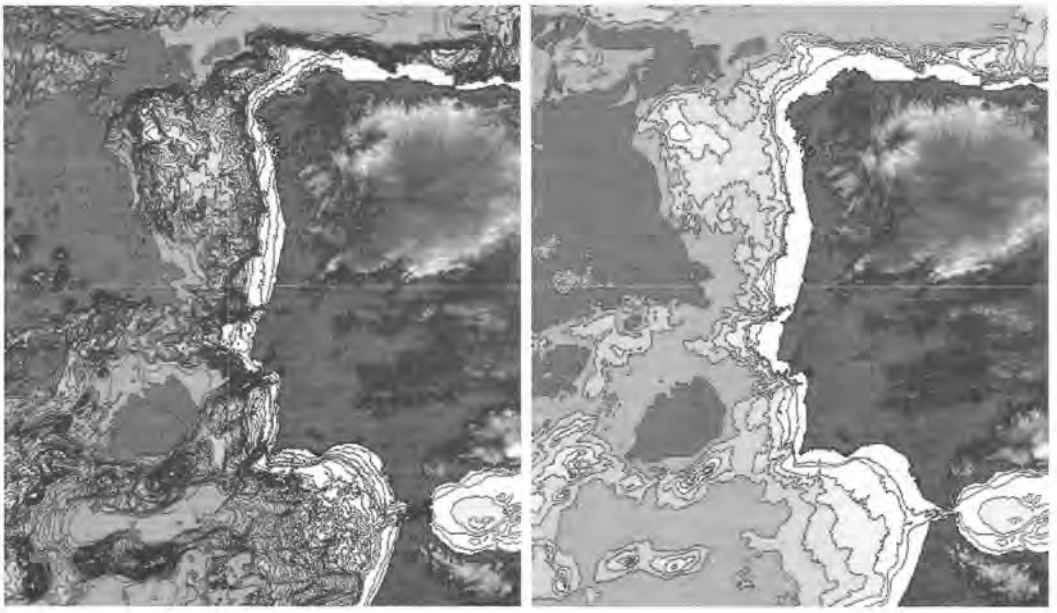
The National Geophysical Data Center (NGDC) in Boulder, Colorado, USA, operates a worldwide digital data bank of oceanic soundings on behalf of the IHO. In the future, bathymetric information may be locally managed and made available on servers maintained by those who "own" the data, creating an even greater need for quality control and standards, a role that NGDC currently performs on its data holdings.

GIS and the Internet

GIS is rapidly evolving from a field that required specialised training into a general type of software that professionals in fields ranging from aquaculture to coastal zone management are able to use easily, and they will want bathymetry as one of the GIS layers. As a major driving force in mapping, the Internet is just coming into its own. The internet will go to sea: already being developed and deployed on a limited basis, it will not be long before data can be moved from instruments aboard ships to shore-based labs, and vice versa, quickly and easily.

Seabed information

Multibeam systems are in common use, but the speed of the vessel remains a major limitation. One consequence is that for some time, both single beam and MBES data will co-exist and methods of combining them will have to be developed or perfected.



Two maps of the Atlantic west of Spain. The different contour intervals are easily selected in the GEBCO Digital Atlas.

"Automatic" seabed classification based on acoustic backscatter, which is related to bottom composition and texture, is being introduced.

Remote sensing

Altimetry, which maps changes in sea surface height and uses it as an indicator of undersea topography, is moving towards the resolution of shorter horizontal wavelength features. Altimetry can be used to unify and interpret acoustic data where it is widely dispersed and randomly oriented and will undoubtedly have a significant role in the future of world scale-bathymetric mapping since it is the only cohesive, single instrument source of data for the deep oceans.

Map scale and edition

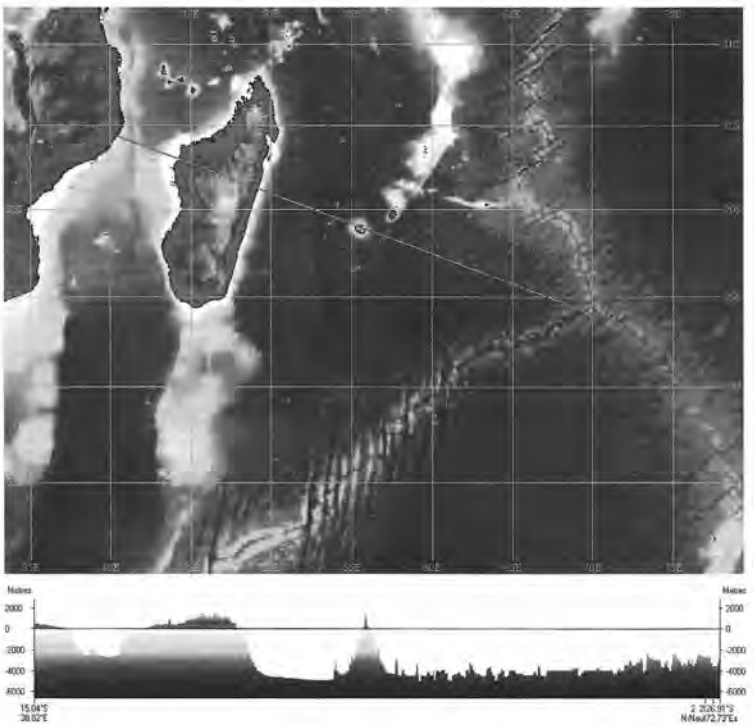
The entire concept of scale is changing with the introduction of GIS and electronic charts. In them, to see more detail, one simply "zooms in" on an area of the same map. Users assume, sometimes incorrectly, that the underlying data will support the displayed scale of information. The concept of "edition" developed during the age of paper printing is changing and some form of constantly updated map will evolve. Achieving this will require energy and time, but there are no serious technological barriers. Non-technical issues to resolve, for instance, how to apply the principal of peer review, will have to be addressed.

The changing role of interpretation

Within the area of seafloor ensonified during a multibeam survey, there is no need to interpret the shape of the seafloor and express it in contours as there was during the single beam, widely spaced track days. There is so much data that it creates the contours itself. Between multibeam passes, there will still be a need to interpret the seafloor from single beam tracks, and ways may be devised to use, in the areas between tracks, the extra information provided by the multibeam.

UNCLOS

The United Nations Convention on the Law of the Sea (UNCLOS) will impact the entire field of Ocean Mapping for the next twenty years. Delineating the juridical Continental Shelf requires a large amount of sea floor mapping and interaction with the Commission on the Limits of the Continental Shelf (CLCS). The Guidelines of the CLCS will influence data collection over extensive areas for the next ten years or so. Mapping the Foot of



Map of the western Indian Ocean. Straight line is location of profile, which is drawn easily with the software included in the GEBCO Digital Atlas.

the Slope may refine our ability to discriminate small features at great depths and accelerate development of statistical or mathematical models of the seafloor. Isolated elevations adjacent to continental margins will have to be examined to determine their origin, and the nature of some ridges will require further investigation. There will be a need to maintain a supporting data base and supporting infrastructure that could be examined by the CLCS when it considers a submission.

International Seabed Authority

Under UNCLOS, the International Seabed Authority (ISA) is the organization through which States Parties to the Convention shall organize and control activities in "the Area", which is the seabed and ocean floor beyond the limits of national jurisdiction. The ISA has issued 15-year contracts to various groups to explore certain patches of the seafloor with a view to recovering manganese nodules. The contractors have done varying amounts of work in their areas, and collected different types of data. It remains to be seen how quickly these data become part of the public domain.

Special Or Protected Areas

As part of the movement towards environmental protection, many states are declaring special marine areas in which human activity will be limited. Establishment of these areas, and the research that will be undertaken within them, will lead to detailed mapping of localized areas.

The Future Role for GEBCO

GEBCO will serve the world's marine community through mapping the world ocean floors in their entirety to higher resolutions through partnerships with organizations and individuals. Working from the shoreline outwards, and from large scale to small scale, in a process which incorporates the larger-scale data into the next successive seaward zone:

- Hydrographic Offices will continue to collect data for the safety of navigation.
- Coastal Zones will be mapped to greater intensity.
- Broad margin states will map the limits to their continental shelves.
- In some regions, these will be combined into the Intergovernmental Oceanographic Commission (IOC) (UNESCO) Regional Maps.
- GEBCO will combine these with the latest surface and satellite measurements into a cohesive and coherent ocean-wide data set.
- Outputs will include raw data, gridded or otherwise homogenized data sets, interpreted contours, digital and paper maps, and layers for marine GIS.
- Data sets will be continuously updated.

A Digital and Virtual GEBCO

Most bathymetrists dream of mapping the entire ocean floor at a fine resolution. GEBCO is the vehicle that converts bathymetric data into useable information and disseminates it to the world. The GEBCO that does so will:

- make digital products from digital data,
- produce a diversity of products based on depth and bottom characteristics,
- produce information appropriate to many scales of investigation,
- provide uncertainty indicators for the quality of each product,
- thrive on partnerships,
- provide bathymetric and other layers to users of marine GISs,
- provide a forum for facilitating and for creating linkages.

About the Author...

David Monahan holds degrees from three Canadian universities and is the Director, Ocean Mapping, Canadian Hydrographic Service. He is also a member of the Ocean Mapping Group at the University of New Brunswick. On the recent retirement of Sir Anthony Laughton, he was appointed Chair of the GEBCO Guiding Committee.

DID YOU KNOW...

LARGEST LAKE IN CANADA

Lake Superior, with its 82,107 square kilometres of water surface, is easily the biggest fresh-water body in the world. But, the lake is shared between Canada and the United States. Only 28,749 square kilometres of Lake Superior are inside Canada, so technically it isn't the largest lake "in" Canada. The biggest lake entirely encompassed by Canadian soil is Great Bear Lake in the Northwest Territories, which has all of its 31,328 square kilometres within the boundaries of Canada.

In the "solely in Canada" class, number two is Great Slave Lake, also in the Territories. Its area is 28,570 square kilometres.

An Exciting End to a Survey Season

By: Al Miller

It was near the end of September 1940 and the Hydrographic Survey ship, *WILLIAM J. STEWART* was almost finished for the season. The Department of National Defense had requested some additional information regarding the waters around the First Narrows and Vancouver Harbour. This was going to take two or three days so the skipper dropped the anchor just off Stanley Park in English Bay. The Chief Engineer decided this would be a good time to do some work on the boilers so everything was shut down.

WILLIAM J. STEWART

On the first day, most of the crew were away on the survey launches and a skeleton few were working on deck. One of the crew came down to the radio room and told me there were flashing lights coming from Stanley Park. It was thought to be Morse code and the Skipper wanted me up on the bridge.

The lights were obviously Morse but at a high rate of speed. The bridge Morse signaling equipment consisted of an incandescent light globe on a short mast and the key must have been a left over from the Ark. Due to the lamp's slow response I sent a slow QRS which was the international Q signal for Send More Slowly. I don't think the person on the other end had ever heard of QRS and came back in a lightening blur of speed. My radio code speed was not really to bad, but lights were just something else. This time I spelled out in plain English "Send more Slowly". The answer came back nice and slow and the message was to the effect that we were to move immediately as they were going to start firing practice.

Apparently, due to being war time, the military had a gun emplacement located in Stanley Park as part of Vancouver's harbour defense. Of course with the boilers shut down it would take at least a couple of hours to bring up operating steam. It would seem the people on shore were not prepared to wait that long and in no time at all we started hearing the shells whistling overhead. We eventually managed to move out of the line of fire but by that time it was all over.

I suppose those signalers on shore thought I must be a pretty dumb radio operator but when it came to reading lights I guess I was.

As usual at the end of the season, everyone is anxious to get home as soon as the job was finished. The Skipper's plan was to up anchor at a time that would have us arrive in Victoria mid morning next day. Some time late that night we entered Active Pass and it must have been at a bad time.

Knowing it was the end of the season the Chief had planned the coal supply so that the bunkers were almost empty and the water tanks practically dry. All launches were in their davits on the top deck so the *STEWART* was extremely top heavy. We must have hit a violent rip as the ship healed over to starboard, paused and shuddered. Slowly it staggered back and rolled over to port and continued lesser rolls eventually returning to normal. With the first roll I was almost thrown out of my bunk. When the ship rolled to port all the pots and pans hanging in the galley swung back against the bulkhead with a terrific crash. Apparently, with the first roll, the stokers and oilers were up and on deck in a flash. The Quartermaster told me later that the inclinometer went right off scale. The whole incident was soon forgotten in the excitement of tying up at the home wharf.

What a great way to end a survey season and my last trip as Sparks as I left the Hydrographic Service the following January.

Although the *WILLIAM J. STEWART* has long been out of service as a survey ship it was not sold for scrap. It is now a hotel and restaurant vessel, renamed *THE CANADIAN PRINCESS* and located at Ucluelet on Vancouver Island.

50 Years Ago...

The Dream of the St. Lawrence Seaway

By: James H. Marsh, Editor in Chief, The Canadian Encyclopedia
Director of Content Development, Historica Foundation

When the first sod was turned near Cornwall, Ont., August 10, 1954, it was not so much the beginning of the great St. Lawrence Seaway as a continuation of centuries of dreams.

Both Jacques Cartier and Samuel de Champlain looked with as much hope as despair over the rapids just west of Montreal. Daydreaming that the riches of China lay just beyond, the French called them "La Chine." The Sulpician priest Dollier de Casson was the first to express the idea of building a small canal to circumvent the rapids in 1680. One Gideon de Catalogne went so far as excavating a canal in 1700, but he went bankrupt only a few hundred metres from completion.

In 1781 the British, ever wary of American intentions along the border, imported a group of Cornish miners to quarry four small canals along the St. Lawrence River. These shallow canals, along with the first Lachine Canal in 1825, and the Cornwall Canal in 1843, facilitated the movement of narrow-draft bateaux from lake Ontario to Montreal.

Beyond the St. Lawrence, the greatest obstacle to navigation on the Great lakes was obviously Niagara Falls. With great ingenuity and ambition, Upper Canada completed the first Welland Canal in November 1829. Forty locks raised or lowered the vessels some 91 metres. The Welland Canal was rebuilt in 1887 and again, on a gigantic scale, from 1913 to 1932. Now that larger "upper lakers" could carry cargo from Lake Superior to Lake Ontario, the St. Lawrence canals stood out as a major bottleneck.

In 1871, the new Canadian government undertook to rebuild all existing canals to accommodate larger vessels. In one of the largest public works undertaken in Canada till that time, all canals and locks were enlarged to 14-foot (4.2 metre) depth. These canals served Canada and the United States until the 1950s. Many steamship companies had ocean-going vessels built to enable them to use the 14-foot locks. For the inland trade a fleet of some 200 ships was built to carry ore and grain.

Although the building of the modern Seaway in the 1950s is cited as a great co-operative venture between Canada and the United States, the Americans were in fact reluctant partners. There was strong opposition from the Atlantic ports, Texas ports, railway interests and others. Lobbyists persuaded the US Senate to reject a Seaway plan in 1932.

In Canada, it was clear that the St. Lawrence bottleneck was an impediment to economic growth, especially after rich deposits of iron ore had been discovered in Labrador. In 1951, Prime Minister Louis St. Laurent succeeded in twisting President Harry Truman's reluctant arm by telling him that if the Americans did not want to help build the Seaway, Canada would build it alone.

Once construction began however, the Americans acted, as Lionel Chevrier wrote, as if "they were responsible for doing the whole job." President Eisenhower, who during negotiations told Chevrier that Canada would "be better off as the 49th state," wanted to take complete control of the International Rapids section. Prime Minister Pearson replied that in that case, Canada would build its own canal and locks there as well. The US relented. (In the end, Canada footed 75% of the bill for the Seaway.)

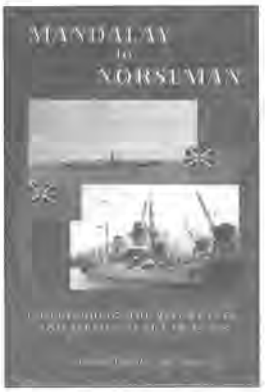
The completion of the Seaway in only five years was a phenomenal engineering and construction achievement. Some 500 engineers and 22,000 workers completed the work in half the time it took to build the Suez Canal, which has no locks.

Among the special problems faced by the engineers was what to do with the bridges over the St. Lawrence River. Those at Cornwall were simply replaced. The Jacques Cartier Bridge at Montreal had to be slowly jacked 15 metres higher. The venerable Victoria Bridge could not be jacked up, however, and the CNR, who owned it, refused to allow any interruptions in traffic. Finally an ingenious solution was found by building an extension to the south end of the bridge so that traffic could be diverted to one side or other of the lock as a ship passed.

The Canadian Coast Guard icebreaker *d'Iberville* was the first vessel to enter the St. Lambert lock on April 25, 1959. The royal yacht *Britannia* sailed in June 26, carrying the Queen and Eisenhower.

The two officially opened the seaway that day.

James H. Marsh is editor in chief of The Canadian Encyclopedia. For more information on Canada's canals, consult The Canadian Encyclopedia, published online by Historica Foundation, at http://www.histori.ca.



MANDALAY to NORSEMAN

Written by Thomas (Tom) D. W. McCulloch.

Review contributed to *Lighthouse*
by Dennis St. Jacques

Published by Trafford Publishing, Victoria, BC, Canada, 2003
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Tom McCulloch is well known to the hydrographic community in both Canada and abroad. He joined the Canadian Hydrographic Service (CHS) in 1953 as a hydrographic surveyor, served as the Regional Director of CHS for Central and Arctic Region in 1968 and then as Regional Director General of the Bayfield Institute of Marine Sciences from 1978 until his retirement in 1985. Internationally, he has made significant contributions to the International Federation of Surveyors (FIG) and directed hydrographic training programs in both the Caribbean and Malaysia. Although many of us were also aware of his background as a seafarer, I looked forward to reading the book and learning more about his earlier experiences as a mariner. I was not disappointed.

This book is about the early life and experiences of Tom McCulloch growing up on the River Clyde in Scotland and his adventures as a cadet and officer in the British Merchant Navy, until his emigration to Canada in 1948. Growing up on the banks of the River Clyde at Greenoch, Tom was continually exposed to the comings and goings of merchant ships on the Firth and he recounts stories of days spent on pleasure steamers with friends and family. Following his high school days, Tom did a short stint as an office boy while taking evening classes in navigation and seamanship, but there was little doubt that Tom would choose a life at sea.

At the age of sixteen, he enrolled as a cadet with the Henderson Line of Glasgow and was dispatched to join the *SS MANDALAY* while she was discharging cargo in Liverpool during the spring of 1941. Tom joined his ship at the height of the Blitz on Liverpool. One of the unique aspects of this book is the ability of the author to step back from his personal experiences and give the reader a broader perspective on the historical context of the events that surrounded his daily life. None were better than his poignant description of the bombing of Liverpool during 1941.

Thus begins the career of a young man aboard a cargo ship bound for Burma at the height of the Second World War. What follows is a detailed and articulate account of life as a junior cadet on the ships of the Paddy Henderson line that takes Tom to ports in Africa, India, Burma and the Middle East. His descriptions of life at sea and in port during this period are candid and often humorous and give the reader a better appreciation of the Merchant Navy's contribution to the war effort. Following his maiden voyage on the *MANDALAY*, Tom worked on the *KINDAT*, the *SALWEEN*, the *AMARAPURA* and the *OCEAN VICTORY*...all with the Henderson Line. His voyage to Murmansk aboard the *OCEAN VICTORY* in late 1943 delivering armaments to the Russian allies came under heavy attack by the German battle cruiser *SCHARNHORST*.

Throughout the war years, Tom took advantage of time ashore to upgrade his qualifications and successfully attained his second mate's certificate in 1944. He had also decided to leave the Henderson Line in order to complete this certificate and subsequently found employment on a tanker that provided support to the allied forces during the invasion of Normandy. A later voyage aboard the *CAPE BRETON* took Tom to the St. Lawrence River and Quebec City and his first visit to Canada.

Following the war, Tom and his long-time sweetheart Doreen were married on March 26, 1946 in Rock Ferry, Cheshire, England. Shortly afterward, he signed on as a deck officer on the cable laying ship, *RECORDER*, and returned to the Far East. Later, he was transferred to the *NORSEMAN* in Durban and spent the next 15 months travelling the world repairing damaged cables. He returned to England in 1948 and took his wife on a second honeymoon. This marked a turning point in Tom's and Doreen's lives which eventually saw them emigrate to Canada in April of 1948. It also marked the end of the first volume of Tom's life story.

I found this book to be both informative and entertaining. It provides unique insights into the world of the British Merchant Navy that could only be provided by someone who had experienced it firsthand. It is also a frank and honest portrayal of the life of a seafarer during the war years. I look forward to the second volume.

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NetSurvey is one of the leading multibeam service solution providers worldwide. We provide a specialist service to survey companies, ports and harbor authorities and research and government organizations. We are at the forefront of multibeam technology, combining the latest equipment and software to give unrivalled results in new and complex areas, such as ROV based surveys, fisheries habitat mapping, detailed wreck investigation and many others.

We can supply any portable multibeam system suitable for vessel, ROV or AUV deployment and all ancillary sensors installed, operated and processed by a team of highly trained multibeam surveyors and engineers. Our specialist personnel are also available to supplement your offshore teams or to act as client representatives.

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IVS has a dynamic and creative team of professionals that are committed to advancing visualization technology; and dedicated to unveiling opportunities to develop and improve visualization and interpretation software in ways that will provide our clients with first-rate software tools to ensure success of their business or research endeavours.

IVS is headquartered in Fredericton, New Brunswick, Canada with an office in Portsmouth, New Hampshire. Both offices provide full support, worldwide in association with a number of alliance partners.

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HydroService AS is a Norwegian company with a strong technological base and a thorough understanding of requirements needed to establish and operate an effective Hydrographic Office.

Being the originators of the acclaimed dKart Inspector S-57/ENC QC/Validation software the company have additionally developed and have in service a complete range of modular COTS tools offering all the system functionality required by a Hydrographic Office.

With the introduction of S-57 International Standard of Cartographic Data Exchange, the nautical cartographic world (HOs) faced the problem of digital data production, as it required double work - to produce traditional paper charts and to establish and support ENC production.

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Gemini Positioning Systems Ltd. is a Calgary based GPS company with over 20 years experience in satellite positioning technology. In addition to providing integrated GPS based solutions, Gemini is the exclusive Canadian Ashteche distributor for Thales Navigation. Gemini also distributes the CSI Wireless brand of DGPS receivers and software.

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Due to the acquisition of Ashteche by Thales Navigation the DSNP product names such as 6501 SK/MK, 6502 SK/MK, Aquarius and Sagitta and the full Ashtech product line will be re-branded under the Thales Navigation brand name. Thales concluded that to enhance marketing efficiency these two product lines would best be represented under one professional brand name.

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C & C Technologies

C & C Technologies (C & C), an international hydrographic surveying company, headquartered in Lafayette, Louisiana, has approximately 170 employees and four offices worldwide.

As of January 2003, eighty percent of C & C's revenues were derived from survey work for the oil and gas industry and the other twenty percent are derived from US government contracts. The oil industry work includes high-resolution marine geophysics for hazard studies and pipeline route surveys, rig and barge positioning, acoustic positioning for ROV's, as well as satellite navigation services. The company has separate offshore oil industry survey departments for geophysical work, marine construction, and navigation.

C & C Technologies has performed hydrographic survey work for various Government groups including NOAA, the US Geological Survey, and the Corps of Engineers. In 1994, C & C was contracted by the U.S. Naval Research Labs to perform research and development work on semi-submersible autonomous underwater vehicles (AUV's) for hydrographic surveying purposes. In January 2000, C & C and Kongsberg Simrad began working on C & C's new commercial AUV rated for water depths up to 3000 meters. The AUV's sensor payload included multibeam swath high resolution bathymetry and imagery, chirp side-scan sonar and sub-bottom profiler, differential GPS integrated with acoustic / inertial navigation and acoustic communications. Since delivery in January 2001, C & C's AUV has completed over 11,000 nautical miles of survey lines for a variety of worldwide clients.

Additional services offered by C & C include: C-Navä, the highest accuracy worldwide Gc-GPS differential correction service available, deep water jumbo coring (up to 30m) collected in water depths to 3000m, in-house state-of-the-art soil analysis lab, and 3 D hazard assessment reporting for MMS deep water site clearances.

For more information regarding C & C Technologies services please contact:

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Kongsberg Maritime, a company in the Kongsberg Group, is a leading supplier of advanced multibeam and single beam echosounders and instrumentation systems.

With its strong application knowledge and trend-setting quality products, Kongsberg Maritim is able to offer unique and complete solutions for ROVs, AUVs, positioning systems and sea bed surveying and mapping.

Kongsberg Maritime has about 980 employees with subsidiaries world wide. Canadian operations include a sales office in Halifax and a factory in Port Coquitlam, British Colombia.The Headquarters are located in Kongsberg, Norway. Kongsberg Maritime exports its products to all of the world's major markets.

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News From Corporate Members
Nouvelles de Membres corporatifs

Association of Canada Lands Surveyors
Association des Arpenteurs des Terres du Canada

The Association of Canada Lands Surveyors (ACLS) is a federally enacted self-regulating professional association with 540 members located across Canada who have expertise in all disciplines related to geomatics. It's a true professional home for hydrographers.

L'Association des Arpenteurs des Terres du Canada (AATC) est une corporation professionnelle de juridiction fédérale. Elle comprend 540 membres répartis sur tout le territoire canadien qui oeuvrent dans toutes les disciplines de la géomatique. C'est un véritable domicile professionnel pour les hydrographes.

In October 2003, the ACLS held its Second Offshore Issues Consultation Workshop. Copies of the proceedings from both workshops are available at:
www.acls-aatc.ca/english/offshore/offshore.htm

The ACLS will hold its Annual General Meeting in Whitehorse, Yukon on June 8 to 11, 2004. For information on the AGM activities, consult the ACLS Web site.

En Octobre 2003, l'AATC a tenu son second atelier consultatif sur les questions extracôtières. Des copies des rapports des deux ateliers sont disponibles à:
www.acls-aatc.ca/francais/offshore/offshore.htm

Le prochain congrès de l'AATC se déroulera à Whitehorse, Yukon, entre les 8 et 11 juin, 2004. Pour les renseignements, visitez le site Web de l'Association.

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Kongsberg EM300 deep-water multibeam sounder selected for Canadian Arctic Research

A state of the art EM 300 1X 2 degree multibeam, hydrographic echo sounder and two EK 60 Scientific echo sounder are the latest tools provided to CASES, the Canadian Artic Shelf Exchange Study. Funded by the Natural Sciences and Engineering Research Council of Canada, CASES is an international effort under Canadian leadership the will create a floating lab for approximately 45 researchers from 11 countries. An EM300 multibeam with the latest in acoustically friendly ice protection were deployed this past summer aboard the former *CCGS FRANKLIN* in her new life as the Arctic research ship *AMUNDSEN*.

AMUNDSEN will work the Canadian Arctic during a 10 year period to revise the existing models of climate change.

For more information please visit:
www.cases.quebec-ocean.ulaval.caa

C & C's AUV Completes Tahiti Project

C & C Technologies recently completed an AUV hazard survey in Green Canyon 596, 640 and 641 for CheveronTexaco's Tahiti project. C & C's AUV, aboard the R/V Supporter, collected high-resolution multi-beam bathymetry, side scan sonar and sub-bottom profiler data in water depths ranging from 1000 to 1300 meters. During the project, the AUV collected over 1000 kilometers of survey line data that was analyzed by onboard route engineers for QA/QC measures.

Since becoming operational in January 2001, C & C's AUV has performed more than 26,000 kilometers of surveys on 54 different projects for government agencies and the oil and gas industry. The water depths for these projects range from 100 to 2850 meters and encompass different levels of complexity. Some of the more high profile projects have been locating historical World War II shipwrecks, performing pipeline investigation surveys and surveying through a full-scale production FPSO location.

C & C Technologies provides a variety of survey services including high accuracy Globally-corrected GPS services, marine construction surveys, high-resolution geophysical surveys, geotechnical surveys including full laboratory testing, as well as land surveys.

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www.cctechnol.com/

Interactive Visualization Systems, New FLEDERMAUS Version 6 Released

Fredericton, New Brunswick, Canada – January, 2004 – Interactive Visualization Systems (IVS), a leading provider of 3D visualization and analysis software, announced today, a major new release of Fledermaus – Version 6. Of the many new features the most significant changes include a native graphical user interface on all platforms with focus on ease of use and efficiency. A new parsing engine for Multibeam, Lidar and other point-based datasets has greatly improved Fledermaus's data handling capabilities. Significant new applications such as omniview, fmcommand and crosscheck along with a new movie making toolset enhance the package's visualization and analysis capabilities.

In addition, Version 6 adds support for the Macintosh platform in addition to Windows, Linux, SGI and Sun. "With the expansion to operation on Mac OS X, Fledermaus can now be utilized by a larger user group. Universities and other academic institutions will see this as a great benefit, as many work on the Mac platform", stated Graham Nickerson, Sales and Support.

Interactive Visualization Systems (IVS) provides innovative and flexible tools for scientific 3D visualization and analysis for surveying, mapping and research. Interactive Visualization Systems' products and services are available worldwide. The company's headquarters are located at 2 Garland Court, PO Box 69000, Fredericton, New Brunswick, Canada E3B 6C2.

For more information please contact:
IVS at (506) 454-4487
www.ivs3d.com

Kongsberg Maritime Customers Benefit From Longer Warranties

Kongsberg Maritime has extended the warranty period on its line of multi beam and single beam echosounders from 1 to 2 years. With a range of echosounders already proven as powerful, effective and cost efficient, Kongsberg Maritime has taken the step of increasing the warranty period in order to offer customers and users further confidence that they have purchased equipment that can be relied on to do the job, without costly and potentially hazardous downtime.

As a major supplier of hydrographic equipment to the offshore marine and scientific communities, Kongsberg Maritime continues to invest R&D into increasing the reliability of its benchmark echosounder systems. The extended warranties are a result of the increase in system reliability achieved in the last two years.

Kongsberg Maritime Echosounders ordered after 1st January 2004 will be subject to the new warranty period.

For more information please contact:
Kongsberg Maritime at (902) 468-2268
www.kongsberg.com

Lighthouse puzzler

By
Beth Weller

with a tip of the hat to Robert W. Service.

	Dogsled	Skis	Snowmobile	Helicopter	Ottawa	Vancouver	Rimouski	Dartmouth	Inuit village	Polar bear	Deepwater port	Landing strip
Paola												
Jim												
Earl												
Carol												
Inuit village												
Polar bears												
Deepwater port												
Landing strip												
Ottawa												
Vancouver												
Rimouski												
Dartmouth												

Lighthouse Puzzler #25

It was the end of the Arctic survey season and a bunch of the CHA guys were whooping it up in the Malamute Saloon. Each of them had wild tales of long days out in the Great Alone, and each had known hunger and night and the stars. It was quite an evening. From what you remember the next morning, can you figure out which CHA Branch they hailed from and who was tagging polar bears?

(Mark an "O" in the boxes for a yes and an "X" for a no. Each column and row will end up with one O and three Xs. Write the answers in the table as you figure them out.)

1. Paola, who was not into heights, was not laying out a new landing strip or using a snowmobile.
2. The one from Ottawa is allergic to dogs and was not looking for a site for a deepwater port.
3. Earl, not from Vancouver or Ottawa, was looking for the Inuit village by skis.
4. Carol, from Atlantic Branch, did not use a helicopter or a dogsled laying out the new landing strip.

Solution to Puzzler #24

Tim and Bernard are not from Central Branch (St. Clair River, clue 2) nor Pacific Branch (Vancouver, clue 4) so, being in adjacent Branches of CHA, must be with Atlantic Branch and the Section du Québec; this means that Stacey must be the one out of helicopter fuel with Pacific Branch, and is out in the summer (back by Labour Day, clue 3).

Bruce was out in the spring, Stacey was summer, and Bruce was winter, so Tim must be the one out in the fall.

Writing the known information in the table, it is clear that the only possible spot for the untethered boat in Halifax, i.e. Atlantic Branch, is with Tim in the fall. So, filling in the final spaces, Bruce's engine is the one that blew up, and Bernard is with the Section du Québec.

THE CANADIAN HYDROGRAPHIC ASSOCIATION AWARD
LA BOURSE DE L'ASSOCIATION CANADIENNE D'HYDROGRAPHIE

(est. 1992 / établier en 1992)

$2,000 for a "Deserving Student" / 2000$ pour un étudiant méritant

Application Criteria

1. The applicant must be a full time student registered in an accredited survey science program (the program must have a Geographic Information Systems, Cartographic, Land or Hydrographic Survey component) in a university or technological college anywhere in Canada. The Administrator of this award will determine the eligibility of the program for the award.

2. The award will be available only to students who are in their second year of study in the degree or diploma program (under graduate) that conforms to the basic subject topic. The applicant will be required to submit a transcript of his/her first year marks at the time of application. The marks must indicate an upper level standing in the class and under no condition less than 70%.

3. The award will be presented to an applicant who can demonstrate a bona fide financial need, coupled with an above average academic performance as stated above.

4. The applicant will be required to write a short paragraph explaining his/her financial need in a clear, concise manner on the application form or, if necessary, attached piece of paper. The importance of this aspect of the application is emphasized.

5. The award application will be submitted to the Administrator of Canadian Hydrographic Association Award Program by June 30 each year and to the address in item 11 below.

6. The value of the award is $2,000. There is one award only each calendar year.

7. The successful applicant will be issued with a special Hydrographic Association Certificate, duly framed, at the time the award is made. He/She will also receive a medallion with the Hydrographic Association Crest and have his/her name mounted on a perpetual winner's plaque. A picture of the plaque duly inscribed will be mailed to the winner along with the $2,000 cheque during the second week of July.

8. The applicant must submit one letter of reference from a official of the university or college where the applicant spent the previous year. This letter of reference must include the address and phone number of this official.

9. An individual student may receive the award once only.

10. The successful applicant's letter of appreciation will be published in the next issue of our professional journal "Lighthouse".

11. Application will be made on the form supplied, which is available from your school's awards office, and sent to:

Critères d'admissibilité:

1. Le candidat doit être un étudiant inscrit à plein temps à un programme reconnu en sciences géodésiques (ce programme doit inclure les systèmes d'informations géographiques, la cartographie, les levés terrestres et hydrographiques) dans une université ou un collège au Canada. L'administrateur de cette bourse déterminera l'éligibilité du programme pour la bourse d'études.

2. La bourse s'adresse seulement aux étudiants qui seront à leur deuxième année d'étude dans un programme menant à un diplôme collégial ou de premier cycle universitaire conforme aux sujets de base. Le candidat doit soumettre une copie de son relevé de notes de sa première année avec sa demande. Les notes doivent être supérieures à la moyenne et avoir une moyenne inconditionnelle supérieure à 70 %.

3. La bourse sera remise au candidat qui, de bonne foi, peut démontrer ses besoins financiers et qui respecte les performances académiques exigées ci-haut.

4. Le candidat devra écrire un court texte, d'une manière claire et concise, démontrant ses besoins financiers sur le formulaire de la demande ou, si nécessaire, sur une lettre jointe. Une grande importance est accordée à cet aspect de la demande.

5. La demande doit être soumise à l'administrateur du programme de la bourse de l'Association canadienne d'hydrographie au plus tard le 30 juin de chaque année à l'adresse mentionnée à l'article 11 ci-bas.

6. La valeur de la bourse est de 2000 $. Il n'y a qu'une seule bourse remise à chaque année civile.

7. Le récipiendaire recevra un certificat spécial de l'Association canadienne d'hydrographie, dûment encadré . Il recevra aussi un médaillon à l'effigie de l'Association canadienne d'hydrographie et son nom sera ajouté sur la plaque des gagnants. Une photo de la plaque gravée sera postée au gagnant avec un chèque de 2000 $ au cours de la deuxième semaine de juillet.

8. Le candidat doit soumettre une lettre de référence d'un représentant de l'université ou du collège où il a suivi son cours l'année précédente. Cette lettre de référence doit inclure l'adresse et le numéro de téléphone de ce représentant.

9. Un étudiant peut recevoir la bourse qu'une seule fois.

10. Une lettre d'appréciation du récipiendaire sera publiée dans l'édition suivante de notre revue professionnel "Lighthouse".

11. La demande devra être faite sur le formulaire prescrit, lequel est disponible aux bureaux de vos écoles, et envoyée à :

Barry M. Lusk, Manager / Administrateur
Canadian Hydrographic Association Award Program / Bourse de l'Association canadienne d'hydrographie
4719 Amblewood Drive, Victoria, BC V8Y 2S2
E-mail: luskbm@telus.net FAX : (250) 658-2036 Website: *www.hydrography.ca*

ANNOUNCEMENTS / ANNONCES

The purpose of this column is not to provide an all-encompassing calendar of hydrographic-related events but to provide you with information on events sponsored by organizations or individuals to whom CHA is connected with. Input comes from organizations such as the CHS, ACLS, FIG, CIG, THSoA and the International Federation of Hydrographic Societies.

UKHO's Ritchie Building opens for business

November, 2003 The United Kingdom Hydrographic Office (UKHO), based in Tauton, Somerset has officially opened its new state-of-the-art archive repository, courtesy of HRH, The Duke of York. The UKHO has a tradition of naming its buildings after past Hydrographers such as Dalrymple, Bligh and Beaufort. The new archive, which will store hydrographic surveys and charts created since 1795 as well as original material dating back to the 16th century voyages of discovery by Cook and Flinders, has been named the Ritchie Building in honour of Rear Admiral CG Ritchie CB DSC FRICS. Former Hydrographer of the Royal Navy (1966-71), Rear Admiral Ritchie is a CHA Life Member. *www.ukho.gov.uk*

His Royal Highness The Duke of York and Rear Admiral GC Ritchie

MULTIBEAM SONAR Training Course (Canada) / Cours de formation en SONARS MULTIFAISCEAUX

The 33rd Coastal Multibeam Sonar training course will take place in Ottawa-Gatineau from **17 to 22 May, 2004**. This training is regarded as one of the best sources for multibeam sonar training in the world. The course will precede CHC 2004.
For more information visit *www.chc2004.com* or email *info@chc2004.com*.

Le cours de formation de la Commission hydrographique US/Canada de Sonars cotiers multifaisceaux se tiendra du 17 au 22 mai, 2004 à Gatineau-Ottawa. Ce cours est l'un des meilleurs au monde en cette matière.
Pour de plus amples renseignements, visitée : *www.chc2004.com* ou courriel *info@chc2004.com*.

Canadian Hydrographic Conference CHC2004, A Canadian Celebration of Hydrography: Foundation for the Future 100 years of Canadian Hydrography 1904-2004

CHC2004 will take place in Ottawa, **May 24-27, 2004**. Help celebrate 100 years of hydrographic achievements while looking ahead toward the future and its innovations and changes. The conference is intended for the marine community in general, with specific sessions for marine historians, marine science and geomatic interest groups. Traditionally CHC attracts up to 500 delegates from approximately 20 countries globally.

CHC 2004 is committed to excellence in program knowledge content, networking opportunities and partnership building. The program will be well balanced between historical content and current practises and innovations within the field of hydrography. Training workshops, with specific hydrographic and cartographic methods and procedures highlighted will be offered along with the United States/Canada Hydrographic Commission Coastal Multibeam Sonar Training Course. These two elements will be held prior to the conference dates. CHC 2004 is co-hosted by the Canadian Hydrographic Service (CHS), Canadian Nautical Research Society (CNRS) and Canadian Hydrographic Association (CHA). Sponsorship opportunities exist for well-matched organizations with like-minded interests.

Situated along the beautifully historical Rideau Canal, Ottawa is an excellent venue for this upcoming conference. Delegates will benefit from several unique social activities that are scheduled throughout the conference.

Please *visit www.chc2004.com* for information on registration, exhibiting, sponsoring or training workshops.

Assistez à la Conférence hydrographique du Canada (CHC 2004) qui se déroulera du **24 au 27 mai 2004**. Joignez-vous à nous pour souligner les 100 ans de réalisations hydrographiques tout en nous penchant sur l'avenir, l'innovation et les changements. La conférence s'adressera de manière générale à la communauté marine et offrira des séances spécifiques à l'intention des historiens marins, des scientifiques marins et des groupes ayant un intérêt en géomatique. Par le passé, la CHC a attiré jusqu'à 500 délégués de quelque 20 pays.

La CHC 2004 veille à assurer l'excellence du contenu du programme ainsi que des possibilités de réseautage et d'établissement de partenariats. Le programme reflétera un bon équilibre entre le contexte historique et les pratiques et innovations actuelles dans le domaine de l'hydrographie. Des ateliers de formation soulignant des méthodes et procédures hydrographiques et cartographiques particulières auront lieu de même que le cours de formation de la Commission hydrographique États-Unis/Canada sur les sonars multifaisceaux côtiers. Les ateliers et le cours se tiendront avant la conférence. Les hôtes de la CHC 2004 sont le Service hydrographique du Canada (SHC), la Société canadienne pour la recherche nautique (SCRN) et l'Association hydrographique canadienne (AHC). Des possibilités de commandites sont offertes aux organisations ayant des intérêts similaires.

La ville d'Ottawa, où coule le magnifique canal Rideau, est un emplacement de choix pour cette conférence. Les délégués pourront participer à diverses activités sociales uniques prévues dans le cadre de la conférence.

Visitez le site *www.chc2004.com* pour plus de renseignements sur l'inscription, l'exposition, les commandites ou les ateliers de formation.

FIG Working Week 2004, The Olympic Spirit in Surveying

This year's working week will be held in Athens, **May 22-27, 2004**. Commission IV (Hydrography) and its work groups will be meeting to present a technical session and tour.
For more information visit *www.fig2004.gr/*

Canadian Institute of Geomatics, New Brunswick Branch- Geomatics Atlantic 2004

The New Brunswick Branch of the Canadian Institute of Geomatics cordially invites you to participate at *Geomatics Atlantic 2004* to be held **June 7–9, 2004** in Fredericton, New Brunswick. This year's conference highlights *digital data issues and the what - where - why - when - how* we get and use our spatially referenced data.

In its seventeenth year, Geomatics Atlantic 2004 will bring together Atlantic Canada's Geomatics practitioners and policy makers in a relaxed, informative and productive three-day event. With a concurrent conference and exhibition, pre-conference workshops and after-hours entertainment and activities, attendees will enjoy both technical sessions and deal-making opportunities, while enjoying the beautiful Saint John River Valley at Fredericton, New Brunswick.

For more information visit: *www.geomaticsatlantic.com.*

97th Annual CIG Geomatics Conference 2004

Geomatics: Powering the Future
June 21-23, 2004
Westin Hotel
Ottawa, Ontario

It is our great pleasure to invite you to the 97th Annual Conference of the Canadian Institute of Geomatics (CIG), **Geomatics: Powering the Future**. This Conference will explore the increasing role of geospatial technology in Canada and how it is moving from innovation to an everyday reality.

Over the years, CIG has supported the geomatics excellence in Canada and expects that this will continue. This excellence and the outstanding international reputation of the Canadian geomatics community has resulted from the contribution of academic institutions, technical schools, government agencies, commercial corporations and professional associations. Our world-class professionals are capable of satisfying the geomatics requirements of all clients and users. The Conference offers an excellent opportunity for presenters to showcase varying solutions to a variety of geomatics problems and work to create an even brighter future for the geomatics community.

Geomatics: Powering the Future promises to be an outstanding professional event.

For further details, please visit our website at:
www.cig-acsg.ca.

97e Conférence annuelle de l'Association canadienne des sciences géomatiques 2004

La géomatique : Une force pour l'avenir
Du 21 au 23 juin 2004
Hôtel Westin
Ottawa, Ontario

C'est avec plaisir que nous vous invitons à la 97e Conférence annuelle de l'Association canadienne des sciences géomatiques (ACSG), dont le titre est **La géomatique : Une force pour l'avenir**. Cette conférence examinera le rôle grandissant de la technologie géospatiale au Canada et comment elle évolue, en passant du stage de l'innovation à une réalité quotidienne.

L'ACSG a appuyé, au cours des années, l'excellence en matière de géomatique et s'attend encore à faire de même. Grâce à la contribution des établissements d'enseignement supérieurs, des écoles techniques, des organisations gouvernementales, des sociétés commerciales et des associations professionnelles, la communauté canadienne de la géomatique a atteint non seulement cette excellence, mais aussi une réputation internationale exceptionnelle. Ainsi, nos professionnels de calibre international peuvent

tous les clients et usagers. La Conférence offre donc une occasion idéale aux présentateurs de démontrer diverses solutions à une vaste gamme de problèmes et de travaux géomatiques pour créer un avenir prometteur au sein de la communauté de la géomatique.

La géomatique : Une force pour l'avenir promet d'être un événement professionnel formidable.

Pour obtenir de plus amples renseignements, veuillez visiter notre site Web à l'adresse suivante : *www.cig-acsg.ca*

International Society for Photogrammetry and Remote Sensing, ISPRS 2004, Geo-Imagery Bridging Continents

The 20th Congress of ISPRS will be held in Istanbul, **July 12-23, 2004**. At present the Call for Abstracts is out.
For more information visit *www.isprs2004-istanbul.com*

FIG Regional Conference for Asia and the Pacific

Commission IV(Hydrography) will be holding a regional meeting during the conference which be held in Jakarta, **Oct. 3-7, 2004**
For more information visit *www.ddl.org/figtree/events/events2004.htm*

CCMC- Ocean Innovation 2004
October 25-27, 2004, The Canada Centre for Marine Communications will be hosting Ocean Innovation 2004 at the Victoria Conference Centre, Victoria, British Columbia.
For more information contact Clayton Burry by Email at: *cburry@ccmc.nf.ca*

The Canadian Institute of Geomatics/ Association Canadienne des Sciences Geomatiques Montreal Branch/Section du Montreal Geomatics 2004/Geomatique 2004

Un choix strategique, Montreal, Quebec, **Les 27 et 28 octobre 2004**, Hilton Montreal Bonaventure
Deadline for receiving proposals/Date limite pour le depot d'une proposition de conference 26 avril.
www.geomatics2004.com ou *www.geomatique2004.com*

DID YOU KNOW...

POSTED AT LLOYDS

From Lloyds little coffee shop in earlier London, grew the world's greatest marine insurance company. From such humble quarters where masters and merchants congregated to discuss freights, rose the massive establishment now housing the documents relative to the shipping of the world.

Outside its doors is a bulletin board, a grim advertisement of ships that are overdue and must (after a certain lapse of time) be considered lost.

A million tired eyes have read the names of the gallant vessels which have never come home: a million aching hearts have turned away in sorrow for a ship that was "Posted at Lloyds!"

hydro04 galway

2-4 november 04

The 14th International Biennial Symposium of The Hydrographic Society

(International Federation of Hydrographic Societies)

Galway Bay Hotel, Salthill
Galway, Ireland

Conference Theme - **DIVERSITY**

hydro4
74 Callington Road, Saltash
Cornwall, PL12 6DY, UK

Tel: +44 (0)1752 843461
(please leave a message and we will return your call)

Fax: +44 (0)1752 848267

E-mail: hydro4@hydrographicsociety.org

CASEY, Peter John

July 5, 1937 - October 28, 2003

"CASEY, Peter John - We regret to announce the death of Peter John Casey on Tuesday, October 28, 2003, in Ruby Memorial Hospital, Morgantown, W.Va. He was born July 5, 1937, in London, England, a son of Joseph Casey and Elizabeth Duffy. He immigrated to Canada in 1950.

Peter was educated in Toronto and earned a degree in civil engineering from the University of Toronto. He received a masters degree in environmental engineering from the University of North Carolina, Chapel Hill. Prior to his position of Program Coordinator of Small Flows, at West Virginia University, a position he held for the last nine years, Peter was Director of Public Health Engineering for the Province of Nova Scotia. He was the town engineer of Glace Bay from 1965-1970. Peter was married to Jean Gillis and had three children, Christopher, Halifax; Jeffrey, Halifax; and Aine Casey Tan, Wolfville; grandchildren, Mira and Nicolas Tan. Cremation services provided by Hastings Funeral Home. A funeral mass will be held 7 p.m. Friday, October 31, in St. Mary's Parish, Star City, Father Dean G. Borgmeyer as celebrant. A reception will follow in the Peace Hall. Interment will be in St. Michael Cemetery, East Margaree, Nova Scotia, following a memorial service being held at a later date. Donations may be made in his memory to The Special Olympics, 5516 Spring Gardens Rd., Halifax, NS, B3J IG6."
(above from the "Cape Breton Post", Sydney, NS)

My recollection of Peter's history with the Canadian Hydrographic Service (CHS) is that he started work with CHS in 1960 and was assigned to the *CSS ACADIA* under HIC, Hiro Furuya.

In 1961 he was with Chuck Leadman on the St. Lawrence River. In 1962 he served on the *CSS BAFFIN*, under the direction of HIC, Russ Melanson.

During 1963 he worked in the office with the primary assignment of selecting transmitter sites for Hi-Fix. In 1964 he was second in charge on the *ACADIA*.

I had the great pleasure of spending that very interesting season with him. We spent considerable time around Botwood, Newfoundland and were generally up and down the coast on numerous jobs.

We had a great summer; getting in to St. John's for bunker once a month was eventful as John O'Shea, Peter Casey and I were off doing what bad boys usually do when given too much rope. I remember Peter and I drinking downtown on one of these trips and we were late getting back to the ship; everyone was lined up at the rail, gangplank about to come up and Captain Taylor fuming. Peter and I casually (under the influence) walked aboard with cases of beer under our arms.

We went back to Ottawa that fall and Bob Marshall, John O'Shea, Peter Casey and I did the usual compilation of data in the office. We saw quite a lot of each other socially over the next couple of years. Peter then got an offer to go to Glace Bay as Town Engineer.

He moved to Cape Breton in 1965; I moved home to New Waterford in 1968 and we saw a lot of each other over the years until he went to USA for studies and eventual employment.

Peter and I traveled from Cape Breton to Halifax and back in 2003 to attend the most recent reunion of the *ACADIA*. This trip was the last I saw of him. He and I were good friends; he was an interesting man; intelligent and proud of his work. He was a great companion. The repartee between Peter Casey, John O'Shea and myself was priceless.

J.W. (Buzzy) Connors, March 21, 2004

CROSS, Clarence Melvin

January 26, 1918 - November 30, 2003

Born January 26th, 1918 in Chesterville, Ontario. Passed away peacefully on November 30th, 2003 after a brief illness at the Winchester District Memorial Hospital. Clarence obtained his BA. in math from Queen's University, then completed his M.A. in physics at the University of Toronto. He was a senior federal public servant in the areas of hydrography and oceanography, retiring in 1976. His chief interests in retirement were genealogy and local history. Survived by Alice Cross of Victoria and children Ian Cross (Lee McMichael-Cross), Philip Cross, Julie Mackenzie (Ian) and Diane Cross. Fondly remembered by grandchildren Patrick, Alexander and Laura. The family wishes to express their sincere appreciation to Dr. Adamson and the nurses of the Winchester District Memorial Hospital. A memorial visitation was held on

Thursday, December 4th at 1 p.m. at the Trinity United Church on Water Street, Chestervllle, Ontario followed by a memorial service at 2 pm. in the church. Inurnment at a later date. Flowers are gratefully declined. If desired, donations can be made to the Winchester District Memorial Hospital or the Chesterville Historical Society or charity of choice. For more information, please call the Chesterville Funeral Home at 613-448-2120.

FORRESTER, Dr. David Warren

February 25, 2004

Passed away in Oshawa, Ontario on Sunday, February 22, 2004. Warren Forrester in his 79th year, predeceased by his parents David and Mary Forrester and by his brother Douglas Forrester. Dear uncle of Bruce D. Forrester (Diana Wood) and Lynda (Robert Todd) both predeceased. Cherished great uncle of Deanna, David, Ryan, and Kyle.

SMEDLEY, Arthur John Robert

August 1, 1923 - January 16, 2004

It is with great sadness that I inform you of the death of John Smedley. His obituary is included below.

John joined the CHS in Pacific Region in the summer of 1977. He worked with the tidal group until his retirement at the end of 1989. During that time John participated in numerous field surveys on the BC coast and in the Western Arctic. He was a wonderful person to travel and work with, and his workmanship was always of the highest quality. He was also never at a loss for energy or good ideas. This is a real tribute to John when you consider he joined the CHS at an age when many of us are already starting to think about retirement!

During Western Arctic surveys we often collected beach pebbles while waiting for a helicopter to pick us up. John used these stones in jewellery that he made during the winter and sold locally and in the Western Arctic. Had eBay been active back in the 80's I'm sure the demand for John's jewellery would have increased tenfold.

While deploying a tide gauge through the ice one spring I had a disagreement with my two "techies" (John and Willie Rapatz) over the need for a tea break. When I decided we should continue working he and Willie had a brief discussion and immediately staged a work stoppage. The point was made and the stove and kettle were unpacked from the komatik for the required tea break. After the break we successfully completed the installation and returned to Pond Inlet.

John's contribution to our increased understanding of tides in Canadian waters was significant and fortunately, like much of what we do in the CHS, this contribution is ongoing through improved tidal predictions and an increased understanding of tidal propagation (Arctic), sea level change and crustal movement.

Fred Stephenson, January 22, 2004

SMEDLEY, Arthur John Robert. Born in Kasuali, India, 1 August, 1923; died at Oak Bay Lodge, Victoria, 16 January, 2004. John entered the Royal Navy from H.M.S. Worcester in 1939, and served at sea throughout the war, ultimately as gunnery officer. He joined the Royal Canadian Navy in Halifax 1953 and served at sea and in various executive shore billets until his retirement in 1968. In that year he and his family joined the regular outflow of navy families from the Maritimes to lotus land. His love of art and of farming drew him away from the sea but he returned to it to work at the Institute of Ocean Sciences until 1988. He married his beloved Nella in 1955, and one of his final conversations with her a few days before his death began 'You are as lovely as always.' He was generous of spirit, understating of his accomplishments, enormously kind, with a sense of humour as blest in capacity as his great barrel chest. He was a gentleman in the truest sense of the word. He will be deeply missed by Nella, and his daughters Susan, Patricia ('Piet'), Sheila (Adrian), and Rosemary, and by his two beloved grandsons, Derek and Adam.

WILSON, John Hugh (Jack)

March 17, 1943 - December 17, 2003

On December 17, 2003, the hydrographic community was saddened and deeply shocked to learn of the passing, of distinguished hydrographer and good friend of many, Jack Wilson.

Jack leaves behind his wife Freda, whom he married on October 23, 1971; sons Troy, Chad and Robin; his mother Isabel, and two sisters Heather and Sharon. Jack was proud of his family and pleased that his sons were responsible adults and well on their way at establishing their careers.

John Hugh "Jack" Wilson was born and raised in the farming community of Riceville, 70 kilometers east of Ottawa. He graduated from Maxville High School in 1962, and spent the next two years working on road construction surveys for the Ontario Department of Highways.

During the summers of 1965 and 1966, Jack worked as a student assistant for the Canadian Hydrographic Service (CHS) on the Trent-Severn waterway survey.

Upon graduation, in 1967, from a three year Civil Engineering Course at the Eastern Institute of Technology (EOIT) in Ottawa, he joined the Legal Surveys Division of the federal Department of Energy, Mines and Resources. He worked six months as an assistant to a Dominion Land Surveyor in the Yukon Territory.

On October 12, 1967, Jack joined Central Region of the CHS, at that time based in Ottawa. In early 1968, he completed the basic hydrography training program which included 3 months field training in the Caribbean. Jack passed the course with distinction.

In 1970, he moved to what is now known as the Central and Arctic Region, of CHS, based in Burlington, Ontario. Jack and Freda moved to the village of Waterdown, just north of Burlington, where their children grew up and received their early education. Jack spent as much time as he could with his boys and hardly ever missed one of their sports games that included soccer, baseball and 17 years of hockey. He also spent a lot of enjoyable time making extensive renovations and improvements to the family home.

Jack's love of nature and the outdoors was shared by and with his family. Together, they spent many good times canoeing, sailing, camping, skiing and hiking. Hiking the "Bruce Trail" was particularly enjoyable and convenient as the trail was very near their Waterdown home.

Jack was a "field man" with the CHS and spent many summers and some winters away from home. However, as a family man, he took his young family with him whenever the opportunity allowed.

Early in his career with CHS, Jack had aspirations of becoming a Dominion Land Surveyor and this came to fruition in 1981 when he obtained his Commission as a Canada Lands Surveyor. Jack was justifiably proud of this achievement.

Jack's career prevailed and flourished during the good years of field hydrography in Canada. He spent the summer of 1968 with Hydrographer-in-Charge (HIC), Ab Rogers, on the Ottawa River survey. In the fall of 1968, he joined George Yeaton, on the Polar Continental Shelf Project (PCSP), which included work in introducing Hovercraft to Arctic surveys. Jack spent the winters of 1969 and 1970 working with Hovercraft in the Beauford Sea, first with George Yeaton and then with John O'Shea. This was followed by a summer survey in 1970 using Hovercraft in Franklin Bay, NWT.

In 1970, Jack completed the Hydrography 2 training program. In 1971, he was Senior Assistant on the Lower St. Lawrence River Survey under the leadership of HIC Bruce Wright. This was followed by a rotational assignment in 1972 with the Tides, Currents and Water Levels Section. In the summer of 1973, Jack accepted an assignment with the Pacific Region working on the *WM. J STEWART*.

In 1974 and 1975, Jack was the HIC of the PCSP winter bathymetry programs in the Eureka and Nansen Sound areas of the arctic. During the summer of 1975, he monitored a contract survey of Lac St.Jean.

In 1975, he declined an offer of a promotion to work out of Pacific Region because of his commitment to his community and family. The year 1977 was another rotational year for Jack with a variety of short projects.

The following years were devoted to presiding over major surveys of Lake Huron Offshore and inshore (1977, 1978 and 1979), rotational assignments (1980) Eastern Lake Ontario – Kingston area (1981), Hudson Bay on the Canadian Coast Guard Ship (CCGS) *SIR WILLIAM ALEXANDER* (1982 and 1983). In 1984, Jack was given another rotational assignment, that included monitoring a contract survey on Manitoulin Island, Loran C calibration in Lake Superior and in the winter, a few months teaching hydrography in Jamaica.

The years 1985 and 1986 were spent as HIC of surveys in the St.Lawrence River in the Cornwall and Long Sault area. The 1987 season started with work in the Cobourg area of Lake Ontario followed by a summer in Hudson Bay as HIC on the *CCGS NARWHAL*. Jack's assignments for 1988 and 1989 were primarily as HIC of local surveys and responsibility for sheet checking. In 1990, Jack was back as HIC of the St. Lawrence River survey in eastern Lake St. Francis. In 1991, he ran a survey out of Picton, Ont. and 1992 was spent primarily in training field activities to Cartographic staff. In 1993, Jack was HIC of a survey of Lake Ontario based out of Oshawa.

For about a year, covering parts of 1994 and 1995, Jack was assigned to the Small Craft Harbours Program of the Department. In 1996, he was HIC of the *CCGS GRIFFON* for the survey upgrading of Georgian Bay hydrographic data. Complimenting these programs, Jack wound up his career in 1997, responsible for a side scan program aboard the *CCGS SIR WILFRED LAURIER*, which was scanning arctic waters for traces of wreckage from the Franklin expedition.

After 30 plus years with the CHS, 22 of them as a hydrographer-in-charge, Jack retired on February 27, 1998. He sold his home in Waterdown and moved, with his wife Freda, to a dream home he had contract-built on the pristine shores of Bob's Lake, north of Kingston. He lived there enjoying life and the rustic flavor of the area while finishing his beautiful home and taking time to enjoy his love of fishing both summer and winter. Jack also got a lot of satisfaction in cutting firewood with the chain saw he received as a retirement give from his fellow hydrographers.

As a hydrographer with an office next to Jack's for most of our careers, I submit my personal remarks.

"Jack was a perfectionist, a diplomat, and a true professional. He was also a gregarious type, who enjoyed the corridor gossip, socializing and ruminating. His smile was infectious. He tackled every situation from a perspective of listening, smiling, and negotiating. His office was orderly to the nth degree, with everything neatly in the right box or slot. Jack had a firm handle on all. However, he savored life immensely, and had great laughs and repartee with fellow hydrographers. As one passes through life, you meet quality people, and remember the good times you enjoyed with them. Jack was one of them, a superb Canadian, and a hydrographer worthy".

Bruce Wright, March 8, 2004.

Pacific Region

Nautical Publications, Pacific Region Update

The start of the New Year saw the completion of a long term refit project in Nautical Publications, Pacific Region. Over the last 20 years as we evolved from a manual drafting office to one of total automation, we were still left with workstations from the old world. We tried to adapt these as best as possible to a world of computers, but there were limitations. Over time, cartographers, who have put down there scribing points and picked up a mouse, began to develop ergonomic related injuries they did not face in the old drafting world.

In order to maintain a healthy work environment for our staff, we embarked on a project to get the ergonomic problems solved. It took a two year struggle to acquire the funding, but in the end, due to the work of a great deal of individuals, we were able to purchase special purpose work stations to meet the needs of cartographers working on chart projects. These were installed in January and all reports from staff have indicated they are working extremely well. Each station has a large tilting work surface, a layout work surface capable of holding an A0 size chart, a proper computer desk where the height of the monitors and keyboard and independently adjustable, and ample storage for reference books, files and personal items, as well as adjustable task lighting and control of overhead lighting. This has become a model of good design for special purpose space needs.

As we look forward to the months to come, we are attempting to finalize a number of projects that we have recently undertaken. Since the retirement of our Sailing Directions officer some time ago, the Navigational Aids unit has maintained the Sailing Directions' publications. Over the last few months, they and staff from other divisions have accepted the challenge of a team project to produce a new edition of BC Vol 1 Sailing Directions. This should be completed in the weeks ahead with a goal of having it printed and available early in the next fiscal year.

Production staff are completing the final proof amendments to 2 new charts in the BC central coast, to complete the series of 5 charts started in Hakai Pass area. Also at the final stage of production, is a new chart of Victoria Harbour. It should also be available early in the next fiscal year.

Electronic chart S57 file production has recently slowed due to a series of technical challenges, but we anticipate those will be resolved shortly. We did however achieve a goal of better timing of the release of paper chart Notices to Mariners with the equivalent updates to S57 files. Our goal of simultaneous release was achieved this past fall, and it is a performance measure we continue to monitor.

Looking ahead this year, we will soon begin work on a series of 12 New Editions to incorporate changes to the Vessel Traffic lanes in the Strait of Georgia/Haro Strait areas. A portion of this scheme into Vancouver Harbour from the entrance to Juan de Fuca Strait was modified 2 years ago and now the completion of the changes are going forward. We must have all the paper charts and ENC files available to users three months prior to the planned May 2005 implementation date.

Finally, we are working towards better integration and planning with the other CHS divisions. We are looking into new sources of remotely sensed data, to better plan revisory survey work, and to validate and integrate documents in hand. We are looking for ways to improve our efficiency and provide the best level of service our resources permit.

Geomatics Engineering Division Highlights

As an enhancement to our ISO 9001 quality management system, Anne Ballantyne has developed a user-friendly navigation tool, ISONice, to facilitate access to ISO documents. Staff find that the ISO numbering system makes it difficult to find documents, but ISONice provides an intuitive index, as well as a very useful search feature.

The project continues to digitize all of the Pacific Coast field sheets and bring them up to the metric and NAD83 standard. So far, thanks to DND funding, we have 15% of the area converted (240 field sheets) and another 50% (163 field sheets) underway.

Fred Stephenson is working with Josef Cherniawsky to develop tsunami models for harbours on the SW coast of Vancouver Island using digital field sheet data and multibeam survey data for the bathymetry. Models have been completed for Victoria, Esquimalt, Sooke and Ucluelet, and work is underway on Port San Juan, Barkley Sound/Alberni Inlet and Bamfield.

Hydrographic Surveys Division, Pacific

Vector/EM1002 mid-water multibeam surveys

West Coast QCI, Sponge Reefs, Oil and Gas in Hecate Strait, Rosario Strait, Northern Strait of Georgia.

Revisory/EM3000 shallow-water multibeam surveys

English Bay, Sandheads, Roberts Bank, President Channel, Trincomali Channel, Haro Strait.

Revisory Surveys

Vancouver, Victoria, Nanaimo Harbours, Campbell River, Port McNeill.

Tidal Surveys

Arctic gauge installations, Henslung Cove Tsunami Response network gauge.

Research & Development

New lost-cost portable hydrographic acquisition system developed.

Changes

Koert Winkel has gone to Geomatics; Michele Gill has left to work for the City.

Upcoming Projects

More Vector multibeam work; Revisory of Ladysmith Harbour.

2004 Survey Plans

More Vector EM1002 mid-water multibeam work in Hecate Strait and West Coast QCI - last two sponge reef complexes. EM3000 moving from Revisor to Otter Bay. Training survey plans - continuation of shallow-water multibeam surveys in Saanich Inlet. Focus on metadata, project management and requirements for Sailing Directions. Otter Bay/EM3000 shallow-water multibeam surveys in SAn Juan Isalnds, Gulf Islands and Haro Strait.

Papers accepted for CHC2004 on Decca and Taining surveys. Course on Hydrographic and Oceanographic Surveying being developed and delivered to BCIT.

DID YOU KNOW...

A "LONG" SHOT

Here's a modern gambling term with an old nautical origin. Because ship's guns in early days were very inaccurate except at close quarters, it was only an extremely lucky shot that would hit the mark at any great distance, hence the inference of "luck" in the gambling term.

Central and Arctic Region

Data Acquisition Division

Hydrographic Surveys

Central and Arctic Region CHS plans to conduct a survey program very similar to last year. The Beaufort Sea program is moving into its third year. This is a joint venture with Natural Resources Canada (NRCan), Indian and Northern Affairs Canada (INAC), DFO Science and Oceans and Laval University. The program will be a multi-facet science and hydrographic program, which will be a three phase operation. The purpose of this project is to develop a better understanding of seabed morphology, habitat, environmental change and the impact of ice on the seabed, as well as the acquisition of baseline information to support Federal Government decisions on Northern Oil and Gas and to enhance the nautical charts of the area for safe navigation. The project will be conducted from the *GGGS NAHIDIK*.

In the Eastern Arctic, the Nunavut Government and the Canadian Coast Guard have requested harbour and approach surveys at various communities: Grise Fiord, Pond Inlet, Clyde River, Broughton Harbour, Pangnirtung, Ungava Bay and the continuation of the surveying programs at Port Burwell (Killiniq), Repulse Bay and Iqaluit. During the last few years, these "opportunity based" surveys have been very successful. In addition to these hydrographic surveys, track soundings will be collected by the ship while proceeding to and from established program areas, for incorporation into the next New Edition of the affected charts and whenever possible, information will be collected in an effort to correct off datum charts and baseline data pertaining to the establishment of the United Nations Convention on Law of Sea(UNCLOS) claim.

The Revisory survey will travel to predetermined locations on the Great Lakes and associated navigable water ways collecting/correcting/updating our suite of charts and publications.

Nautical Publications Division

Charts

Between November 2003 and March 2004, 17 New Edition charts were published in the region as follows: Mackenzie River (6411, 6423-6430, 6454-6455), Hudson Strait (5459, 5411), Ungava Bay (5467), Hudson Bay (5630, 5400), Welland Canal (2042) and the Beaufort Sea (7662). In addition, 182 Notices to Mariners were drafted for critical changes to charts in both southern and Arctic waters.

Work on the New Chart of Lake Timiskaming (1556) is nearly complete, and the production of new charts in Georgian Bay (2242), and the Arctic (7736, 7790-7792) is progressing well.

Electronic Navigational Charts

During the same period, one ENC (Killarney to/à Little Current) and six S57 updates were released to NDI. At the end of January, CHS headquarters converted all regional ENCs from IHO S-57 version 3.0 to version 3.1.

Sailing Directions

Also during the same period, nineteen Notices to Mariners were drafted for Sailing Directions and work continued on Sailing Directions, Arctic Canada Vol. II [1985 edition] listing any discrepancies between the text and published charts and collecting information on the various communities.

Technical Services Division

Technical Services will be installing a Kongsberg-Simrad upgrade of the multibeam system from EM3000 to the EM3002 system on the Merlin launch during the summer of 2004. The Merlin launch has had performance tests conducted during the fall of 2003 that resulted in a structural review by the manufacturer, MetalCraft, the installation of an autopilot and some work to reduce noise. Testing will be conducted in Hamilton Harbour where there has been significant ground-truthing and recent data collection.

Data Management initiatives are planned in the area of integrating the source database components as part of the Hydrographic Infrastructure Network into the workflow and Quality Management System. This work will entail documenting business processes, work instructions and business rules for the use of these data storage and management systems. The current source tools include Cubestor by Cubewerx, CARIS HPS/HPD and their Source and Product Editors, and Helical visualization tools and the in-house (Oracle based) meta-database CHSDir. CHSDir, more recently, has been used to monitor performance measures by recording and reporting production milestone events.

DID YOU KNOW...

COIN UNDER MAST-STEP

From time immemorial, a small coin has been placed in the mast-step of a newly launched vessel, to propitiate the gods and bring good luck.

NATIONAL

Minutes Canadian Hydrographic Association
2003 National Annual General Meeting
Held October 15, 2003, at 18:00, in the Marquis Room
The Fairmont Palliser Hotel, Calgary

Andrew called the meeting to order at 18:35, and welcomed everyone.

Attendees: Andrew Leyzack (CHA National President), Terese Herron (National Secretary), Andrew Brebner, Bruce Calderbank (VP, Prairie Schooner Branch), Carl Friesen (President ACLS), David Gray, Dave Gartley (VP, Pacific Branch), Tim Janzen (VP, Central Branch), Stacey Kirkpatrick (VP, Ottawa Branch), Ian Lloyd, Dick MacDougall, J-C. Tétreault (Executive Director, ACLS) and George Schlagintweit.

1. To receive the reports of the Director's for the years 2002 and Quebec 2001.
A motion was put to the floor to accept the Branch Reports as provided by the Branch VP's for the year 2002 and Quebec 2001.
Moved: Tim Janzen Second: Dave Gray
CARRIED

Discussion: The question of a quorum was asked. According to the by laws, members present constitute a quorum

2. To accept the financial statements of the Corporation and the auditor's financial report for the year ending 31 December 2002.
It was noted that the bottom line on the National Statement did not match the closing balance on the comprehensive report due to the inclusion of accounts receivable.
Moved: George Schlagintweit
Second: Dick MacDougall CARRIED

3. To accept the minutes of the 2002 Annual General Meeting held at the Westin Harbour Castle, Toronto during CHC2002.
The minutes were published in Lighthouse, posted on-line and available at the meeting.
Moved: Dave Gray Second: Tim Janzen
CARRIED

4. To accept the National Budget for the year 2003.
The National budget for the year 2003 was available online and at the meeting. The original budget was revised to include travel for the Director's to attend meetings in Calgary.
Moved: Dave Gartley Second: George Schlagintweit
CARRIED

5. To appoint Brian Power and Al Koudys as auditors for the year 2003.
Motion was not made at meeting as one auditor had not yet accepted appointment. Subsequently auditors accepted appointment. At the meeting there was no objection to either appointment.

6. Lighthouse Report.
Edition 61 was the conference edition for CHC2002 and worked very well. We hope to have CHC2004 use the spring edition in 2004 for the same purpose. The printing has gone to black and white to keep costs down.
Gray – always submits papers with the intention of them being published in b&w.
Leyzack – although colour is nice to have we cannot afford to publish in colour all the time. We need to work within our means, colour gives better definition for diagrams and graphs and some graphics. We need to inform authors that black and white is a requirement from source as converted files have reduced quality/resolution.
Gray – multibeam imagery looks better in colour. The variation of a different Lighthouse on each edition is good.
MacDougall – are we looking for a decision on b&w or colour?
Leyzack – no, sometimes colour is needed and the decision would be made by the editor's based on that. Lighthouse is not competing with Hydro International, is not as scholarly as Geomatica or The Hydrographic Journal, we get some papers from our own members. The journal is doing well, we receive complimentary feedback. Many complements at Hydro 2002 in Kiel.

7. Student Awards Program.
Terese reported that the 2002 recipient of the CHA Award was Jade van Peteghan a student at the Northern Alberta Institute of Technology and the 2003 recipient was Matthew H. Bigney a student at the University of New Brunswick. Award information is mailed out in January and is awarded to a deserving student in their second year of full time studies. Pacific Branch also has an award available.
Gray – a few years ago there were questions raised about the financial management of the award, has this been resolved?
Leyzack – this has been taken care of. Barry manages the fund and provides a report at the end of each year. Currently the investment is in an 11% mortgage fund. Dave Gartley has signing authority on the investment so we are covered if anything happens to Barry.

8. Other Business.
A presentation was made to Bruce Calderbank for his efforts in coordinating our (CHA) presence at the ACLS conference.

11. Motion to adjourn
Moved: Bruce Calderbank
Second: George Schlagintweit CARRIED
Andrew thanked everyone for coming. Meeting adjourned at 19:10.
After the meeting we enjoyed a delicious roast beef dinner followed by an impressive presentation by Gordon Guenette on the Raising of the Kursk.

OTTAWA BRANCH

The Ottawa chapter of the CHA has recently appointed new executive officers at the annual general meeting. They are:

Stacey Kirkpatrick - Vice President
Susan Greenslade - Treasurer
Nancy Akerley - First Executive
Trevor Hutchinson - Second Executive

Also passed at the meeting was a membership rate increase to $40/year effective immediately. The additional revenue will be used to organize activities in the coming year.

The Ottawa branch held a brown bag video-luncheon on March 2nd for its new and existing members. Presented was a 30 minute video documentary entitled "Raising of the Kursk". The story was about the 9000 ton Russian nuclear submarine that sank in the Barents Sea in August of 2000 and its subsequent salvage operation.

At the CHC 2004 in Ottawa, David Gray will be presenting two papers. The first will be a presentation on the chapter David wrote for "Charting Northern Waters" discussing the technical developments in charting since World War II. His second paper will be presented to the Canadian Nautical Research Society. The paper looks at the missions of Sir Wilfred Grenfell along the coast of Labrador and the state of the Hydrographic charts at the time. For more information about the CHC 2004, visit the website at *http://www.chc2004.com/*.

Chart users take note. The new digital PDF colour patches are being made available from the website *http://www.notmar.gc.ca*. These patches are available to the public and replace the colour printed patches distributed in the monthly Notices to Mariners booklet. The monthly NTM booklets will now contain a monochrome version of the web patch.

For those that do not know, the Friends of Hydrography is a Canadian Volunteer Group supported by the Canadian Hydrographic Association. They are a small group of retired CHS employees who believe in recording and preserving the historical highlights of Canadian hydrography. Please feel free to visit their website at *http://www.canfoh.org/* and discover some of this rich history.

There are some upcoming retirements in the NCR. Jean-Pierre Seguin (Jeep) started working for CHS on 27 January, 1969. He worked 6 months for chart maintenance and the rest of his career has been linked to Notices to Mariners. By the time he retires he will have spent 35 years with the unit. Talk about dedication! Congratulations on your forthcoming retirement Jeep!

CENTRAL BRANCH

AGM

Central Branch held its 14th AGM on December 11th 2003, at the Mimico Cruising Club in Etobicoke, Ontario. The business portion of the evening was conducted quickly, and was followed by dinner and a guest speaker. Once again the Club was decorated and had festive airs that put members in a festive social mood, and made for a very pleasant event, filled with lively discussion. The guest speaker was Todd Ford whose presentation "Students on Ice" was the perfect cap to an already fantastic evening. Todd was one of a group of Canadian scientists, teachers and students who embarked on an eco-tour of Antarctica aboard a converted Russian icebreaker. A very worthwhile and enjoyable presentation!

H2O

The 33rd annual Central Branch H_2O Curling Bonspiel was held in Grimsby, Ontario on February 21st 2004, and was a great success yet again. Sixteen teams were represented, playing on four sheets of ice, in two draws. Hats off to Earl Brown, Brian Power and Jacqueline Leyzack who have come through year after year to organize this fantastic event, get great sponsors, and provide a day of enjoyment for curlers of all ages and talent levels. Hydrographers, hydrographic-types and their families once predominated the H_2O in participation, and though that predominance has dwindled, some of the charter people like Ab Rogers continue to come out on the ice year after year. Many other long-time regulars to the H_2O, were also in evidence again this year. The winning team for 2004 was: Lareina Rising, Christine Simard, Ed DeBruyn, and was skipped by Joe de Laronde of Sarnia, Ontario.

2004 H20 Winners
Skipped by Joe de Laronde (left)

Central Branch would like to thank our 2004 H_2O sponsors:

Algoma Central Marine
Canadian Coast Guard
Canadian Hydrographic Association
Canadian Hydrographic Service
CARIS
DataQC Inc.
DFO Health & Wellness Committee
Emma's Back Porch
Fisheries & Oceans Canada (Sarnia)
HYPACK Inc.
Joe Dogs Gas Bar and Grill
Kongsberg Maritime
Knudsen Engineering Ltd
National Water Research Institute
Offshore Systems Ltd
Ontario Great Lakes Area DFO
Philthy McNasty's
Stanley Hardware
Upper Lakes Group Inc.

Summer BBQ

Terese Herron and Shawn Cook will host the 2004 Summer Barbecue at their home in Dundas, Ontario. The date for the event will likely be a Saturday in mid-June, but warm, sunny weather has been ordered for the entire month just to keep all the bases covered. Check the CHA web site (*http://www.hydrography.ca*) closer to June, as details will be posted as they become available.

New VP

2004 marks the third term for current Central Branch Vice-President Tim Janzen, and the bylaws dictate that a new V-P is needed for next year. Nominations for 2005 will open in October and elections will be held in December, as per usual, but the Executive would like to get a head-start on asking volunteer candidates for the position to come forward. Tim will remain on the Executive in 2005 in the capacity of Past V-P, and will assist the successful candidate in getting acquainted with their duties.

New Branch Editor

Central Branch is also seeking a *Lighthouse* Branch Editor. This person would assist the *Lighthouse* editorial team by soliciting, coordinating and editing news articles from Central Branch. Volunteers are asked to contact Tim Janzen at 905-336-4850, or *janzent@dfo-mpo.gc.ca*.

Change of Newsletter Responsibilities

As of January 2004, long-time (18 years!) editor of the Central Branch Newsletter, J. (Sam) Weller, handed over the editorial reins to Tim Janzen.

DID YOU KNOW...

THE RIDEAU CANAL

The 202-kilometre waterway, which stretches from Kingston to Ottawa, was built in the wake of the War of 1812 as a wartime supply route to Kingston and the Great Lakes.

The military minds of the day thought the international border along the St Lawrence River wouldn't be safe if the Americans attempted another invasion, so the canal was constructed. It was designed to provide a secure water route for troops and supplies from Montreal to reach the settlements of Upper Canada and the strategic naval dockyard at Kingston.

The canal was built between 1826 and 1832 under the supervision of English Lieutenant Colonel John By but never served its intended purpose because the feared invasion didn't materialize. The waterway became a major artery for regional commerce, and continued to be for several decades, until the St. Lawrence Canal and railway systems were introduced in the 1850's. It was later a major route for luxury steam boats.

Today, the canal is used mainly by pleasure boats in summer, and in winter an eight-kilometre stretch close to downtown Ottawa becomes the world's longest skating rink.

Rates Tarifs

POSITIONING / EMPLACEMENTS

The acceptance and positioning of advertising material is under the sole jurisdiction of the publisher.

L'approbation et l'emplacement de l'annonce sont à la discrétion de l'éditeur.

DIGITAL REQUIREMENTS
EXIGENCES NUMÉRIQUES

Advertising material must be supplied by the closing dates as digital Tiff 600dpi files. Proofs should be furnished with all ads.

Single-page inserts will be charged at a full-page body rate. Material must be supplied by the client. Page size must conform to the single page insert trim size (below).

L'annonce publicitaire doit être fournie aux dates de tombée. Les épreuves devraient être fournies avec tous les suppléments.

Les insertions d'une page seront chargées au tarif d'une pleine page. Le matériel devra être fourni par le client.

PUBLICATION SIZE
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Publication Trim Size/ Dimension de la revue:	**8.5" x 11.0"**
Live Copy Area/ Encart libre:	**7.0" x 10.0"**
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PRINTING / IMPRESSION

Offset screened at 133 lines per inch.
Internégatif tramé à 133 lignes au pouce.

CLOSING DATES / DATES DE TOMBÉE

LIGHTHOUSE is published twice yearly, in Spring and Fall. The closing dates are March 15th and September 15th respectively.

LIGHTHOUSE est publiée deux fois par année, au printemps et à l'automne. Les dates de tombée sont le 15 mars et le 15 septembre respectivement.

RATES / TARIFS

All rates are quoted in Canadian Funds. Corporate Members receive a 10% discount.

Tous les tarifs sont en devises canadiennes. Les membres corporatifs ont droit à un rabais de 10%.

	B & W/ N & B	Colour/Couleur Four/Quatre
Outside Back Cover *Couverture arrière*	NA/SO	$1,025
Inside Cover *Couverture intérieure*	NA/SO	$825
Body, Full Page *Pleine page*	$475	$675
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Les tarifs sont assurés aux termes des contrats publicitaires jusqu'à concurrence d'un an. Les annulations ne sont pas acceptées après la date de tombée.

All advertising material should be directed to:
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Telephone (905)336-4558 Fax (905)336-8916
E-mail lighthouse@car.dfo-mpo.gc.ca

HINTS TO AUTHORS

LIGHTHOUSE publishes material covering all aspects of hydrography.
Authors submitting manuscripts should bear the following points in mind:

1. Submit a hardcopy complete with graphics including tables, figures, graphs and photos.
2. Submit digital files, one with text only and a separate file for each graphic (tables, figures, photos, graphs) in its original form or in .tif format (600 DPI). Photos may be submitted separately to be scanned. These may be submitted via E-mail or on CD ROM to the Editor.
3. Papers should be in either English or French and will be published without translation.
4. An abstract, information about the author(s) and contact information should be included.

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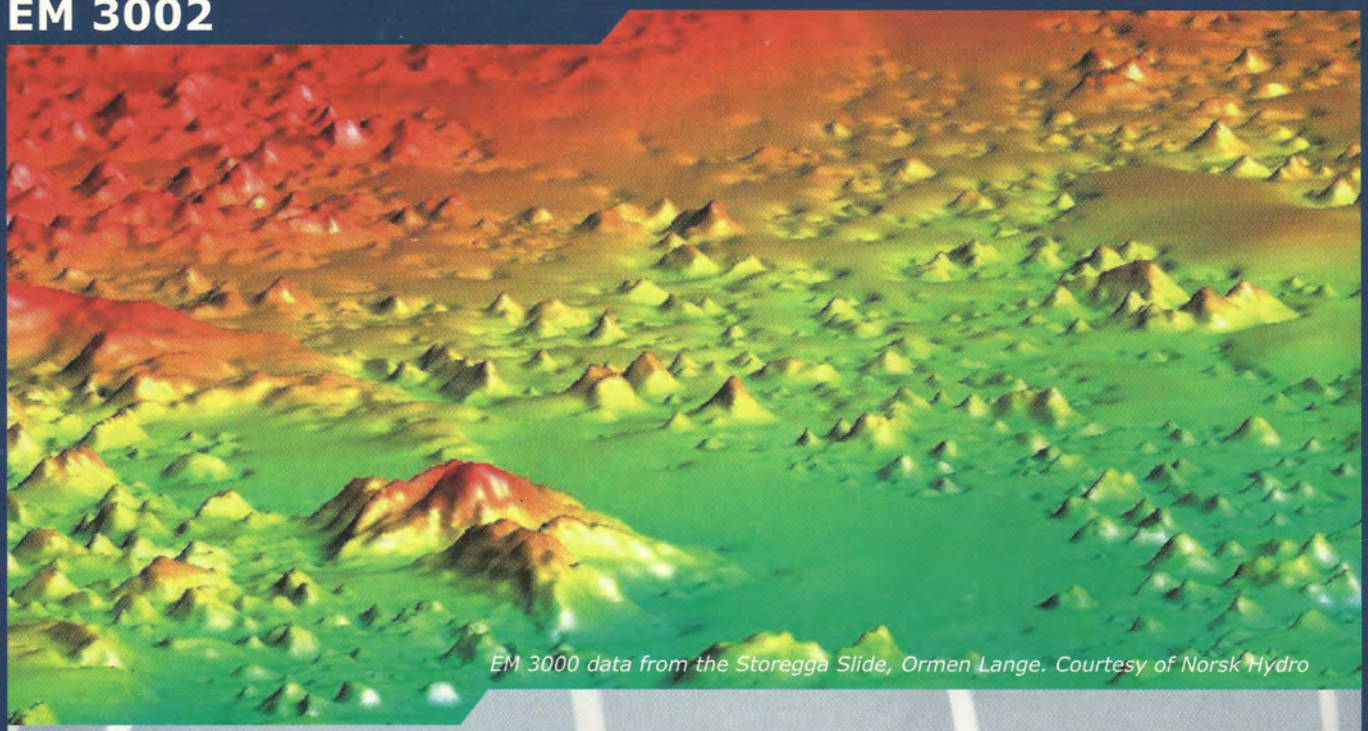
KONGSBERG

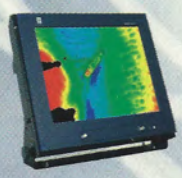
EM 3002



EM 3000 data from the Storegga Slide, Ormen Lange. Courtesy of Norsk Hydro

"EM 3002 - A real break-through for high resolution multibeam echo sounders!"

Erik Hammerstad,
Product Group Manager,
Kongsberg Maritime



EM 3002 operator display

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- All beams maintained for all depths
- Applications:
  - Coastal engineering inspection and monitoring
  - Environmental seabed and habitat mapping
  - Acoustic backscatter imaging of the seabed
  - Seabed sediment classification
  - Mapping of biomass in the water column

Complies with IHO-44 special order.

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