LIGHTHOUSE

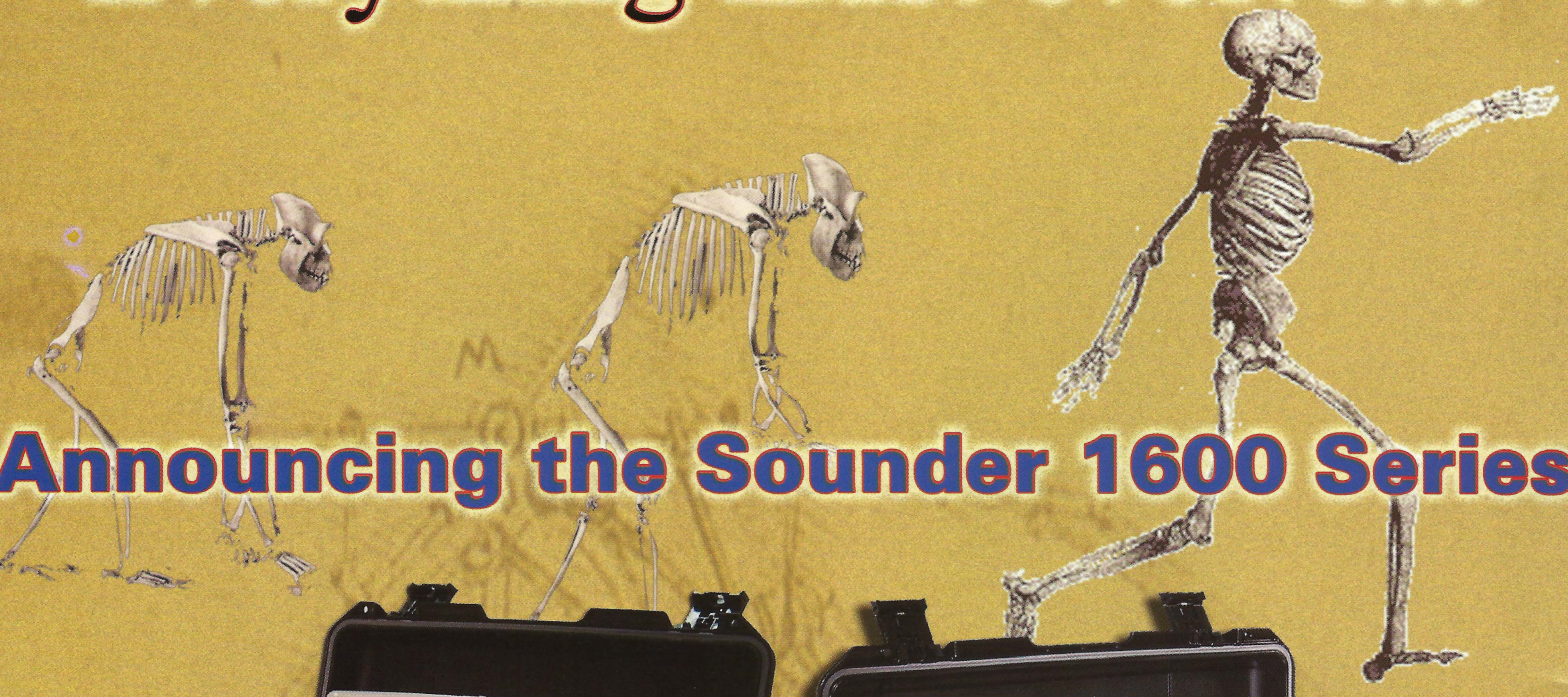
JOURNAL OF THE CANADIAN HYDROGRAPHIC ASSOCIATION
REVUE DE L'ASSOCIATION CANADIENNE D'HYDROGRAPHIE

Edition No. 68 Spring / Summer 2006
Édition No. 68 Printemps / Été 2006

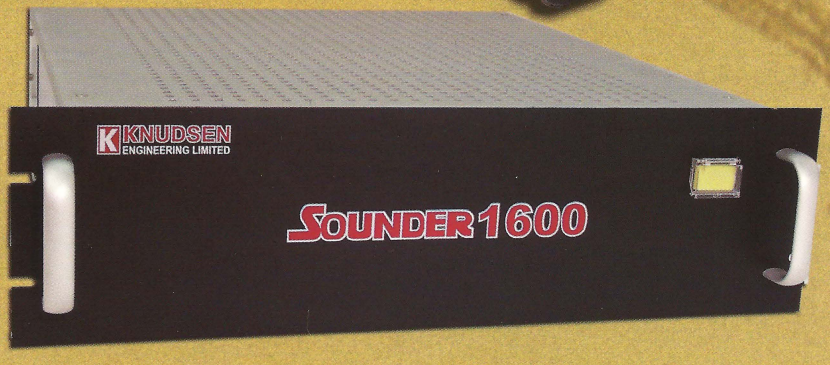
CONFERENCE EDITION
EDITION DE CONFÉRENCE

ISSN 0711-5628

Everything must evolve...



Announcing the Sounder 1600 Series



KNUDSEN ENGINEERING LIMITED

BSI REGISTERED
ISO 9001:2000
FM 99514

info@knudsenengineering.com
www.knudsenengineering.com
Phone (613) 267-1165
Fax (613) 267-7085

Journal of the Canadian Hydrographic Association Revue de l'Association canadienne d'hydrographie

contents contenu

LIGHTHOUSE

Edition/Édition 68 • Spring/Summer Printemps/Été 2006

Editorial Staff/Équipe de rédaction

Editor/Rédactrice en chef:	C. Zeller
Layout/Mise en page:	J. Weedon
Translation/Traduction:	Section du Québec
News/Nouvelles:	CHA Branches
Treasurer/Directeur des finances:	G. McFarlane
Distribution:	E. Brown

Every edition also receives assistance from the CHA Lighthouse Committee.
Chaque édition est réalisée grâce à la collaboration du comité Lighthouse de l'ACH.

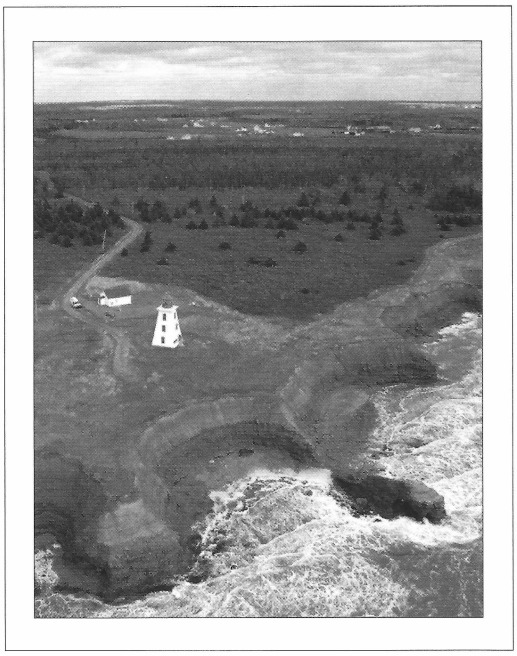
All *LIGHTHOUSE* correspondence should be sent to
Adressez toute correspondance au:

LIGHTHOUSE, Canadian Hydrographic Association
867 Lakeshore Road P.O. Box 5050
Burlington, ON Canada L7R 4A6
Telephone/Téléphone: (905) 336-4501
Fax/Télécopieur: (905) 336-8916
E-mail/courriel: Lighthouse@car.dfo-mpo.gc.ca

regular features / chroniques

Visit us at : www.hydrography.ca

Cover / Couverture



Cape Egmont Lighthouse
Cape Egmont, Prince Edward Island

Photograph credit: Department of Fisheries and Oceans, Bedford Institute of Oceanography, Dartmouth, Nova Scotia

The Cape Egmont Lighthouse was built in 1884 and is the same design as the Wood Islands Lighthouse and the Cape Bear Lighthouse (also located on Prince Edward Island). It is the only light on the coast along the 46 mile stretch between West Point and Seacow Head. Serious erosion of the 33 foot cliff led to the tower being moved in 1998 (*Source: various sources from the Internet*).

For the mariners - List of Lights #1024; Light Characteristics: Flash 1.5 seconds, Eclipse 3.5 seconds; Focal Height 19.86m; Nominal Range 12.5NM; GPS Location 46°24'6.642"N, 64°8'2.435"W (*Source: CCG List of Lights*).

[Editor's Note: *Image has been digitally edited removing a large skeleton tower located beside the separate white building for presentation purposes.*]

directors/directeurs

Editor's Note / Note du rédacteur

This is *Lighthouse*; Canada's hydrographic journal. Issue 68 is the spring edition and the companion to CHC2006. It contains articles from a spectrum of hydrographic professionals. The autobiography of Mike Easton, C.M. scientist emeritus of the Canadian Hydrographic Service, is presented alongside the work of graduate students from one of the most prestigious of schools in the realm of hydrographical science and geodesy. In addition, we are proud to reprint an article from one of our corporate partners from across the waters, a Hydroservice piece that first appeared in *Hydro International*. The renowned John Hughes Clarke was good enough to let us include an advance look at an article that will soon appear in the *Hydrographic Journal*. This magazine attempts to find a balance between the technical and the humanistic. Also, it looks to promote the best works of hydrography while still providing a stage for the emerging professionals and all in the spirit of adventure and wonder.

Two of the goals of the CHA are to promote hydrography and the professional development of Canadian hydrographic professionals. The latter is well addressed by this issue and the 67 others before it, and hopefully, by the hundreds to follow. The former goal, while still being addressed, is more illusive. It is illustrative that the spell checker has yet to believe that there is even a word 'hydrography", much less a considering it a household word.

Lighthouse is a volunteer driven publication. Its continuance is a testament to the past members like Earl Brown and Paola Travaglini and the current CHA crew of Andrew Leyzack, Jim Weedon, Fred Oliff, Brian Power and many others. There is no magazine without their dedication and willingness to expend their energy and skills to make each issue as sharp as possible.

Moreover, this publication cannot be realized without the kind support of our advertisers. That the likes of Kongsberg and Knudsen advertise in our publication of hearty but not unlimited circulation is homage to their support of hydrography as much as their desire to tell the world of their newest and best products. They deserve our continued thanks and respect for helping to ensure our mission continues.

Lastly, and most importantly, our thanks are directed at our patrons whose membership makes this publication possible and worthwhile. It survives by their will and their proud efforts. They spread the word that hydrography is essential to navigation, trade, science, safety and security. It will be with us until the oceans run dry or people turn their back on the sea. Neither of which is likely to happen soon. Please share this issue with your peers and friends. They are as welcome as you are to send along your comments, suggestions and items for inclusion. It is with your continued enthusiasm that *Lighthouse* shall last as long as hydrography and we will be the better professionals for it and, just maybe, help make hydrography a household name.

Craig Zeller

Message from the National President
Mot du Président national

CHC2006 is here and I tip my hat to the organizing committee for pulling together this event in a relatively short time frame. Having been involved with the organization of past conferences I can attest to the amount of work involved with making one of these events happen. There's an additional challenge when efforts are made to select papers to develop a technical program around the conference theme. That theme, *Bridging Disciplines*, is most topical to our profession as users are discovering many non-traditional uses for hydrographic services. Much to their credit, the organizers have selected topics which are relevant to a recent IHO circular announcing the first World Hydrography Day (WHD).

The United Nations General Assembly have taken notice of the contributions of Hydrography and have passed a resolution under the Oceans and law of the sea agenda to declare June 21 World Hydrography Day. Resolution A/60/30, adopted on November 29, 2005 includes the statement, "*World Hydrography Day", [is] to be celebrated annually on 21 June, with the aim of giving suitable publicity to its work at all levels and of increasing the coverage of hydrographic information on a global basis, and urges all States to work with that organization to promote safe navigation, especially in the areas of international navigation, ports and where there are vulnerable or protected marine areas*". The IHO has requested its Member States to help communicate the "*recognition of the WHD and through this the significance of the IHO and its Member States Hydrographic Offices contribution to safety of navigation, protection of the marine environment, development and security*".

The theme for this first WHD is "85 years of the IHO contributing to worldwide safety to navigation" and both the CHA and the Canadian Hydrographic Service have planned events to recognize the occasion. I am proud to say that our association has, over its history, built a number of memorials to help bring public attention to the contributions of Hydrography. In recognition of WHD, we can look back on initiatives such as Central Branch's Admiralty Launch *Surveyor*, Guardian of Elevations established by Quebec Branch, and the plaque placed by our Pacific Branch in honor of the *CSS William J. Stewart.*

While the IHO is marking its 85th anniversary, we too have a reason to celebrate as it has now been 40 years since the CHA was founded. Therefore my wish for this organization's 40th is that we can continue to practice the intent of our founders through the promotion of Hydrography to the public and in the professional development of our members.

Je lève mon chapeau au comité organisateur de la CHC2006 pour la réalisation de cet événement en un laps de temps relativement court. Ayant déjà été impliqué dans l'organisation de conférences, je peux témoigner de la quantité de travail requis pour que de tels événements se réalisent. Les efforts fournis pour sélectionner les articles du programme technique représentant le thème de la conférence comportent un défi additionnel. Ce thème, « D'une rive à l'autre », est des plus représentatifs de notre profession car les usagers découvrent plusieurs utilisations non traditionnelles aux produits dérivés de l'hydrographie. Les organisateurs, à leur grand mérite, ont sélectionné des sujets lesquels sont pertinents à la récente lettre circulaire de l'OHI annonçant la première Journée Mondiale de l'Hydrographie (JMH).

L'Assemblée générale des Nations Unies a pris acte des contributions de l'hydrographie et a passé une résolution à l'ordre du jour sous les océans et le droit de la mer pour déclarer le 21 juin Journée Mondiale de l'Hydrographie. La résolution A/60/30, adoptée le 29 novembre 2005 inclut l'énoncé suivant: « *la Journée Mondiale de l'Hydrographie» sera célébrée annuellement le 21 juin, ayant pour objectif de publier adéquatement ses travaux à tous les niveaux, d'accroître la couverture de l'information hydrographique au niveau international et d'inciter tous les pays de coopérer avec cette organisation dans le but de promouvoir une navigation sécuritaire, particulièrement dans les zones de navigation internationale, dans les ports et là où existent des zones maritimes vulnérables ou protégées* ». L'OHI a demandé à ses pays membres de l'aider à transmettre la « *reconnaissance de la JMH, et se faisant, la signification de l'OHI et de la contribution des Bureaux hydrographiques de ses pays membres à la sécurité de la navigation, à la protection de l'environnement marin, au développement et à la sécurité*».

Le thème de cette première JMH est « L'OHI : 85 ans de contribution à la sécurité de la navigation mondiale » et ensemble, l'Association canadienne d'hydrographie et le Service hydrographie du Canada ont planifié des activités pour reconnaître cet événement. Je suis fier de mentionner que notre Association a, depuis ses débuts, construit des rappels commémoratifs pour attirer l'attention du public sur les contributions de l'hydrographie. En reconnaissance à la JMH, nous avons derrière nous les accomplissements tels que la baleinière de sondage Surveyor de la section Centrale, du Gardien des Altitudes de la section du Québec et de la plaque commémorative en l'honneur du CSS William J. Steward de la section du Pacifique.

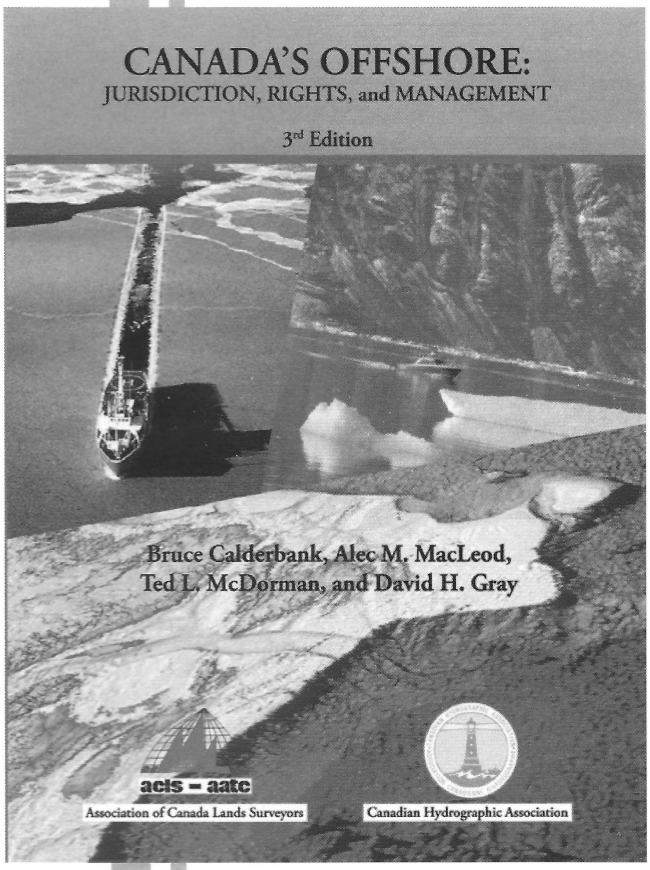
Alors que l'OHI souligne son 85e anniversaire, nous aussi avons une raison de célébrer puisque cela fait 40 ans que l'ACH a été fondée. Par conséquent, mon vœux en ce 40e anniversaire de notre organisation est que nous continuions de poursuive le but de nos fondateurs par la promotion de l'Hydrographie auprès du public et par le développement professionnel de nos membres.

Andrew Leyzack

Canada's Offshore:

Jurisdiction, Rights, and Management

Bruce Calderbank, Alec M. MacLeod, Ted L. McDorman, and David H. Gray



8.25" x 10.75" 352 pages
ISBN 1-4120-7815-6 B&W illustrations C$ 65
ISBN 1-4120-7816-4 Colour illustrations C$ 170
Extensive footnotes, bibliography

The last few years have seen major changes to the laws governing the offshore created by international agreements, Canadian legislation, and court decisions. This is the first Canadian book to deal comprehensively and systematically with these important issues pertaining to the jurisdiction, rights, and management in Canada's offshore.

The laws dealing with Canada's offshore have undergone considerable change and this book brings together various streams to provide an understandable overview.

This book covers the following:

- International practices, customs, laws, and treaties concerning the oceans, and their effects on Canada.
- Canada's responses to international ocean-related events through Canadian legislation, regulations and practices.
- International treaties and conventions, Canadian court decisions, and the result of arbitration decisions concerning Canada, with specific emphasis on the resulting ocean boundary delimitations.
- The mechanics of describing and determining ocean boundaries, and interpreting ocean-related Canadian legislation.
- Practical issues related to Canada's offshore oil and gas industry.

About the Authors

Bruce Calderbank, Editor in Chief, has worked in the offshore since 1978. **Alistair (Alec) M. MacLeod** is the Legislative Advisor to the Surveyor General of Canada Lands. **Ted L. McDorman** is a Professor at the Faculty of Law, University of Victoria, Victoria, British Columbia. **David H. Gray**, now retired, was the Geodesy, Radio Positioning and Maritime Boundary Specialist for 25 years at the Canadian Hydrographic Service.

About the Contributors

Dr. Susan Nichols, P.Eng., is a professor and manages the Land and Coastal Studies Program in the Department of Geodesy and Geomatics Engineering at the University of New Brunswick (UNB). **Sam Macharis Ng'ang'a,** is a part time lecturer and Land and Coastal Management Researcher for the Centre for Property Services at UNB. **Dr. Michael Sutherland** is a Post Doctorate Fellow at the University of Ottawa. **Sara Cockburn**, an attorney and an M.Sc.Eng (Geodesy and Geomatics Engineering), is a Project Manager-Special Projects (Marine) for CARIS.

For more information or to obtain books for purchase or review, please contact:

Association of Canada Lands Surveyors

T: 613-723-9200
F: 613-723-5558
W: www.acls-aatc.ca

TRAFFORD PUBLISHING

For purchase on line at:
W: www.trafford.com

Sponsors

- Kongsberg Maritime
- Brooke Ocean Technology Ltd.
- CARIS
- IVS 3D
- ESRI Canada
- ROMOR Atlantic Limited
- Canadian Hydrographic Service
- Canadian Hydrographic Association
- Hydro International
- CubeWerx

KONGSBERG

IVS 3D

ESRI Canada

CANADIAN HYDROGRAPHIC ASSOCIATION · ASSOCIATION CANADIENNE D'HYDROGRAPHIE ·

ROMOR ATLANTIC LIMITED

Hydro INTERNATIONAL

BOT Brooke Ocean Technology Ltd

CANADA HYDROGRAPHIC SERVICE HYDROGRAPHIQUE

caris

CubeWerx

A Universal Hydrographic Database

In Search of the "Holy Grail"

By: Andrey Dmitriev and Eivind Eik Mong, Hydroservice A/S, Norway

Editor's Note: This paper previously appeared in the October 2005 edition of *Hydro International*. Reprinted with permission.

The idea of a Universal Hydrographic Database (UHD) is well known within the hydrographic community. After years of discussions and attempted implementations, a UHD has become an attractive goal for those who strive to improve quality of navigational products with help of the newest technology – the Holy Grail of hydrography that will be able to resolve all outstanding problems. Being among the supporters of the UHD idea, the authors dare to put forth requirements for such a database, as well as to analyze approaches to UHD implementation.

Requirements to Universal Hydrographic Database

The main task for an HO is to provide for safe navigation within its zone of responsibility, as stated in regulation 9 of SOLAS Chapter V. All other tasks are just incremental steps toward fulfilling this main objective: survey, production and maintenance of navigational charts – paper as well as electronic, production and maintenance of navigational publications, exchange of relevant information with other governmental institutions (home or foreign) are all aimed at providing safe navigation.

Therefore, a real Universal Hydrographic Database should be a tool applied to all HO activities and any product produced by an HO (e.g. a navigational chart) should simply be a "subset" of information stored in the database – in other words, such a database should be the single source for all HO products. And the UHD must guarantee that a product derived from it is fully compliant with various national and international laws, standards and requirements, because navigational products among other properties possess legal responsibilities.

In theory, such a database should be capable of storing and maintaining:

- Raw survey materials and processed bathymetry,
- Navigational aids information,
- Other hydrographic entities used in vector electronic charts,
- Cartographic and typographic entities used in paper charts and books,
- NtM source and meta data,
- Raster data.

The database must also guarantee data consistency and security, it must allow a product to be retrieved with minimal efforts and time; it must guarantee that a product is correct, complete and current; it should provide interfaces for external information systems. To make it all work, all of the above must be coupled with traceability and workflow management. And of course the database must be reliable to the highest degree to guarantee fulfilment of the main objective – safe navigation.

For a user, it is not really important how data technically is organized within the UHD; what is important is the ability of the database as a production system to produce the safest possible product with less effort and complexity.

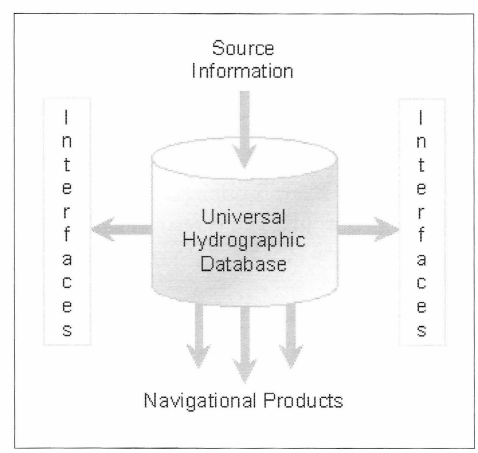


Figure 1: The Universal Hydrographic Database idea.

These requirements lead to the conclusion that the Universal Hydrographic Database is much more than just a data storage system or, regardless of computational power it delivers, a database engine. It is a complex of task specific tools, methods of using these tools and a management system that guarantee the generation of safe navigational products.

Nature of Hydrographic Data

To be a single source for all products including ENC, the database must contain a single, complete model of hydrographic reality – preferably in terms of S-57.

The nature of hydrographic data is such that all entities are naturally divided into 2 groups – the ones that possess identical spatial characteristics in all products and the ones that change their shape depending on the scale of the product (this is true for all possible products – ENC, AML, paper chart, etc.). First group comprises features such as aids to navigation, traffic schemes, some special areas and state boundaries. Second group comprises seabed, land, coastline and bathymetry in general.

With entities of the first group – scale-independent features – everything is really simple, such features either are in a product with no change or are not in at all.

The rest – scale dependent features – must be generalized before they can be used in a product (it goes without saying that the UHD stores such features at the best achievable accuracy, meaning at the largest scale).

Approaches to Universal Hydrographic Database Implementation

Today we can see two main approaches to UHD implementation.

1. "All-in-one" approach
2. "Tool-for-the-purpose" approach

All-in-one UHD

The "all-in-one" approach is based on the idea that a UHD should be built as one physical database, provided that a powerful enough database engine can be employed. Supporters of this approach say: "Let us utilize the newest data exchange standards, let us take the newest database engine available, let us utilize the powerful data tracking methods of this engine and this will fulfil all requirements for HO production. Each hydrographic feature will be stored in the database just once and it will easily go into various products made out of the same source."

However, although the "all-in-one" approach looks extremely attractive as it combines the natural desire for a simple solution with a common belief that powerful technology is able to solve all issues, difficulties arise from the very beginning – with scale-dependent features.

In hydrographic practice, generalizing is a semi-automatic procedure where "good cartographic judgement" is unavoidable. To accommodate this fact, a UHD must be structured into scale bands and one feature description will have multiple geometry links. From a hydrographic perspective this generates multiple models of reality because some features may disappear in some scale bands. Technically there cannot be too many scale bands; consequently the generalized geometry will correspond to several "standard" scales only. Thus the idea of a single source for all products changes into a "single-source-for-all-products-in-a-scale-band" idea – still not bad, but less "Holy Grail-like" than before.

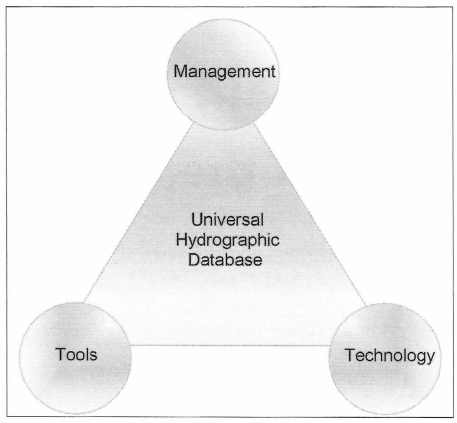


Figure 2: The Universal Hydrographic Database Elements.

Let us analyze an ENC cell product (provided the database is S-57 based, this is the simplest case scenario). Among other requirements, the ENC Product Specification contains some not directly connected with hydrography: chain-node topology, clipping areas and lines at cell boundaries and unique feature IDs.

When a cell is generated, due to clipping, the source database features must be modified and one feature may turn into several features with different shapes – each one with a unique ID. A product may even require manual editing – for instance, when a cell's scale gets in between two database scale bands and more generalizing is necessary. For products like paper charts or NtM booklets editing after extraction is unavoidable. Thus there are several instances of the same real-world feature – each scale level and each product contains its own instance and they may not be fully identical! As a result, to maintain a product, the product must be stored in UHD as a separate entity.

To conclude, the all-in-one database idea now looks like this:

- Database contains a set of models of hydrographic reality made at fixed scales.
- Products derived from those scale bands must also be stored in the database.
- Information in the database naturally multiplies, it is impossible to have just one instance of a scale dependant feature and hence changes must be done several times.
- Product extraction may require manual operation.

One must also keep in mind that to extract a single product an HO has to set up, deploy and populate the database; there is no step-by-step implementation. Introduction of the all-in-one UHD is really a revolution at an HO because it requires a total restructuring of the organization.

Tool-for-the-purpose UHD

The tool-for-the-purpose approach is based on the following premise: a continuous coverage of S-57 cells works as a hydrographic database. This is so because:

- S-57 cells are organized in scale levels, each level is seamless (no data overlap).
- Each cell is complete and suitable for safe navigation.
- From software point of view, it is a matter of a query engine where to search for data – in a database or in a set of cells; the user will get the same result.

Accepting this idea, one will see two immediate benefits compared to the "all-in-one" approach:

1. No complicated extraction is required, cells are ready products that can be distributed and maintained directly.
2. Cells can be used as source for highly automated paper chart production.

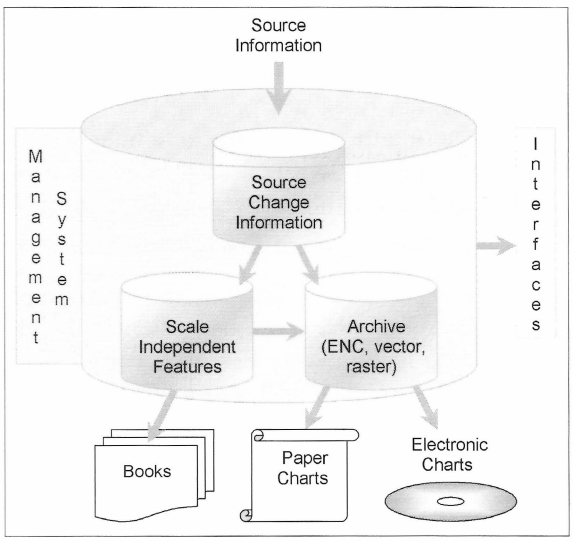


Figure 3: Tools-for-the-purpose Universal Hydrographic Database.

As we have seen, the idea of a single source does not really work even for an all-in-one UHD. Therefore, we have to accept this fact and minimize the complexity of the solution by breaking the whole database into specialized tools, responsible for a certain HO product. Each tool can be used independently, but when combined into a common environment and working together, the tools will form the Hydrographic Database that meets the requirements for an UHD.

These tools are:

- a feature database for scale-independent features (Feature Object Database) – the source for scale-independent ENC features and for Light List book;
- file-based database (Archive) that stores S-57 cells, survey data, raster and paper charts;
- a database that keeps and processes source information for changes in hydrographic reality (Source Message Database); these changes initiate cell updates, paper chart corrections and NtM production;
- software interfaces between the tools and interfaces to the outer world – GML, web-based publishing and so on;
- a workflow management system that organizes and monitors the production process according to existing HO guidelines.

The resulting UHD will possess the same functionality as an "all-in-one" database with the following advantages:

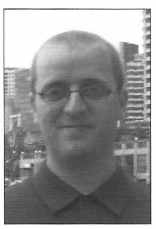
- Modular structure, an HO is using just the parts it really needs and there is no need to install and deploy all parts at once.
- More reliable operation, because the information is maintained in the same form it will be used on board a ship.
- Product quality is achieved with less effort, because there is no need for complicated product extraction routines.
- Less data duplication, because hydrographic database storage and product storage is the same.
- Easier expansion, as there is no need to modify the main database structure if a new product is not S-57 compatible.

Conclusion

The main function of a Universal Hydrographic Database is its capability to produce safe navigational products. A technical solution selected for UHD implementation must achieve this goal using the safest and most reliable methods. In this respect the "tool-for-the-purpose" implementation approach is preferred over the traditional "all-in-one" database organization.

About the Authors:

Andrey Dmitriev is Production Manager of HydroService AS in St. Petersburg, Russia. He takes part in all development projects including dKart Office production system and dKart Inspector.



Eivind Mong is a Technical Support Engineer at HydroService AS, based out of Toronto, Canada. He is involved in dKart Office support, installation, training and S-57 and S-58 standards development and implementation.

Improved Definition of Wreck Superstructure Using Multibeam Water Column Imaging

By: John E. Hughes Clarke and Steve Brucker, Ocean Mapping Group, Department Geodesy and Geomatics Engineering, University of New Brunswick
Kal Czotter, Canadian Hydrographic Service - Pacific Region, Institute of Ocean Sciences, Sidney, BC

[Editor's Note: *An expanded discussion of this topic will appear in a forthcoming edition of The Hydrographic Journal and will also be presented as a paper at CHC 2006.*]

A major priority in navigational hydrography is the reliable delineation of the least depth in an area. In regions with significant anthropogenic debris (sunken vessels, offshore engineering structures etc.), that least depth is routinely found on submerged man-made features rather than the longer wavelength natural geomorphology.

Multibeam sonar has been widely adopted as the de-facto tool for hydrographic survey and provides previously-unobtainable resolution of natural geomorphic relief such as sand waves, rock ridges and reefs. Such multibeam sonars, however, have to achieve bottom detection at non-specular angles and thus must reliably track the seabed, even in the presence of sidelobe echoes and mid-water scatterers such as fish.

In order not to frequently mistrack on false echoes, bottom detection algorithms tend to have spike filters and optionally range-gating. Those filters and gates, however, tend to reject the discontinuous distribution of scatterers observed around man-made features like wrecks. Thus there is a trade off between having "clean" bottom tracking, and reliable delineation of discontinuous, but possibly real, targets.

The example images shown here demonstrate the improved efficacy of using the water column imaging capability available with the latest generations of multibeam sonars. In the examples shown, the real-time bottom tracking (yellow dots) [*see Editor's Graphic Note*] is locking on to just a single target (the strongest, or the most like the adjacent) at a given beam-forming angle, whereas, due to the finite beam-width and the presence of sidelobes (Hughes Clarke, 2006), there are often multiple possible echoes at that elevation angle.

In the examples shown, a 60m long wreck in 22m of water is imaged at 8 knots using an EM3002, pinging at 10 Hz. The wreck (the *G.B. Church*) was deliberately sunk for recreational diving and was photographed extensively as she settled. The exact position and size of all protruding features are thus well known. The water column imaging (processed using the OMG/UNB SwathEd software), clearly reveals all the protruding features including masts, davits, spars and ribs over the hold. The real-time bottom tracking algorithm does not reliably pick up all these targets. By altering the bottom tracking filter settings (to wide open), a greater density of true targets is revealed, but at the expense of false echoes as well (Hughes Clarke, et al., 2006).

By using the water-column imaging, the hydrographer is able to quality assure the spurious outliers in the vicinity of a man-made feature with increased confidence. It is hoped that such an approach will remove the need for routine wire or bar sweeping still performed by many hydrographic agencies.

References:

Hughes Clarke, J.E., 2006, Applications of Multibeam Water Column Imaging for Hydrographic Survey: The Hydrographic Jounal, April Issue, in press.

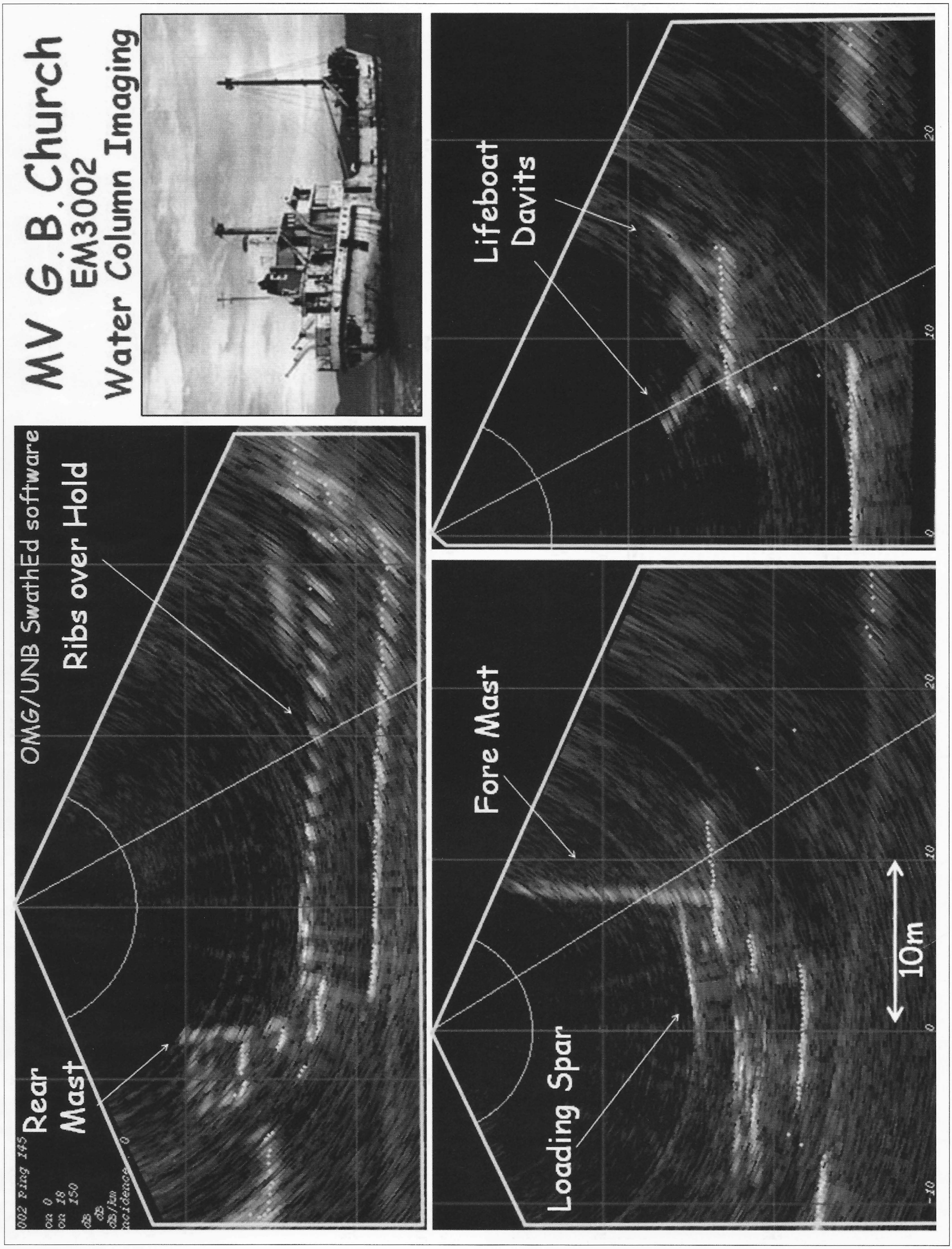
Hughes Clarke, J.E., Lamplugh, M. and Czotter, K., 2006, Multibeam Water Column Imaging : Improved Wreck Least-Depth Determination: Canadian Hydrographic Conference, Halifax., June 2006.

About the Authors

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.

Steven Brucker is currently working towards concurrent undergraduate degrees in Geodesy and Geomatics Engineering and Computer Science at the University of New Brunswick as well as having studied at the British Columbia Institute of Technology. He is currently employed by the Ocean Mapping Group and has worked aboard the *HERON* as well as the *CCGS AMUNDSEN* in the Canadian Arctic.

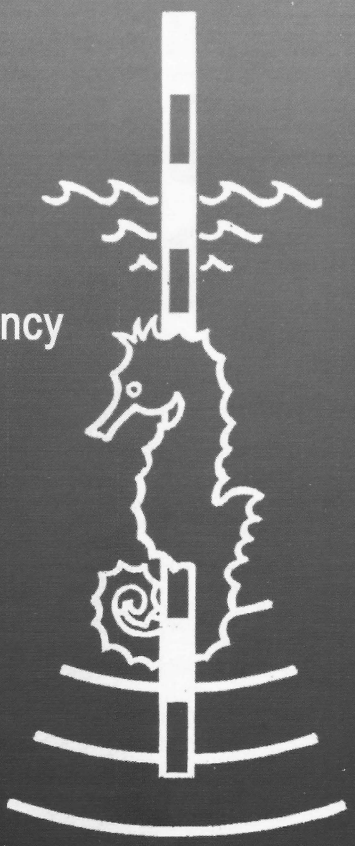
Kalman Czotter is an Engineering Project Supervisor in the Hydrographic Surveys Division, Canadian Hydrographic Service - Pacific Region. He has worked as a field hydrographer with CHS since 1974. He obtained his Canada Lands Surveyor's commission in 1993. He has authored numerous articles, reports on various hydrographic systems, is the current chairman of the CHS Technical Support Working Group and is also a member of the CHS Standards and Procedures Working Group.



Example images demonstrating the improved efficacy of using the water column imaging capability available with the latest generations of multibeam sonars.

[Editor's Graphic Note: *The image has been presented in grayscale due to printing requirements. The yellow dots referenced in the paper are shown as distinct white dots on the example images.*]

International Federation of Hydrographic Societies



- is a unique global partnership of learned national and regional hydrographic societies
- addresses every specialism within the hydrographic and related professions, at all levels of experience and proficiency
- supports improved standards in education and training
- promotes knowledge and expertise at its symposia, seminars and workshops
- publishes both the prestigious quarterly The Hydrographic Journal and other specialist literature
- offers a wide range of additional information and services at www.hydrographicsociety.org

serving the interests of the world hydrographic surveying community

International Federation of Hydrographic Societies
PO Box 103
Plymouth
PL4 7YP
United Kingdom

Tel & Fax: +44 (0)1752 223512
email: helen@hydrographicsociety.org

www.hydrographicsociety.org

Antwerp Hydro'06
6-9 November 2006

'Evolutions in Hydrography'

6-9th November 2006
Antwerp, Belgium

organised by Hydrographic Society Benelux on behalf of the International Federation of Hydrographic Societies

www.hydro06.com

The Good Fortune of a Sextant Surveyor

By: Mike Eaton, Canadian Hydrographic Service, Atlantic Region, Retired

Mike Eaton joined the Canadian Hydrographic Service (CHS) in 1957 in Ottawa and moved to the Bedford Institute in Dartmouth in 1963 shortly after it opened. In 2005 he was made a member of the Order of Canada for his work on the development side of the CHS. This is his brief autobiography.

Beginnings

I was born a doctor's son in North Ferriby, near Hull, on the muddy banks of the Yorkshire side of the Humber estuary (all points to be read in England, not in Quebec or Newfoundland!). Both my parents enjoyed walking, so I learned my favourite recreation early. As a teenager I was sent to a so-called 'public school' (meaning a private boarding school) in Scotland, and I spent my school holidays working on a farm in the village to help the war effort. I had always liked messing about in small boats and so as soon as I finished school in 1945 I joined the British Navy, and spent the next 12 years as a bridge officer. Right away I found I was spending more time on big ships than in small boats, so as soon as I was through the extended initial training I specialized in surveying and spent much of the following five years in a sounding boat.

The Navy has been charting the world for over 200 years (viz. Capt. Cook's surveys of the 1760s, which about doubled the size of Newfoundland) and I worked on the coasts of England, Scotland, Persian Gulf, Zanzibar, Borneo, Malaya, learning the dual trades of bridge officer and hydrographic surveyor. I started with a sextant for positioning by horizontal angles on shore marks, but I also got involved in the new Decca radio-positioning navaid used for the Normandy landings as it came into use for general navigation. But even in the surveying service the traditional naval duties played a significant part, so I decided to look for work outside the navy where I could concentrate on surveying. I preferred a cool climate, and Canada was an open-minded country with a good international reputation so I applied to the CHS for a job.

In Canada

In coming to Canada in 1957 I had three strokes of good fortune. First, the CHS just happened to be looking for staff with my background of mariner combined with surveyor at that time. Second, that Canada was in an optimistic and self-confident mood and the government was willing to spend money on new developments which promised to improve the life of Canadians. There was a good future for those working in technology development.

As a Dutch colleague once said "If I had stayed in Holland I would have mapped a town; I came to Canada and I mapped a continent". If I personally had stayed in the UK I might have ended up on revision surveys of a muddy estuary. In Canada I was lucky enough to start by surveying in Hudson Bay and then in the Arctic for five years developing towed echo-sounding for charting in open leads by helicopter. Next I took an education break to get a Physics degree and afterwards worked on testing, calibrating and implementing new radio navaids for hydrographers and oceanographers, and for general navigation as well. Finally, I took part in the biggest improvement in navigation for 50 years - the Electronic Chart.

Radio-Positioning Nav-Aids

In the 30 years from the 1950s, which marked the end of positioning chart surveys by sextant on shore marks, up to the early 1990s when Navstar Global Positioning System (GPS) satellites provided worldwide coverage, hydrographic surveyors used a variety of radio-positioning nav-aids with shore-based transmitters. The manufacturers of these systems seldom tested them beyond the factory bench, where of course they worked fine. We found that things were often very different out in the real world of transmitting through the atmosphere over rough terrain and across the water.

This applied particularly to Loran-C, whose coverage was being expanded over Canadian waters in the 1970s. The propagation velocity of the radio wave must be known accurately if a navaid is to be used for surveying or to be latticed on the chart, and for the long range, low frequency 'groundwave' transmissions of Loran-C this velocity varies widely depending on the conductivity of the surface over which the radio wave is propagated. The earlier European Decca chains set up along concave coastlines to cover narrow seas had avoided this problem by laying out medium range chains with the transmitters on the coastline and the propagation paths almost entirely over sea-water, which has a constant conductivity and hence a constant and well-known propagation velocity. But such a layout just does not fit the generally convex east coast of North America. To get adequate coverage with reasonable fix geometry at sea the Loran-C transmitters had to be located inland and they had to transmit over far longer ranges than Decca. There was little real knowledge

Mike Eaton receives his honary lifetime membership in the CHA from Atlantic Branch Vice-President Andrew Smith.

of the propagation velocity over land beyond the fact that it varied widely depending on the ground conductivity, and this became a serious problem in putting an accurate lattice on the charts.

We realized that we would have to calibrate the computed lattice at sea, augmented by less expensive land calibration along the coast. We obviously could not calibrate the entire coverage, and to extrapolate by force-fit of the predicted lattice to limited calibration from a small sample of calibration points would be asking for trouble. So, with the help of Paul Brunavs and Dave Gray of Nautical Geodesy, we went back to the basic prediction model in order to adjust the ground conductivity to give the correct propagation velocity that fitted the calibration measurements. The problem here was that a standard Loran receiver measures the TIME DIFFERENCE between the arrival of the master signal and the signal from each of the secondaries, whereas we needed to measure the actual TRAVEL TIME from each transmitter separately. Fortunately the solution was available in the form of a 'rho-rho' range-measuring Loran receiver incorporating an atomic clock which could be set to simulate the instant at which the master station transmitted. At Bedford Institute of Oceanography (BIO), Steve Grant programmed this in machine language, allowing us to measure the travel time of each transmission to each calibration position. Nick Stuifbergen then calculated the land conductivity, and hence the land-path correction, for all points on that bearing from the transmitter.

Another aspect of this work was testing the performance of survey systems, such as Decca Hi-Fix, Motorola Mini-Ranger, Sercel Syledis, etc. I remember testing Syledis by driving the calibration truck up a hill directly away from the transmitter, and finding that the ranges decreased instead of increasing as they should have! What was probably happening was that the direct signal from the transmitter was being attenuated by rough terrain between us and the transmitter whilst we were getting a strong signal reflected back from the hilltop in the opposite direction. Syledis was intended for use in coastal waters where our test situation could arise, perhaps by having an island between the launch and the transmitter attenuating the direct signal while strong reflections were being received from a cliff in the opposite direction. So we had to be aware that such a problem might occur. Another ranging system, Miniranger, detected two signal paths, one direct and one reflected from the surface of the water and the two sometimes cancelled each other out, either giving false ranges or 'range-holes' with no ranges at all. Terrestrial radio systems are also strongly affected by weather. At long range, the UHF Syledis that we tested would go down at the approach of a storm coming up the coast from the USA, long before the weather forecasts gave warning.

The Electronic Chart

My third stroke of good luck was the arrival of the enabling technology for the Electronic Chart (i.e. computer chart-making and satellite navigation) at the stage in my career when I could take full advantage of it.

The Electronic Chart is an entirely new way of navigating ships in confined waters. It is arguably even more important in the history of navigation than the invention of radar. The paper chart is an edited record of all the information gathered on a hydrographic survey. Plotting the ship's position on a paper chart by radar, bearings on shore marks, or radio-positioning takes time and is not very accurate, and so can only be used to direct the ship when there is plenty of sea-room. On the much more powerful Electronic Chart the ships position is shown continually and very accurately by the GPS satellite receiver, so the Electronic Chart is ideal for directing the ship in real time in close-quarters situations such as entering a harbour and docking.

It is surprisingly easy to get lost at sea. I got lost once myself in my early years, on watch on a survey ship off the west coast of Scotland. I had failed to keep a good 'dead reckoning' of the ships position and I didn't know where we were until I called the more experienced navigation officer and he put us back on the chart again.

Even close to land, where it matters most, it is virtually impossible to know exactly where the ship is. While all ports and seaways have buoys, lights, marks in line on shore and so on, and all ships carry radar, the shore marks seldom give an exact position and may be lost in

fog, and it is not always easy to say exactly what part of the shoreline, or which buoy, the radar is seeing. For example, a few years back the tanker *Exxon Valdez* ran aground off Anchorage, polluting a large part of the Alaskan coastline. The officer on the bridge apparently got lost and by the time he called the captain the ship was aground. It is inconceivable that this accident could have happened if that ship had been using an Electronic Chart which showed on the display exactly where the ship was and where the rocks lay ahead of her, plus the time she would hit them if no avoiding action were taken.

The principle of the Electronic Chart is simple: digitize the chart and display it on a screen, and put the ship on the chart display in the position provided by GPS (which is so precise that it is sometimes more accurate than an old chart). This gives the mariner a real time picture, a bird's eye view of the situation, continually updated and providing an accurate forecast of where he will be in 6 minutes time, 12 minutes time, etc., unless, he does something to change the ship's course and speed. This is a huge benefit to the mariner, reducing the stress of ship-handling enormously. One time, as I watched a ship's captain on the bridge easing a bulk carrier alongside a dock considerably smaller than his ship, and getting a headrope out long before I thought the bow was level with the wharf, the Captain said to me "I cannot think how I managed to do this in the days before we had the Electronic Chart!" And I remember another occasion during trials on a US Coastguard ship when we were hustled off the crowded bridge and sent down below to watch docking on the Electronic Chart in the blind plotting centre. At the moment we saw the ship get alongside on the display, we felt the slight bump as she touched the wharf! Very impressive.

So the term "Electronic Chart" does not really do full justice to this new development. The paper chart is a static archive of hydrographic information. The Electronic Chart is a dynamic real-time tool for navigation, which combines on one display the chart and two other critical sources of information:

1. radar overlay to verify the satellite positioning ("Never rely on one positioning method alone" is a vital maxim),
2. the Automatic Identification System (AIS, automatic inter-ship sharing of GPS position and velocity vectors), to overlay the location and velocity vector of other ships (thus adding collision avoidance to grounding avoidance).

In the early 1980s, thanks to Tim Evangelatos, the CHS was one of the first hydrographic services in the world to be developing methods of handling the large amount of data from hydrographic surveys by computer. Every year at that time a list of development topics was posted, and when in 1982 I saw 'Electronic Chart' on that list I recognized that due to my combined mariner's and hydrographer's background I was perhaps the CHS member best qualified for the job. Somewhat unwillingly, I took it on, and within a year it had gripped my imagination and I continued working on it for the next 20 years, well after I had officially retired in 1988.

At the start, Hugh Astle, of Universal Systems Ltd (now 'CARIS'), developed an Electronic Chart Testbed for us, and we used this on a small ship in Halifax Harbour to investigate the capabilities of the Electronic Chart and find out what developments were needed to make it effective and safe. Later, other hydrographic offices became interested, and in 1988 we took our Testbed to join several commercial Electronic Charts, including the Vancouver Offshore Systems Limited version then under development for the Port aux Basques ferry, on the Norwegian "North Sea Project". This was the first major seagoing test to "Demonstrate and analyze the usefulness of the Electronic Chart". The CHS Testbed was the only system to have a radar overlay and to use official hydrographic office data (a later requirement for IMO acceptance).

From then on the Electronic Chart had worldwide acceptance, and I was involved as a Canadian technical adviser in standards being developed by the International Maritime Organization (IMO) and the International Hydrographic Organization (IHO) to define the Electronic Chart Display and Information System (ECDIS), a standardized form of Electronic Chart internationally accepted as a replacement for the paper chart.

As usual, it soon became clear that "the devil is in the details" and the most significant of these from the mariners' point of view was the design of the chart display. So to help sort this out I chaired the IHO Colours & Symbols Working Group on developing the details of the core unit - the mariners' display - from its inception in 1989.

This display design project had three aims:

1. to ensure that the display is clear and unambiguous,
2. to ensure that there is no uncertainty over the meaning of the symbology,
3. to establish an accepted pattern for the ECDIS display that becomes familiar to,
4. the mariner so that he can take in the navigational situation at a glance.

Aim 1. - maintaining a clear display - was our main concern, and we had good advice from human perception institutes in Holland, Canada and Germany on how to achieve this. One of the complicating factors in maintaining a clear, i.e. un-cluttered, display is the need to show radar and AIS on the screen as well as chart information, and as Swedish pilot Sven Gylden wrote wisely in "Seaways" of Aug.'86: "Even the most experienced and well-trained navigators can make a mistake when forced to handle too much information at the same time". So we provided the means for the manufacturer to give the mariner full control

over what information appears on the display, so that the navigator can reduce what he sees to the essentials. For the structure to carry all these symbolization instructions we went to Germany, the original proponent of object-coded versus symbol-coded hydrographic data, and at the Hamburg sea-school Gert Buttgenbach, now head of 7Cs GMBH, developed the very effective IHO Colours & Symbols Presentation Library.

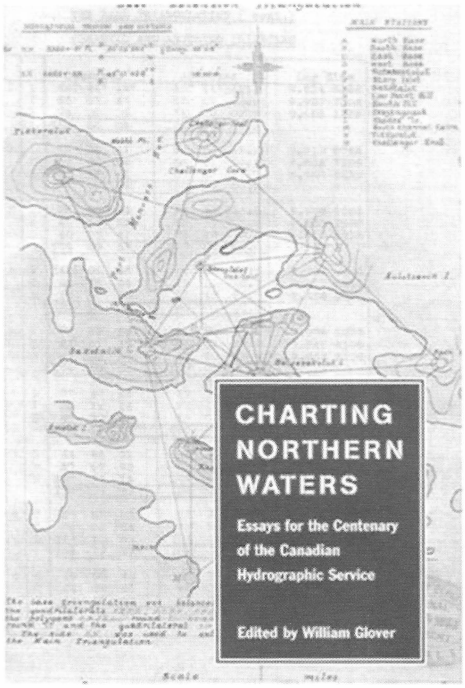
Manufacturers complain that the rigidity of the standards inhibits the development of ECDIS, but I believe that it is essential to have a uniform system for this big-ship, international trade, version of the Electronic Chart. Remember that the IHO was set up by the world's HOs almost 100 years ago to standardize the paper chart for similar reasons, and the mariner has benefited from that. Manufacturers of the unregulated version of the Electronic Chart, officially known as the ECS, are free to innovate, and there are probably 50 times more ECS in the world than ECDIS. But most importantly, I also believe that the official ECDIS must be kept flexible enough to adapt to new requirements and to pick up improvements tested on the ECS. If the ECDIS doesn't do this, it will die.

Working on the IHO Colour & Symbol Specifications gave me 15 post-retirement years of hard slog, but it was extremely interesting work, mostly in Canada through contracts with CARIS and NDI and CHS Central Region, but also working with HOs in Norway, Holland, Germany and Australia, plus the IHO in Monaco. My emphasis throughout was on what the mariner needs, not necessarily what the cartographer or the ECDIS manufacturer would like to see.

DID YOU KNOW...

World's Largest Tides

Where in the world are the largest tides? Is it Ungava Bay, Canada or the Bay of Fundy, Canada? Locations at both have measured tides larger than anywhere else in the world.



CHARTING NORTHERN WATERS

Edited by William Glover

Review contributed to *Lighthouse* by Fred Oliff

Published by McGill-Queen's University Press, Montreal, 2004
ISBN: 0773527109 Hardcover, 276 pages

Launched at CHC2004 for the centenary of the Canadian Hydrographic Service, *Charting Northern Waters* is a collection of essays published by the Canadian Nautical Research Society.

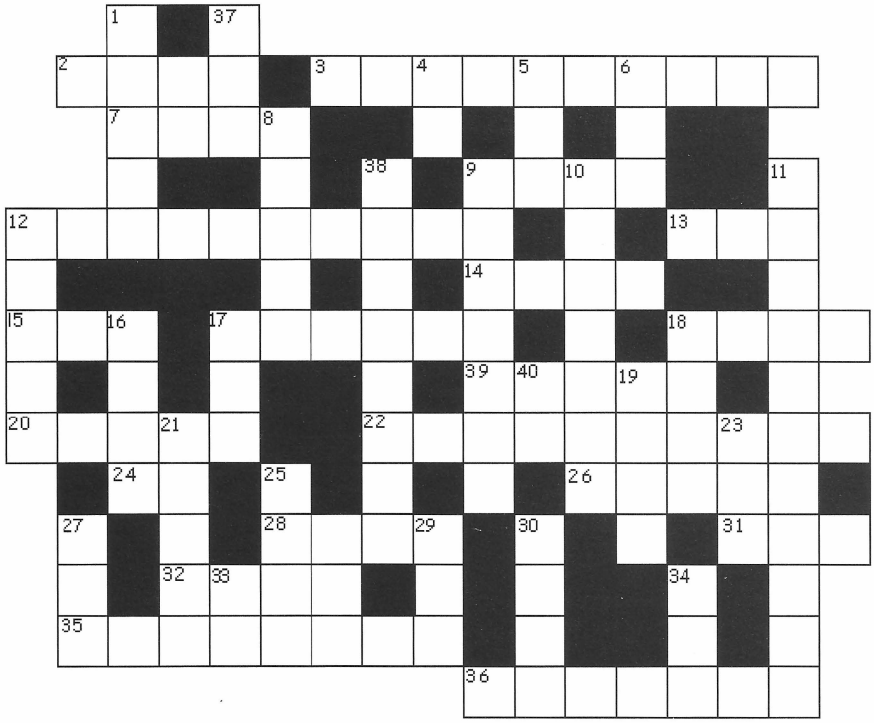
The editor, William Glover, has compiled 10 essays chronicling the French, Spanish, British, German, Russian, Canadian and American contributions to "northern" hydrography. What was interesting to note was that, in most cases the hydrography was done in Canada, but not by Canadians. The title *Charting Northern Waters* may be misleading to some and the expectation might be that the Arctic would be the main focus of the book. This is not the case and, in my opinion, northern is a relative term and it is dependent on the position of the reader. The target audience is more than likely to be found somewhere in southern Canada and, in this case, northern is appropriate for the majority of the essays focus on waters to the north.

Being somewhat of a keen amateur historian, I was fascinated to read of the early explorations and contributions of Alejandro Malaspina, a Spaniard of Italian birth; Spanish names such as Tofino, Galiano and Malaspina are still found on the modern charts.

Equally interesting was the wartime hydrography collected by German submarines for the war effort against the Allies in WWII. It is just coincidence but a hydrographic survey of the St. Lawrence River has just located perhaps the first ship, the *SS Nicoya*, sunk by the Germans in the Battle of the St. Lawrence. It was a lot more interesting than the recounting of mileages and costs associated with the Russian hydrographic studies of the first 40 years of the 20th century. The same cannot be said of the Ret'd Admiral Steve Ritchie's Labrador surveys. This essay chronicled some of the trials and tribulations of cold weather hydrographic surveying before the inclusion of Newfoundland into Confederation. Everyone who has surveyed in modern day cold weather can appreciate the trying conditions, without the marvels of recent innovations in cold climate clothing, which the British were faced with in the years 1932-34.

Anyone interested in the nautical history of Canada, or in the foundations of the CHS, should read this book. It is indeed a valuable contribution to any library of Canadiana.

The CHC 2006 Conference Crossword



Across

2 acronym – UN aplenty
3 The business end of the sounder
7 Store bought software; or beds
9 Canadian coin that bears the Bluenose
12 Dedication, desire and ..
13 The body and not the herb
14 Maclean:"The devil's only friend". Bad news on ships.
15 Loran correction
17 Ships and guitars have one
18 West Coast CHS hydrographer or mammal akin to a bunny
20 The consequence of built bridges
22 Some folks really dig it
24 To get it done
26 Exhibitor at CHC 2006
28 Cardinal direction; down but not south
31 Radio call, less urgent than some
32 A sticking point; no spot for the towed array
35 A local hero – the tugboat and not the goalie
36 Measuring the earth
39 Made for single use

Down

1 Diamonds are seducers but these wreck transducers
4 Morning
5 Pleasure craft, a jet .
6 To employ (an object)
8 A Canadian hero - ….. Dave Osborne
9 Of the nation - not around the farm
10 The boss and our client
11 Sounding of the sea, simply stated
12 This is for boats; draught is for hydrographers
16 This can crease a chart
17 A crew replacement conveyance
18 The wheel
19 Early spring can often be this
21 Singular bug, seldom found on their own
23 acronym – out of position
25 The line not the first
27 Sailors clothes
29 Hydrographers used to wear one to dinner
30 Good to ward off scurvy but better with tequila
34 Titantic's bane
37 Local time zone in the winter months
38 An aeolian lady?
40 An expression of surprise

Solution may be found elsewhere in this edition of *Lighthouse*.

Usage of Oceanographic Databases in Support of Multibeam Mapping Operations Onboard the *CCGS AMUNDSEN*

By: Jonathan Beaudoin and John Hughes Clarke, University of New Brunswick, Fredericton, NB
Jason Bartlett, Canadian Hydrographic Service, Burlington, ON

Introduction

In 2003, through a joint Canadian Foundation for Innovation (CFI), National Sciences and Engineering Research Council (NSERC) funded program, the decommissioned 1200 class icebreaker *Sir John Franklin* was brought back into service as a multidisciplinary science platform for research in the Canadian Arctic (Figure 1). Renamed the *CCGS Amundsen*, the ship was equipped with a variety of acoustic and supporting survey instruments to make her capable of state-of-the art seabed mapping. The 98-metre vessel is equipped with a 30 kHz Kongsberg-Simrad EM300 multibeam echosounder, which is a shallow to mid-ocean depth system (nominally 10m - 5000m). Further information about the mapping capabilities of the *CCGS Amundsen* is covered in Bartlett, Beaudoin, Hughes Clarke, (2004). The *Amundsen* plays an integral role in the ArcticNet program, a Network of Centres of Excellence of Canada (NCE) that studies the impact of climate change in the coastal Canadian Arctic (ArcticNet, 2006). Of the many research areas covered by the ArcticNet program, seabed mapping falls under Project 1.6 -- The opening NW Passage. The ArcticNet proposal lists one of the goals of Project 1.6 as building "a precise bathymetry for the Northwest Passage and other areas of the Canadian Arctic, using the state-of-the-art EM300 multi-beam echo-sounder". The word "precise" implies that due care must be taken to ensure that all soundings are as accurate as possible.

Figure 1: CCGS Amundsen after deploying scientists for surface ice sampling on the Arctic pack ice in the Beaufort Sea.

For the sake of brevity, a full discussion of the sources of errors in multibeam echosounding is avoided. Errors in orientation and position of the vessel are dealt with through adequate instrumentation: Applanix POS/MV 320 for orientation, heave and heading, and CNAV differentially corrected GPS for horizontal positioning. Vertical control is addressed by Hughes Clarke, Wert, Dare, Beaudoin (2004). The remaining, and most worrisome, of all sources of error onboard the *Amundsen* is sound speed. Surface sound speed errors were a problem in 2003, but they have since been dealt with in post-processing (Beaudoin, Hughes Clarke, 2004). The focus of this paper is the variation in sound speed throughout the water column, which causes refraction of the acoustic ray path and introduces systematic errors in the depth and horizontal position of soundings.

Problem

The *Amundsen* is equipped with several sound speed profiling instruments, one of which is a moving vessel profiler (MVP) from Brooke Ocean Technology, specifically the MVP 300. The MVP was not used during the 2003 transit for fear of ice damage. It was successfully deployed for the first half of the 2004 field season. However, mechanical wear rendered it inoperable for the second half. Unfortunately, it was lost in 2005 while surveying in the Labrador Sea. Without the MVP, sound speed profiles must be performed while the ship is stationary; this is accomplished with a conductivity, temperature and depth (CTD) profiling instrument.

During ship transit, a tight schedule constrains the amount of time available for the collection of stationary sound speed profiles along the ship's track. Profiles are collected intermittently, though not frequently enough to resolve oceanographic boundaries, leading directly to systematic biases in the multibeam depth measurements. Given the lack of MVP data and the few opportunities for stationary

profiles while transiting, there are two round trips from Quebec city to the Beaufort Sea for which there is little to no sound speed information available for the mapping data collected during transit (Figure 2).

Proposed Solution

It is necessary to investigate the usage of other sources of sound speed information instead of limiting the post-processing to the few profiles collected during transit. Since the speed of sound in water is a function of pressure, temperature and salinity, oceanographic databases of temperature and salinity values may be used to infer sound speed. It is the purpose of this preliminary work to assess the suitability of the World Ocean Atlas 2001 (specifically the ¼° grid) as a source of sound speed information for undersampled sections of ship transit.

The World Ocean Atlas 2001 contains temperature and salinity data for 1° and 5° grid (Figure 3). The grids, which cover most of the vertical extent of the world's oceans, are resampled from profiles from the World Ocean Database 2001 data. A ¼° grid of temperature and salinity, generated using the same methods as the 1° and 5° grids, is also available (Boyer Levitus, Garcia, Locarnini, Stephens, and Antonov, 2005). The ¼° dataset (referred to as WOA01 from this point on) is available as a set of yearly, seasonal and monthly averages; these grids may prove useful as sources of sound speed calibration in the absence of CTD and MVP profiles. Since the WOA01 grids represent average conditions (and are based on sparse datasets), there is a need to assess the robustness of the grids for ray tracing purposes, this being the subject of this work.

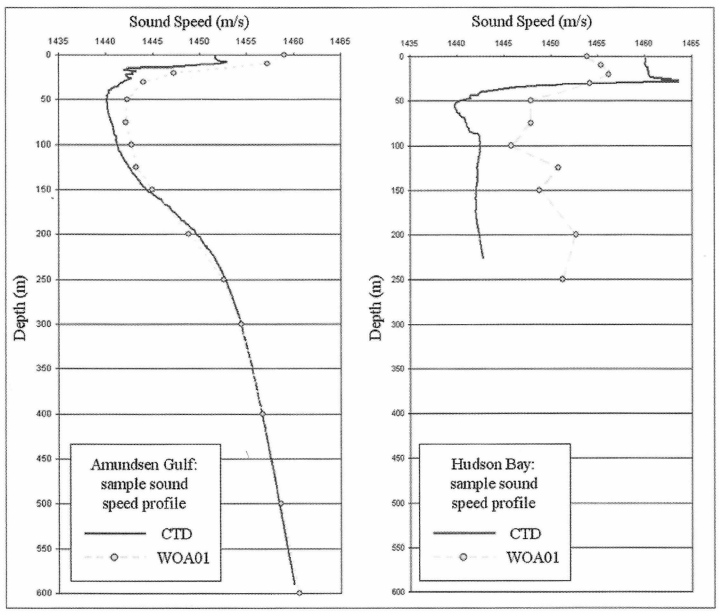


Figure 4: Comparison of actual sound speed profiles versus profiles extracted from WOA01 for Amundsen Gulf and Hudson Bay. Note that WOA01 vertical resolution decreases with depth.

Assessment of WOA01 grid robustness

Discrepancies (or errors) in sound speed profiles have non-intuitive effects on depth and positioning error. Figure 4 shows an example of the discrepancies between actual sound speed profiles and profiles from WOA01. A simple way to assess WOA01 is to use it for ray tracing and compare the results to a "true" dataset. An experiment was performed in which parallel ray tracing solutions were computed using (a) 362 actual sound speed profiles collected during the *Amundsen's* 2004/2005 field seasons (considered the "true" dataset), and (b) sound speed profiles corresponding to the 2004/2005 profile times/locations extracted from WOA01. The steps of the experiment are further described below.

Comparative ray tracing solutions were computed using each profile pair ("true" profile and corresponding WOA01 profile) with depression angle ranging from 30° to 90°. For each depression angle encountered during the ray tracing, the discrepancy between the two solutions was monitored,

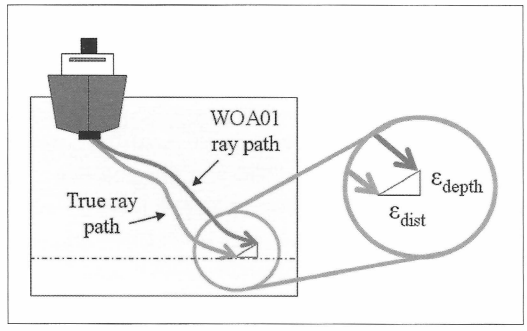


Figure 5: Illustration depicting a comparative raytracing solution between an actual sound speed profile and a WOA01 sound speed profile for a given depression angle. Varying the depression angle from 30° to 90° allows for the investigation of the error behaviour across the nominal swath width of the EM300 as installed on the CCGS Amundsen.

with the CTD profile generating a "true" solution against which the WOA01 ray tracing solution was compared (Figure 5). The worst case discrepancy encountered over the range of depression angles was reported as the result, sample results from one of the profiles are shown in (Figure 6). This generated a dataset of 362 assessments of the worst-case scenario errors incurred through usage of WOA01 profiles for ray tracing.

Results

The maximum observed errors due to WOA01 ray tracing for the 362 CTD profiles used in the experiment were less than 1% of water depth for depth and 2% for horizontal position, for 95% of the cases (Figure 7). Several trends are apparent when the data are examined geographically (Figures 8 and 9). For example, the western Arctic WOA01 profiles perform more than adequately most of the time,

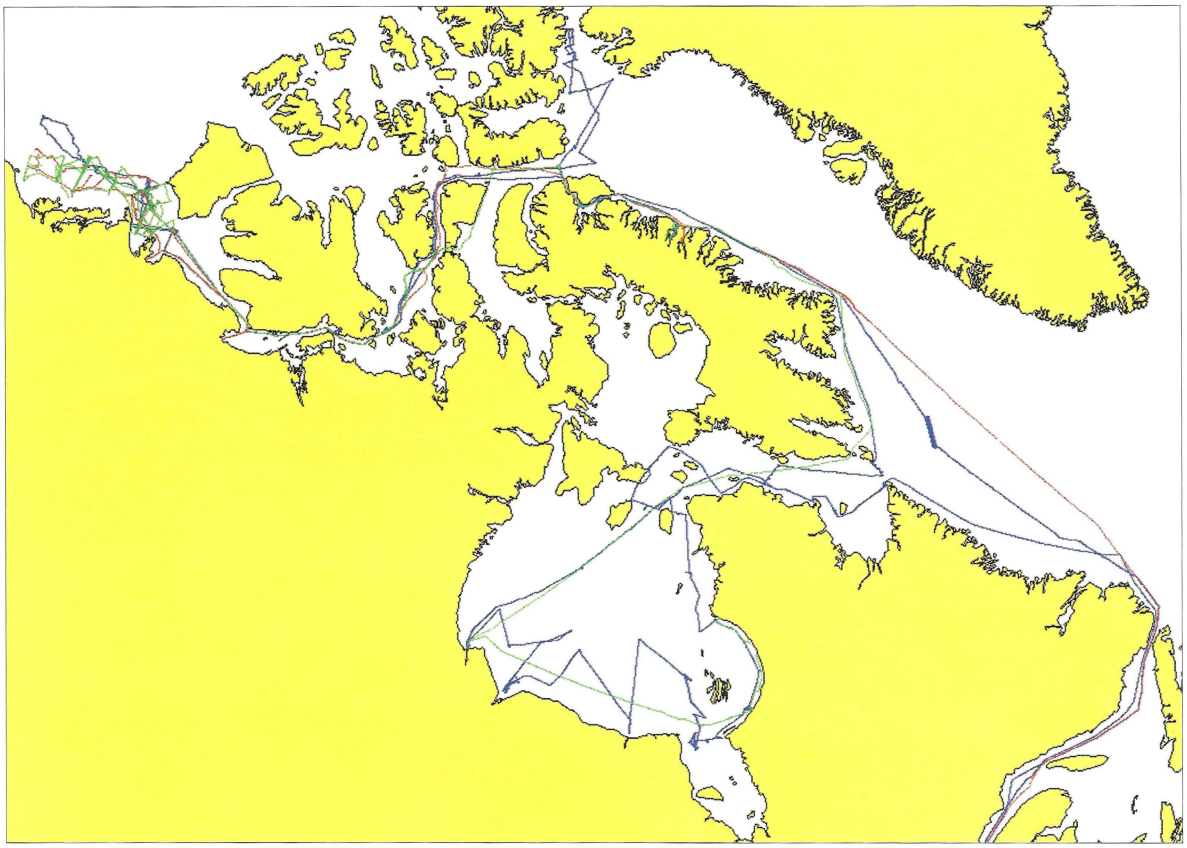


Figure 2: Shiptrack of the CCGS Amundsen over the 2003, 2004 and 2005 field seasons (in red, green and blue, respectively). After travelling north in 2003, the Amundsen overwintered in Franklin Bay in the western Amundsen Gulf and returned to Quebec city in 2004. The 2005 field season was the first round-trip to the Arctic accomplished in one year.

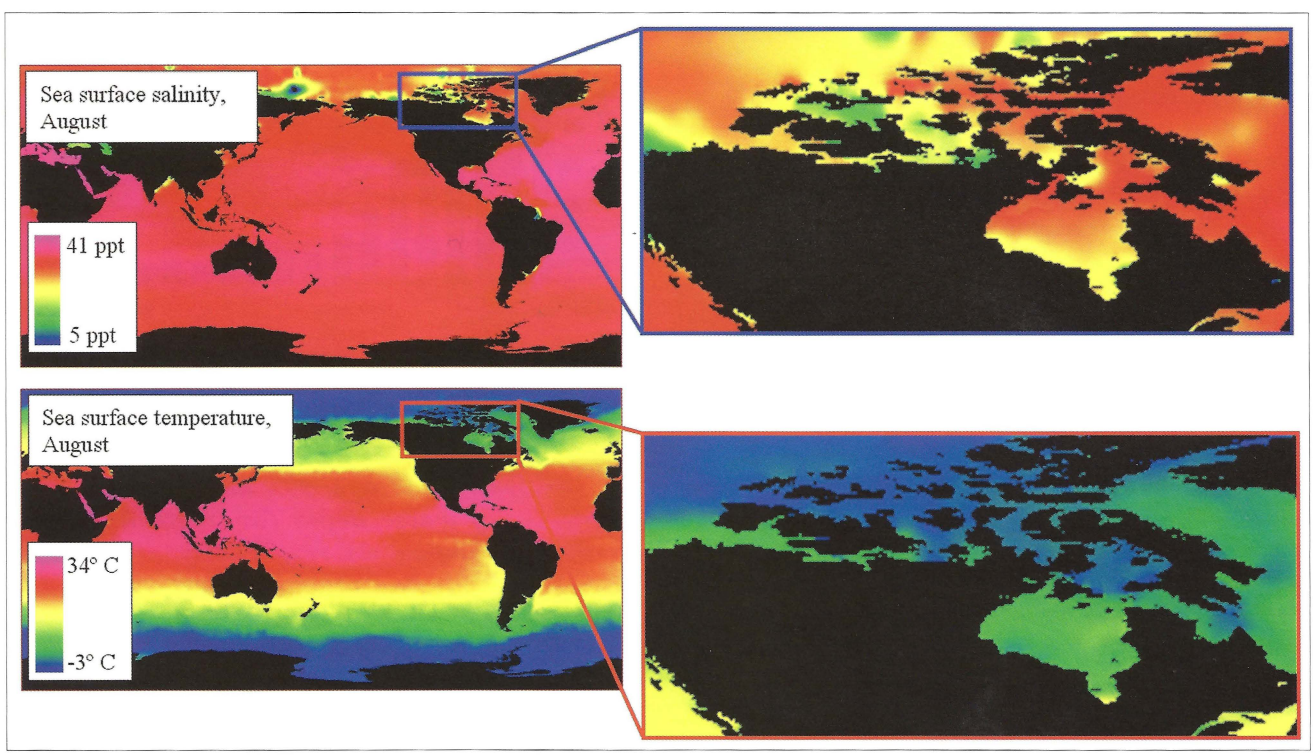


Figure 3: Sea surface salinity and temperature for the month of August, extracted from WOA01. Spatial resolution is ¼° in both latitude and longitude. Fluctuations in surface salinity are largely due to the presence of pack ice, which is quite variable from one season to the next.

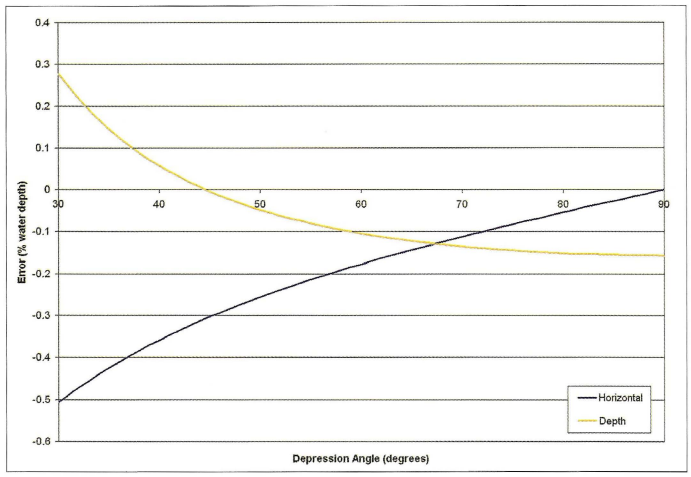


Figure 6: Sample results from comparative raytracing demonstrating variation in horizontal and depth error across the swath. As expected, errors are at their worst at the outer edges of the swath (corresponding to a 30° depression angle, far left on the x-axis). These results pertain to a profile collected in the eastern Amundsen Gulf.

giving errors less than 1% of water depth in almost all cases. Lancaster Sound and Smith Sound suffer more horizontal error, though the depth error is quite tolerable. Hudson Bay, on the other hand, is likely the area of poorest applicability of the WOA01 profiles, though errors are still surprisingly small.

Interpretation

This approach has two saving graces: (i) the surface sound speed is measured continuously, and (ii) for the most part, the WOA01 profiles agree remarkably well with 2004/2005 profiles below the surface mixed layer. As observed by Dinn, Loncarevic, Costello (1995) and Cartwright, Hughes Clarke (2002), ray tracing algorithms tend to recover gracefully when faced with outdated sound speed profiles that converge to reality at depth as long as one preserves the ray parameter (Snell's constant) through the measurement of the surface sound speed with a probe. By fixing the ray parameter at the surface, the true and computed ray paths will become parallel once the variable surface layer is passed. This is due to the fact that the ray parameter will maintain the correct departure angle at the deepest portion of the layer of surface variability regardless of the intervening sound speed structure in the water column. An error in depth and across-track distance is introduced due to the poorly matching surface portion of the WOA01 profiles. However, this error is constant and becomes increasingly insignificant with depth, especially in the case where the thickness of the variable surface layer is small with respect to the entire water column (Cartwright et al., 2002). This is likely why the largest of errors (expressed as a percentage of water depth) are seen in Hudson Bay, a bay that is considerably shallower than the Amundsen Gulf and Lancaster Sound.

Conclusion

The forecasted errors in this simulation suggest that WOA01 can be used for ray tracing in the absence of MVP/CTD profiles without seriously impacting on sounding accuracy. The worst performance is realized in Hudson Bay, whereas the grid proves to be quite suitable for ray tracing purposes in most of the western Arctic. The results obtained in this work are, of course, subject to several caveats:

(1) They apply only to the geographic areas of CTD sampling in the 2004/2005 field seasons. A "leap of faith" is required to expand the conclusions drawn in this study to the areas between sampling stations.

(2) They apply only to electronically beam-formed multibeam systems that measure the surface sound speed continuously. The same simulation was performed without surface sound speed matching between profiles; results were, as expected, very poor with errors approaching and occasionally surpassing 10% of water depth.

(3) They are limited to multibeam systems with a 120° angular sector. The angular sector of the *Amundsen's* EM300 is limited to +/-60° due to the transducers being recessed in the hull for protection against ice (refer to Bartlett, 2004 for more details). The minimum depression angle examined was thus limited to 30° and a wider swath system should expect larger errors in the outer portions of the swath.

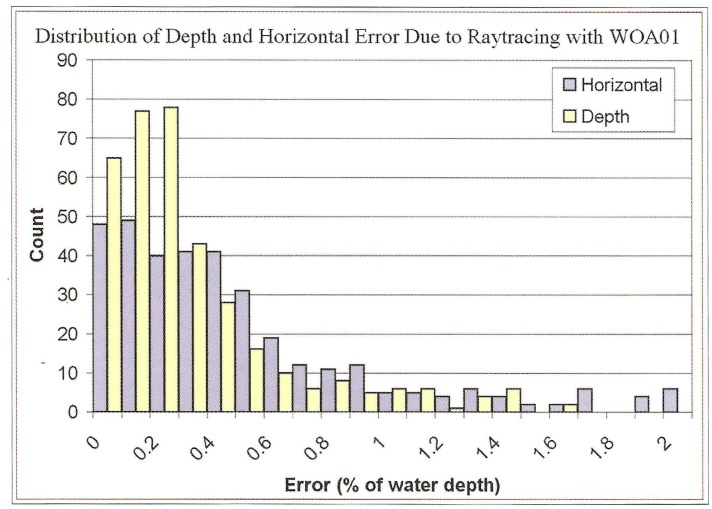


Figure 7: Histogram of results from comparative raytracing for all 362 profiles in the dataset. Of all errors, 95% are less than 1% and 2% of water depth for depth and horizontal components, respectively.

Future work

Future sampling schemes onboard the *Amundsen* can focus on undersampled geographic areas to improve this assessment of WOA01 ray tracing performance in said areas. In areas where WOA01 performed poorly (e.g. Hudson Bay), it would be useful to investigate the usage of the ArcticNet CTD profiles to improve the grid.

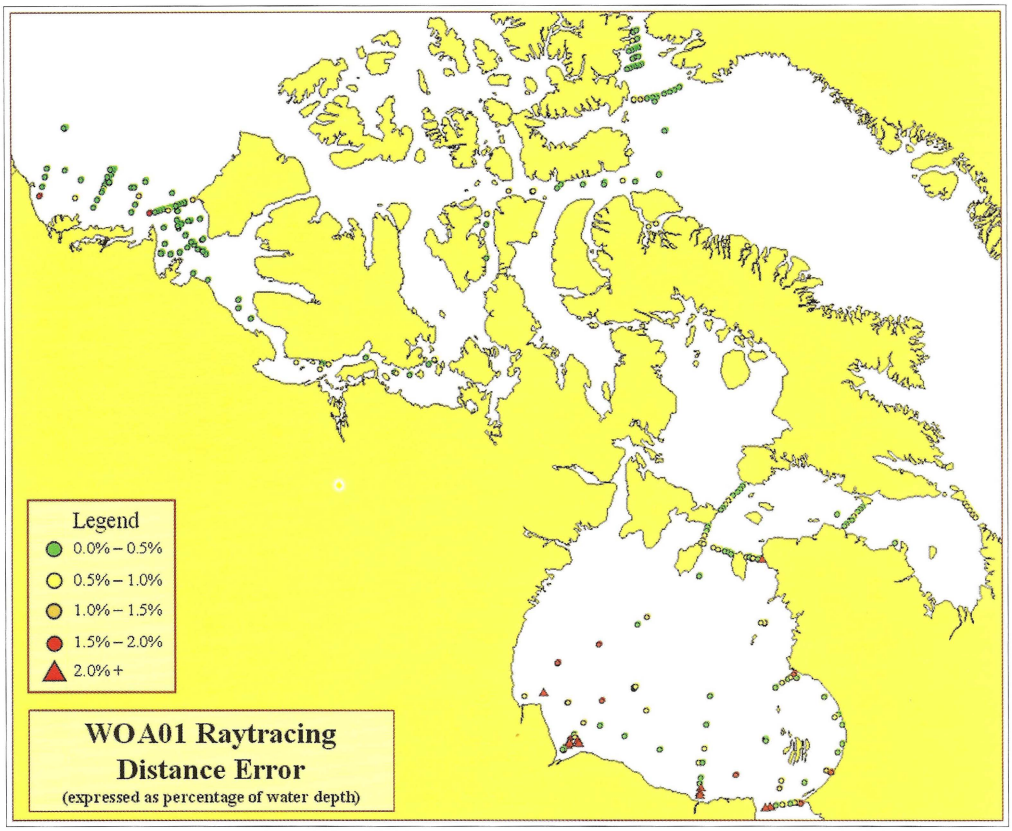


Figure 8: Geographic plot of horizontal component of error from comparative raytracing experiment.

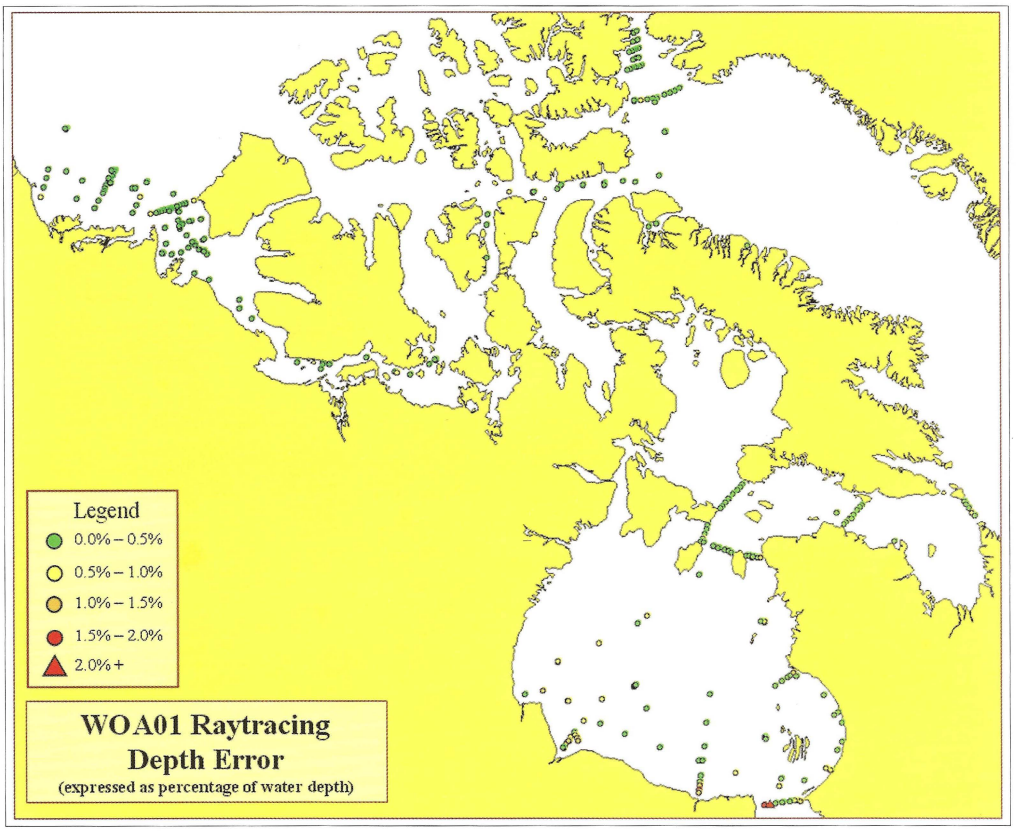


Figure 9: Geographic plot of depth component of error from comparative raytracing experiment.

HydroService
dKart Technology

dKart™ Office

A DIGITAL SOLUTION FOR HYDROGRAPHIC OFFICES AND CHART PRODUCERS

The fully integrated ENC-based cartographic production environment that includes:

- S-57 Object Oriented Database
- Electronic charts production and updating (ENC, AML, Inland ENC, etc.)
- Paper charts out of ENCs production and maintenance (INT1, INT2, M4, etc.)
- Notices to Mariners and other nautical publications compilation and design
- On-line Data Services (charts, publications, catalogues on the Internet, automated NtM delivery, etc.)

dKart Technology

- MORE THAN JUST TOOLS
- A COMPLETE PRODUCTION TECHNOLOGY

Members of dKart Office family:

dKart Inspector
dKart Editor
dKart Publisher
dKart FODB
dKart Archive
dKart Catalogue
dKart WEB Server
dKart Hydrographer
dKart Product Generator
dKart Exchange Set Verifier
dKart NtM Production

Hovlandsveien 52, P.O.Box 212,
N-4379 Egersund, Norway
Tel.: + 47 51 464960
Fax: + 47 51 464701
E-mail: info@hydroservice.no

There is a need to incorporate WOA01 into ArcticNet multibeam post-processing. Based on this work, it is feasible that sound speed profiles, collected over several years of ArcticNet operations, can be used in conjunction with WOA01 to provide a reasonably correct approximation of the water column. For ray tracing purposes, spatial-temporal decision algorithms must be designed that intelligently choose amongst existing CTD profiles, and then fall back to the database when no CTD profiles exist within the search area/time.

Acknowledgements

The authors would like to acknowledge the Networks of Centres of Excellence Canada and sponsors of the Chair in Ocean Mapping as sources of funding. Furthermore, the Captains and crew of the *CCGS Amundsen* are thanked for their patience and professionalism while dealing with the motley collection of 40+ scientists, technicians and engineers that are entrusted to their care each field season onboard the *Amundsen*.

References

ArcticNet, 2006. ArcticNet - Network of Centres of Excellence of Canada, *http://www.arcticnet-ulaval.ca/*, Visited March 29, 2006.

Bartlett, J., Beaudoin, J and Hughes Clarke, J.E., 2004, CCGS Amundsen: A New Mapping Platform for Canada's North: Lighthouse, Journal of the Canadian Hydrographic Association; Edition No. 65

Boyer, T., Levitus, S., Garcia, H., Locarnini, R.A., Stephens, C., and J. Antonov (2005), "Objective analyses of annual, seasonal, and monthly temperature and salinity for the World Ocean on a 0.25° grid". International J. of Climatology, v 25, n 7, Jun 15, 2005, Advances in Marine Climatology, p 931-945

Beaudoin, J. and Hughes Clarke, J.E., 2004, Retracing (and re-raytracing) Amundsen's Journey through the Northwest Passage: proceedings of the Canadian Hydrographic Conference 2004, Ottawa, CDROM

Cartwright, D.S. and J.E. Hughes Clarke (2002). "Multibeam Surveys on the Fraser River Delta, Coping with an Extreme Refraction Environment". Canadian Hydrographic Conference 2002, Proceedings, CDROM

Dinn, D.F., Loncarevic, B.D., and G. Costello (1995). "Effect of Sound Velocity Errors on Multi-Beam Sonar Depth Accuracy". Oceans Conference Record (IEEE). San Diego, CA, USA, IEEE, Piscataway, NJ, USA, 1995.V 1001-10.

Hughes Clarke, J.E., Wert, T., Dare, P., Beaudoin, J., and Bartlett, J. A stable vertical reference for bathymetric surveying and tidal analysis in the high Arctic. ArcticNet Annual Scientific Meeting, poster presentation, December 2004, Quebec, Canada.

About the Authors

Jonathan Beaudoin is a PhD student studying at the University of New Brunswick in Fredericton, New Brunswick, with his main research interest being the application of oceanographic databases for multibeam surveying in the Canadian Arctic Archipelago. In addition to being a student, Jonathan is the Ocean Mapping Group's dedicated research assistant associated with the ArcticNet project, which sees him involved in all stages of arctic mapping operations. He holds bachelor degrees in Geomatics Engineering and Computer Science, both from the University of New Brunswick.

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.

Jason Bartlett is a graduate of the Geodesy and Geomatics Engineering program at the University of New Brunswick. He is currently employed with the Canadian Hydrographic Service and works in close cooperation with the Ocean Mapping Group onboard the *CCGS Amundsen*. He has experience in both seismic surveying and hydrography which are both integral to the work onboard the *CCGS Amundsen*.

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*

Go F.I.G.ure

by Andrew Leyzack

This regular feature provides information and current news from the International Federation of Surveyors (FIG) with emphasis on FIG Commission 4 (Hydrography).

Working Week 2005 and the 8th International Conference on the Global Spatial Data Infrastructure (GSDI-8), Cairo, were well attended by several Canadian delegates. Canada (Edmonton) placed 2nd in a 3-way bid for the 2010 Congress, losing out to Sydney Australia. The strength of the Australian bid could be attributed to a large show of support from the Asia-Pacific region's member associations. We have however thrown our hat into the ring to serve as a backup venue for Working Week 2007 should security issues compromise Israel's ability to host this conference.

2006 is a year of transition for FIG as the working groups will be concluding their activities by the time we hold the FIG Congress this fall and new work plans for 2006-2010 are being formulated. The FIG office has circulated limited copies of their Annual Review and the Commission 4 2004-5 CD to various stakeholders including the CHA both publications summarize our work over the past two years.

Commission 4 work group structure:
4.1- Strategic Partnerships, Adam Kerr
4.2- A Vertical Reference Surface for Hydrography, Ruth Adams and Dr. Ahmed El-Rabbany
4.3- Administering Marine Spaces (Coastal Zone Management), Dr. Michael Sutherland

Additionally, we maintain a standards liaison within the FIG Standards Network and have been cooperating with the IHO in its Capacity Building initiative. The IHO First Edition, Manual of Hydrography (IHO M-13) is the product of their Capacity Building initiative. A copy has been burned onto the Commission 4 CD or you can download it free of charge from the IHO web site:
http://www.iho.shom.fr/
Then select > Publications > Catalogue > M-13.

As for standards activities, Commission 4 performed a review of ISO TC211 CD 19130.2 Geographic information-Sensor data models for imagery and gridded data and reported back to the FIG Standards Network on those sections relevant to Hydrography. Industry contacts were solicited to help assess the impact of a recommended vessel reference system.

Working Group 4.1 has brought forward Memoranda of Understanding with the International Hydrographic Organization (IHO) and the International Federation of Hydrographic Societies (IFHS). Working Groups 4.2 and 4.3 have been progressing towards final publications of their work and most recently, WG 4.3- Administering Marine Spaces held a workshop at the FIG regional meeting in Accra, Ghana, last March.

Through our recent agreements with the IHO and the IFHS we now have an opportunity to cooperate with these organizations to shape a change in direction for our future working groups. We believe our sister organizations can help us fulfill of our mission to develop guidelines and standards that will assist Hydrographers in the provision of their services. To this end, our outlook for the next 5 years will include continued involvement with the IHO in the areas of Capacity Building and standards.

A first call for input into our 2006-2010 work plan was initiated last March but I encourage you to take this opportunity to contact us and share your thoughts on the technical and/or policy issues of concern to you or your organization. If you are interested in learning more about FIG or specifically Commission 4, please contact your local CHA branch office for a copy of the 2004-5 Review or Commission 4 CD or log on to *www.fig.net* for more information.

Andrew

CORPORATE MEMBERS / MEMBRES CORPORATIFS

ASI Group Ltd.
P.O. Box 2205, 250 Martindale Road
St. Catharines, ON, L2R 7R8, Canada
Contact: Darren Keyes, Senior Operations Manager
Tel: (905) 641-0941 FAX: (905) 641-1825
E-mail: marine@asi-group.com
Website: www.asi-group.com
(affiliation - CHA Central Branch)

Association of Canada Lands Surveyors
900 Dynes Road, Suite 100E
Ottawa, ON, K2C 3L6, Canada
Contact: Jean-Claude Tétreault, CLS, a.-g., P. Eng., MBA
Tel: (613) 723-9200 FAX: (613) 723-5558
E-mail: admin@acls-aatc.ca
Website: www.acls-aatc.ca
(affiliation - CHA Central Branch)

C & C Technologies
730 East Kaliste Saloom Road, Lafayette, LA, 70508, USA
Contact: Art Kleiner
Tel: (337) 261-0660 FAX: (337) 261-0192
E-mail: aak@cctechnol.com
Website: www.cctechnol.com
(affiliation - CHA Central Branch)

Canadian Centre For Marine Communications
P.O. Box 8454, St. John's, NF, A1B 3N9, Canada
Contact: Bill Carter, Director, Information Marine
Tel: (709) 579-4872 FAX: (709) 579-0495
E-mail: bcarter@ccmc.nf.ca
Website: www.ccmc.nf.ca
(affiliation - CHA Atlantic Branch)

ESRI Canada Limited
1496 Bedford Highway, Suite 606
Bedford, NS, B4A 1E5, Canada
Contact: Chris Davey
Tel: (902) 423-5199 Ext28 FAX: (902) 492-3912
E-mail: cdavey@esricanada.com
Website: www.esricanada.com
(affiliation - CHA Atlantic Branch)

Fugro Jacques Geosurveys Inc.
25 Pippy Place, St. John's, NF, A1B 3X2, Canada
Contact: Todd Ralph
Tel: (709) 726-4252 FAX: (709) 726-5007
E-mail: toddralph@fjg.ca
Website: www.fugro.com
(affiliation - CHA Central Branch)

HydroService AS
Hovlandsveien 52, P.O. Box 212
Egersund, Norway, N-4379
Contact: Egil O. Aarstad
Tel: +47 51 464960 FAX: +47 51 464701
E-mail: info@hydroservice.no
Website: www.hydroservice.no
(affiliation - CHA Central Branch)

Interactive Visualization Systems (IVS)
420 York Street, 3rd Floor
Fredericton, NB, E3B 3P7, Canada
Contact: IVS Canadian Office
Tel: (506) 454-4487 FAX: (506) 453-4510
E-mail: info@ivs3d.com
Website: www.ivs3d.com
(affiliation - CHA Atlantic Branch)

IXSEA Inc.
35 Corporate Drive, 4th Floor, Burlington, MA, 01803, USA
Contact: Stephane Loeul, Managing Director
Tel: (781) 685-4632 FAX: (781) 685-4798
E-mail: stephane.loeul@ixsea.com
Website: www.ixsea.com
(affiliation - CHA Central Branch)

Knudsen Engineering Ltd.
10 Industrial Road, Perth, ON K7H 3P2, Canada
Contact: Judith Knudsen
Tel: (613) 267-1165 FAX: (613) 267-7085
E-mail: judith@knudsenengineering.com
Website: www.knudsenengineering.com
(affiliation - CHA Central Branch)

Kongsberg Maritime
261 Brownlow Avenue, Dartmouth, NS, B3B 2B6, Canada
Contact: John Gillis
Tel: (902) 468-2268 FAX: (902) 468-2217
E-mail: john.gillis@kongsberg.com
Website: www.km.kongsberg.com
(affiliation - CHA Central Branch)

Sani-International Technology Advisors Inc.
3075 14th Avenue, Suite 224
Markham, ON, L3R 0G9, Canada
Contact: Anthony P. Sani
Tel: (905) 943-7774 FAX: (905) 943-7775
E-mail: tsani@sani-ita.com
Website: www.sani-ita.com
(affiliation - CHA Central Branch)

L3-Klein Associates Inc.
11 Klein Drive, Salem, NH, 03079, USA
Contact: Garry Kozak
Tel: (603) 893-6131 FAX: (603) 893-8807
E-mail: garry.kozak@L-3.com
Website: www.l-3klein.com
(affiliation - CHA Central Branch)

Sea Lab Canada (Marine Equipment Rentals)
P.O. Box 22133, Bayers Road RPO, Halifax, NS, B3L 3T9
Contact: Terry Dwyer, Operations Manager
Tel: (902) 830-7898
E-mail: shipwrecked@ns.sympatico.ca
Website: www.sealabcanada.ca
(affiliation - CHA Atlantic Branch)

McQuest Marine Sciences Ltd.
489 Enfield Road
Burlington, ON, L7T 2X5, Canada
Contact: Ken McMillan
Tel: (905) 639-0931 FAX: (905) 639-0934
E-mail: email@mcquestmarine.com
Website: www.mcquestmarine.com
(affiliation - CHA Central Branch)

Terra Remote Sensing Inc.
1962 Mills Road, Sidney, BC, V8L 3S1, Canada
Contact: Rick Quinn
Tel: (250) 656-0931 FAX: (250) 656-4604
E-mail: rickq@terraremote.com
Website: www.terraremote.com
(affiliation - CHA Pacific Branch)

NetSurvey Ltd.
Office 4, Manor Farm, Fenny Compton, Southam,
Warwickshire, CV47 2YY, United Kingdom
Contact: Duncan Mallace
Tel: +44 1295 770 011 FAX: +44 1295 770 066
E-mail: duncan@netsurvey.co.uk
Website: www.netsurvey.co.uk
(affiliation - CHA Central Branch)

Usher Canada Limited
18136 - 102 Avenue, Edmonton, AB, T5S 1S7, Canada
Contact: Hal Janes, Edmonton Branch Manager
Tel: (780) 484-4644 FAX: (780) 486-1134
E-mails: hjanes@ushercan.com, rleeman@ushercan.com
Website: www.ushercan.com
(affiliation - CHA Prairie Schooner Branch)

RESON Inc.
100 Lopez Road, Goleta, CA, 93117, USA
Contact: RESON Inc.
Tel: (805) 964-6260 FAX: (805) 964-7537
E-mail: sales@reson.com
Website: www.reson.com
(affiliation - CHA Central Branch)

Brooke Ocean Technology Ltd
11-50 Thornhill Drive, Dartmouth, NS, B3B 1S1, Canada
Contact: Brooke Ocean Technology Ltd
Tel: (902) 468-2928 FAX: (902) 468-1388
E-mails: sales@brooke-ocean.com
Website: www.brooke-ocean.com
(affiliation - CHA Atlantic Branch)

Corporate Members
Membres corporatifs

We invite your organization to become a corporate member in our association. Consider the following benefits:

- ***Receive three copies of each issue of Lighthouse (published twice annually).***
- ***An invitation to participate in CHA seminars.***
- ***Listing and recognition in every edition of Lighthouse.***
- ***An annual 250 word description of your organization in Lighthouse.***
- ***10% off advertising rates in Lighthouse.***
- ***10% off exhibitor fees at CHA sponsored events.***
- ***Listing and link to your home page on each CHA Branch Web site.***
- ***News from corporate members in every edition of Lighthouse.***

The CHA, through *Lighthouse,* is active in promoting the strength and diversity of organizations and companies that support the hydrographic and related communities. Get onboard with us as a corporate member and we will help you reach potential customers throughout our worldwide distribution.

To join, please contact one of the Directors as listed on page 2. International applicants please remit to Central Branch. To obtain an application visit us at *www.hydrography.ca*

Annual dues for CHA Corporate Membership is $150.00 (CDN).

NetSurvey Limited

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.

We offer an in-house data processing service that can range from simple swath bathymetry cleaning to full 3D Visualization and fly-through using Fledermaus software. NetSurvey also offers bespoke training courses with a practical emphasis.

All of our surveyors/engineers are trained up on Reson, ELAC, Simrad and GeoAcoustics multibeams; Applanix, TSS, Kongsberg-Seatex and CODAOctopus motion sensors; QPS, Eiva, CARIS HIPS/SIPS and Fledermaus software.

With our large equipment pool available for hire and some of the most experienced multibeam specialist personnel, NetSurvey can provide you with peace of mind and the complete multibeam solution at a very competitive rate.

If you would like to receive further information about NetSurvey and its services contact Duncan Mallace or visit *www.netsurvey.co.uk*

If you would like to receive further information about NetSurvey and its services please contact:

Mr. Duncan Mallace
Tel: +44 1295 770 011 FAX: +44 1295 770 066 E-mail: duncan@netsurvey.co.uk
Website: *www.netsurvey.co.uk*

Interactive Visualization Systems (IVS)

Interactive Visualization Systems (IVS) with its world class, scientific 3D visualization and analysis software, Fledermaus, provides innovative, interactive and client-driven solutions and knowledge for surveying, mapping and research. Fledermaus presents intuitive insight into massive geographic data sets of numerous data types promoting professional interaction and collaboration.

Fledermaus has been developed to allow our clients to explore, analyze, manipulate and gain knowledge from their data by representing very large complex information in the best possible way - in an intuitive fashion - in the way that we perceive the real world everyday. This virtual reality allows new insight to be rapidly gained and more information to be extracted from the underlying data. This results in Fledermaus providing our clients with added value in efficiency, accuracy, completeness, integration, and communication.

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.

If you would like to receive further information about IVS and its services please contact:

Interactive Visualization Systems
Tel: (506) 454-4487 FAX: (506) 453-4510 E-mail: info@ivs3d.com
Website: *www.ivs3d.com*

HydroService AS

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 has additionally developed and has 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.

In response to this challenge, HydroService AS developed dKart Office, a family of dedicated COTS software tools. The modular system comprises a fully integrated production environment aimed at:

- Electronic charts production and updating (S-57/ ENC, AML, Inland ENC, etc.).
- Paper charts production and maintenance (INT1, INT2, M4, etc.).
- Notices to Mariners and other nautical publications compilation and design.
- On-line Data Services (charts, publications, catalogues on the Internet, automated NtM delivery, etc.).

dKart Office can be smoothly integrated into any existing production environment either via independent modules or as a complete Digital Hydrographic Office solution. It will assist in building and improving production performance by reducing costs, expanding the product range and raising your office's overall effectiveness.

HydroService AS also conducts basic and advanced training of system operators and managers in S-57, QC and ENC/Paper Chart production.

For further information please contact:

Egil O. Aarstad
Tel: +47 51 464960 FAX: +47 51 464701 E-mail: info@hydroservice.no
Website: *www.hydroservice.no*

ASI Group

ASI Group provides a complete range of hydrographic, geophysical and visual inspection techniques to conduct underwater investigations. Lake bottom surface features and targets are located, measured and mapped with precision accuracy in real-time using a combination of geophysical mapping and charting tools. In-house cartographers and graphic specialists interpret geophysical data to produce quality technical reports in hardcopy and GIS compatible formats.

ASI's survey vessels are trailerable and equipped with a wide variety of survey equipment pacjages. In addition to surface vessels, ASI owns and operates a fleet of purpose-built remotely operated vehicles (ROVs) to deploy sonar and video imaging in open water, tunnels and pipelines.

ASI provides greater efficiency and accuracy in mapping rivers, estuaries, channels, lakes or harbour bottom surfaces for:

- Geological investigations
- Habitat mapping and archaeological surveys
- Underwater search, survey and recovery
- Dredging surveys and volumetric determination
- Sonar profiling/imaging surveys
- Remotely operated vehicle inspections
- Integrated navigation and positioning services
- Cable and pipeline inspections.

For further information please contact:

ASI Group
Tel: (905) 641-0941 Fax: (905 641-1825 Website: *www.asi-group.com*

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:

Mr. Mike Dupuis, Mr. Jeff Fortenberry, Mr. Art Kleiner, or Mr. Frank Lipari
at (337) 261-0660 email to info@cctechnol.com or
visit C & C's Website at *www.cctechnol.com*

Kongsberg Maritime

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.

For more information regarding Kongsberg Maritime please contact:

Mr. John Gillis
Survey & Underwater Vehicle Instrumentation
Tel: (902) 468-2268 FAX: (902) 468-2217 E-mail: john.gillis@kongsberg.com
or visit Offshore: *www.km.kongsberg.com* and Marine: *www.simrad.no*

RESON Inc.

Established in 1976, RESON has grown steadily and is now one of the world's leading companies in the field of underwater acoustics and high-power ultrasonics. In addition, RESON is the leading company in the design, manufacture, delivery, and support of integrated multibeam echo sounder systems. RESON also designs and manufactures specialty Transducers, Hydrophones, and complete Sonar Systems.

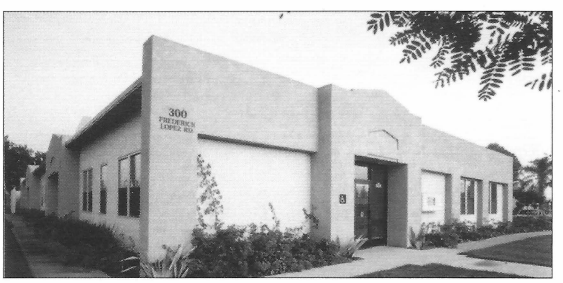
RESON is an international corporation with offices in Denmark, Scotland, Germany, South Africa, Singapore, the Netherlands, Italy and the United States.

We have assembled a team of highly skilled engineers committed to advanced engineering and to the design of sonar and acoustic systems. In addition, RESON employs a team of more than one hundred professionals dedicated to such disciplines as Program Management, Quality Assurance, Manufacturing, Software Development, Security, and Administration. The resulting corporation, RESON, is renowned for providing innovative solutions to complex underwater surveying and military problems.

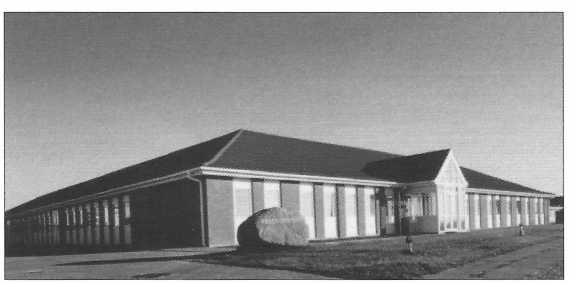
To date, RESON has delivered over 700 multibeam systems, more than all our competitors combined.

In summary, RESON is involved in the following application areas:

- Seafloor Mapping and Inspection
- Offshore and Construction
- Acoustic Calibration
- Acoustic Test Range
- Surveillance and Security
- Mine Counter Measures, MCM
- Anti-Submarine Warfare, ASW
- Systems Performance Modeling
- High-Speed Signal Processing Hardware and Software
- Image Processing.



RESON Inc, USA


RESON A/S, Denmark

For further information please contact:

RESON Inc.
Tel: (805) 964-6260 FAX: (805) 964-7537 E-mail:sales@reson.com
Website: *www.reson.com*

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.

For further information please contact:

Association of Canada Lands Surveyors
Tel: (613) 723-9200 FAX: (613) 723-5558 E-mail: admin@acls-aatc.ca
Website: *www.acls-aatc.ca*

ESRI Canada Limited

Since its establishment in 1984, ESRI Canada has made a commitment to promote, support, and implement GIS technologies in different areas and fields. ESRI Canada has dedicated itself to providing superior products, outstanding client support, and contributing technical knowledge, people, and expertise to the collection, analysis, and communication of geographic information.

As a member of the international ESRI family, ESRI Canada is one of 91 international distributors and consulting firms (totalling over 2,300 employees) that provide ESRI software and services around the world. Headquartered in Toronto, Ontario, ESRI Canada has regional offices and training centres in major urban areas, coast to coast, providing a complete range of GIS services to Canadian clients. With over 200 employees and 20 years of experience, ESRI Canada has built a highly coordinated and innovative team of engineers, information technology specialists, GIS specialists, and resource professionals.

ESRI Canada provides complete, GIS-oriented, business solutions to our valued customers, building an excellent reputation for the application of information technology within both private and public sectors. To accomplish this, we have organized ourselves to deliver both GIS software solutions and professional customer services.

For further information please contact:

ESRI Canada Limited
Tel: (416) 441-6035 FAX: (416) 441-6838 E-mail: info@esricanada.ca
Website: *www.esricanada.com*

DID YOU KNOW...

Circumnavigate the Americas
In 1970 the *CCGS Hudson* became the first ship to circumnavigate the Americas. (Source: CHC 2006 website - www.chc2006.ca)

ESRI to Release New Nautical Solution

ESRI is set to release an extension for ArcGIS version 9.2 which supports the compilation and updating of S-57 compliant data sets, the maintenance of electronic navigational charts (ENCs) as well as the production of hardcopy chart products portraying INT-1 symbology. This capability is being released as part of the Production Line Tool Set (PLTS™) for ArcGIS®9.2 Nautical Solution. PLTS for ArcGIS is a collection of tools that work together to establish efficient end to end workflow, either in a single or multi-user environment leveraging the geodatabase as the central data repository.

PLTS for ArcGIS—Nautical Solution provides a framework for optimizing the ArcGIS environment to reduce time spent performing normal day to day production tasks. Through the implementation of the S-57 knowledge base, Nautical Solution performs run time validation against the S-57 specifications and many of the S-58 checks, thus driving higher quality feature capture throughout production. In addition, PLTS for ArcGIS has been organized to reduce the number of clicks required to accomplish normal production tasks, further speeding up production time.

The subcomponents embedded in Nautical Solution have been componentized to further address the needs of demanding S-57 and ENC production. Among these is the S-57 importer to ingest S-57 files or exchange set into the geodatabase while maintaining the unique identifiers and relationships between features. The Notice to Mariners (NTM) tool helps to automate the collection of NTMs and provides the ability to track the status of each notice. The S-57 Publisher supports the publication of single or multiple cells electronically. Lastly the Map Production System—Atlas component embodies 6 scales of nautical chart templates based on IHO standards to support the rapid compilation of hard copy products. PLTS for ArcGIS 9.2 Nautical Solution is scheduled for release in the latter half of 2006.

For further information, please contact:

Dewey Marino
ESRI Inc.
Tel: (909) 793-2853
dmarino@esri.com

Chris Davey
ESRI Canada Limited
Tel: (902) 423-5199 x28
cdavey@esricanada.com

DID YOU KNOW...

Birth of the Canadian Hydrographic Service
Under the name of the Georgian Bay Survey, the Canadian Hydrographic Service was born on 13 August 1883. This was prompted by the 1882 sinking of the passenger steamer *Asia* in Georgian Bay claiming 150 lives. (Source: CHC 2006 website - www.chc2006.ca)

DID YOU KNOW...

Canadian Hydrographic Service ISO Certified
The Canadian Hydrographic Service (CHS) became one of the very first Canadian Federal organizations to have all its offices nationally ISO registered. CHS was registered to the ISO 9001-2000 standard on November 28, 2001 and was recertified for another three years on February 11, 2005. (Source: CHC 2006 website - www.chc2006.ca)

IXSEA Announces ROPOS Deal

The ROPOS Remotely Operated Vehicle is equipped with the IXSEA Global Acoustic Positioning System (GAPS)

IXSEA today (April 21) announced the signing of a deal with the Canadian Scientific Submersible Facility (CSSF) for a Global Acoustic Positioning System (GAPS), a number of transponders along with spare parts. GAPS is a calibration-free acoustic positioning system which combines inertial and acoustic technologies.

The CSSF, based in Sidney, British Columbia, Canada, is a nationally registered not-for-profit corporation. Established to manage and operate the Remotely Operated Platform for Ocean Science (ROPOS) system once the Department of Fisheries and Oceans could no longer fund underwater research vehicles, the CSSF successfully transferred the ROPOS Remotely Operated Vehicle operation from government to the private sector.

The GAPS, purchased by the University of Victoria, will be operated by the CSSF. Vincent Auger of the CSSF said the GAPS was selected after several weeks of trials for its key strengths:

- Fast, simple installation onto ships of opportunity
- Integrated, high accuracy motion, attitude and position sensors
- Elimination of sensor offset errors, as the entire unit is self-contained
- No calibration required, saving expensive ship time and other calibration costs for every installation.

Mr. Auger further stated the acoustic performance was also better than other available systems. "Taken as a whole, the GAPS system will save time and deliver exceptional results."

This is not the first time CSSF is using IXSEA's equipment however as it already purchased an OCTANS 6000 for the ROPOS ROV last year.

About IXSEA and Navigation and Positioning
At IXSEA, we combine smart technology and experience with marine know-how to provide our customers with the most efficient and user-friendly navigation and positioning systems.

Our Fiber Optic Gyroscope (FOG) technology, which has reached the highest international standards for use in space, is at the heart of our easy to use and versatile Gyrocompasses and Inertial Navigation Systems. We are at the centre of the data fusion revolution: by merging our Inertial Navigation Systems (INS) and Global Acoustic Positioning Systems (GAPS, IXSEA's USBL), we provide accurate and robust subsea positioning where all data is fused into optimal solutions.

We strive to exceed our customers' expectations every time with our high-performance technology, our international sales network, installation and round-the-clock customer support.

To sail. To sound. To analyze.

Further information:

Anne Berg
Public Relations Manager
IXSEA
Email: anne.berg@ixsea.com
55 Avenue Auguste Renoir
78160 Marly Le Roi
France
Tel: +33 (0)6 32 01 59 47

DID YOU KNOW...

World Hydrography Day
June 21st has been declared World Hydrography Day by the United Nations General Assembly.

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. Input comes from organizations such as the CHS, ACLS, FIG, CIG, THSoA and the International Federation of Hydrographic Societies.

Canadian Hydrographic Association Call for Nominations 2007-2009

Nominations for CHA National President, 2007-2009, will open at this year's Annual General Meeting of the Canadian Hydrographic Association, June 7, 2006.

Terms of Reference Include:
Participation as a member of the CIG Technical Council.
Participation as a member of the CIG Canadian National Delegation to the FIG.
Liaise with Government, Industry and Academia on matters pertaining to Hydrography.
Liaise with other surveying and mapping associations and federations: ACLS, FIG- Commission IV, and International Federation of Hydrographic Societies.
Chair ad-hoc committees where required.
Assist *Lighthouse* editor-in-chief by contributing editorials and reports.
Contribute editorials to other surveying and mapping publications: Hydrographic Journal, Hydro International, International Hydrographic Review, Sea Technology etc.

Please submit your nominations to the CHA National Secretary:

Terese Herron
Canadian Hydrographic Association
867 Lakeshore Road
Box 5050
Burlington, ON
L7R 4A6
E-mail: herront@dfo-mpo.gc.ca

Association of Canada Lands Surveyors / Canadian Hydrographic Association-Canada's Offshore: Jurisdiction, Rights, and Management

The ACLS and CHA are pleased to announce the publication of the first Canadian book to deal comprehensively and systematically with issues pertaining to the jurisdiction, rights, and management in Canada's offshore. The laws dealing with Canada's offshore have undergone considerable change and this book brings together various streams to provide an understandable overview. For more information please refer to the enclosed flyer on page 5 or to purchase books online, please visit Trafford Publishing.

Website: *www.trafford.com*

Spatial Sciences Institute (SSI), Australia-New Hydrography Commission

The SSI Board has formally approved the creation of the Hydrography Commission of the SSI and the Land Surveying Commission of the SSI. This has been achieved by separating these disciplines in the Institute's former Land Surveying and Hydrography Commission. The unanimous decision followed wide consultation of all interested parties and now gives the Hydrographers of Australia, New Zealand and the region, a clear professional structure, resourced and supported by their Institute, within which to focus on their core business. The new Commission will tend to mirror aspects of the FIG Commission 4 (Hydrography) so as to harmonize the international responsibilities so obviously inherent in the maritime disciplines.

The Board has appointed Commander John Maschke, RAN as the Interim Chair of the new Commission. The Professional Certification processes for the Hydrography Commission are fully in place as the Australasian Hydrographic Surveying Certification Panel (AHSCP) formerly " ...Accreditation Panel" has been successfully providing all certification to global standards for the maritime disciplines for over ten years. The AHSCP indeed provided both the inspiration and the model for the SSI's current Professional Certification Scheme.

For more information please contact:
The SSI Membership Officer
E-mail: valentina@spatialsciences.org.au
Telephone: (02) 6282 2282

Association of Canada Lands Surveyors- National Surveyors Conference and Annual General Meeting

The ACLS National Conference and 22nd Annual General Meeting will be held June 20-23, 2006 at the Grand Okanogan Lakefront Resort, Kelowna, British Columbia.

Seminar Themes:
Geomatics Business Skills
Moving Towards Aboriginal Self Reliance
International Land Tenure Projects
Diverse Applications of Geomatics Technology

Workshops:
Time Management
The Applications of High Definition Surveying in the Geomatics Industry
ACLS Affairs

For more information please contact the ACLS
Website: www.acls-aatc.ca
Email: admin@acls-aatc.ca
Telephone: (613) 723-9200

International Hydrographic Organization (IHO) - First Annual World Hydrography Day

Last fall, the United Nations General Assembly, under the Agenda item on the Oceans and the law of the sea, adopted a resolution to declare June 21, World Hydrography Day. This resolution, *"Welcomes the adoption by the International Hydrographic Organization of the "World Hydrography Day", to be celebrated annually on 21 June, with the aim of giving suitable publicity to its work at all levels and of increasing the coverage of hydrographic information on a global basis, and urges all States to work with that organization to promote safe navigation, especially in the areas of international navigation, ports and where there are vulnerable or protected marine areas".*

In future, the IHO's Directing Committee will select a "theme" for the celebrations each year and propose it to Member States. This year the theme will be "85 years of the IHO contributing to worldwide safety to navigation"

IHO Member States have been instructed to observe this day. The Canadian Hydrographic Service and Canadian Hydrographic Association will be orchestrating regional and national celebrations. For example, the CHA Central Branch has initiated an event in cooperation with Parks Canada and the Canadian Hydrographic Service, Central and Arctic Region which will be held at the Canada Marine Discovery Centre, Hamilton, Ontario.

For updates on activities in your region, visit the Canadian Hydrographic Service Web site: *www.charts.gc.ca* or contact Geneviève Marquis.

E-mail: marquisg@dfo-mpo.gc.ca
Telephone : (613) 990-1501.

For more information World Hydrography Day please visit *www.iho.shom.fr/*

International Hydrographic Organization (IHO) - New Manual on Hydrography, M-13

The IHO have published their first edition *Manual on Hydrography* (IHO Pub M-13). The general objective of the IHO *Manual on Hydrography* is to provide knowledge on the concepts involved in Hydrography as well as guidance to plan and execute hydrographic surveys. The Manual is considered to be a professional guide for hydrographic surveyors and a tool for teachers and students involved in hydrographic courses or programs.

The content of the Manual is divided into seven chapters:

- Chapter 1- Principals of hydrographic surveying, including specifications;
- Chapter 2- Positioning;
- Chapter 3- Depth determination, principles and techniques;
- Chapter 4- Sea floor classification and target detection;
- Chapter 5- Water levels and currents;
- Chapter 6- Topographic surveying applied to Hydrography;
- Chapter 7- Hydrographic practice.

The Manual has an important role to play in Capacity Building, which is a key IHO initiative and therefore translation into French and Spanish is presently under consideration. The Manual can be downloaded free of charge as individual chapters from the IHO web site.

For more information please visit *www.iho.shom.fr/*

International Federation of Surveyors (FIG), XXIII Congress and XXIX General Assembly- Shaping the Change

The German Association of Surveying and Society for Geodesy, Geo-Information and Land Management (DVW) and FIG will be co-hosting the 23rd FIG Congress in cooperation with INTERGEO- the world's largest international trade fair for geodesy, geo-information and land management. The event will run from October 6-13 and will be held at the International Congress Centre, Munich, Germany.

For more information please visit *www.fig2006.de*

Association Canadienne des Sciences Géomatics, Section de Montréal- Géomatique 2006, Au cœur des processus

The Montreal Branch of the Canadian Institute of Geomatics (CIG) has been organizing its renowned Geomatics symposium for 25 years now.

Geomatics 2006, *Driving the Processes* will be held October 25-26, 2006 at the Hilton Montréal Bonaventure, Montreal, Quebec.

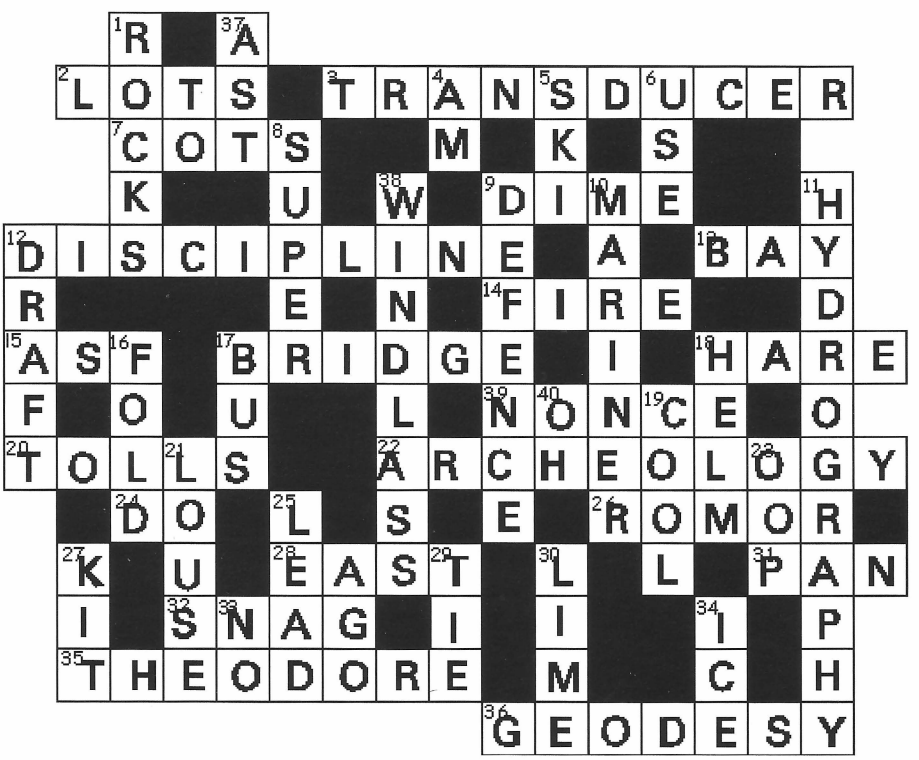
For more information please contact the CIG, Montreal Branch
Website: *www.geomatics2006.com*
Email: info@geomatique2006.com
Telephone: (514) 495-0327

International Federation of Hydrographic Societies (IFHS) - Hydro 06, Evolutions in Hydrography

The Hydrographic Society Benelux and the IFHS are co-hosting this event, which will be held November 6-9, 2006 at the Provincial House, Antwerp, Belgium.

For more information please visit *www.hydro06.com*
Email: info@hydro06.com

The CHC 2006 Conference Crossword Solution



LAURENTIAN REGION

Discovery of a Major Shipwreck off St. Yvon in the Gaspe

Mont Joli – While conducting research to characterize the habitat of spotted wolffish, a threatened species in the Gulf of St. Lawrence, a team of hydrographers and scientists from Fisheries and Oceans Canada's Maurice Lamontagne Institute, came upon a shipwreck which is believed to be the first ship sunk by a German submarine during the Battle of the St. Lawrence.

The research cruise was conducted on September 13, 2005 aboard the *Frederick G. Creed*, a Fisheries and Oceans Canada vessel. The team of scientists was conducting a bathymetric survey with a multibeam echo sounder off St. Yvon, on the north side of the Gaspe Peninsula, to obtain information on spotted wolffish habitat. The hydrophone array detected an unusual shape, which, following data processing and analysis, was determined to be a shipwreck.

Located about six nautical miles (11 kilometres) northeast of Cloridorme, the wreck is roughly 115 metres long and 30 metres wide and lies at a depth of 270 metres. The structure rises 15 metres above the sea floor. The shipwreck is likely to be the *SS Nicoya*, a merchant ship that had been requisitioned for the war and was torpedoed by a German submarine on May 11, 1942. The wreck's size and position correspond with various reports about the sinking of the *SS Nicoya*.

The Maurice Lamontagne Institute is part of Fisheries and Oceans Canada's network of research centres. It conducts research and monitoring activities to learn more about aquatic ecosystems and the effect of human activities on ecosystems, as well as to ensure the safety of navigable waterways.

A jpeg image of the shipwreck resting on the seabed is available on request.

For More Information:

Sylvi Racine
Senior Communications Advisor
Fisheries and Oceans Canada
Quebec Region
(418) 775-0744
www.qc.dfo-mpo.gc.ca

PACIFIC REGION

Client Liaison and Support Division

A three-dimensional high water coastline was completed by Pete Wills and Don Jodrell. This built upon the past work of Pete, who assembled an excellent 2D high water coastline which is topologically correct. This coastline continues to receive rave reviews for the fidelity to the geography. The 3D coastline becomes important when it is used for gridding purposes. Often, the high water coastline is arbitrarily assigned zero elevation, and this causes interpretation problems in crucial low elevation areas.

The first sheet of classified sea floor (bottom type) using QTC *Impact* and *CLAMS* was produced internally by Jim Galloway, Jim Parks, and Ralph Loschiavo. It is designed to be a thematic layer consistent with the multibeam layers overlaid on charts. Successive classified sea floor images will be performed under contract to industry.

It has been a busy time for Hydrographic Systems Support, involving Bill Hinds, Gordon Worthing, Al Thomson, Dave Gartley, and Al Thorn. Aside from supporting surveys, the main focus has been on re-engineering the west coast tidal network. Bill used MS Project to identify project stages, progress, and required resources, and maintains the database weekly. Internally, HSS staff was the primary recipients of ergonomic furniture and dividers. This has addressed some long-standing problems in the workplace, and created a much more pleasant environment. Dave Gartley presented the second of a three-part networking course, to excellent reviews.

Don Jodrell was tasked with implementing an improved version of the national Dealer web pages, and that is underway.

The monitoring of water heights and flows at Second Narrows bridge has become important again. There was a very serious incident involving a large freighter being dragged onto the bridge. Fortunately it was able to be halted before an accident occurred, but it required numerous tugs (perhaps seven), the anchors deployed, and the freighter engines in full reverse. It was stopped about 50 metres from the bridge. In consequence, CHS has been assisting ASL Environmental Sciences to submit a proposal to the port authority for monitoring improvements.

An elevation grid for the Ucluelet area, based upon CHS bathymetry and LIDAR topography was created for local industry. It is to be used for tsunami modelling and impact prediction upon this vulnerable community.

Generally, there has been a growing demand for CHS data for GIS use. It is becoming clear that these requests usually involve more than a simple delivery of data; there is often subsequent support required. With financial support from the Oceans sector, the region has purchased Fledermaus professional, and upgraded the ESRI software to ARC/INFO. The upgrade will allow CHS to seamlessly interact with the OHEB data store, and facilitate GIS support.

The Chart Sales counter closed in November. Effective March 31, the distribution will cease. There have been a handful of complaints to the Minister. Client Liaison by Tim and David will continue, and the two distribution persons will be redeployed to higher-level tasks.

Many CHS and IOS staff are concluding a full year of part time French training (two hours per week). The next course will involve 35 persons at IOS, and actually be at three different competency levels. Organizing the interest, competency evaluations, and finally the multi-agency funding has consumed a major amount of time. However, the excellent feedback regarding the opportunity, the instructor, and the personal progress has had a huge positive morale impact.

The CHS national Marketing Committee met in Montreal at the boat show, including Terry as chair and David as the Sales representative. Under the guidance of Paul Bellemare, it refreshed its mandate to focus upon outreach, product and service innovation, and policy support.

Hydrographic Surveys Division

1. Thanks to a major new influx of funding, major upgrades to the PWLN and Emergency Response Networks are underway. Much of the decaying infrastructure (wharves, gauge shacks, wells and bracing) is being replaced and new communications equipment is being installed.
2. 2005 multibeam surveys aboard the CCGS Vector (EM1002A) and CCGL Otter Bay (EM3002S) have concluded and the data is now in final cleaning and checking stages and being submitted with its associated metadata. 2006 surveys are being planned, with the majority of work to occur in the summer in Queen Charlotte Basin, and on local surveys in the spring and fall. Surveys to support the planned terminal facilities in Kitimat will begin in 2006.
3. We are starting to learn how to use CUBE in HIPS 6.0 for automated data cleaning. It will be quite a learning curve and will form the backbone of the 2006 Training Survey planned for late April and early May. Fledermaus has also been purchased so we will have a comparison CUBE processing engine to confirm the results obtained using the HIPS implementation.
4. Orthoimagery is being acquired to support a number of chart revisory surveys, local resurveys and datum rectification projects. A combination of archive imagery, satellite re-tasking and new airborne missions is being investigated.

CENTRAL BRANCH

Meetings 2005

Six CHA Central & Arctic Branch general meetings were held in 2005. In addition to the business portion of the meetings, a wide variety of interesting topics were presented to members by guest speakers.
Those Speakers and their topics were:

- Dale Nicholson, A/Director, CHS, Central and Arctic Region – "*The* hot topics in hydrography"
- Dan Dexel of Aquatic Sciences Inc. – "Deep Water ROV Pipeline Repair and Alignment"
- Dave Monahan of the University of New Hampshire (CHS ret'd) – "*UNCLOS* and how it affects Canada's Arctic"
- We had a tour of the Better Bitters brewery in Burlington, Ontario and sampled some of their products. Some of us enjoyed it so much we actually purchased some for home consumption!
- Robin Martel of Fugawi, the mapping software company, gave us a demonstration of some of the latest in their product line. Most interesting was the 3-D imaging software available in the topographic map software.
- October's meeting was cancelled due to Fred Oliff's broken ankle.

- Tim Janzen presented an unseen CBC video of "Life aboard the *CCGS Henry Larsen*". Interesting to see what life is like aboard an icebreaker but we all know it can be rougher than all that!
- Harold Wilkinson presented forensic engineering analysis of Quebec bridge failures of the early 1900s at our AGM at the Mimico Cruising Club.

Meetings 2006

- January 2006 we were pleased to have Matt Holland of CARIS presenting some recent hydrographic software applications during a late January warm spell!
- February 2006 we had an open and frank discussion about the CHA and *Lighthouse*.
- March 2006 New Life member Sam Weller gave an entertaining presentation on his 2005 teaching trip to Estonia. Thanks Sam!
- April 2006 meeting is to be held at Ab Rogers' residence and we are expecting C-Map reps to give us an update on their activities.

Thank you to the guest speakers for your informative presentations. Your presentations were very well received by CHA members.

And a special thanks to Heimo Duller, Better Bitters (John Romano), Brian Power, and Thirty Bench Winery and Sam Weller for hosting meetings this year. Your hospitality is greatly appreciated.

Committee Reports 2005

ADMIRALTY LAUNCH 'Surveyor'

In the spring the launch's condition was assessed and found to be in very good condition, there was very little maintenance required. The hull below the water line was painted, the new oars had leather added to the looms and new rope fenders were made to replace the originals which were in poor condition. During the event at Niagara on the Lake, *Surveyor* sustained minor damage to the mounting brackets that support the flag staff when *Surveyor* passed under the bowsprit of one of the tall ships participating in the event. The flag staff caught on the tall ship's bow sprit and was ripped off, none of the crew were injured except for their pride as this took place in full view of the public who were assembled along the shores of the Niagara River to watch the USA forces invade Canada from seaward. The damaged bracket has since been repaired.

The first event this year took place on Sunday June 12th on the Grand River. *Surveyor* and crew were asked to participate in the National Aboriginal Day celebrations taking place at the Pauline Johnson House, on the Six Nations Indian Reserve along the shores of the Grand River. Mr. Nick Wells, a minister and re-enactor, played the part of Bishop Stewart who first visited the settlement c. 1784 when he arrived by boat having traveled up the Grand River from Lake Erie. The second event took place on July 15-17, 2005 at Fort George located at Niagara-on-the-Lake. Surveyor and her crew participated in the "School of the Sailor and Grand Encampment". Victor Suthren, the Squadron Commodore organized the event. British and American forces camped out at the fort while re-enacting a major War of 1812 battle between the USA and Canada. The School of the Sailor provided re-enactors an opportunity to learn about seamanship by crewing and rowing longboats, and manning the sails aboard the tall ships that participated in this event.

MEMBERSHIP

• Branch

Central Branch extends a warm welcome to its newest members – Hans Biberhofer, Julia Duller, Mohammed El-Diasty, corporate member IXSEA, Ian Taylor and Reson Inc. The Central Branch membership stands at 73 up slightly from last year at this time. John Henry (Sam) Weller, a long time and very active member of our branch retired from the Department of Fisheries and Oceans, Canadian Hydrographic Service this spring. At Sam's retirement the CHA branch executive bestowed upon Sam a Life Membership in CHA Central Branch in recognition for the outstanding contribution he has made to our association. The branch *Newsletter* was one of Sam's initiatives, which required a large amount of effort. Sam took great pride and care producing each issue - thanks Sam. The branch transferred two corporate members; *Interactive Visualization Systems* and *Canadian Centre for Marine Communications* to the Atlantic Branch.

Many thanks to our continuing Branch corporate members ASI Group, C&C Technologies, Fugro Jacques Geosurveys, Hydroservice AS, Knudsen Engineering Ltd., Kongsberg Maritime, L3-Klein Associates Inc., McQuest Marine Sciences, NetSurvey Ltd. and Sani-International Technology Advisors Inc. Central Branch is honoured to include several special people in its membership: Earl Brown, Tom McCulloch, Ab Rogers and Sam Weller, Life Members; George Macdonald, Honorary Member and Steve Ritchie, International Life Member. The 2006 membership renewal notices will be sent out the beginning of December to help ensure the Branch meets the corporation by-laws that states that members are in arrears as of February 1st.

• International

Central Branch of the CHA administers the International Members on behalf of the National Office. This committee

helps to maintain contact with the CHA's 13 International members and ensures they have an opportunity to voice opinions and take part in CHA activities. We encourage communication between our members abroad and are delighted when we receive news from them. All International Members receive the Central Branch Newsletter to keep in touch between issues of the CHA's Journal *Lighthouse*.

• Elections

Nominations for the 2006 Executive were officially opened on October 31st; this is later than usual due to the cancellation of the October meeting. Due to this late announcement the closing date for nominations was extended past the November meeting to the 18th of November to allow members time to submit their choices. As of the closing date for nominations the committee had not received any nominations for the next year's executive. Branch members in good standing are published in the October *Newsletter* to inform the membership who they can nominate. Since there was no October *Newsletter* this may explain the lack of nominations. The 2006 executive is comprised of Branch vice president, treasurer, secretary and four executive members, one of which is the past branch VP. The 2005 executive VP, Secretary and some executive members have agreed to stand for re-election. The Treasurer's position must be filled as current treasurer must step down.

PACIFIC BRANCH

On Wednesday February 22, Pacific Branch held it annual general meeting. The new executive for the coming year are:

Carol Nowak – Vice President
Ken Halcro – Treasurer
Sarah McDonald – Secretary
Craig Lessels – Member at Large
Kay Donaldson – Member at Large

Dave Gartley continues to serve in his role of past Vice President. Thank you to the old executive and we look forward to the next year under the new executive.

The 2005 BCIT Pacific Branch bursary was awarded this past fall. The bursary fund is healthy and ongoing.

We say goodbye to Michael Hohl of CHS Pacific (Nautical Charts and Publications). Mike spent 29 years here. At the same time we say goodbye to Michael we also welcome 3 new faces into CHS. We are pleased to welcome Sarah McDonald, Kay Donaldson, and Tracey Prentice to the organization. They are currently working in their rotational assignments as part of the multi disciplinary hydrographer training program.

Sarah McDonald is originally from the Ottawa Valley. She earned her Bachelor of Environmental Science in Geography at the University of Waterloo before moving to Victoria to earn her Masters of Science in Geography from the University of Victoria. She then worked for the Canadian Forest Service before joining the Canadian Hydrographic Service. Sarah is currently assigned to the Nautical Publications division.

Tracey Prentice is from Victoria. She worked for the Canadian Hydrographic Service, as a contractor, after completing her Bachelor of Science in Geography from the University of Victoria. She returned to school taking the diploma in Geomatics at the British Columbia Institute of Technology. She now returns to the Canadian Hydrographic Service. Tracey is currently assigned to the Hydrographic Surveys Division.

Kay Donaldson is originally from Ottawa. She earned her Bachelor of Science in Geography at the University of Victoria. While attending school, Kay joined the Canadian Naval Reserve. She worked with the Canadian Navy after graduation until joining the Hydrographic Service. She still maintains her part time involvement in the Naval Reserve. Kay is currently assigned to the Geomatics Engineering Division.

We also offer congratulations to long time CHS Pacific staff member now working in Newfoundland, Shelley Parkhouse and her partner Mark Power on the birth of a baby girl.

ATLANTIC BRANCH

The Canadian Hydrographic Association's Atlantic Branch is renewed for a second year. The branch had its Annual General Meeting on March 15, 2006, and the Annual Budget was presented by branch Secretary-Treasurer, Wendy Woodford. The books are balanced and our membership has grown to 30 members. We are delighted to announce that ESRI has joined us as a corporate member. The upcoming 2006 Canadian Hydrographic Conference has dominated branch activity, with CHA members participating on a variety of organizing committees. Conference co-chairs are Secretary-Treasurer Woodford and Director Mike Lamplugh. The level of organization and commitment by CHA members is exceptional, and all indicators are pointing to a very successful conference. Also at this time, congratulations are extended to Atlantic Branch member (and director) Craig Zeller, who is assuming the editorship of *Lighthouse*.

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
DIMENSIONS DE LA PUBLICITÉ

Publication Trim Size/ Dimension de la revue:	**8.5" x 11.0"**
Live Copy Area/ Encart libre:	**7.0" x 10.0"**
Bleed Size/ Publicité à fond perdu:	**8.75" x 11.5"**
Single Page Insert Trim Size/ Insertion d'une page	**8.25" x 10.75"**
Standard Ad Sizes/ Grandeurs standards des suppléments:	
Full Page/ Pleine page:	**7.0" x 10.0"**
1/2 Page/ Demie-page:	**6.875" x 4.75"**
or/ ou:	**3.375" x 9.75"**

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
Half Page *Demie-page*	$300	$475
Single-page Insert *Insertion d'une page*	$475	$675
Professional Card *Carte d'affaire*	$125	NA/SO

RATE PROTECTION
TARIFS ASSURÉS

Advertisers will be protected at their contract rates for the term of their contracts up to one year. Cancellations are not accepted after closing date.

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:
Tout le matériel publicitaire doit être acheminé à:

LIGHTHOUSE
P.O. Box 5050, 867 Lakeshore Rd., Burlington, ON L7R 4A6
Telephone (905)336-4501 Fax (905)336-8916
E-mail lighthouse@car.dfo-mpo.gc.ca

SUGGESTIONS 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.

RESON

High-Resolution Multibeam Echosounder System

SeaBat

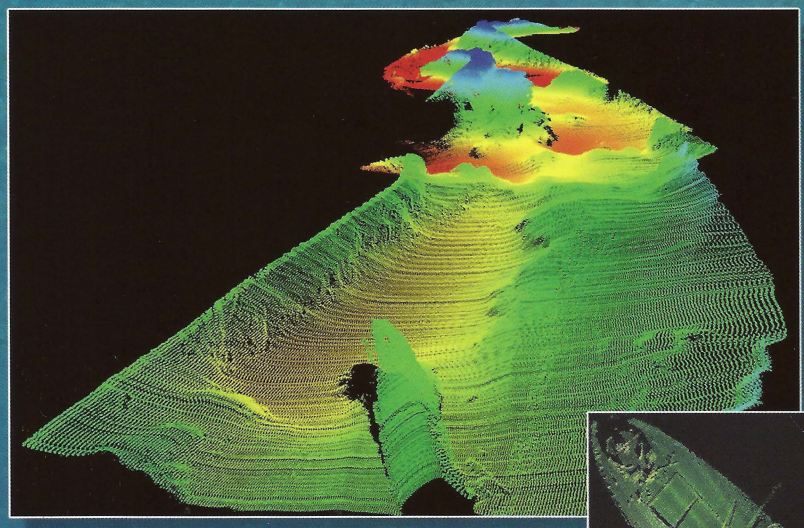
Simply the Best

- Operates at 400kHz
- Superior Resolution Bathymetry & Imagery
- 256 Focused 0.5° Beams at 400kHz
- Up to 50Hz Update Rate
- Compact Surface Vessel, ROV or AUV mountable
- Optional 6000m Depth Rated Housing
- External Synchronization
- Optional Water Column Raw Data Logging & Storage
- Full Calibration Option

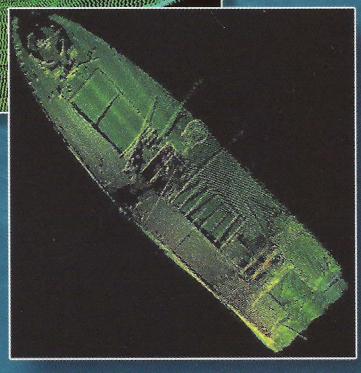
SeaBat 7125 Receiver

TC 2160 Projector 400kHz

TC 2163 Projector 200kHz



SeaBat 7125 data of a shipwreck at 95 meter water depth near Oslo, Norway. Data collected using RESON PDS2000 software



High resolution image of the SS Richard Montgomery wreck in the Thames estuary, United Kingdom, collected using RESON software

www.reson.com

Denmark Tel: +45 47 38 0022
USA Tel: +1 805 964 6260
UK Tel: +44 1224 709900
Germany Tel: +49 431 720 7180
South Africa Tel: +27 21 701 1720
Singapore Tel: +65 6 872 0863
Italy Tel: +39 051 57 26 43
The Netherlands Tel: +31 10 245 1500

Multibeam echo sounder

EM 710 - *New standard for Flexibility and Precision*

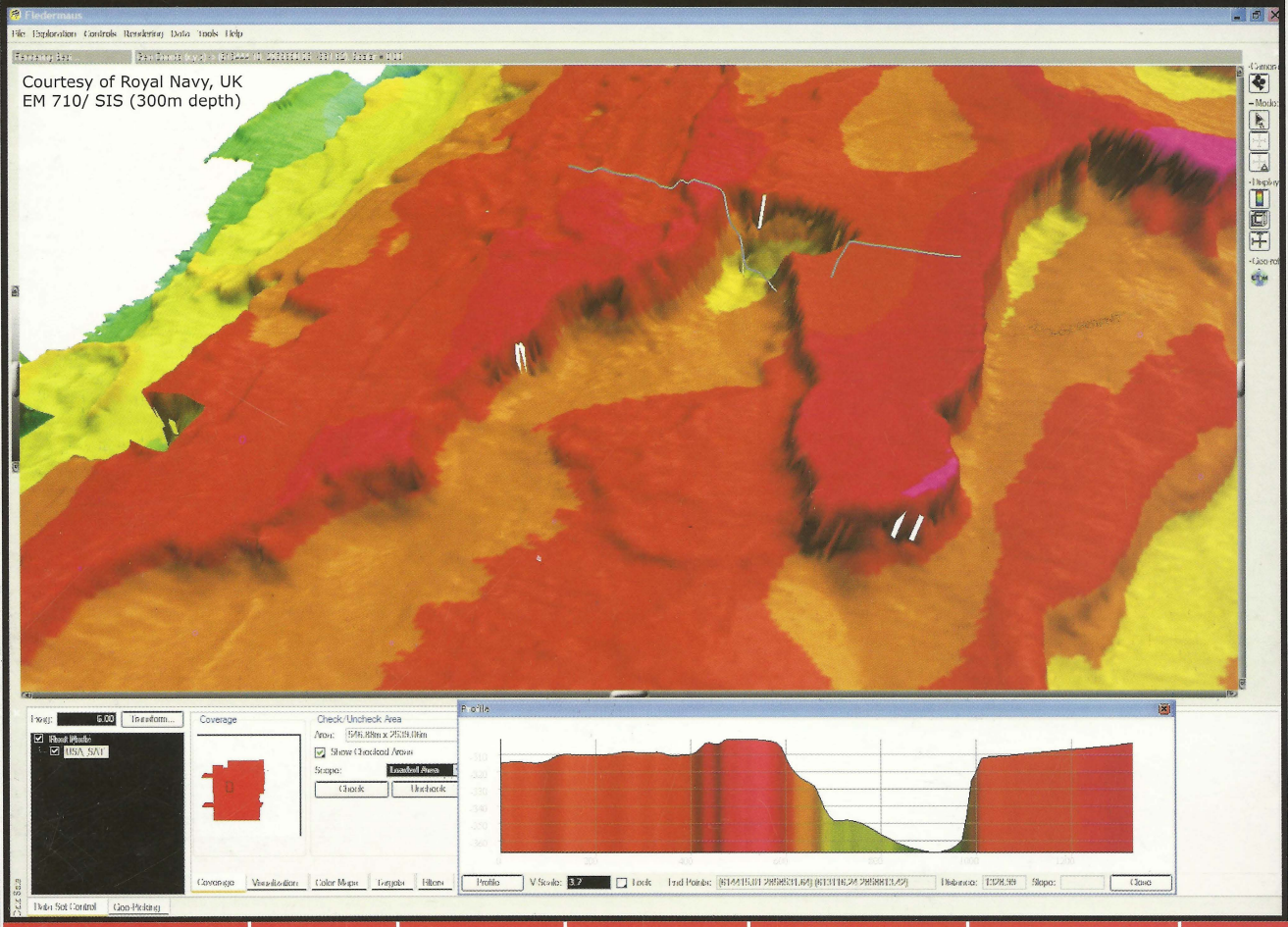
Shallow to medium water depths

Kongsberg Maritime proudly introduces the EM 710 concept.

Based upon 20 years of experience with multibeam echo sounders, we are launching a system packed with new technology.

New technology:
- Wideband transducers using composite ceramics technology
- Fully programmable transmit pulse waveforms
- Floating point, 140 dB dynamic range receivers
- High resolution beam processing for improved resolution

Main system features:
- 70-100kHz frequency, up to 2000m range capability
- Beams actively stabilized for yaw, pitch, roll
- Beams focusing for both transmission and reception
- Choice of transducer sizes/resolution 0.5 to 2 degrees
- Transducers for permanent hull mounting or portable use
- Chirp pulse waveforms with coherent signal compression on reception
- Calibrated seabed imagery as well as imaging of reflectors in water column



Underwater instrumentation ► SONARS ► TELEMETRY ► POSITIONING ► HYDROGRAPHIC ECHO SOUNDERS ► CAMERAS AND LIGHTS ► AUTONOMOUS UNDERWATER VEHICLE

Norway: +47 33 03 41 00, USA: +1 425 712 1107
Canada: +1 902 468 2268, UK: +44 1224 22 65 00
Italy: +39 06 615 22 476, Singapore: +65 68 99 58 00

www.kongsberg.com
e-mail: subsea@kongsberg.com

KONGSBERG