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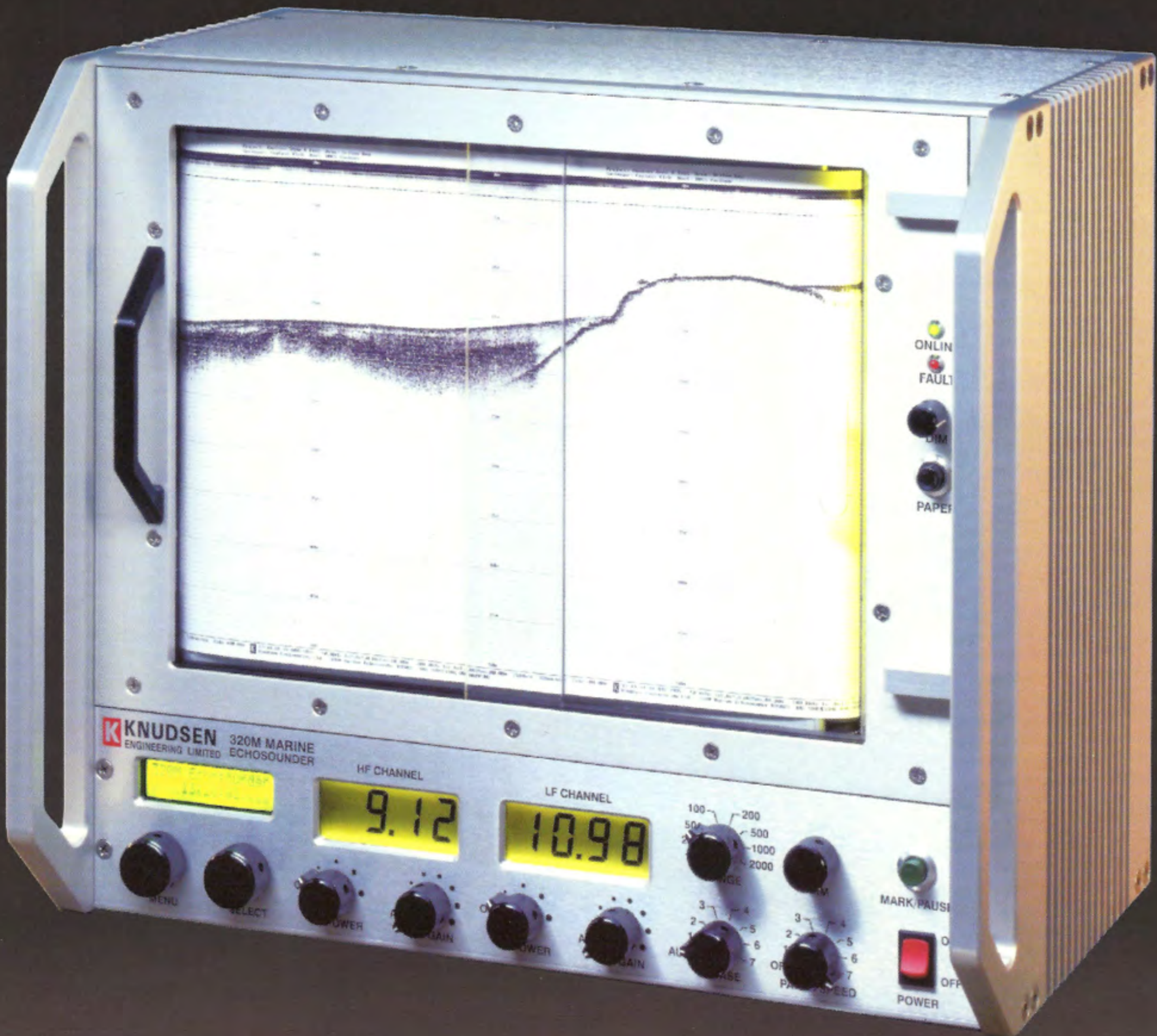

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INUKSHUK
near Pond Inlet, Nunavut
Photograph taken by a member aboard the C.C.G. Icebreaker Henry Larsen

The term inukshuk (the singular of inuksuit) means "to act in the capacity of a human". Inuksuit may be found in a variety of shapes and sizes; arranged in various manner or placement and serving not only as physical markers but also messengers or spiritual guides. They also vary in name depending on their purpose.

They may guide a hunter travelling on land, or on the sea or ice within sight of land. They may indicate dangerous places, snow depth, a high point of land, or a spiritual place, just to name a few.

John Mercuri, a multidisciplinary hydrographer with the Canadian Hydrographic Service, has written a paper discussing cartographic symbolization citing Inuksuit as an example. His paper appears in this edition of *Lighthouse* (page 7).

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Errata

There was an error in Edition 66 in the article "The Last Years of *BAYFIELD (II)* Remembered" on Page 8. The article indicates there had been three scientific ships named in dedication of Henry Bayfield. Friends of Hydrography (FOH) (*www.foh.org*) believes there were four *Bayfields*. *Bayfield III* (according to FOH) was a twin-engine 49½ foot wooden cabin-cruiser built in 1949 at Meaford and used to 1963. Mr. David H. Gray brought this to our attention. Thank you David.

Message from the National President

Mot du Président national

A former CHA director recently told me that he thought the CHA hasn't changed much since his time on the board of directors. Back then we were concerned with facilitating professional development and training for Hydrographers while strengthening our affiliation with organizations like the Canadian Institute of Surveying (CIS) and The Hydrographic Society. Yes times have changed and so have the names of the organizations to which we continue to cooperate with but the basic premise for what we and our affiliates have endeavoured to achieve in representing the interests of the hydrographic community has not. Change is good and consistency can be boring but sometimes I wonder if we often confuse progress with change. To our former director I can only say, "plus ça change, plus c'est la même chose".

For those who are wondering just where we've been coming from with the idea of a national certification program for hydrographic surveyors, one of our motivating factors is rooted in the origins of the Canadian Institute of Geomatics (CIG) and the Association of Canada Lands Surveyors (ACLS), two organizations which share a common heritage. Both began within the Association of Dominion Lands Surveyors (ADLS), formed in 1882, which later became the Canadian Institute of Surveying (CIS) in 1934. In the late 1880's, a period of continued railway expansion in Canada's north, the ADLS presented a memorial to the Canadian government claiming that the government's practice of accepting railway right-of-way plans signed by Civil Engineers was an injustice to Dominion Land Surveyors. Now what would surveys of railway right-of-ways and offshore surveys have in common? The position of the surveying profession is that the execution of these surveys is to be performed by a qualified surveyor. For dirt surveyors, the question of qualifications is clear but where the rubber meets the water the picture is not so clear particularly where the survey may not necessarily be for legal purposes.

The issue of qualifications for surveyors working in the Canadian offshore and in fact the eventual incorporation of the ACLS arose in the early 1970's when the offshore oil industry became concerned that Dominion Land Surveyors (responsible under statutory law for conducting legal surveys in the offshore), did not in fact have the expertise to conduct these surveys. To address the issue, a professional affairs committee (called the Weir Committee) was formed within the CIS. In identifying a need to update the DLS qualifications in order to "maintain and respect the public trust implicit in the continuing provision of professional surveying services in the public and private domains" (Weir 1973), the work of the Weir Committee resulted in a number of recommendations which included:

- The creation of a multi-disciplinary designation, Canada Surveyor: Géomètre Canadien, which would replace the DLS designation and encompass all surveying disciplines including hydrography and that the Canada Surveyor would have the capability to apply for authority to survey anywhere in Canada.
- The formation of an independent, self sustaining secretariat to maintain the new designation.

Such a secretariat exists today in a self-regulated and multi-disciplinary professional body known as the Association of Canada Lands Surveyors (ACLS). The Canada Surveyor became the Canada Lands Surveyor (CLS) and their capability to (legally) survey anywhere in Canada exists through an agreement of mutual recognition of qualifications between the ACLS and all provincial land survey associations. Thirty years later, we are once again faced with a need for expertise and competency to support private sector activity in the Canada's offshore. Surveys in support of mineral exploitation, Canada's Article 76 claim to an extended continental shelf and the Canadian Hydrographic Service's, Future Directions statement to "increase reliance on external data collection" (CHS 2003) are driving this need.

To wrap this message up, I would like to be clear that ACLS-CHA task force Recommendations on the Certification of Hydrographers do not implicate Canadian Surveyors with having to hold a jurisdictional license to practice hydrography. Our recommendations call for a nationally recognized, certification of competency based on the requirements to obtain a CLS Commission, to be delivered and maintained through a self-regulated professional body known as the ACLS. In this regard, I believe the role of the surveying profession is best described in a quote from George Comrie, President of the Professional Engineers of Ontario (PEO). In context to the provincial government's recent incursions into the PEO's regulatory regime, Mr. Comrie affirms that, "Governments have entrusted the professions with self-regulation because they accept that we have greater knowledge and expertise in our respective disciplines that the government itself." (Comrie, 2005). While I agree that an employer is free to set the bar on what qualifications it requires to perform the task at hand, the ongoing maintenance of the public's perception and trust in what qualifications a specific job title implies (i.e. Hydrographic Surveyor), rest with the surveying profession.

Message from the National President

Mot du Président national

Un ancien directeur de l'ACH me disait récemment qu'il pensait que l'ACH n'a pas changé beaucoup depuis son mandat au conseil d'administration. À cette époque il était question de faciliter le développement et la formation des hydrographes ainsi que de renforcer notre affiliation avec des organisations comme l'Association canadienne d'arpentage et le Hydrographic Society. Oui les temps ont changé ainsi que le nom des organisations avec lesquelles nous continuons de coopérer mais le but que nous et nos affiliés essayons toujours d'atteindre ne l'est pas, c'est à dire représenter le mieux possible les intérêts de la communauté hydrographique. Le changement est bon et la consistance peut être ennuyante mais quelques fois je me demande si nous confondons progrès et changement. À notre ancien directeur je peux seulement dire : « Plus ça change, plus c'est la même chose ».

Pour ceux qui se demandent d'où provient l'idée d'un programme national de certification en hydrographie pour les arpenteurs en hydrographie, un de nos facteurs motivateurs tire ses origines de l'Association canadienne des sciences géomatiques et de l'Association des arpenteurs des Terres du Canada (AATC), deux organisations qui partagent un héritage commun. Les deux dérivent de l'Association des arpenteurs des terres du Dominion (AATD) établie en 1882 laquelle devenait, en 1934, l'Association canadienne d'arpentage (ACA). À la fin des années 1880, durant une période d'expansion continue du chemin de fer dans le nord canadien, l'AATD a présenté un mémoire au gouvernement canadien prétendant que la pratique gouvernementale d'accepter des plans signés par des ingénieurs civils pour les droits de passage du chemin de fer étaient une injustice envers les arpenteurs des terres du Dominion. Maintenant, que peuvent avoir en commun l'arpentage des droits de passage des chemins de fer et les levés côtiers? Dans les deux cas, l'exécution de ces levés doit être fait par un arpenteur qualifié selon la position de cette profession. Pour les arpenteurs qui travaillent sur terre ferme, la question de la qualification est claire mais lorsque terre rencontre mer, on est en eau trouble particulièrement lorsque les levés n'ont pas nécessairement des fins légales.

Les questions de la qualification des arpenteurs travaillant au large des côtes du Canada et l'éventuelle incorporation de l'AATC ont surgi au début des années 1970 quand l'industrie pétrolière a craint que les arpenteurs fédéraux (mandatés par la loi à faire l'arpentage légal au large des côtes) n'aient pas l'expertise nécessaire pour effectuer de tels travaux. Pour répondre à cette question, un comité des affaires professionnelles (appelée Comité Weir) a été formé par l'ACA. En identifiant un besoin d'une mise à jour des qualifications des arpenteurs fédéraux pour « maintenir et respecter la confiance du public implicite dans la fourniture continue de services professionnels d'arpentage des terres publiques ou privées » (Weir 1973), les travaux du comité Weir ont fait plusieurs recommandations dont lesquelles incluent :

- La création de la désignation multidisciplinaire, Canada Surveyor: Géomètre Canadien, lequel remplacerait la désignation d'arpenteur fédéral et engloberait toutes les disciplines de l'arpentage incluant l'hydrographie et que le Géomètre Canadien ferait autorité dans les levés partout au Canada.
- La formation d'un secrétariat indépendant autosuffisant pour maintenir la nouvelle désignation.

De nos jours un secrétariat autoréglementé existe et l'Association des arpenteurs des terres du Canada (AATC) est un corps professionnel multidisciplinaire. Le géomètre canadien est devenu l'arpenteur fédéral (a.f.) et sa capacité à arpenter (légalement) partout au Canada existe par une entente de reconnaissance mutuelle des qualifications entre l'AATC et toutes les corporations professionnelles provinciales d'arpentage. Trente ans plus tard, nous faisons encore une fois face au besoin d'appui dans l'expertise et la compétence du secteur privé pour les levés côtiers au Canada. L'article 76 du Canada réclame une extension du plateau continentale en appui aux levés d'exploitation minière et la déclaration d'accroître la confiance dans la collecte de données externes, énoncée dans les Orientations futures du Service hydrographique du Canada (SHC 2003) ont conduit à ce besoin.

Pour conclure ce message, j'aimerais clarifier que les recommandations du comité spécial AATC-ACH sur la certification des hydrographes n'impliquent pas les arpenteurs fédéraux à détenir un permis pour la pratique de l'hydrographie. Nos recommandations proposent l'obtention d'un certificat des compétences reconnu nationalement et basé sur les exigences à obtenir un brevet a.f. qui serait émis et maintenu par une corporation professionnelle autoréglementée comme l'AATC. À cet égard, je crois que le rôle de la profession d'arpenteur est bien décrit dans un document de M. George Comrie, président du Professional Engineers of Ontario (PEO). Dans le contexte de l'incursion récente du gouvernement provincial dans les règlements du PEO, M. Comrie affirme que « les gouvernements ont confiance aux professions autoréglementées parce qu'ils acceptent que nous avons une plus grande connaissance et expertise dans nos disciplines que le gouvernement lui-même. » (Comrie 2005). J'accepte le fait qu'un employeur est libre de déterminer le niveau de qualification requis pour accomplir un travail, mais il faut que la confiance et la perception du public soient maintenues lorsqu'un titre spécifique d'emploi (i.e. arpenteur hydrographe) laisse entendre des qualifications reposant sur la profession d'arpentage.

Andrew Leyzack

BOOK REVIEW

NAVIGATOR to HYDROGRAPHER

Written by Thomas (Tom) D. W. McCulloch

Review contributed to *Lighthouse* by Stephen MacPhee

Published by Trafford Publishing, Victoria, BC, Canada, 2005
ISBN: 1-4120-4592-4, 278 pages

"Navigator to Hydrographer" is the second book by Tom McCulloch and is a sequel to "Mandalay to Norsemen – Childhood on the River Clyde and Service at Sea". The earlier book covers Tom's early life up until 1948 and this book covers the period from 1948 to 1970. In 1948, Tom and his wife Doreen arrived in Canada, emigrants from Britain, and Tom began his life as a deck officer on vessels trading world-wide and in the Great Lakes. In 1979, Tom had been confirmed as the Director-General of the Bayfield Laboratory of the Marine Sciences and Surveys and his family of five were becoming established in their respective pursuits. Tom is a man of vision and his rapid advancement from Navigator to Hydrographer to Director-General demonstrates well his energy, his commitment, and his persistence.

Like the earlier book, this one is an excellent read. It is filled with the interests and character of Tom but on more than a few occasions, Tom's strong character is supplanted or replaced by that of Doreen. The book has Forewords by Michael Bolton (recently deceased) and by Admiral Steve Ritchie. Michael provided a short background to hydrography in Canada after World War II and discussed the requirements for training and new equipment as technological advances were made. In the book, Tom continues to emphasize the importance of training and the role he played in technological development as well as the role he played in making training a priority of the managers of the Canadian Hydrographic Service (CHS) in the 1960s. Steve Ritchie discusses Tom's life as a hydrographer and characterises Doreen as the heroine who brought up a family of five with a husband often away from home for long periods of time. Steve ends his Foreword by appropriately saying that, "... this book is a major contribution to the history of Canadian hydrography."

"Navigator to Hydrographer" is in many ways quite personal and Tom, as he did in his working life, does not shy away from controversy, nor does he forget the many haunts where he had a good run ashore. Tom displays an excellent memory in his writing and writes about his shipmates and co-workers in the CHS mostly with much esteem but sometimes with a few disparaging comments. He also writes about issues of the time, particularly Canadian politics, with a little more bias than one would expect from a bureaucrat of today. The importance he places on his background as a mariner and his love of the Arctic are evident throughout the entire publication.

While the first three-quarters of the book is dedicated to Tom the Mariner and Hydrographer, the last part of the book is dedicated to Tom the international traveller, involved in the advancement of the surveying profession. He discusses his role as President of the then Canadian Institute of surveying (1971), his role in the Fédération Internationale des Géométres (FIG), and his role in the Commonwealth Association of Surveying and Land Economy (CASLE). In all of his travels, Tom not only discusses the program content of the conferences and meetings he attended but also discusses the hotels he stayed at, good and bad, and the food that was provided, mostly good.

This is a wonderful story of an important segment of one man's life, as he achieved his various ambitions and as he discusses his weaknesses and his strengths. His discussion of the Canadian Hydrographic Service of the 1950s and 60s also provides and interesting contrast to the CHS of today.

Cartographic Symbolization: An Evolution from Sea Monsters to Inuksuit

By: John Mercuri, Canadian Hydrographic Service

The purpose of this paper is to discuss the evolution of cartographic symbolization and in particular how cartographic symbolization has changed from the hand drawn era to the computer assisted era. To cite examples from the field of Hydrographic charting, this evolution has had a profound effect on the state of cartographic symbolization. Discussed in this paper is how computer assisted cartography and mass standardization has changed the look and feel of modern day hydrographic charts and the problems and difficulties of introducing new cartographic symbols which are based in traditional methods.

Le but de cet article est de discuter de l'évolution de la symbolisation cartographique et en particulier comment la symbolisation cartographique a changé du dessin manuel à l'ère numérique. On donne des exemples où cette évolution a eu un profond effet sur l'état de la symbolisation cartographique du terrain. Cet article discute comment l'évolution de la cartographie numérique et la standardisation massive ont changé l'aspect et la fini des cartes hydrographiques modernes ainsi que les problèmes et les difficultés d'introduire de nouveaux symboles cartographiques lesquels sont basés sur les méthodes traditionnelles.

Introduction

Arthur Robinson, a professor of Cartography, University of Wisconsin, has suggested that, "cartography is in the midst of a revolution in technology and we are about midway through it" (Robinson 1995). The revolution he is speaking of may as well be over as the evolution from hand-drawn to mechanical and now to digital has had profound effects on the state of cartography and in particular cartographic symbolization. This change has had both positive and negative impacts on the field of Cartography and the field of Hydrography. Cartographers and Hydrographers have the unique responsibility to depict the earth in a fashion which is accurate and which shows as much information as possible; without confusing or making the purpose of the map difficult for the user to understand.

Maps and charts alike are drawn using graphic symbols to depict features on the Earth's surface. These graphic symbols have transformed themselves throughout time, since the earliest maps were created in ancient Mesopotamia (2300-2500 B.C.), there has been a trend from an individualistic/stylistic form to a more uniform/standardized presentation. Although the purpose of mapping has almost completely remained the same, mapping as a practice has changed from an art form with some science to almost pure science without or with very little art form.

The evolution over time of generalizing and standardizing symbols is two fold: one is to lessen confusion among diverse users, and second to represent more information on the map than can otherwise be shown. Historically, only skilled artisans were able to achieve a good representation of reality through abstract symbology, whereas today extensive symbol libraries help the average cartographers get the same message across with a lot less skill. With the advent of computer graphics the repeatability of more complicated symbology has become easier; in fact symbols to the naked eye are 100% identical. Symbols created using computer graphics can now be drawn more elaborately and with more complexity without the concern of confusion, inconsistency and inaccuracy. The following example (Figure 1) shows a comparison of a modern, more complex symbol for a marina shown as a sailboat, versus an old symbol, simply shown as a circle encompassing the letter M.

Figure 1: Chart symbols for a marina

Even though computer aided cartography has greatly aided the field, one must be mindful of the repercussions. This of course leads us down the path of what is known as clip-art-cartography which consequently has caused the proliferation of poor maps. With computer graphics it has obviously become easier (and superior to manual drafting) to make maps with pictorial symbols rather than representative ones. In the following example (Figure 2) there is no question as to what sort of common feature the (tower) symbol on the left represents, whereas the symbol on the right obviously needs a legend or ancillary description (Chart No.1) and perhaps an understanding of western languages (Tr).

Figure 2: Chart symbols for a tower

Some advantages of using pictorial symbols are that they:

- lessen the need for a legend (leading to more efficient use of map space and cost reductions);
- represent a feature closer to reality (communicating with less abstraction).

The question then arises; can pictorial symbol representation be used for other less common yet conspicuous features such as Inuksuit (Inuit built Stone Monuments)? Can it be represented by its own symbol or does one have to misuse or adapt a cairn or monument symbol with descriptive text? Is it possible to move forward in graphic communication by going back to our traditional / historical roots in cartography? With the advanced CAD systems and modern plotters one can readily remove a certain sterility which has been introduced to mapping for cost reduction and mass production reasons. Today, the loss of traditional cartographic skills seems to have accelerated with the advent of computer aided design. One should in fact take advantage of the consistency and accuracy of the CAD programs and meld them as much as possible with traditional methods, perhaps through the use of more stylized hatching or pictorial symbols.

An example of a pictorial symbol used in hydrographic charts and relevant to this paper is the cairn (Figure 3). A cairn is depicted as three circles stacked in a pyramidal form and described by the following definitions:

- Canadian Hydrographic Service: Cairns are piles of stones piled into a pyramid shape.
- International Hydrographic Organization: Cairn, a mound of stones, usually conical or pyramidal, raised as a landmark or to designate a point of importance in surveying.

Cairn Symbol Cairn in Reality

Figure 3: Depiction of cairn (left) and real example (right)

However, as good as this pictorial symbol may be at representing a real feature, it does not adequately represent all landmarks which are "piles" or "mounds" of stones. For example, while an Inukshuk is a pile of rocks, it is not built in the same fashion as a Cairn. In fact, by tradition, the various ways in which the rocks in an Inukshuk may be stacked will define its purpose and specific message for travellers. This leads to the following questions:

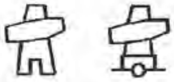
- What is an Inukshuk?
- Is it culturally significant?
- How can it be symbolized?
- If conspicuous, should it be symbolized on Hydrographic Charts?

What is an Inukshuk?

The arctic stone figures most familiar to southerners are called Innunguait which is Inuktitut for "in the likeness of a human". However, these are often mistaken for an Inuksuit which means "to act in the capacity of a human" (Hallendy, 2001). As southerners we have adopted the term Inukshuk as a generic term for the many forms of Inuit stone monuments. Innunquaq (plural form of Innunquait) are fashioned out of slabs of rock, both large and small, in the shape of a person standing with his arms outstretched. "While the original purposes for which Inuksuit were built have been lost, some common explanations continue to this day. The first explanation is that they guide or channel caribou into areas or shooting pits where Inuit can easily hunt them. Another purpose attributed is that they serve as markers, or signposts, to help guide Inuit across the tundra" (Patenaude, 2000). Some also suggest that the many of the Inuksuit were built as objects to mark places of power and veneration (Hallendy, 2001).

How can an Inukshuk be symbolized?

It is evident that some of these Inuksuit have become significant markers in an almost barren landscape. An Inukshuk is an information beacon for travellers in Canada's north. "An open leg on an Inukshuk found near water or a coastline points to an open channel for passage to navigate your way, and if the Inukshuk is in the middle of land, the open leg points towards a valley as a route to pass through the mountains. The open (longer) arm of an Inukshuk points you in the direction you should be going. A marker Inukshuk placed near a lake shows that the fish can be found in the lake at the exact same distance the Inukshuk is placed from the shoreline."(Government of Canada www.aaw-ssca.gc.ca) It is believed that many Inukshuit are several hundred years old and over their history the inuksuit have taken on many forms and have served in many different ways.



Proposed Symbols

Inukshuk in Reality

Figure 4: Depiction of an inukshuk (top) and a real example (above)

Is the Inukshuk culturally significant?

Inuksuit are not only visually significant (conspicuous) but also culturally significant to the native people of the Canadian Arctic. They show to the world that mankind has left a familiar mark on even the most inhospitable terrain. Mapping as well puts mankind's stamp or perspective on the environment. Is it not only fitting that the Inukshuk shares this exact same quality? As maps give us a sense of identity so do the Inuksuit, because they have become a cultural icon of the Canadian Arctic. Due to this fact, it is important to map these icons of which people are becoming aware of. "Western Maps are inspired by luminaries of our Eurocentric past." (Morantz, 2002) As cartographers, it is important to realize and become aware of the paradigms we may carry as baggage where objects that may be viewed as insignificant by some cultures, may be viewed as significant by others. It is important that we remain sensitive of those cultures whose connection with the land is inherently different than ours. In the map below by Simeonie Qapappik, (an Inuit elder from Cape Dorset) the importance of the Inuksuit on the landscape becomes evident (Figure 5).

The coast of southwestern *Baffin Island* by Simeonie Qapappik, Cape Dorset, 1990. Courtesy of Norman Hallendy.

Figure 5: Inuit map of Inuksuit

Should we chart Inuksuit?

"Historically speaking, past Cartographers would steal information from other maps, good cartographers would dig deeper into surveys rather than use historical accounts."(Morantz, 2002) So just because others do not map or chart Inuksuit does not mean that these features should be discounted as insignificant visual aids. Cartographers and Surveyors should investigate further and decide whether the Inuksuit need to be charted. Mapping and trailblazing, moving into new frontiers, are a motif and a tradition for Surveyors and Cartographers alike. The creation of new methods and new symbology is a part of the idea of moving forward of our understanding of our world.

How do we find a balance in accurately displaying information without removing all of the cultural significance and identity of that particular place? How can this be done while observing international standards? The solution can only be through communication and involvement of all parties. So the question persists, should the Inuksuit be charted? In some cases the answer will be yes and in many the answer will be no. If it is a conspicuous feature then Hydrographic survey guidelines would require us to position and describe them. However, if we do not create a proper symbol to identify the feature, we are not accurately communicating its description and the answer will always be no.

As time progresses one might argue that cartography is moving further and further away from its origins. Perhaps it has become more of a tool used for systematically dividing space, rather than showing the user what they might expect to see, guiding people through the perceived unknown. The use of the map/chart as a tool is not only achieved by the actual map itself but also by the stylistic flare which the map exhibits. Techniques of style and art when used on a map or chart give the user a greater sense of the area which they are about to traverse. In the past much of the stylistic form was used to fill gaps in the unknown areas and as those gaps have become discovered, less usage of style and art are evident. "Cartography is about maps. This includes the art, science and technology of map making, the use of maps as research tools and as sources of information, and the study of maps as historical documents and works of art." (Dudycha, 2003)

Shown in Figure 6 is an example of an old and new style Canadian Hydrographic compass rose. Note the earlier fleur-de-lis motif used in the magnetic declination arrow. With International standardization, this element of style been removed and Canadian Charts have become more detached from their *Nouveau France* beginnings introduced by early explorers/cartographers like Samuel de Champlain (Figure 7).

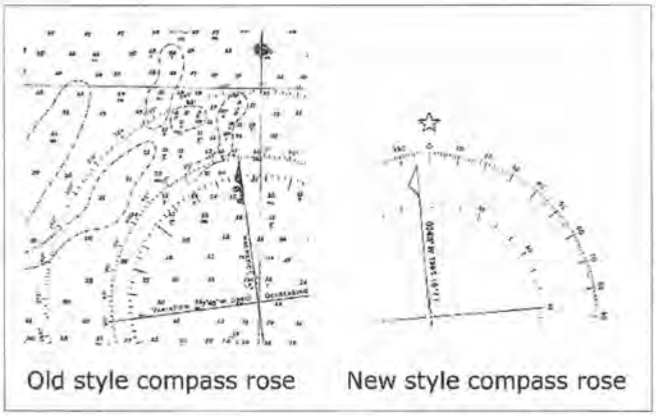


Figure 6: Examples of old (left) and new (right) styles for compass rose

Figure 7: Illes de la Nouvele France, Samuel de Champlain 1567-1635 (United States Library of Congress)

Sometimes human nature causes one to continually do things because that is the way they were done before and as time goes on it is easy to forget why things are done in that way. It is easy to assume that is the right way and all other ways are wrong. There is nothing wrong with pausing to ask the question, why? Thus, questioning current trends borne from existing patterns. "More often than not, the map user is different from the map maker and the map maker rarely collects the original data."(Dudycha, 2003) In the hydrographic case this is untrue, because as cartographers who often participate in field surveys, we have the unique opportunity to create products that are more effectively designed with the user's needs in mind. Charts are special purpose maps in that they have one major difference over a typical map: charts are designed to be worked on as a tool for navigation, maps tend to be read and looked at. Because of this it is so important to accurately display as much information as possible, in order to aid in marine navigation. But if art and style do not interfere with the effective use of the chart as a tool, why not include them as much as possible?

The purpose of this paper is to help stimulate discussion, to revaluate where we are and how we got here. While I believe there is genuine value in reintroducing elements of art and style in the use of pictorial symbolization, I am not advocating that we put sea monsters back on the charts (Figure 8). Although, I like sea monsters and would not mind them being there.

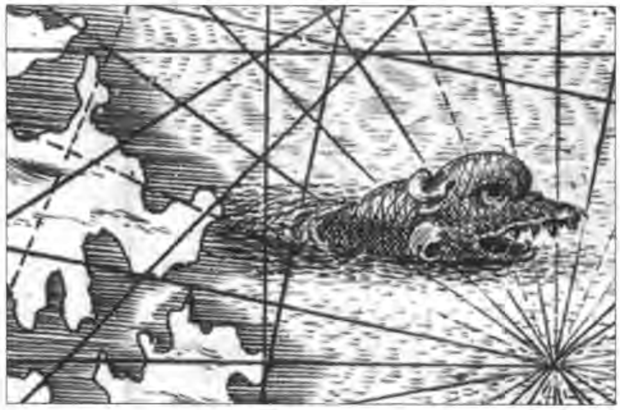


Figure 8: German Map of Japan 17th century (Watson Collection, Cornell University)

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Appendix A References:

1. West Vancouver, British Colombia. (Photo:Stock photo 3302) *http://www.pbase.ca*
2. Collingwood, Ontario. (Photo: Richard Dakin) *http://www.usefilm.com/image/694349.html*
3. Igloolik, Nunavut. (Photo: Cherry & Bryan Alexander) *http://www.arcticphoto.co.uk/gallery2/arctic/peoples/inuitcan*
4. Rankin Inlet, Nunavut. (Photo: Tim Janzen)
5. Montreal, Quebec. (Photo: Arif Khan) *http://www.mishami.image.pbase.com/u38/arifakhan/large/25014774.Dscf0138.jpg*
6. Toronto, Ontario. (Photo: Inukshuk by Kellypalik Qimirpik)

Appendix A : Conspicuous Inuksuit (Visible from Seaward and Significant to Navigation)

1. West Vancouver

2. Collingwood

3. Igloolik

4. Rankin Inlet

5. Montreal

6. Toronto

About the author...

John Mercuri is a multi-disciplinary hydrographer with the Canadian Hydrographic Service who is involved in Arctic Surveys and Raster Charting. He is a graduate from Carleton University, Ottawa Canada (1997) and has also studied cartography and GIS from the Helsinki University of Technology, Espoo, Finland (2002).

The International Federation of Hydrographic Societies - The Organisation, Past and Present

By: Helen Atkinson, Operations & Publications Manager, IFHS

The Hydrographic Society (1972-2004)

'The story of The Hydrographic Society is inevitably intertwined with the story of sea surveying'.
Alan Ingham, Founding Hon. Secretary, 1982

In response to the rapid expansion of the world's oil and gas industries, and the inherent need for suitably skilled personnel to supply the new demand, North East London Polytechnic hosted a series of exploratory meetings in the early 1970s. As a direct result of these discussions The Hydrographic Society was formally established, in a meeting at BP's headquarters, on 24 March 1972.

The following year saw the introduction of the Society's, now familiar, seahorse logo and in 1974 the Society was granted charitable status. A decade after its inception, The Hydrographic Society was formally incorporated as company limited by guarantee in May 1982.

The Society's principal aims have been the promotion of the science of surveying over water and related disciplines as well as the fostering of recognised standards of education and training for those engaged in, or intending to engage in, the hydrographic profession. For these purposes, the Society launched an independently administered Educational Fund in 1987 which was maintained with the aim of providing practical assistance to those at, or near, the start of their careers; particular emphasis being given to assisting individuals from third world countries and newly emerging coastal states.

The Society's objectives have largely been realised by regular promotion and organisation of international symposia, seminars and technical workshops (including the now familiar biennial *Hydro* series which began in 1976) as well as by representation at, or liaison with, other major learned and professional bodies associated with surveying and the marine sciences. The quarterly journal, *The Hydrographic Journal*, has distributed worldwide free to members and on subscription to others.

Membership of the Society has been open to any individual or organisation with an interest in survey afloat or any related disciplines. No formal qualifications were necessary. Members, both individual and corporate, represented the fields of hydrography, oceanography, geophysics, civil engineering and associated disciplines at all levels of expertise.

It could be argued that just four years after its foundation the Society sowed the seeds of the soon-to-be Federation with its first Regional Meeting, held by the Home Counties West Region in the, now legendary, Magpie Hotel, Sunbury-on-Thames. Almost immediately similar Regions then sprang up in East Anglia, Merseyside and the North West and Scotland.

Individual and Corporate membership numbers continued to flourish throughout the 1970s whilst simultaneously adopting an increasingly diverse and international profile, with members eventually being drawn from almost 70 countries. In 1980 the Society took its next significant step towards federation with the foundation of the first national Branch in the United States. The following year the US Branch was joined by its sister organisation in the Netherlands (later to become the Benelux Branch) and in time by further Branches in the UK (1985), Denmark and Australasia (1986). The process of decentralisation continued as several of the Branches went on to create their own Regions and Chapters and the potential viability of Branches in other key areas was explored.

Philosophy for Change

'... What was needed was a co-ordinating focal point through which international interests could be channelled towards a wider audience. Perhaps an umbrella organisation would be a more useful move.
And so it has come about. Our Society's national Branches have achieved national autonomy while maintaining a strong flow of information along a highway of international mutual cooperation. Make no mistake, whatever happens, hydrography remains a vitally important part of a coastal country's prosperity, and our societies will have a part to play.'
Geoffrey Haskins, Former President and Chairman of Council of The Hydrographic Society

After three decades as a highly successful independent, learned organisation operated within an international Council-led framework it was almost inevitable the

Society's success would be the very undoing of its established format. The success of its international Branches and their Regions ultimately resulted in their desire for domestic self-governance.

Towards the end of 2001 the members voted in favour of the proposal to start a process of change, whilst still maintaining and improving on the range of services offered to the membership. The five Branches of The Hydrographic Society were allowed to evolve into autonomous national/regional hydrographic societies (NHS).

In turn, The Hydrographic Society has been evolving into the 'International Federation of Hydrographic Societies', to functioning as the international 'umbrella organisation'.

International Federation of Hydrographic Societies

The International Federation of Hydrographic Societies is a unique partnership of learned national and regional hydrographic societies which, through its international membership, has the ability to reach representatives of every specialism within the hydrographic profession, at all levels of experience and expertise. It, therefore, has great international power as a focal point for ideas and as a catalyst for their realisation.

The Federation promotes the development of hydrography and hydrographic learning and provides opportunities for the exchange of ideas and practices throughout the world.

The Federation strives to provide a global focal point for the wider hydrographic community, both individual and corporate, to bring tangible benefits to all classes of memberships of the national affiliated societies, and to provide members of the national societies with a range of products and services. The Federation is responsible for organising international *Hydro* symposia, seminars and technical workshops, the publication of specialist literature including *The Hydrographic Journal*, as well as maintaining and developing this well-established website. In turn, these activities are complemented by an international programme of symposia and seminars and informal national and regional evening meetings, workshops and social events.

Through its constituent societies, Federation members - both individual and corporate - include contract hydrographic surveyors, government, military and political service personnel, oceanographers, geophysicists, geologists, environmental scientists, civil engineers, port surveyors and operators, academics, project managers, software engineers, surveyors in all sectors of private practice, petroleum companies, research and educational institutes, environmental protection and monitoring organisations, professional bodies and other associations, equipment manufacturers and suppliers, dredging and salvage contractors and others involved in associated sciences, technologies and applications.

Structure and Principles

Membership of the Federation is comprised exclusively of national hydrographic societies or similar organisations. The founding members were the national hydrographic societies which evolved from the former Branches of The Hydrographic Society. From 2005 membership is open to any other national society or similar organisation, subject to the approval of the Executive Committee.

The Federation's simple structure allows the national societies the freedom to operate under their own independent constitutions, maintain their own membership databases and determine and collect their own subscriptions whilst simultaneously maintaining an international position, reinforced through the continued delivery of the respected products and services established under The Hydrographic Society.

The Federation is governed by a small Executive Committee comprising of one Representative per national society, on the principle of one member, one vote. The Operations Manager and the Hon Treasurer also advise the Executive in an ex-officio capacity.

In recognition of its international nature, the Federation's constitution makes provision for the use of modern technology and procedures, whenever possible, including virtual meetings, video conferencing and electronic voting.

For further details regarding any of the Federation's activities, services or publications, please contact:

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An Overview of Hydrographic Surveying and Mapping Techniques for Coastal Construction Projects in Hong Kong

By: Steve Y. W. Lam, The Hong Kong Polytechnic University

This paper briefly describes the current practice of hydrographic surveying and mapping for coastal construction projects in Hong Kong. It presents the coordinate reference system, methodology and procedures of the survey operations, principal elements of the automated system, and the application of the mathematical model of Delaunay triangulation in solving the GPS heighting problem.

Introduction

As a major international shipping harbour and commercial centre of Asia Pacific, Hong Kong has constructed many coastal structures such as seawalls, breakwaters, ferry piers, ocean terminals and cross-harbour bridges and tunnels to facilitate marine transportation and reclamation for the rapidly growing land development. Most of the coastal structures in Hong Kong are built within two kilometres of the shoreline. Some of these engineering structures also serve to protect beaches and upland structures from erosions and pollutants. During each stage of a project's life (e.g. planning, acquisition, design, construction, operation and maintenance) hydrographic and engineering surveyors are employed to perform the following operations (Figure 1):

- Establishment of a geodetic network and co-ordinate reference system.
- Mapping of all features, both onshore and offshore, and entering these features properly into the geographic information system (GIS) and the computer-aided design (CAD) system to facilitate project planning and engineering design.
- Setting-out the designed three-dimensional models in the field for construction.
- As-built surveying for checking the geometric tolerances and volume quantities of the completed structures.
- Monitoring of ground displacements and structural deformation for the safety of the workers and the public.

And the following survey instrumentation is commonly adopted in these operations:

- Vessels for shallow water surveys (e.g. boat and helicopter).
- Auto-tracking electronic total station and real-time kinematic (RTK) GPS receiver for position-fixing afloat (PFA) at, for example, half-second epochs.
- Depth sounding devices such as multiple-frequency multibeam echosounders.
- Gyro compass onboard for directing the heading of the survey vessel.
- Inertial measurement unit (IMU) that measures pitch, roll and yaw; and heave sensor onboard for corrections or refinement of the bathymetric data.
- Salinity and velocity profiler to correct sound velocity for echosounder measurements.
- Tide-gauge to record sea-level change.
- Onboard computers and software which integrate data from the above hardware for survey computations, navigating the survey vessel and chart production.

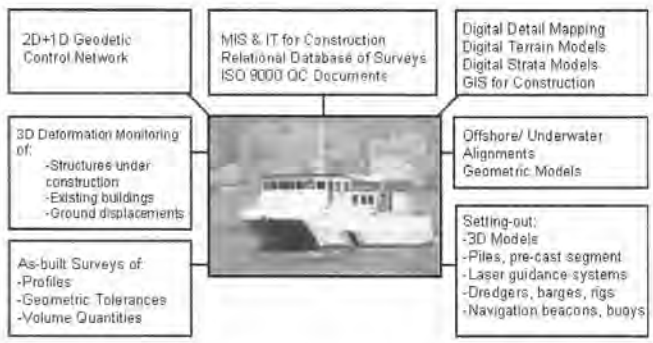

Figure 1: Survey operations for coast construction projects (Lam, 2005)

Position-Fixing Afloat (PFA) and Digital Mapping

For practical aspects of construction projects, a rectangular grid coordinate system has been established in Hong Kong so that location, alignments and geometric models of all the building structures for the works can be designed and set out with minimum complication. A false origin (800,000.000m Northing, 800,000.000m Easting) has been designated at the southwest corner of the grid system so that all the plane coordinates (Northing, Easting) are positive. All heights, levels or vertical elevations on land

and within the harbour refer to the Hong Kong Principal Datum (reduced level of HKPD = 0.000m) which is 0.146m above the Chart Datum of Hong Kong (SMO, 1995). This orthogonal projection system provides a one-to-one correspondence between points on the geodetic surface and points on the plane surface, and allows spatial coordinates to be used. The conversion between geodetic and plane coordinates is expressed in terms of mathematical formulae that permit numerical computation to any predetermined accuracy for the result. In addition, a central meridian is chosen to pass through the center of the project area so that the need for applying a scale factor and $(t - T)$ direction corrections for all sight lines could be excluded in plane computations except for very long surveyed lines. T is the projected grid azimuth of the arc and t is the plane azimuth of the chord for a projected line of sight in plane computations.

A *fix* in hydrographic surveying is the instant at which the position of a point or vessel is observed (ASCE, 1998). Depending on the accuracy required of the survey operation, PFA can be performed by using sextant, auto-tracking electronic total station and/or RTK GPS system. Soundings can be performed using a variety of techniques from leadline to airborne sounding (Thomson et al., 1983; Ingham and Abbott, 1992; ASCE, 1998; Wells, 1997).

PFA by sextant resection, bearing-bearing intersection and distance-distance intersection are now replaced by auto-tracking electronic total station (e.g. Trimble ATS™) in short-range operations. The onshore total station is capable of synchronising with onboard instrumentation at high speed and sending instantly up-to-date measurements to the computer system on the vessel. With the sounding data from the echosounder and other instrumentation, coordinates (Northing, Easting, Reduced Level) are computed by polar and trigonometrical techniques.

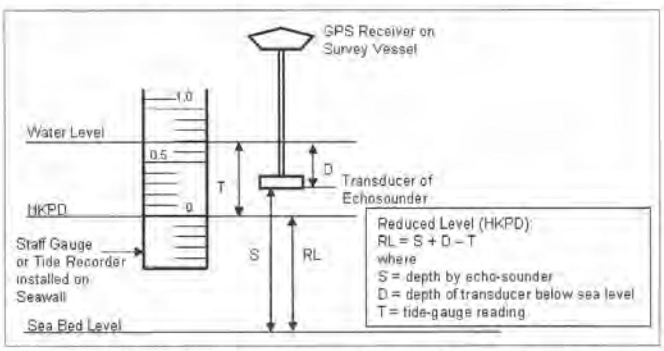

Figure 2: Reduction of soundings from tide-gauge readings

An RTK GPS system (e.g. Trimble MS™ and Leica GPS System 500™) is used in both short- and long-range (up to 10km baseline) operations providing centimetre horizontal and vertical positioning accuracy. Using data from RTK base stations such as those provided by the Hong Kong Government, the GPS system can replace a radio-linked tide gauge with tide and heave measurements in real-time. However, in most cases, tide-gauge records are still adopted and used in conjunction with GPS, where sounding reductions (Figure 2) will be influenced by a vertical error of over ±0.1m from tide-readings and their interpolation. This error is sometimes not acceptable under the mapping standards of construction projects.

There are several reasons causing such a problem in Hong Kong. GPS determines heights with respect to the chosen reference ellipsoid while orthometric heights are adopted by construction projects and referenced to HKPD on the local geoid. Their relationship is expressed by the following equation:

$$H = h - N \qquad (1)$$

where H is the orthometric height or reduced level determined by spirit levelling, h is the ellipsoidal height determined by GPS, and N is the geoid-ellipsoid separation.

Two principal methods are applied to determine geoid-ellipsoid separation for the transformation of GPS ellipsoidal height to orthometric heights, namely the gravimetric method and the geometric method. Unfortunately, precise gravimetric data are not available to contractors and errors in applying the gravimetric method are difficult to predict and vary considerably according to site location. Hence the geometric method of Delaunay triangulation (Delaunay, 1934) for planar surfaces is recommended to represent the geometric models of geoid-ellipsoid separation (Figure 3) in solving the transformation problem. The method is explained as follows.

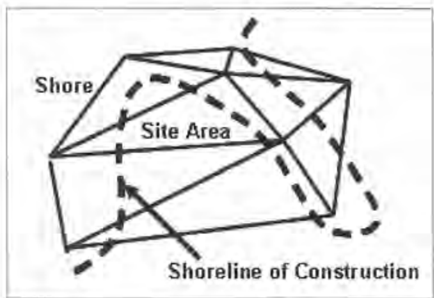

Figure 3: Geoid-ellipsoid separation model by Delaunay triangulation

The equation of a triangle is given by

$$N = A + B\,(EP) + C\,(NP) \qquad (2)$$

where N is the geoid-ellipsoid separation at point P, and EP and NP are Easting and Northing coordinates, respectively, of point P with respect to the plane coordinate system of the construction site. A, B and C are coefficients of the plane equation.

In order to determine the three coefficients, a minimum of three coordinated level benchmarks that surround the site and have GPS-derived heights must be available. Thereafter, geoid-ellipsoid separation at any GPS position is interpolated in the triangular plane by equation (2) and the orthometric height is found by equation (1).

From the experience of the author, this planar or linear approximation method achieves centimetre-level accuracy for orthometric heights derived by GPS over a small construction area.

A more rigorous approach is to apply a multiple regression equation as given by (NIMA, 2000). Another approach is recommended by (Featherstone et al., 1998) in which the gravimetric geoid model is combined with, and constrained by using, geometrically derived geoid heights that surround the survey area. This geodetic method can be used to transform GPS heights more accurately than either the gravimetric or geometric method alone.

After the transformation model has been chosen, the tasks required for detail mapping are given as follows:

- Calibration of echosounder, GPS receivers and all other survey instrumentation.
- Configuration of hardware and software observation parameters and datum.
- Input of site limits, sounding lines and aerial photographs into the computer system.
- Data collection along predetermined lines and logging vessel position and depth in the field.
- Search and sweep to locate all obstructions on site.
- Determination of seafloor materials and hazards.
- Surveying of topographical details on shore.
- Delineation of high and low water marks.
- Processing of all field data with datum transformation of points to (N, E, RL).
- Detection of outliers and editing of points and topographic features.
- Generation of digital terrain model (DTM), digital strata model (DSM), contours (colour-coded depths), longitudinal profiles, cross-sections and volume quantities.
- Converting the mapping data into DXF, DWG, DGN, IGES or other formats for further applications in CARIS™, GIS and CAD systems.

Data processing and plotting are accomplished by onboard or office-based computer systems (e.g. HYPACK™ and HYDROpro™). Allowable errors for the hydrographic surveying and mapping are prescribed by the U.S. Army Corps of Engineers and the International Hydrographic Organization, S-44.

Setting-out for Coastal Construction

Coastal construction activities include dredging, driving foundation piles, erection of structures and underwater pipe-laying. Depending on the type of structural element, method of construction and available instruments, different survey methods are applied in the setting-out operations. Laser-transit with fan-lens has been replaced by RTK GPS in setting-out dredging alignments. By integrating measurements from GPS, echosounders and other instrumentation, software packages (e.g. DREDGEPACK® and HYDROpro™) provide real-time three-dimensional positions of the cutter head, seafloor profiles (existing versus designed) and other digging information to the operators of dredgers and hopper barges. The software Target: Pile™ is usually found in the control room of a piling barge to give the operator real-time guidance for manoeuvring the rig into the required position, within the piling accuracy of 50mm.

For setting-out of structural elements over water (e.g. columns and beams), the points to be staked are given (N, E, RL) coordinates according to design alignments, cross-sections and dimensions in construction drawings - so that construction layout from randomly located control points is feasible with the use of total stations. In order to achieve millimetre accuracy in setting-out levels, the technique of reciprocal levelling using conventional-optical and digital levels is applied.

Conclusions and Future Developments

This paper has presented the hydrographic surveying and mapping techniques for coastal construction projects in Hong Kong, including the current adoption of the hardware and software systems by the surveying practice. Depending on the range of measurement and interference on the observing sites, auto-tracking total station and RTK GPS methods are commonly used with echosounders and computer systems in PFA, digital mapping and setting-out procedures.

The application of Delaunay triangulation is used to establish a precise geometric geoid-ellipsoid separation model for GPS heighting. In the future, densification of the referenced surfaces will be needed to cover the whole territories of Hong Kong, such that these data will be available to all GPS users. The applications of airborne LIDAR bathymetries and SHOALS are being investigated. We are seeking fast, accurate and cost-effective methods to apply to locations where the present acoustic surveying, photogrammetric and remote sensing techniques are most limited in monitoring and assessing the Hong Kong marine environment and the nearby Pearl River region in mainland China. LH

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About the Author

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DID YOU KNOW...

Boxing the Compass

Calling the names of the 32 points of the compass in clockwise order. The compass nomenclature and the point system are indicated below:

North	- Ahead	South	- Astern
N by E	- One point on starboard Bow	S by W	- One point on port quarter
NNE	- Two points on the starboard bow	SSW	- Two points on port quarter
NE by N	- Three points on the starboard bow	SW by S	- Three point on port quarter
NE	- Broad on starboard bow	SW	- Broad on port quarter
NE by E	- Three points forward, starboard beam	SW by W	- Three points abaft, port beam
ENE	- Two points forward, starboard beam	WSW	- Two points abaft, port beam
E by N	- One point forward, starboard beam	W by S	- One point abaft, port beam
East	- On the starboard beam	West	- On the port beam
E by S	- One point abaft, starboard beam	W by N	- One point forward, port beam
ESE	- Two points abaft, starboard beam	WNW	- Two points forward, port beam
SE by E	- Three points abaft, starboard beam	NW by W	- Three points foward, port beam
SE	- Broad on starboard quarter	NW	- Broad on port bow
SE by S	- Three points on starboard quarter	NW by N	- Three points on the port bow
SSE	- Two points on starboard quarter	NNW	- Two points on the port bow
S by E	- One point on starboard quarter	N by W	- One point on the port bow

THE FRANKLIN CONSPIRACY

Written by Jeffrey Blair Latta

Review contributed to *Lighthouse* by Peter Knight

Published by Hounslow Press, Victoria, 2001
ISBN: 0888822340 Paperback, 320 pages

"Perhaps in all the world there will be few spots more hallowed in the recollection of English seamen than this cairn on Cape Herschell."
-McClintock quoted by Jeffrey Blair Latta in his book

The Oxford dictionary defines epic as '... pertaining to that kind of narrative poetry which celebrates the achievements of some heroic personage of history or tradition.' And the dictionary continues, '... any imaginative work embodying a nation's conception of its own past history or of incidents in it.' Epics always remain such, but it is important that they continue to be re-invented in the contemporary context. Jeffery Blair Latta's book "The Franklin Conspiracy" is a marvellous re-telling of the Franklin story. But it is the present-day significance of the historical facts that really captures our interest, and I think that Latta's bold approach stimulates a contemporary interpretation.

Jeffery Latta, like Pierre Berton and Farley Mowat before him, is one of a group of investigators who have recognized and attempted to honour the epic quality of the 19th Century Arctic voyages of exploration. Latta's contribution is a scholarly investigation of the historical sources; an attempt to understand these within a political context (focusing on the British Admiralty), and a supra-contemporary re-imagining of what might have been going on among the northern islands 150 years ago. The result is sensational. However, I shall not attempt to describe the details here as Latta is careful himself not to alienate his readers with an overly abrupt presentation of his case.

Nothing speaks as strongly as a work that is able to combine what is personal with what has meaning to society as a whole. This occurs at two levels in Latta's work; the first is the activation of personal memories that all those with interest in this subject may experience. Here Lattas's descriptions of the Arctic landscape powerfully activated my own imagination and memories of the Arctic, providing new meaning to the bits and pieces of my own experience. The second personal-societal link occurs when we understand an epic—in this case Franklin's journey— as exemplifying a life-or-death struggle that takes place within the psyche of a nation (or the individuals representing that nation). Latta believes in a profound mystery associated with the people and places that form the context of Franklin's fate. If we allow Latta the freedom to speculate, we must also allow the reader a freedom of interpretation. Franklin's journey becomes for me a manifestation of societal evil (which we need ever remember originates in ourselves), but one which contains the saving grace that the journey was one designed (probably unconsciously) to meet that evil head-on.

"One more line, across a land so cold and barren ...". I've never liked Stan Roger's song about Franklin; it contains too much of the officer, not enough of the land. Neither have I ever really liked the idea of the northern expeditions: people hopelessly out of place; their hideous and depressing cultural insularity; the futile wasting of people and resources. But Latta has helped me here. There is another way of reading the history of Arctic exploration that culminates with the loss of Franklin's expedition. It is possible to see Franklin's journey not as the foolish and ugly, chauvinistic thing of the song, but a kind of voyage to the heart of darkness. This is a voyage in which the Admiralty confronts its own nature, our own nature, because, of course, this is also our legacy, these are our traditions.

Latta nearly called his book The Shaman's Light. But what is light and beauty in one culture can be Hell in another. The central meaning of the Franklin story as retold by

Latta is not man versus nature, but rather the destruction of men and women by society. Nineteenth Century society is represented by the respectability and honour of the British Admiralty, but Latta reveals the Admiralty as a conspiring, even murderous representative of the darkness within human society. In Latta's story, I can't help thinking that the abominable snowmen with whom the expedition battle are a supernatural representation of the Admiralty itself. The most important battles in life are fought with and against ourselves, why might this not also be true at the scale of society? So the Franklin expedition becomes the Admiralty confronting its own abominable nature. And the Admiralty's reluctance to find Franklin is thus a metaphor for our own unwillingness to confront the sins of our own past—personal or societal.

Which brings us to the pertinent question of just what these sins might be? Surely the question we need to answer as a society is: what are the things that we accept as normal today, which, 250 years from now will be considered inhuman, unconscionable and abhorrent? History teaches us that the worst of these sins are sanctioned at the highest level of society and are committed by the leading exemplars of that society. The Admiralty, the universities, the United Nations—anywhere that humankind engages with and is complicit with the established institutions of society. These are pertinent questions for the reader and two examples come to my mind—the destruction of the self-reliant and independent peoples of the Arctic, and now, the destruction of the planet itself through the alteration of its climate. It is okay, I think, to accept our history, drawing out the good achievements, and understanding the worst of our behaviour as necessary guides without which we may never have know ourselves. It is partly through the Arctic voyages of exploration that we have mapped the Arctic and become something as a nation. But we might also see these accomplishments as means of discovering the darkness of our collective behaviour. Latta shows us that we used to battle chimeras at the cost of expeditions, now we battle chimeras (uncertainty, poverty, terrorism) at the risk of life on Earth.

Latta's book doesn't leave us many heroes, Lady Franklin is one of them. The book also contains a challenge. Lady Franklin's heroism consisted in going as far as it was possible for her to go in aiding her husband, and thereby also furthering our knowledge of the world and of ourselves. Lady Franklin would not have rested had there been any means of making any further discoveries concerning the expedition. No further means existed during Lady Franklin's time, but today circumstances are different. One of Franklin's ships remains undiscovered, but is likely to lie somewhere on the seafloor of Queen Maud Gulf. The challenge is the following: Find that ship!

Performance Comparison of DGPS and WADGPS for Marine Users

By: Ruben Yousuf, Department of Geomatics Engineering, University of Calgary

Differential GPS (DGPS) positioning methods are often employed for hydrographic surveying applications. For the most part, these services offer satisfactory performance in terms of accuracy, reliability and availability. For instance, Canadian and United States Coast Guard specify the DGPS horizontal tolerance to be 10m (95%) and, under normal operating conditions, studies have shown that accuracies fall well within this bound. During high levels of ionospheric disturbance, however, considerable degradations in DGPS positioning accuracies can occur. In recent years, large ionospheric gradients have been observed in North America during geomagnetic storm events. GPS differential ranging errors are a direct function of such gradients, and very large differential positioning errors have been observed in both Canada and the United States.

An alternative to single-baseline DGPS is wide area DGPS (WADGPS), where observations from a network of GPS reference stations are used to model spatially correlated ionospheric range errors. A source of WADGPS positioning capabilities is the Wide Area Augmentation System (WAAS). This service is free of cost to the public, provided that the user has a WAAS-capable receiver. The WAAS service is considered here as a potential alternative for marine users and surveying applications, as compared with the single-baseline DGPS capabilities offered by the Canadian and United States Coast Guards. Both single-baseline DGPS and WAAS positioning accuracies are investigated here, throughout North America, for a severe geomagnetic storm event in 2003. Results show that DGPS horizontal positioning errors of 10-15m (95^{th}-percentile) are common during these events, and that WAAS positioning errors generally exceed those observed for DGPS. This is attributed to the sparse WAAS reference network, and associated limitations in resolving the severe ionosphere gradients.

Introduction

Differential GPS (DGPS) involves calculating range errors at a reference station with known coordinates and relaying the error information to remote users within the region of coverage (generally within 500km of the reference station). In this manner, orbital and atmospheric errors are reduced, and the satellite clock error may be eliminated, but receiver noise and multipath effects still remain. Various multipath mitigation techniques exist including proper selection of antenna placement, receiver firmware and hardware.

Atmospheric effects are generally reduced in DGPS mode. However, during severe weather conditions (in case of tropospheric) or high levels of ionospheric disturbance, the residual differential range errors could be very significant. The ionospheric range error (I) is a function of the signal frequency and the electron density along the signal path:

$$I = \pm 40.3 \frac{TEC}{f^2} \quad \text{(in meters)} \qquad (1)$$

where TEC denotes the total electron content integrated along the signal path (in el/m^2), f is the signal frequency (in Hz), and + (-) denotes the group delay (phase advance). The ionospheric range error can dominate the DGPS error budget under high levels of ionospheric activity. Additional effects of ionospheric scintillation can cause degradation of receiver tracking performance and, in extreme cases, loss of navigation capabilities entirely (Knight et al., 1999).

Users worldwide rely on DGPS systems for a variety of marine applications. These include hydrographic surveying applications, and exploration/exploitation of marine resources, assistance to vessel traffic management services, search and rescue operations, environmental assessment and clean-up, and underwater mine detection and disposal. Marine horizontal position accuracy requirements are 2-5m (95%) and 8-20m (95%) for safety of navigation in inland waterways and harbour entrances/approaches, respectively; horizontal position accuracies of 1-100m (95%) are required for benefits of resource exploration in coastal regions (DOD/DOT, 2001). Horizontal positioning accuracies better than 2m (95^{th}-percentile) are required for Special Order surveys (IHO, 1998).

In wide area differential DGPS (WADGPS), GPS observations from a sparse network of reference stations are used to model correlated error sources over an extended region. WADGPS services allow consistent levels of positioning accuracy to be achieved at all locations within the coverage area. With a growing demand for accurate and reliable DGPS positioning worldwide, several WADGPS services have been developed in recent years. Current operational WADGPS systems include the WAAS, a system designed by the FAA for precision approach and enroute navigation of commercial aircraft. The WAAS service is free and positioning applications now extend beyond aviation. Many lower-cost marine receivers currently include WAAS positioning capabilities. The FAA now provides maps of horizontal positioning availability within North America for non-aviation users (Figure 1). Due to the advanced methods used to model spatially correlated errors, it is often assumed that WAAS positioning accuracies are improved versus single-baseline DGPS methods. The WAAS reference network is sparse, however, and limitations exist in modeling high resolution ionospheric features.

An ionospheric feature of particular importance for DGPS and WADGPS applications is called "Storm Enhanced Density" (SED). An example of the ionospheric TEC distribution characterizing this effect is shown in Figure 3. The SED is observed as a plume of enhanced TEC extending north through the United States into Canada, and over the pole into Europe (Coster et al., 2003a; Coster et al., 2003b). This feature develops in the afternoon local time sector and can persist into early evening. As demonstrated in Equation 1, GPS ionospheric range errors are directly proportional to TEC values. Large differential range errors arise when severe gradients in TEC are present. Some of the largest gradients on Earth, in the range 50-70ppm, are observed at the edges of the narrow SED plume shown in Figure 3. SED effects can persist for several hours and are a significant concern for reliable DGPS and WADGPS services in North America. This feature has only been identified in recent years, by generating high-resolution spatial maps derived from observations at hundreds of GPS reference stations (e.g. Figure 3). No comprehensive studies have yet been conducted to quantify the impact on GPS positioning applications. Analysis of DGPS and WADGPS (WAAS) horizontal positioning accuracies during periods of SED are the focus of this paper.

The WAAS

The WAAS augments the current GPS constellation to satisfy positioning and navigation requirements for aviation in terms of integrity, availability, accuracy, and continuity. Satellite clock, orbit and ionospheric range corrections are generated using observations from ground GPS reference stations. These corrections are sent to users via geostationary satellites.

The information generated and compiled by the WAAS network is relayed to users via various messages. These messages are received as blocks of data in the form of a 250-bit sequence. Each message has a specific format, purpose and name. The full set of WAAS messages are given in DOT (1999). The pseudorange correction information is generally given in message types 2-5 and 24-26. WAAS provides four types of corrections to users: slow clock, slow orbit, fast clock and the ionosphere grid. Information in these messages must be localized to user locations and combined to form the full pseudorange correction for a given satellite. In general, the pseudorange correction PRC_{WAAS} is expressed as

$$PRC_{WAAS} = PRC_{orbit} + \Delta t_{SV} \cdot c + PRC_{iono} \tag{2}$$

where c is the speed of light. The orbital correction PRC_{orbit} is derived at time t_k from the orbital error vector given by $\boldsymbol{\delta}$

$$\boldsymbol{\delta} = \begin{bmatrix} \delta x_k \\ \delta y_k \\ \delta z_k \end{bmatrix} = \begin{bmatrix} \delta x_0 \\ \delta y_0 \\ \delta z_0 \end{bmatrix} + \begin{bmatrix} \delta \dot{x}_0 \\ \delta \dot{y}_0 \\ \delta \dot{z}_0 \end{bmatrix} (t_k - t_0) \tag{3}$$

where t_0 is the time of applicability. This vector is then projected along the appropriate receiver-satellite line-of-sight (LOS) to form the scalar correction:

$$PRC_{orbit} = \frac{\mathbf{LOS} \cdot \boldsymbol{\delta}}{|\mathbf{LOS}|} \tag{4}$$

The satellite clock error Δt_{SV} describes deviations from true GPS time and is modeled as a scalar value for a given satellite. It is computed using a second-order polynomial using coefficients transmitted in the WAAS messages.

Ionosphere range errors are a major contributor in the GPS error budget, and are a focus of the analysis conducted here. The WAAS models ionospheric delay using dual-frequency GPS measurements from 25 reference stations in North America. Estimates of vertical total electron content (VTEC) values are defined at ionospheric grid points (IGPs) over the WAAS region of coverage (Altshuler, 2002). These ionospheric vertical delay corrections at standard IGPs are provided in the WAAS messages. The IGPs are defined at regular spacings in latitude and longitude (spacings of 5°x5° at geographic latitudes below 55°) on an ionospheric shell at 350km altitude.

In order to derive localized ionospheric corrections, users interpolate VTEC corrections from the WAAS grid for each satellite in view. The interpolated values are then mapped to the observations' slant paths, using a simple mapping function, to derive the scalar correction PRC_{iono}. Three- or four-point interpolation is suggested depending on the grid spacing and IGP band mask. Further details on the interpolation method and mapping function are provided in DOT (1999).

Ionospheric Storm Event

Extreme geomagnetic storms were observed during October-November 2003. Activity commenced with one of the most severe storms of the past 15 years, in late October 2003. A major solar flare developed at approximately 11:00 UT on October 28. A severe geomagnetic storm commenced in the Earth's environment at 06:00 UT on

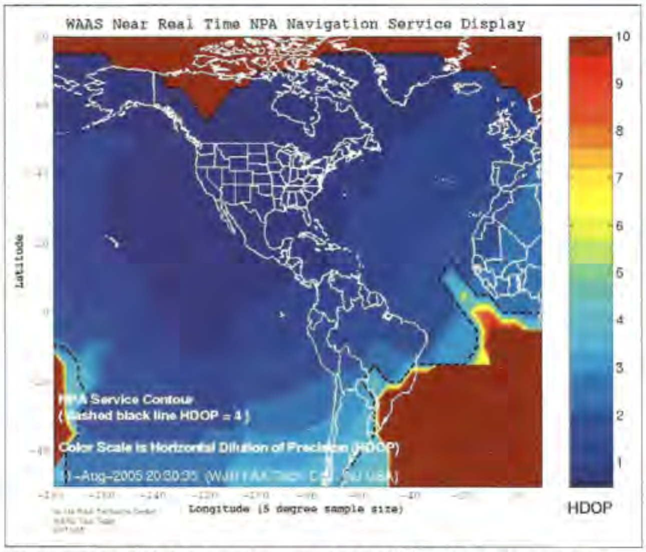


Figure 1: WAAS horizontal positioning coverage (FAA, 2005)

October 29. Activity continued for several days, with further solar coronal mass ejections (which trigger ionospheric activity in the Earth's environment) at approximately 21:00 UT October 29 and 16:00 UT October 30.

Figure 2 shows the Kp index for the full October 2003 storm period. Kp values represent the level of ionospheric activity, as observed in fluctuations of geomagnetic measurements at ground-based magnetometers – which indicate the presence of increased electric currents in the ionosphere. Such values are taken to be a good indication of increased ionospheric activity. Kp values are measured on a scale of 0-9. Maximum values of 9 were observed on both October 29 and 30. This indicates severe storm events for extended periods on both days. Communications were disrupted for commercial aircraft operating in polar regions, and satellite instruments were shut down to mitigate the impact of enhanced radiation in the space environment. Aurora was observed at mid-latitudes – in both Europe and the United States. Development of strong SED was observed in North America.

The gradients associated with SED were extremely large during the October 2003 event. The spatial distribution

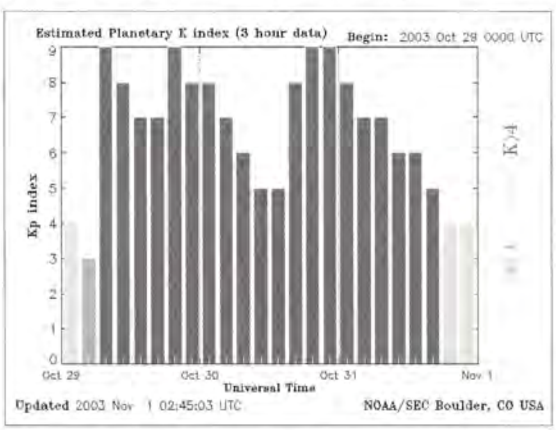


Figure 2: Kp values for October 29-31, 2003 (NOAA SEC)

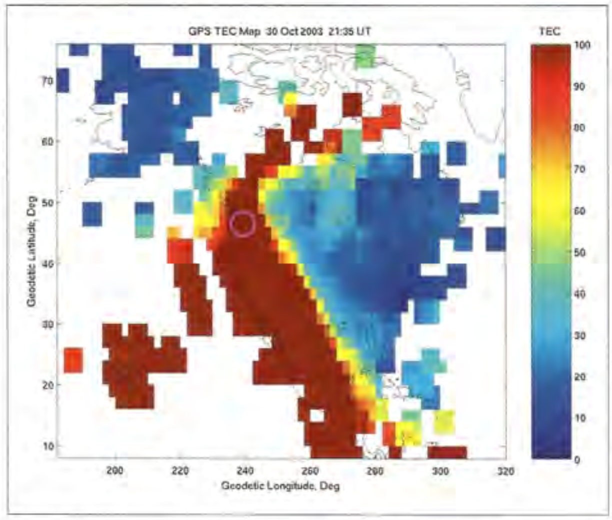


Figure 3: Storm enhanced density effect shown in TEC map (units are TECU) derived from more than 400 GPS reference stations (21:35 UT, October 30, 2003). The light coloured circle indicates a region of large ionosphere gradients.

of SED over North America is shown in Figure 3 at 21:35 UT on October 30, 2003. Development of SED persisted during the period 19:30-23:00 UT on October 30, and very large gradients in ionospheric delay were observed (with values as large as 70ppm in the region indicated by the magenta circle). A similar distribution of SED also occurred on October 29. The increased spatial decorrelation of ionospheric range errors had a direct impact on DGPS (and WAAS) positioning accuracies.

Data Set and Processing

An extensive study of the effects of SED (and ionosphere gradients) on DGPS and WAAS horizontal positioning accuracies is conducted for the October 2003 geomagnetic storm event. This analysis focuses on comparisons of single-baseline DGPS with WAAS positioning accuracies. The impact on single-baseline DGPS users is quantified in both the United States and Canada by processing hundreds of single baselines with lengths in the range 100-200km. The impact on WAAS users is quantified by applying WAAS corrections at a number of user sites in North America. Data from existing CORS (Continuously Operating Reference Stations) and IGS (International GPS Service) sites are used in this study.

All available CORS station pairs ("user"-"reference") with baselines in the range 100-200km are chosen for single-baseline DGPS processing. One station is designated as reference, and DGPS corrections generated for this site are applied at the user station. Positioning results are then compared with known truth coordinates at the user site to determine DGPS horizontal positioning accuracies. This DGPS post-processing was conducted using L1 code observations and a modified version of the C3NAVTM™ software (Cannon et al., 1995). Horizontal DGPS position estimates were computed for each epoch at the user sites and the 95th-percentile horizontal positioning error statistics were generated. An HDOP threshold of 2.3 was applied for derivation of all results to ensure adequate satellite geometry.

WAAS error messages are derived from the raw 250-bit streams archived by the Federal Aviation Authority (FAA) which operates the WAAS. These messages contain the clock, orbital and ionospheric error information necessary to conduct wide-area positioning. Using the localization schemes described in a previous section, it is possible to then compute WAAS corrections at any location in North America. This allows the flexibility of computing positioning accuracies across a large region of interest during the storm events for complete assessment of the WAAS performance. Localized WAAS corrections are computed for approximately 40 CORS/IGS sites and the WADGPS position solutions are derived. Positioning results at these WAAS user locations are then compared with known truth coordinates to generate error statistics. An HDOP threshold of 2.3 was again applied for derivation of all horizontal positioning results.

Results and Analysis

Single-baseline DGPS horizontal positioning accuracies are derived for approximately 800 baselines within the CORS network. The stations used in these analyses are shown in Figure 4. Results for the different baselines were combined and averaged to derive half-hourly spatial maps of 95th-percentile DGPS horizontal positioning accuracies for North America. WAAS horizontal positioning accuracies were also derived for different stations within the CORS network. This processing is then directly comparable to the single-baseline DGPS results. The approximately 40 WAAS "user" locations are shown in Figure 5. Again, as for the single-baseline DGPS processing, results for these simulated WAAS users are combined and averaged to create half-hourly spatial maps of 95th-percentile horizontal positioning accuracies in North America.

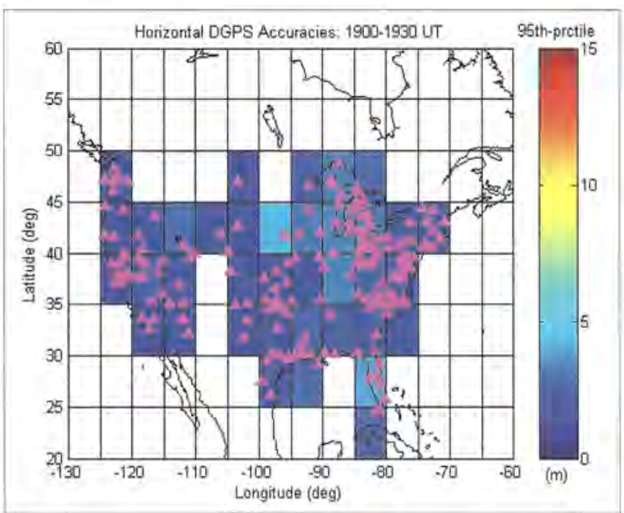


Figure 4: 95th-percentile DGPS horizontal positioning accuracies for the period 19:00-19:30 UT October 30, 2003, for baselines of lengths 100-200km. Locations of CORS reference stations used in the DGPS processing are shown as triangles.

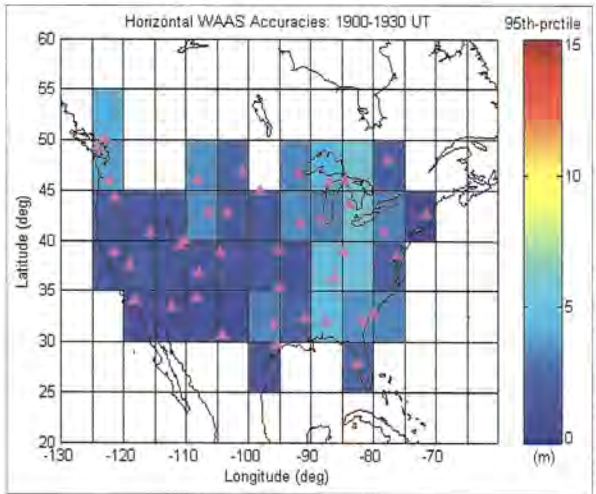


Figure 5: 95th-percentile WASS horizontal positioning accuracies for the period 19:00-19:30 UT October 30, 2003. Locations of CORS reference stations used in the processing are shown as triangles.

Both the single-baseline DGPS and WAAS results are generated for the entire October 29-31, 2003 storm period. The DGPS positioning accuracies for quiet ionospheric conditions (prior to the storm development on October 30) are shown in Figure 4. Positioning accuracies are in the range 1-3m for the 100-200km baselines. These accuracies are consistent across the entire United States. Figure 5 shows the WAAS horizontal positioning accuracies (95th-percentile) for the period 19:00-19:30 UT on October 30, 2003 – again, prior to the ionospheric storm and development of SED across North America. Typical WAAS positioning accuracies are in the range of 1-5m for this ionospherically quiet time.

In contrast, Figure 6 shows single-baseline DGPS horizontal positioning accuracies (95th-percentile) for the period 23:00-23:30 UT on October 30, 2003. During this period, severe ionospheric gradients have developed across the western United States, consistent with the SED development shown in Figure 3. Positioning errors of 8-15m (95th-percentile) are observed in the western United States for the 100-200km baselines. These results quantify the spatial extent of degraded DGPS positioning accuracies during this storm event. The magnitudes of these positioning errors exceed acceptable standards for reliable marine DGPS navigation and requirements for many hydrographic surveying applications.

In comparison, Figure 7 shows the WAAS horizontal positioning accuracies (95th-percentile) for the period 23:00-23:30 UT on October 30, 2003. The positioning accuracies are not generally improved in the western region, as compared with DGPS results. Horizontal positioning accuracies during quiet ionospheric times (Figures 4 and 5) are less than 5m across North America for both DGPS and WAAS. However, severe accuracy degradation occurred in the west during the storm (Figures 6 and 7). For single-baseline DGPS, errors were in the range of 8-15m in the affected areas. The WAAS accuracies are in the range 5-15m also, but at several locations the errors exceed 15m.

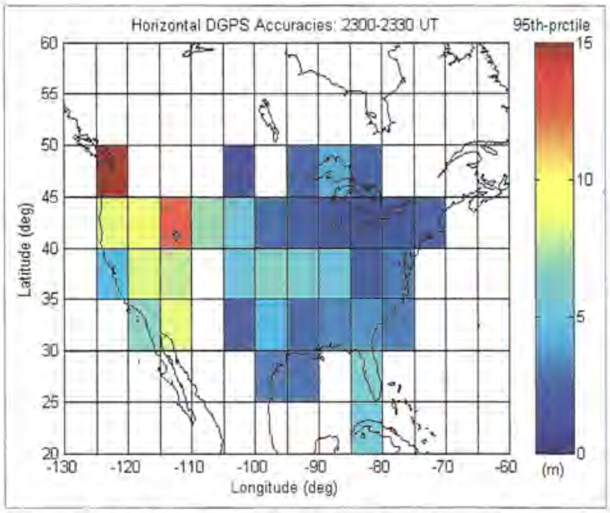


Figure 6: 95th-percentile DGPS horizontal positioning accuracies for the period 23:00-23:30 UT October 30, 2003, for baselines of lengths 100-200km.

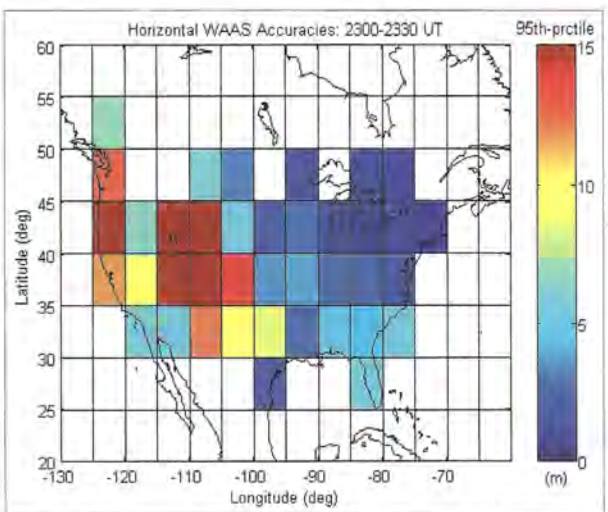


Figure 7: 95th-percentile WASS horizonatl positioning accuracies for the period 23:00-23:30 UT Octiber 30, 2003.

In order to observe the temporal variations in horizontal positioning accuracies throughout this storm event, additional analyses focus on four DGPS baselines in the northwest. The region of interest is indicated by the magenta circle in Figure 3. Very large ionospheric gradients were observed in this region on both October 29 and October 30. The user location is taken as CORS station KELS (46.12° N, 122.90° W), with the four DGPS baselines as follows (baseline lengths in brackets): KELS-PABH (158 km), KELS-RPT1 (147km), KELS-GOBS (164km) and KELS-NEWP (193km). These baselines are oriented west, north, east, and south, respectively, from KELS. The WAAS positioning solution is also computed for user station KELS, for comparison with the DGPS results. The 95th-percentile positioning errors are shown in Figure 8. Larger horizontal positioning errors are observed during the late hours (UT) on both October 29 and 30. DGPS errors are in the range 5-20m during the storm periods, with little dependence on baseline orientation or length. The largest DGPS horizontal positioning errors are observed for the shortest baseline KELS-RPT1. In almost all cases, the WAAS positioning errors exceed those derived for DGPS. WAAS horizontal positioning errors are as large as 25 m on October 30. The larger positioning errors persist for several hours.

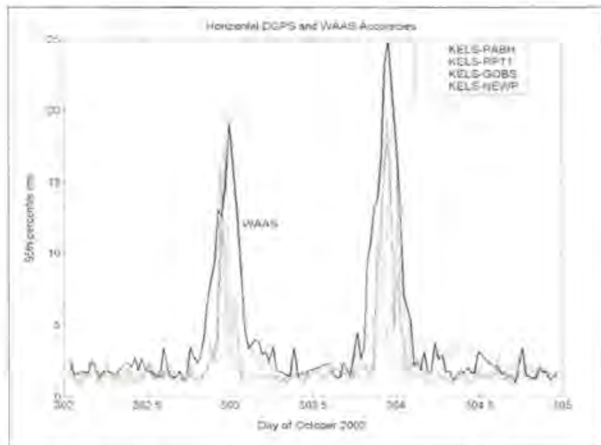
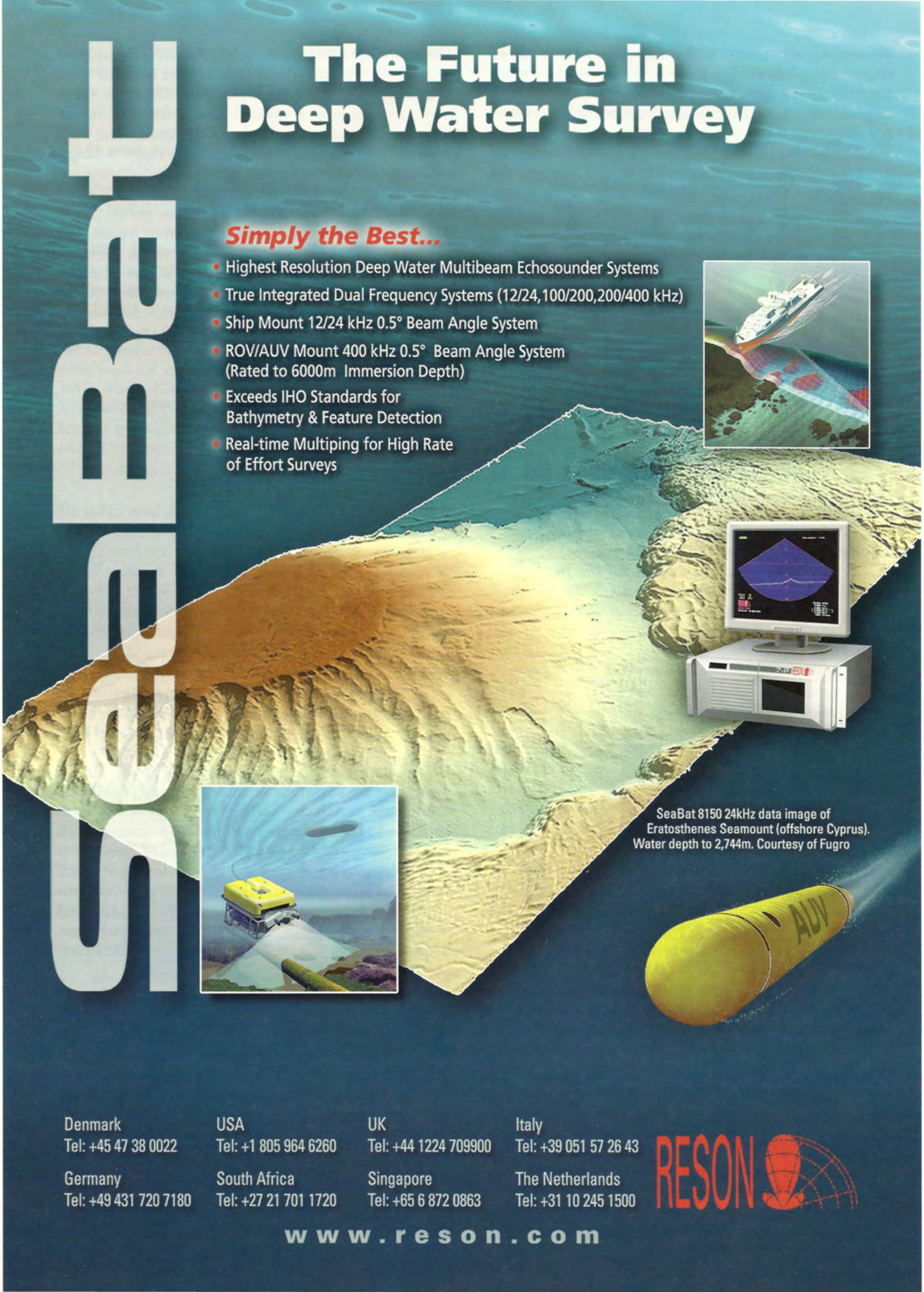


Figure 8: 95th-percentile DGPS and WAAS horizontal positioning accuracies for Ocyober 29 (day 302) - 31 (day 304), 2003. User KELS is located in the northwest United States.

Overall, the WAAS did not provide improved positioning performance during this storm event. Using WAAS as an alternative to current single-baseline DGPS systems (such as United States and Canadian Coast Guard marine DGPS) will not mitigate the impact of severe ionospheric storm events. The sparse network of WAAS reference stations is unable to fully capture the ionospheric features, and the WAAS ionosphere grid spacing of five degrees is not adequate to provide full resolution of ionospheric effects at user locations.

Conclusion

Large ionospheric gradients may be observed in the mid- to high-latitudes during geomagnetic storm events. Such effects are associated with a phenomenon called storm enhanced density. During severe SED events, significant spatial decorrelation of ionospheric ranging errors can occur. Differential corrections derived for a single reference station DGPS approach become decorrelated, and increased DGPS positioning errors occur. In an ionospheric storm event studied here (October 29-31, 2003), horizontal DGPS positioning errors were observed to increase by factors of 10-30.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Increased horizontal DGPS positioning errors are an issue for reliable hydrographic surveying operations in North America. Operational DGPS systems, such as the Canadian and United States Coast Guard DGPS services, attempt to achieve DGPS horizontal positioning accuracies of 10 m (95%) for marine users. Positioning accuracies are not within these error bounds for severe geomagnetic storm events. Positioning errors may exceed the minimum standards defined by IHO for positioning of navigation aids and important features [IHO, 1998]. Geomagnetic storm events are not uncommon, with SED effects observed at least once every four-five months in recent years. It must be noted, however, that most geomagnetic storms are more moderate than the severe event studied here.

The potential of employing a wide area differential GPS approach was investigated here. In particular, WAAS performance was compared with single-baseline DGPS. By employing the WAAS approach, the DGPS positioning errors were not mitigated; in fact, the positioning errors increased in many cases. Ionospheric features are not fully resolved by WAAS during such storm events because of the sparse reference network and five-degree ionosphere grid spacing. Future developments for the WAAS include the addition of four reference stations in central-eastern Canada. Such stations will provide additional information for improved modeling of local ionospheric effects. These sites will not improve the ionosphere model in western regions, however. Alternative methods of positioning must be explored to provide optimal positioning accuracies during such severe geomagnetic storm events. LH

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CHC2004, Celebrating Canadian Hydrography

By: David Pugh, CHC2004 Conference Chair
Laurie-Anne Cornish, CHC2004 Communications and Promotions

This article was previously published in Oceans a newsletter for Fisheries and Oceans Canada.

In spring 2004, the Canadian Hydrographic Service (CHS), a division of DFO's Science Sector, co-hosted its biennial international hydrographic conference. The 33rd Canadian Hydrographic Conference (CHC 2004), A Canadian Celebration of Hydrography: Foundation for the Future drew 400 attendees from 22 countries over three days to celebrate 100 years of hydrographic excellence. The conference was held from May 25th – 27th, 2004 in Ottawa at the Westin Hotel.

CHS's 100th Birthday (1904-2004)

For a year and a half, a handful of Ottawa CHS staff balanced their regular job responsibilities with those of a conference committee member. Sharing this organizational challenge with Dave Pugh, Conference Chair, were the following co-host organizations: Canadian Hydrographic Association (CHA); Canadian Nautical Research Society (CNRS); and, CHS. Additional support came from the over 40 commercial and institutional exhibitors who introduced participants to the latest technological products in the field of hydrography.

Following the opening speeches by Larry Murray, Deputy Minister DFO, Denis Hains, A/ Dominion Hydrographer CHS, and others, the importance of hydrography was underlined by a Keynote Address given by Dr. Art Collin. The opening speakers emphasized the growing involvement of hydrography in aquatic sciences. The environment, fishery, security, ocean management, offshore oil-and-gas activities and many others all need the support of hydrography.

The highly anticipated panel on the Impacts on Mapping and Charting of United Nations Convention on the Law of Sea (UNCLOS) ratification was composed of leading national and international experts and led by DFO's resident expert, Dave Monahan. It was certainly a highlight of the conference and was attended by many DFO sector staff who listened closely to the discussion.

Several generations of Dominion Hydrographers present at CHC 2004: a testament to a century of wisdom.

G. Ewing, A. Collin, D. Hains, R. Douglas, S. McPhee, A. O'Connor Mr. and Mrs N. Gray

CHC 2004 participants were invited to the National Library and Archives of Canada unveiling of a special one-year Charting of New France exhibit. Dr. Wendy Watson-Wright, ADM-Science shared the podium with Dr. Ian E. Wilson, National Archivist of Canada, both of whom gave informative and entertaining welcome remarks to the delegates gathered.

CHC's goal has always been to provide a constructive and informal setting for professional practitioners, policy makers and historians to discuss the future of hydrography. The program contained a solid balance between historical content and current practices and innovations. Exhibitor and participant feedback from CHC 2004 sent a strong message of congratulations to the hard-working conference staff for a very successful and informative conference.

Information on CHC 2004 can be obtained by visiting www.CHC2004.com or through Dave Pugh at (613) 991-9427.

D. Hains, S. Masry (CARIS), L. Murray, W. Watson-Wright
A walk through the CHC 2004 Exhibit Hall.

Dows Lake, Ottawa - CHA's replica of a 1792 survey launch - 'Surveyor'.

Letters to the Editor

CHA 2005 Student Award

To the Editor:
I am excited and proud to have won the Canadian Hydrographic Association Student Award. I'd sincerely like to thank the Association for this honour. I know that in competing for this award I am up against quite stiff competition, so winning the award was a surprise. I am a graduate of the Cartography: Digital Mapping Technology program at the Centre of Geographic Sciences in Nova Scotia, but also have a science degree behind me from the University of Alberta. My sights are set on another round of schooling in the next few years and this award is certainly a huge help in achieving that. I have done some nautical charting and thoroughly enjoy it. Not only is it a complex form of mapping geared to a large audience, who are high end technical map users, but if certain techniques are used in making the map, it can truely be a beautiful thing. Of course, just about every map has been shaped in one way or another by hydrography, but I digress. Once again I'm very pleased to have won, and I thank you.

Regards,

Jeffery Wielki, Bsc.
Sherwood Park, AB

Canadian Institute of Geomatics

We often hear complaints about the Canadian Institute of Geomatics and what it does for us. Most often these concerns are directed at Geomatica and that it is too scientific for most surveyors. The common response is that it needs to be world class to be recognized – after all it is the image of Canadian surveying and geomatics. Yes, it does represent the image of Canadian geomatics and yes, it is world class! But it is not a magazine for eggheads – it is a magazine for all professional surveyors. Why does it enjoy a subscription of 5% of its members from the international fraternity of surveyors – because it is world class.

But is it relevant to Canadian cadastral surveyors? Most definitely! Just in a brief review of the last four issues of Geomatica I find:

- Geomatics and the Law by Alec McEwen –regular articles on current court cases that are of interest specifically to cadastral surveyors.
- Association reports which keep us up to date on the activities of sister associations - particularly provincial survey associations, the ACLS and CCLS.
- A Demographic Study of Land Surveyors in the Maritime Provinces – a concern in every province!
- 25 Years of Geomatics at the University of Calgary
- Official Coordinates, Lawfully Established Monuments and South African Cadastral Surveys by Professor Michael Barry – Cadastral Chair at the U of C.
- Regular features of interest to all surveyors such as Bill Brookes excellent articles entitled Field Notes & Office Memos and Survey Humour, Industry News, Book Reviews, Fifty Years Ago, Presidents Report, The International Scene and the Calendar of Events – general but information that is interesting and relevant to everyone of us!

If there is anyone in this profession that is a technical misfit, I am it, but I still find membership in CIG to be valuable and I enjoy receiving and reading Geomatica – a world class publication – even if I don't read articles with mathematical equations and technical jargon in them. There is enough meat in Geomatica for everyone.

Personally, I feel that as members of the Canadian surveying (geomatics) profession, membership in our national organization is a must. Membership is part of continuing professional development, membership is part of keeping in touch with colleagues and industry developments across the country, membership is being part of the Canadian surveying profession.

The CIG is at a crossroads – there have been a proliferation of new technical organizations springing up recently that compete directly with the CIG and I appreciate that you can't belong to them all but CIG has a long, proud history of bringing the surveying profession together at the national level – we need to support it!

Ken Allred

FIG

Go F.I.G.ure

by Andrew Leyzack

Part of my work within FIG Commission 4 has been to cooperate with the FIG Standards Network on standards issues pertaining to hydrography. The chair of the FIG Standards Network, Mr. Iain Greenway helps to keep all the Commissions in the know about the latest draft standards in the works and facilitates the opportunity for FIG via the Standards Network to comment on those documents prior to their formalization. In February 2005, The International Organization for Standardization (ISO), technical committee on Geographic Information/Geomatics (TC211) released a draft document entitled CD19130.2, Geographic information- Sensor data models for imagery and gridded data. With input from the International Hydrographic Bureau (IHB), this document which primarily focuses on space borne and airborne sensors had been expanded to include data acquired from shipboard (hydrographic) systems. Of relevance to manufactures and users of hydrographic sensors and software applications is a proposed standard for a platform coordinate reference systems.

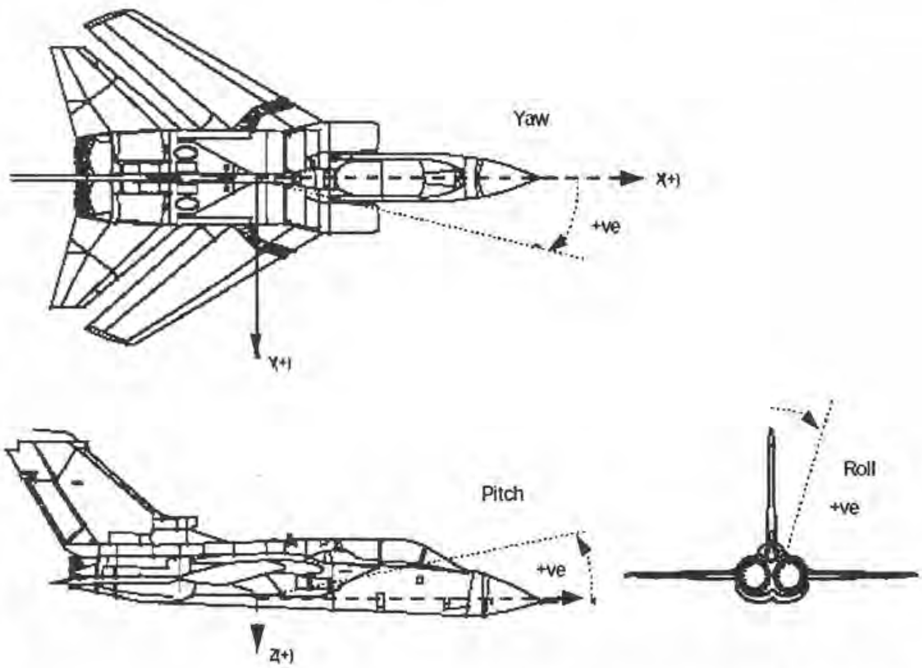
Presently there are various platform coordinate reference systems being employed by various manufactures and developers of hydrographic sensors and software. As a user, I can attest to the confusion of having to manipulate sensor data referenced to one specific coordinate reference system using a data processing software package which uses a different convention. As part of a mail campaign to inform industry of the standard, I asked if it would not make sense for providers of sonar, attitude sensors and hydrographic data processing system to all subscribe to a common platform coordinate reference system. I invited various vendors and service providers to comment on the standard and to provide a description of the platform coordinate reference system convention used in their products and services.

The information gathered was used to assess the impact of this aspect of ISO/TC211 CD19130.2.

The proposed standard calls for a 3D Cartesian (x,y,z) coordinate system, fixed to the platform with its origin at the platform centre of mass. The coordinate system parameters are as follows:

The **x-axis** is oriented towards the ground track direction of the platform.
The **y-axis** is perpendicular to the x and z-axes and points (positive) to the right of the track.
The **z-axis** is perpendicular to the x and y-axes and points (positive) towards the nadir.

Roll is measured clockwise from the negative z-axis in the y-z plane, as seen from the negative x direction (astern).
Pitch is measured counter clockwise from the positive x-axis in the x-z plane, as seen from the positive y direction (starboard).
Yaw is measured clockwise from the positive x-axis in the x-y plane, as seen from the negative z direction.



Source: ISO/TC 211 CD19130.2

Look to the next edition of Go F.I.G.ure for my report to the FIG Standards Network as well as a summary of FIG Working Week 2005 and GSDI-8, Cairo.
For more information about ISO/TC211 please visit *www.isotc211.org/*
News and information regarding the FIG Standards Network can be found at *www.FIG.net*

Andrew

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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*

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

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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.

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If you would like to receive further information about NetSurvey and its services contact Duncan Mallace or

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

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Website: *www.multibeam.net*

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.

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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:

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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.

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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.

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- Geological investigations
- Habitat mapping and archaeological surveys
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- Remotely operated vehicle inspections
- Integrated navigation and positioning services
- Cable and pipeline inspections

For further information please contact:

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C & C Technologies

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

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

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

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

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

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visit C & C's Website at *www.cctechnol.com*

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

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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:

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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
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- 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
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Corporate Members
Membres corporatifs

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

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

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

For further information please contact:

Association of Canada Lands Surveyors
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Website: *www.acls-aatc.ca*

News From Corporate Members
Nouvelles de Membres corporatifs

C & C Technologies Purchases M/V Northern Resolution

C & C Technologies recently announced the purchase of the *M/V Northern Resolution* from Malene Østervold Shipping AS of Norway. The 247-foot Norwegian flagged vessel was purchased to assist in the acquisition of geophysical and geotechnical data. The vessel has accommodations for 50 passengers and can transit at a speed of 12 knots for up to 50 days duration.

The *M/V Northern Resolution* was dry-docked in New Orleans, LA for modifications. The modifications included hull-mounting an EA 600 deepwater single beam profiler and EM 120 mulitbeam, installing the launch and retrieval system for C & C's new *C-Surveyor II AUV* and making alterations to the vessel's design to ensure efficient operations. Although the majority of the projects intended for the *M/V Northern Resolution* are AUV assignments, the vessel will also be mobilized to perform conventional geophysical surveys and deep water geotechnical soil sampling.

Thomas Chance, President of C & C Technologies added, "We are extremely excited about the addition of the *M/V Northern Resolution* to our fleet. This vessel will allow for us to further expand our international services and react more timely to the increased demand for AUV services."

C & C Technologies, the worldwide leader in AUV operations, also provides a range of survey services including high accuracy Globally-corrected GPS services, marine construction surveys, high-resolution geophysical surveys and geotechnical surveys including full laboratory testing. For more information regarding C & C Technologies' services, please send email to *info@cctechnol.com* or contact Jay Northcutt at (+1) 337-261-0660.

M/V Northern Resolution

Kongsberg Wins Statoil Process Control Contract

Statoil has awarded Kongsberg Maritime a contract worth approximately $11.2 million USD for the upgrading of process control systems for oil and gas production on Statfjord A, B and C. The delivery will also comprise a sophisticated process simulator.

The upgrading of the control systems for process control, data acquisition (PCDA) and process shutdown (PCDA and PSD) consists of a complete replacement of all system components, and will take place while the control system is in operation. The changeover to the upgraded systems will be carried out during a week's revision stop for each of the three platforms during 2006.

The process-simulator will be used for process studies, verification of the upgrading process of PCDA systems and optimisation. The Kongsberg Maritime upgrades to the Statfjord platforms will make them well equipped to meet future challenges in the late-phase project, which includes a complex crossover from oil to gas production.

The Statfjord contract is a result of a long-term co-operation between Statoil and Kongsberg Maritime. The contract also includes management, maintenance and modifications on Statoil's installations at Heidrun, Norne, Åsgard A and B and the Kristin field.

"The Norwegian oil and gas market, with its development projects and upgrading is vital to Kongsberg Maritime," says Tor Erik Sørensen, Executive Vice President, Sales & Marketing, Kongsberg Maritime. "We have a frame contract for maintenance and operation for new projects with Statoil and the Statfjord agreement joins several similar contracts for other Statoil installations."

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The CLS Professional Designation

In the past, there has been confusion over which persons can perform CLS work as well as the circumstances under which one can use "CLS" as a professional designation. In order to clarify these issues, the Association of Canada Lands Surveyors (ACLS) requested a legal opinion from lawyer David Jardine of Shores Belzil Jardine on the matter. Mr. Jardine's opinion is as follows:

"I have looked at the Act (Canada Lands Surveyors Act) and the Regulation (Canada Lands Surveyors Regulations) concerning the use of the CLS title by someone who is not a member [of the ACLS] or who is not licensed [with the ACLS]. I think that you are correct in your interpretation that a person who holds a commission can use the title of "Canada Lands Surveyor".

The Act defines Canada Lands Surveyor as "a person who holds a commission". "Commission" is defined as a commission granted under section 49 or deemed to be granted under section 48. Neither of these sections indicates that a person must be a member of the Association to receive a commission.

Section 63 of the Act makes it an offence for any person "other than a Canada Lands Surveyor" to use the title or to advertise or purport in any way that they are a Canada Lands Surveyor.

Section 25(1) of the Regulation authorizes a person who holds a commission to use the title. This corresponds to the provisions in the Act. None of these provisions make use of the title dependent upon either membership in the Association or the holding of a license.

Section 25(2) is not drafted clearly. My best sense of its purpose is that it is intended to prohibit a person holding a commission but not a license from associating their name and title with an entity. I assume this is intended to prevent any implication that the entity is able to engage in surveying activities on Canada lands or private lands in a territory ("Canada Lands").

The Act also makes clear that holding a commission is not sufficient authority to engage in surveying on Canada Lands. Sections 50 to 53 make clear that a license under section 53 is required. Section 52 makes clear that the requirements for a license include: a commission, membership in the Association, a certain level of experience and practical training within the 5 previous years, and any additional requirements set by the Regulations and Bylaws.

Section 64 of the Act makes it an offence for any person "other than a license holder or a person acting under the direction of a license holder" to engage or to purport to engage in surveying on Canada Lands.

The Act and the Regulation therefore set up a system where a person may hold a commission and even be a member of the Association but may not be able to engage in surveying on Canada Lands because they do not have a license. This is potentially confusing for members of the public who may well assume that anyone who is a Canada Lands Surveyor is entitled to engage in surveying on Canada Lands. It also makes it difficult to determine when someone is making an improper representation by using the designation.

There was a somewhat similar case in Alberta in 1985. A lawyer who was suspended sent certain letters on letterhead where he was described as a "Barrister and Solicitor". He also filed a Statement of Defence in a court action and described himself the same way. Under the Legal Profession Act, only members could use the designation "Barrister and Solicitor". Only members who were on the Active List could practice law. There were three categories of members: active members; inactive members and suspended members.

In a prosecution under the offence provisions of the Act, the suspended lawyer was charged with practicing law when he was not entitled to do so and with representing himself as entitled to practice law. The Court found that the lawyer could refer to himself as a Barrister and Solicitor since he was a member (a suspended member was still a member). Thus simply writing a letter using letterhead that described himself as Barrister and Solicitor was not an offence even if the person receiving the letter assumed that this meant the writer was able to practice law. However, filing a Statement of Defence was practicing law and the suspended member was convicted on this count.

There is a clear analogy to your Act. The right to use the protected title was given to persons who were not authorized to practice law because they were not on the active members list. I think that the same principle would apply to someone who held a commission but not a license.

Some professional statutes avoid the potential confusion for the public by restricting the use of the protected title to persons who are members and who are currently licensed to practice. This is the common form of protected title provision in the health professions in Alberta. Similarly, under the Alberta Land Surveyors Act, an Alberta Land Surveyor is defined as "an individual who holds a certificate of registration and an annual certificate to engage in the practice of surveying under this Act." The right to use the names "Alberta Land Surveyor", "surveyor", or "land surveyor" and the right to use the ALS designation are restricted to "practitioners" who are defined as Alberta Land Surveyors or surveyor's corporations or partnerships. The right to practice is also restricted to practitioners.

It is interesting to note that your discipline provisions relate to any "member of the Association, Canada Lands Surveyor or permit holder." This appears to state that anyone who is a member or who holds a commission as a Canada Lands Surveyor may be subject to the discipline provisions even if they are not a license holder. Despite this wording, I am not sure how far the Courts would go in permitting you to discipline a person who held a commission but was not a member or a license holder and who did not engage in surveying on Canada Lands. The Courts might hold that such a person did not come within your discipline provisions.

For more information please contact:

Jean-Claude Tétreault, CLS, a.-g., P. Eng., MBA
ACLS Registrar
admin@acls-aatc.ca

DID YOU KNOW...

Mayday
'Mayday' is the internationally recognized voice radio signal for ships and people in serious trouble at sea. Made official in 1948, it is an anglicizing of the French m'aidez, 'help me'.

Pan Pan
A ship urgently needing help but not in imminent danger uses the signal Pan Pan (from the French 'panne', meaning 'breakdown').

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.

New CIG Executive Director / nouveau Directeur Exécutif de l'ACSG

The Canadian Institute of Geomatics is very pleased to announce the hiring of a new full time Executive Director effective February 1, 2005. Jean Thie comes to CIG with over thirty years of experience in Geomatics including significant experience in the management of professional organizations and networks. Mr. Thie has been involved in many aspects of the Geomatics profession including private, public and academic sectors and several disciplines within Geomatics, at the provincial, national and international level. He is fluent in English and French as well as Dutch and German. We welcome Mr. Thie to the organization and look forward to working with him in creating a bright future for CIG and Canadian Geomatics professionals.

L'Association canadienne des sciences géomatiques est fière d'annoncer l'embauche d'un nouveau Directeur Exécutif a plein temps à compter du 1er février 2005. Monsieur Jean Thie possède plus de trente années d'expérience en géomatique, incluant une expérience particulière dans la gestion d'associations professionnelles et de réseautage. Monsieur Thie a été impliqué dans plusieurs aspects de la géomatique professionnelle, dans les secteurs publics, privés et académiques, et dans plusieurs disciplines de la géomatique au niveau provincial, national et international. Il parle couramment le français et l'anglais, mais aussi l'hollandais et l'allemand. Nous lui souhaitons la bienvenue dans notre association et nous désirons travailler avec lui pour un brillant avenir de L'Association canadienne des sciences géomatiques et pour les professionnels canadiens de la géomatique.

New Dominion Hydrographer and Director General of CHS / nouveau d'hydrographe fédérale et de directrice générale du SHC

Dr. Savithri (Savi) Narayanan was appointed as the Dominion Hydrographer and Director General of the Canadian Hydrographic Service (CHS), effective August 2, 2005.

Subsequent to this appointment, on October 3, 2005, Dr. Narayanan was appointed the Director General, Canadian Hydrographic and Oceanographic Science and Services. In this position she is responsible for the development of the national program and strategies related to Hydrography (CHS), Seabed Mapping, Oceanography and Climate, and Management of Scientific Data. She retains the title and role of Dominion Hydrographer.

Dr. Narayanan holds a doctorate degree in applied mathematics (1973) from Harvard University. After her graduation, until 1988, she worked as the section head of oceanography in a consulting firm in Victoria, BC, as a visiting scientist at Memorial University of Newfoundland, and subsequently as an assistant professor at the same university.

She joined Fisheries and Oceans Canada in 1988 as an Oceanographer and later became the section head of oceanography in St. John's, NL. In 1996, she was appointed as the director of the Marine Environmental Data Service (MEDS) in Ottawa.

Savi also brings considerable international experience to CHS, having played a leadership role in the activities of International Council for the Exploration of the Seas (ICES), North Atlantic Fisheries Organization (NAFO), Intergovernmental Oceanographic Commission (IOC) and World Meteorological Organization (WMO), and from 2001 to 2005, as the co-president of the WMO/IOC Joint Technical Commission for Oceanography and Marine Meteorology.

C'est le 2 août 2005 que le dr. Savithri (Savi) Narayanan a été nommée au poste d'hydrographe fédérale et de directrice générale du Service hydrographique du Canada (SHC).

Suite à sa nomination, le dr. Narayanan a été nommée directrice générale du Service des Sciences hydrographiques et océaniques du Canada. Ce poste la amenée à assumer la responsabilité du développement du programme et des stratégies nationales liées à l'hydrographie (SHC), à la cartographie du fond marin, à l'océanographie et au climat,ainsi qu'à la gestion des données scientifiques. Elle portera toujours le titre et remplira le rôle d'hydrographe fédérale.

Mme. Narayanan est titulaire d'un doctorat ès mathématiques appliquées (1973) de l'Université Harvard. Après l'obtention de son doctorat, et jusqu'en 1988, elle a été chef de la section de l'océanographie d'une firme de consultants de Victoria (Colombie Britannique). Par la suite, elle a été chercheuse invitée à l'Université Memorial de Terre-Neuve, ainsi que professeure adjointe à cette même université.

Elle a rejoint les rangs de Pêches et Océans Canada en 1988 à titre d'océanographe, puis elle a obtenu le poste de chef de la Section océanographie à St. John's (Terre-Neuve-et-Labrador).
En 1996, elle a été nommée au poste de directrice du Service des Données sur le milieu marin (SDMM) à Ottawa.

Savi a acquis une expérience considérable à l'échelle internationale, étant donné le leadership qu'elle a exercé dans le cadre des activités du Conseil international pour l'exploration de la mer (CIEM), de l'Organisation des pêches de l'Atlantique Nord-Ouest (OPANO), de la Commission océanographique intergouvernementale (COI) et de l'Organisation météorologique mondiale (OMM), et compte tenu du poste de co-présidente de la Commission technique mixte OMM/COI d'océanographie et de météorologie maritime qu'elle a occupé de 2001 à 2005.

Arab Institute of Navigation- Melaha 2006

CHA member, Dr. Ahmed El-Rabbany of Ryerson University is on the organizing committee for this conference and extends an invitation to the Arab Institute of Navigation's Third International Conference &Exhibition
May 15 – 17, 2006
Sofitel El Karnak Luxor Hotel
Luxor, Egypt

Conference topics include:
Transport and Logistics
Inland Water Ports and Infrastructure
Inland Water Vessels
Navigation and Communication:
Safety, Security and the Environment:
Hydrographic surveying and Electronic Charting

For more information please contact:
Arab Institute of Navigation Conference Secretariat
Telephone: +203/550-9824 & 550-9686
Fax: +203/550-9686
E-mail: ain@aast.edu
www.ainonline.org/melaha2006

Canadian Hydrographic Association-Annual General Meeting

June 5, 2006
Westin Nova Scotian
Halifax, NS

Association of Canada Lands Surveyors-Annual General Meeting

The 22nd ACLS AGM will be held
June 20- 23, 2006.
Grand Okanagan Lakefront Resort
Kelowna, BC

Seminars include:
Aboriginal Issues
High Definition Surveying
LIDAR
International Opportunities for Surveyors; and
Business Skills

Accompanying persons and a social program are at the planning stage but so far a golf tournament, cruise, and wine tour are being set up.

For more information please visit the ACLS website:
www.acls-aatc.ca

www.hydrography.ca

RANDHAWA (Navjot), Vicki

April 15, 2005

RANDHAWA (Navjot), Vicki - 39, Halifax, passed away peacefully among loved ones on Friday, April 15, 2005. She was the beloved daughter of Pyara and Satnam Randhawa of Halifax. Born in London, England, she came to Canada at 20 days old, with her parents in 1965. She graduated from the Technical University of Nova Scotia in 1990. A professional engineer, she worked as a hydrographer for the Bedford Institute of Oceanography. She is survived by her parents; her brother, Navpreet (Deedee); sister-in-law, Harveer; nieces, Kaureen and Jasmeen, both of Tampa, Fla.; brother, Navdeep (Deepee), Nassau, Bahamas. Vicki enjoyed the outdoors, mountaineering and many sports, including badminton, field hockey and varsity soccer. She will be dearly missed by family and friends, and remembered for her smile, courage, humor and good spirits, despite an 11 year battle with multiple sclerosis. Her family wish to thank all those who helped Vicki: staff at the Nova Scotia Rehab Centre, Multiple Sclerosis Society, The Red Cross, QEII Health Sciences Centre and a great group of friends.

BOLTON, Mike

May 5, 2005

BOLTON, Mike – former Director, CHS, Pacific Region passed away peacefully May 5, 2005. Mike Bolton was born in 1929 and came to Canada from England in 1940. After obtaining a diploma in engineering from Carleton University, he spent two years with the Topographical Surveys before joining CHS circa 1951. For 13 years, he surveyed waters off Canada's east coast, in the Arctic and the Caribbean Sea. He was in the hydrographic survey party attached to *HMCS Labrador* when she became the first Canadian naval vessel (and first deep draft ship) to sail the Northwest Passage in 1954. He was the first chairman of the Marine Sciences Branch Committee on Training and Career Planning, and in 1964 was appointed the first Regional Hydrographer of Central Region and was Hydrographer-in-Charge aboard *CSS Baffin* during the first Canadian hydrographic and oceanographic survey in the Caribbean. In 1968, he was appointed Regional Hydrographer of Pacific Region, a position he held until his retirement in October 1985. This period of almost two decades was a very exciting and challenging one for the Canadian Hydrographic Service, and with Mike's strong leadership was a very productive period for Pacific Region. He and Bob Stewart were two of the founding fathers of IOS and were both strong promoters of the ocean science community in the Greater Victoria area.

After his retirement Mike was an active member of CHA and regularly attended IOS social events (especially those linked to golf).

Retired CHS staffer Awarded Order of Canada

The Governor General's recent announcement of new recipients of the Order of Canada included Mike Eaton, a retired member of the Canadian Hydrographic Service, Atlantic Region.

R. Michael Eaton was born in England but was educated mainly in Scotland. He served 12 years in the British Royal Navy where he qualified as a watch-keeping officer and specialized in hydrography. For seven years, he surveyed the Thames Estuary, west coast of Scotland, Persian Gulf, Zanzibar, Malaya and Borneo.

Immigrating to Canada, he joined the Canadian Hydrographic Service (CHS) in 1957. Mike moved to the Polar Continental Shelf Project as head of the hydrographic section, 1959-63. In charge of hydrographic surveys on the ice of the Arctic Ocean, he improved the sounding technique from lowering a lead and line through holes exploded in 3 metres of sea-ice or drilled with an auger, to placing an echo-sounder transducer directly on a film of oil on the ice. In 1963 he was in charge of a survey of Hell Gate (between Devon and Ellesmere Islands) where an echo-sounder transducer was towed in the open leads through the ice from a low-flying helicopter – a dangerous procedure not repeated. He was noted for being ultra-cautious when planning and working in this harsh environment – to the good fortune of his survey crews. For his endeavours, he was elected a fellow of the Arctic Institute of North America.

Transferring back to the Canadian Hydrographic Service and then to its Atlantic Region, he wrote a manual for the proper use of the medium frequency Hi-Fix positioning system, which was used extensively by CHS and other Hydrographic Offices world-wide. He obtained an honours Bachelor of Science degree in physics in 1970 from Dalhousie University and was awarded his Canada Lands Surveyor's accreditation in 1982.

Mike was the first person in Canada, and possibly in the world, to apply the laws of probability to the measurements of depths and to the locations of those depths at sea. This early attention to this subject has been further developed at the Ph.D. level at several universities. Meanwhile scientists working at the BIO were asking for precise navigation in their work offshore. Mike migrated into this specialty and formed the Navigation Group, becoming its head. He was involved in an inter-departmental study on the speed of Decca radio waves over seawater in 1969 and planned propagation velocity tests over sea-ice in the Beaufort Sea in 1973. He studied the speed of medium frequency radio waves along the Nova Scotian coast in 1973. He combined various positioning systems to reduce their weaknesses, have redundancy and improve the accuracy. He used a cesium beam frequency counter on board the ship to predict Loran-C time of transmission. He later added Doppler sonar log and the ship's gyrocompass information as further inputs. These technological advances allowed CHS to do bathymetric surveys between Labrador and Greenland and in Hudson Bay and allowed scientists to do surveys as far as mid-Atlantic Ocean. For this, and his other work with Loran, Mike was awarded the Medal of Merit by the International Loran Association in 1983.

He advocated the replacement of the Decca and Loran-A stations in Canada with Loran-C, thus saving the Canadian Coast Guard millions of dollars annually, while improving the overall positioning accuracy. He recognized that the hyperbolic lattices for Loran-C had to be compensated for the errors caused by a slower velocity over land. He carried out trials in "dirty weather" on *CCGS Labrador* and *CCGS Narwhal* to test the radio reception of Loran-C at the edge of its advertised coverage area, and surveyed the signal delays in a special truck on land and from ships at sea. Thus CHS was able to provide positioning accurate to 100 metres. Over many years, he ran individually tailored navigation courses for fishermen, Canadian Power & Sail Squadron, Canadian Coast Guard and Canadian Navy encouraging the proper use of the navigation tools and to take best advantage of them.

Mike Eaton realized the potential of digital data presentation of marine charts via computer monitors. In 1982, he organized a workshop on the future of marine electronic charts where he invited experts in aircraft electronic displays, and in digital data management. In 1983, Mike portrayed the future of nautical charts as a real-time position on a cathode ray tube display with the nautical chart as background, augmented with real-time water levels corrected for tide, radar display not only from the ship but also from shore, and collision avoidance information as well. It sounded futuristic, but twenty years later much of what Mike was forecasting is now available. And Mike has had his hand in seeing it happen. He ran the CHS Electronic Chart test-bed project 1984-88, and demonstrated it during the Norwegian North Sea ECDIS (electronic chart display and information system) tests in 1988. Of the six systems on board the survey vessel, the Canadian Test-bed was the only one that provided a radar overlay and was the only entry from a hydrographic office. He retired from CHS in 1988, accepted a Scientist Emeritus status to chair a Working Group at the International Hydrographic Organization to standardize internationally the colours and symbols used in the electronic charts. The "look and feel" of today's electronic charts – the greatest improvement in navigation in 50 years – can be attributed very much to Mike Eaton's vision.

In June 2000, he was awarded the Canadian Marine Safety Award by the Canadian Marine Advisory Council for his development and promotion of ECDIS.

At a quiet time at a conference in an unfamiliar city, Mike would strike out alone to a museum or art gallery. He would prefer to sit quietly in his hotel room with a good book than go out on the town with the boys. In his own familiar surroundings, he enjoyed his gardening and was concerned about the wildlife habitat in the rural area near his home. His wife Rosemary was active in the community in the crusade for the development of the Cole Harbour Heritage Farm Museum and the provincial park surrounding Cole Harbour.

CHS honours retiring Surveyor General - Mike O'Sullivan

At the dinner normally associated with the Canadian Council on Geomatics meetings, 100 people gathered to wish Michael J. O'Sullivan, Surveyor General and International Boundary Commissioner, all the best in his retirement. Mike came to the Public Service only 15 years ago after working almost 30 years in the private sector as an Ontario Lands Surveyor, but in that short time certainly put his mark on the survey industry. During his tenure as Surveyor General, he saw the Canada Lands Surveyors become the only nationally self-regulated professional body in Canada, represented the survey industry on the floor of the House of Commons before the Committee of the Whole and led the Legal Surveys Division through program review. His *modus operandi* of hard work but time for relaxation was the brunt of some "roasting" but was also admired as being cost-effective. Mike has demonstrated that a time to have a break for intense meetings to "bond" as a person with the people with whom you are negotiating can have real dividends.

The Canadian Hydrographic Service has never been too far away from the Surveyor General's office. For example, Frederic H. Peters was Surveyor General and Chief of the Hydrographic & Map Service from 1936 to 1947. As much as CHS surveys the water column of Canadian waters, Legal Surveys Division is responsible for the cadastral surveys of the Canada Lands that are underneath much of the water that CHS surveys. That land represents almost 40% of the total of Canada, whereas the Yukon, Northwest Territories and Nunavut – the traditional dry-land areas surveyed by Canada Lands Surveyors – represent only 25% of Canada. The expansion of the cadastral survey profession into the watery realms must represent one of the largest "power grabs" in Canada by a professional body. The CHS assisted with the expansion of the profession to include geodesy, hydrography and photogrammetry. Thirty-four CHS staff members took advantage of the grand-fathering option and 28 others have obtained their CLS certification by writing the required examinations.

The CHS has also had close ties to the International Boundary. One has only to remember that before the formation of the International Boundary Commission in 1925, the boundary in the Great Lakes was under the jurisdiction of the International Waterways Commission, with William J. Stewart from CHS as one of the commissioners.

To honour Mike's retirement the CHS gave him a copy of CHS Chart 1550 – Lac Deschenes – an area that Mike frequently sails upon with his 27-foot C&C sloop *Thumper*. The chart included the signatures of about 20 CHS staff members (some retirees) that hold CLS qualifications. Mike was inundated with gifts from the regional offices of LSD, from the US office of IBC, and various sectors of NRCan, including the Geological Survey.

DID YOU KNOW...

The Tallest Lighthouse
The steel Marine Tower at Yamashita Park in Yokohama, Japan is 106m (348ft) high. It has a visibility range of 32km (20 miles) and an observatory 100m (328ft) above the ground. Visitors can see Japan's Mount Fuji from the observatory.

The Most Powerful Lighthouse
The Créac'h lighthouse on the coast of Finistère, reputedly the most powerful in the world, built in 1859 and stands 55 metres tall and is visible for up to 80 miles.

The Father of the Modern Lighthouse
The world's first stone lighthouse was the Eddystone Lighthouse, built just south of Plymouth, England in 1756 by John Smeaton.

The First Lighthouse
The first documented lighthouse was the Lighthouse of Alexandria, built in 200BC on the island of Pharos. Considered as one of the Seven Wonders of the World.

PRAIRIE SCHOONER BRANCH

General News

CHA - Prairie Schooner Branch went through a change of leadership recently with Bruce Calderbank stepping down as Vice-President after many years of stellar service to both the Branch and the Association as a whole. Many thanks, Bruce! Paul Sawyer, formerly a Vice-President with the Captain Vancouver Branch is now at the helm in Calgary.

Member News

Since mid-2004, Bruce Calderbank has worked in Turkmenistan as a Navigation QC on an ocean bottom cable 3D seismic survey, has been a Survey QC Specialist for a shallow water swath echo sounder survey in the Mackenzie Delta, as well as undertaking various assignments in Canada and the United States. He started 2005 working offshore Holland as a Navigation QC. Further, he has been volunteering as the Editor-in-Chief and a co-author for the revision of the Association of Canada Lands Surveyors text on "Canada's Offshore: Rights, Jurisdiction and Management" which will be launched at CHC 2006.

Paul Sawyer, of Real Time Project Services Ltd., has been busy for the last two years helping to engineer and re-construct a GBS drilling platform for deployment in the Russian Far East. Having completed that project, Paul is moving on to construction management of the Whistler Nordic Centre for the Vancouver 2010 Olympic Games and other opportunities.

Fred Cheng , formerly Regional Manager of UMA Geomatics, UMA Engineering Ltd, Calgary has joined the Department of Sustainable Resource Development, Government of Alberta and re-located to Edmonton. Fred completed his Masters Degree in Geodesy and Geomatics Engineering in 2004 from the University of New Brunswick and is contemplating on furthering his Ph.D. studies with the University of Washington. Fred continues to be actively involved with committees in the Alberta Land Surveyors' Association and the Association of Canada Lands Surveyors.

ATLANTIC BRANCH

The Canadian Hydrographic Association has renewed the branch in Atlantic Canada. It is currently a 21 member strong chapter, and the first regular meeting was well attended on February 3, 2005 in Dartmouth, Nova Scotia. An exciting year is planned, with guest lecturers to be scheduled.

The Canadian Hydrographic Conference (CHC) is to be held in Halifax, Nova Scotia (Canada) in the spring of 2006. Planning is well underway, so keep your calendars open. CHA Atlantic is pleased to announce that two of its own members, Mike Lamplugh and Wendy Woodford, have accepted the positions of co-chairs for CHC 2006.

DID YOU KNOW...

The Fresnel Lens

The Fresnel lens was invented in 1822 by French physicist Augustine Fresnel who invented a lens that would bear his namesake and be found along the coasts of Europe and North America. The Fresnel lens served to make Lighthouses an effective aid to navigation.

Frensnel lenses come in many different sizes called 'orders'. There are commonly six orders of lenses. The first-order being the largest and reaching heights up to 10 – 12feet with a six foot diameter and a range of 20+ nautical miles; down to the sixth-order, the smallest, at about 1.5feet in height with a diameter of one foot and a range up to 5 nautical miles. There are a few variations outside of the common six orders.

Tests have shown that a Fresnel lens could capture 83% of its light compared to 3% for an open flame and 17% for a flame with reflectors behind.

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

HINTS TO AUTHORS

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

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