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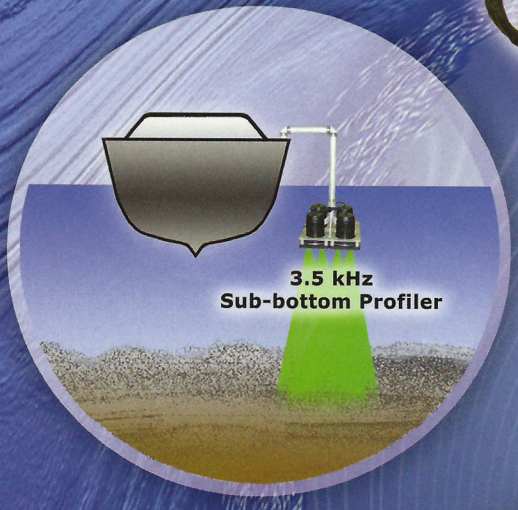

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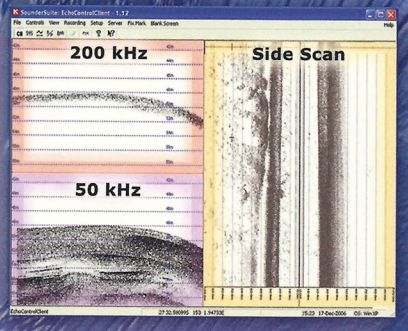

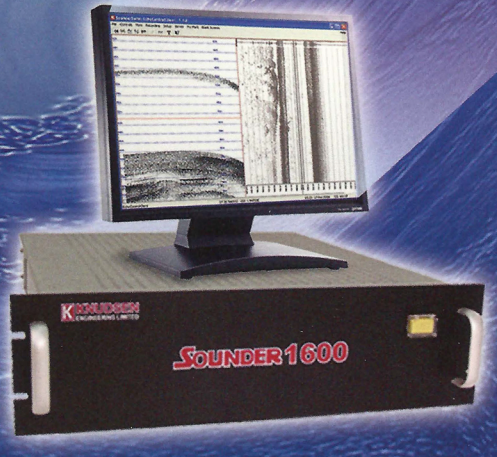

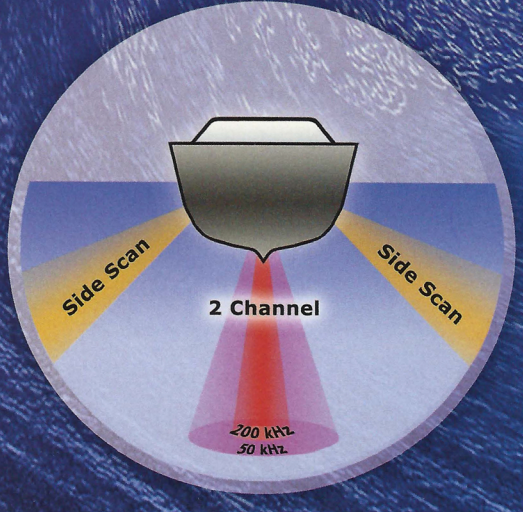

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LIGHTHOUSE

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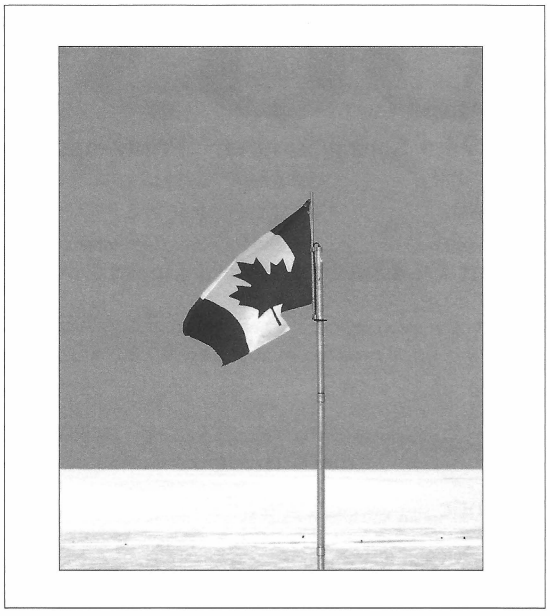


Ward Hunt Island Canadian Flag
Quttinirpaaq National Park, Nunavut

Approx Coordinates: 83-05-06°N, 74-09-24°W

Photograph credit: Jim Weedon

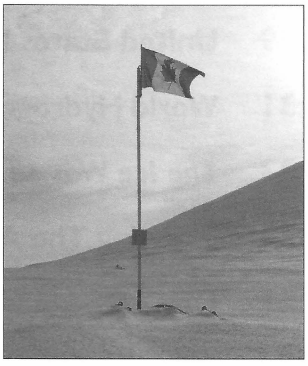
Ward Hunt Island Canadian Flag

Granted, the flagpole is not a lighthouse, but it is a beacon nonetheless. The Canadian Flag at the Parks Canada site on Ward Hunt Island - just off the northern tip of Ellesmere Island. Located in Quttinirpaaq National Park, Nunavut, the flag welcomes Arctic travellers to the northern reaches of Canada. Possibly the northern most Canadian Flag on land, it overlooks the vast frozen Arctic Ocean from an island that is often the starting point for adventureous trekkers heading to the North Pole.

The photograph was taken during the 2009 UNCLOS operations (February-May). The ice camp was located just offshore to the north, between Ward Hunt Island and the Ward Hunt Island Ice Shelf.

The Arctic continues to be the centre of great interest and accordingly, a significant portion of this Edition is devoted to Northern related topics. Additional information regarding UNCLOS activities and the mapping of the Arctic seabed are presented inside.

A close up of the plaque attached to the flagpole may be found at the end of the UNCLOS article on page 46.



Ward Hunt Island/Parks Canada Flag Pole

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Editor's Note / Note du rédacteur

This is Edition 74, the spring and summer edition. It has been a long time in the making. The volunteer army comprised of the staff and contributors to Lighthouse are a busy bunch; the combined forces of field work, conferences, re-location, and multiple projects all pull against the desire to publish promptly. That is just the way it is. In spite of this, it is amazing that the busiest people seem to be able to find the time to deliver the goods. Sometimes submissions come in early and sometimes they arrive at the last minute. Whenever and however they arrive, they are appreciated. Moreover, the authors' efforts reveal the significance of the work that is being done today and the relationship it has to the scientific, commercial and political aspects of world affairs.

There is no better example of this than recent multi-national surveys in the North. In fact, in the middle of compilation, it looked like this might be called the Arctic edition. That is because there is a lot of work, seismic and hydrographic, going on there. Furthermore, events in the Arctic are finding their way into the news more often and, for better or worse, are receiving much attention. This issue does have an UNCLOS update from Richard MacDougall and a piece from Ron Macnab. Other items may well appear in future editions.

In the end, Edition 74 became the usual mixed grill – and not just because we couldn't find a suitable Arctic lighthouse for the cover. Rather, there are noteworthy activities on the three coasts, in between, and beyond. Rob Hare's paper on the new survey platform on the West coast appears courtesy of The Hydrographic Society of America. It was first presented at the United States Hydrographic Conference this spring. Roger Cameron provides us with a detailed wrap up of that conference. Robert Dorais has delivered an enticing introduction to next year's Canadian Hydrographic Conference in Québec City.

At the suggestion of President McFarlane, the minutes of the CHA Annual General Meeting are included along with the organization's letters patent and by-laws. While this may not be as captivating reading as the other articles, it does serve to remind of the duties and responsibilities of CHA; as a registered organization representing the professional interests of Canadian hydrographers. Further to that end, there is also news on changes to the Student Award as well as updates from the regions.

Captain Nick Perugini has responded to an article in Lighthouse 73 on the court case surrounding the grounding of the Queen Elizabeth II. It is well worth reading and is great reminder that there are often conflicting sides to an event. That this takes place in a court room, focusing on navigational safety, based in no small part on the efforts of mariners and hydrographers, is a sobering reminder of implications or our actions as hydrographers. In closing then, I trust you will find the edition better late than early.

Craig Zeller

Message from the National President
Mot du Président national

I have now embarked on my third year as National President of the CHA. Together we have been able to move forward on some of the issues that are of significant interest to the well being of our association.

With the strong support of the CHS, we have been able to revitalize the Ottawa Branch which is now functioning very well, also our Pacific Region has stepped up to embrace and service the members of our former Prairie Schooner Branch.

We continue our active participation in the affairs of CIG (Canadian Institute of Geomatics) with whom we are formally associated, by contributing to its Council meetings, by membership in its CNCFIG (Canadian Coordination Committee for FIG activities) and by supporting its position on CCLS (Canadian Council of Land Surveyors) initiative – Professional Surveyors Canada. Through our relationship with the CIG we intend to participate more fully in the activities of FIG Commission 4 – Hydrography. We have also finalized membership on the CIG Hydrography Committee which will begin meeting shortly.

We maintain our very close ties with the Hydrographic Society of America and recently attended their 12th Biannual Meeting U.S. Hydro'09 in Norfolk, Virginia, U.S.A. We look forward to welcoming their members to CHC 2010, June 21 – 23 in Quebec City, where we intend to reciprocate their gracious hospitality and many kindness.

We also attended the 5th National Surveyors Conference and 25th AGM of the ACLS in Canmore, Alberta as well as their Ontario Regional Meeting in Toronto earlier this year. We have been invited by the ACLS to participate on their special task force to work on a communication plan to promote the Marine Cadastre within Government.

We have seen a change of guard with respect to National Student Award Management and on behalf of all of our members, I extend a heartfelt thanks to Capt. Barry Lusk, a former National President for his exemplary efforts on behalf of our Association. It was edifying to see our latest recipient receive his commission as a Canada Lands Surveyor at the recent ACLS AGM.

By the time you are reading this we will have celebrated yet another World Hydrography Day on June 21st and very likely have made another National Student Award.

In closing I would like to wish all a safe, happy and enjoyable summer.

Je suis maintenant à ma troisième année en tant que président national de l'ACH. Ensemble nous avons pu faire avancer certains des dossiers qui sont d'intérêt significatif pour le bien être de notre association.

Avec l'appui marqué du SHC, il nous a été possible de relancer la section d'Ottawa qui fonctionne maintenant très bien. De plus, notre section du Pacifique s'est chargée de s'occuper et de servir les membres de la défunte section Prairie Schooner.

Nous continuons notre participation active avec l'Association canadienne des sciences géomatiques (ACSG), avec laquelle nous sommes formellement associée, en participant aux réunions du conseil, en étant membre du Comité canadien de coordination pour les activités FIG et en endossant sa positon sur l'initiative 'Arpenteurs professionnels du Canada' du Conseil canadien des arpenteurs-géomètres. Par l'entremise de notre association avec l'ACSG nous planifions participer plus pleinement dans les activités de la Commission 4 du FIG – Hydrographie. Nous avons également finalisé notre adhésion au Comité sur l'hydrographie de l'ACSG qui débutera ses réunions prochainement.

Nous maintenons des liens proches avec l'organisation Hydrographic Society of America et avons récemment participé à leur 12e réunion bisannuelle lors de la conférence Hydro 2009 à Norfolk, Virginie aux État-Unis. Nous sommes impatients d'accueillir leurs membres à la Conférence hydrographique canadienne du 21 au 23 juin 2010 (CHC 2010) à Québec où nous en profiterons pour leur rendre leur bienveillante hospitalité et leur amabilité.

Nous avons également participé à la 5e Conférence nationale des Arpenteurs, à la 25e réunion générale annuelle de l'Association des arpenteurs des Terres du Canada (AATC) à Canmore en Alberta ainsi qu'à leur réunion régionale à Toronto plus tôt cette année. Nous avons été invités par l'AATC à participer à leur groupe de travail spécial pour l'élaboration d'un plan de communication pour promouvoir le cadastre marin à l'intérieur du gouvernement.

Nous avons été témoin de changements en ce qui concerne la gestion du Prix de l'étudiant national et au nom de tous nos membres j'aimerais remercier Capitaine Barry Lusk, un des anciens présidents de notre association, pour ses efforts exemplaires faits au nom de notre organisation. Il a été édifiant de voir notre dernier récipient recevoir sa nomination en tant qu'Arpenteur des Terres du Canada lors de la dernière réunion générale annuelle de l'AATC.

Lorsque vous lirez ce texte nous aurons déjà célébrer une autre Journée mondiale d'hydrographie le 21 juin et aurons vraisemblablement attribué un autre Prix de l'étudiant national.

En terminant, j'aimerais souhaiter à tous et toutes de passer en toute sécurité, un bon et agréable été.

George McFarlane

Old Ships, New Ships, Red Ships, Blueprints[1]

By: Rob Hare, Canadian Hydrographic Service, Pacific Region

[Editor's Note: This paper was presented at the United States Hydrographic Conference 2009 and appears with the kind permission of The Hydrographic Society of America.]

The Canadian Hydrographic Service (CHS), like other hydrographic offices and organizations worldwide, has much experience in retrofitting multibeam sonars into and onto existing vessels. Some of these vessels are past their predicted lifespan, but will continue in service for some years to come while the replacement vessels are designed, approved, funded and ultimately built. A new experience for the CHS will come in finding a replacement vessel for inshore hydrographic and oceanographic research to accommodate either an existing multibeam sonar (or sonars), or to come with a new sonar as part of the vessel scientific instrumentation.

Herein, a tale of Pacific Region CHS' experiences with shallow and mid-water multibeam sonars on various vessels, the latest saga being the upgrade of our EM1002A mid-water system mounted on a mechanical ram on the CCGS *Vector* (built in 1967) to a 0.5° x 1.0° EM710 gondola installation with other scientific sonars and navigation equipment. We looked to the experiences of our CHS colleagues on the east coast of Canada, to the Naval Oceanographic Office (NAVOCEANO) and other experts in marine acoustics and underwater design for their advice on what has worked, what has not worked and how CHS might make the most of the potential Vector replacement. The Regional Class Research Vessel (RCRV) being designed and built for the US research fleet holds much promise for this replacement.

Introduction

When faced with a new sonar to install, a review of existing installations, what has worked and what has not worked is a good starting point. Several hydrographic organizations worldwide have recently switched from flush-mounted or pod mounted multibeam sonars to gondola installations with significant successes. Experiences of CHS in Atlantic Region (CCGS *Matthew* EM710 installation) and NAVOCEANO (TAGS-60 class upgrades to EM710 and EM120) have shown that a gondola installation can greatly improve acoustic performance through better bubble sweep down rejection.

Background

CHS Pacific region had its first experiences in multibeam surveying with the DOLPHIN (Deep Ocean Logging Platform for Hydrography with Integrated Navigation)/ EM100 in 1994. In 1996 CHS acquired 3 EM3000 shallow-water multibeam systems, complete with Applied Analytics POS/MV version 1. Each system was installed in 31 foot CHS P-boats (*Puffin*, *Petrel* and *Penguin*) and accepted by CHS Atlantic Region office in Dartmouth (Bedford Institute of Oceanography – BIO). Pacific Region was shipped the launch *Puffin* with EM3000 serial number 0001! In 1997, the launch *Puffin* was transferred to CHS Québec Region and a new EM3000 system was purchased and installed in the 41 foot Bertram vessel *Revisor*. By 2003, the *Revisor* was showing signs of age, so the system was moved to the 44 foot east coast trawler *Otter Bay*. In 2006, CHS upgraded 5 EM3000 systems nationally to EM3002, with an associated upgrade of the POS/MV systems to version 4.

The EM1002A system was purchased in 1999 and installed in the Canadian Coast Guard Ship (CCGS) *R. B. Young*, which had been in cold lay-up since 1997. In 2002, the system was moved to the CCGS *Vector*, a much older but program-funded vessel for science in Pacific Region. In March 2008, CHS acquired a 0.5° x 1.0° EM710 which was to replace the EM1002A on the *Vector*. The following table summarizes this timeline. The figures that follow it show the progression of ships and systems.

Old Ships

Table 1 lists the vessels used for multibeam installations in CHS Pacific Region.

Vessel	Built	System		Removed
Puffin		EM3000, S/No. 1	1996	1997 - sent to CHS Québec Region
Revisor	1972	EM3000	1997	2003 - vessel retired
Otter Bay	1992	EM3000	2003	2006
Otter Bay		EM3002	2006	N/A
R.B. Young	1990	EM1002A	1999	2002 - vessel sold to Alaska State Department of Fish & Wildlife
Vector	1967	EM1002A	2002	2008
Vector		EM710	2009	N/A - replacement planned for 2013

Table 1: Multibeam vessels in CHS Pacific Region 1996-present.

[1] With sincere apologies to Dr. Seuss. "One fish, two fish, red fish, blue fish" is a children's book released in 1960.

EM3000/2

Puffin

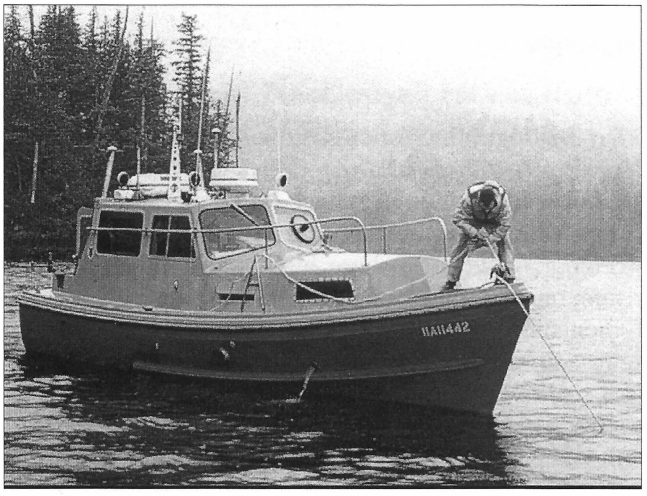

Figure 1: CSL Puffin EM3000 serial number 0001.

Figure 2: Puffin in-keel fairing of EM3000.

Revisor

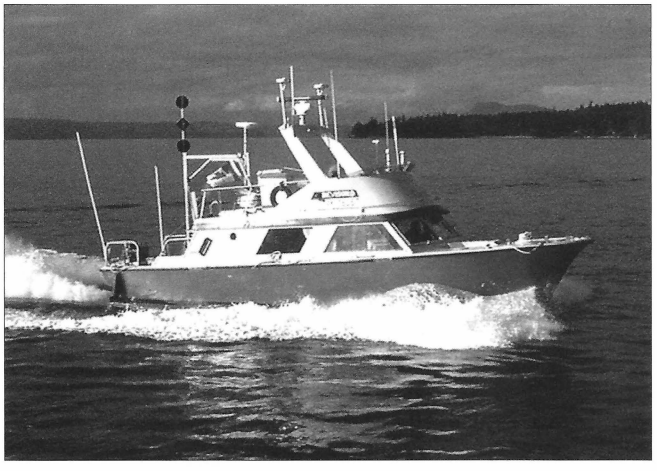

Figure 3: CSL Revisor EM3000.

Otter Bay

Figure 4: CCGC Otter Bay EM3000/30002.

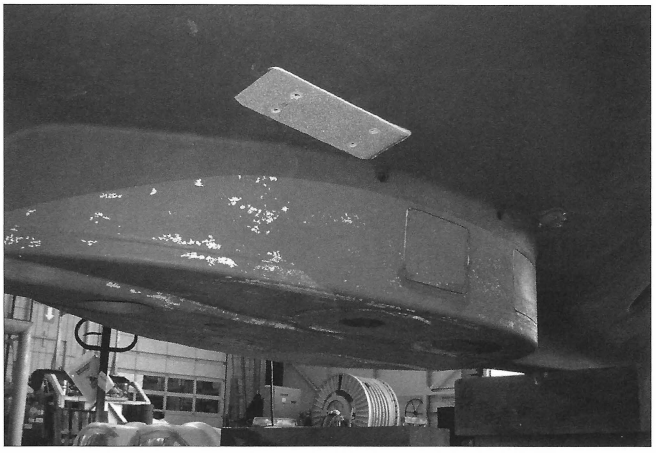

Figure 5: Otter Bay along-keel transducer pod (EM3002 is on port forward).

EM1002A

R.B. Young

Figure 6: CCGS R.B. Young EM1002A.

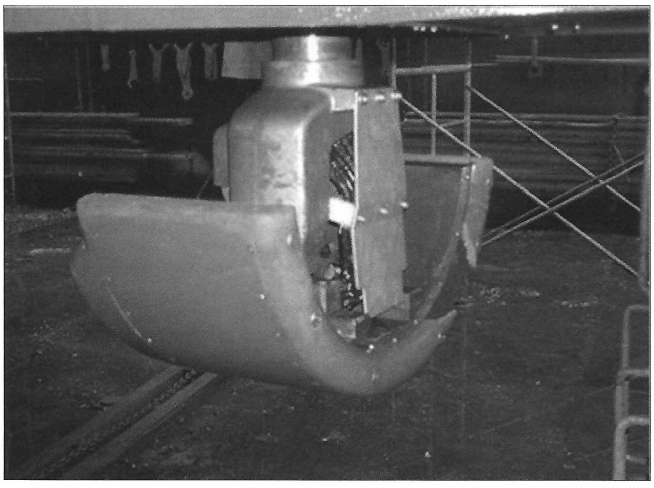

Figure 7: R.B. Young EM1002A transducer damage from semi-submerged debris (logs).

Vector

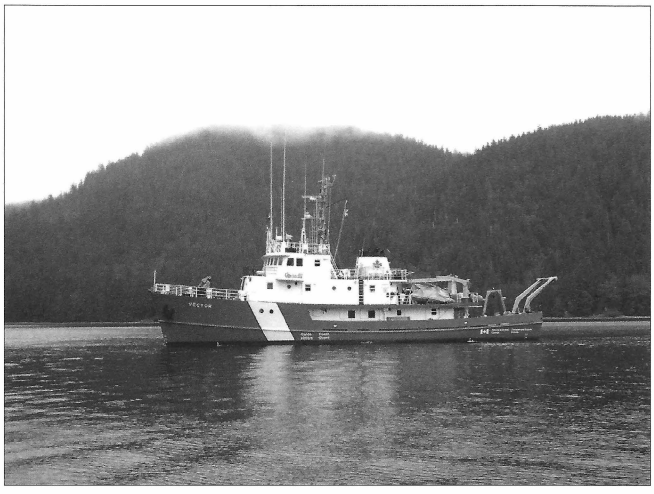

Figure 8: CCGS Vector EM1002A/EM710 (0.5x1.0).

Figure 9: Vector EM1002A transducer protection grids (cow catcher).

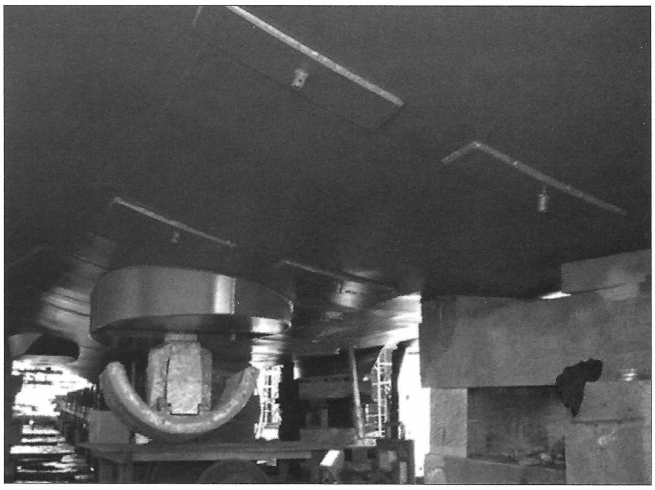

Figure 10: Vector EM1002A installation on ram (Note studs for cow catcher).

The remainder of this paper is devoted to a discussion of the *Vector* upgrade from EM1002A on a ram to a gondola-mounted EM710 (0.5°x1.0°) and the possibilities for the *Vector's* replacement.

New Ships

Vector Replacement Considerations

The consensus of the *Vector* science user's committee, at a meeting held in May 2007 to discuss the replacement vessel, was that we need a clone of it (Table 2). While it does work well for the existing science programs that use it, the *Vector* replacement would have to meet all safety and vessel requirements of the day it is built. This includes the necessity to have all accommodations above the water line which could result in a somewhat larger vessel and commensurate increase in costs to build crew and run. Acoustic quietness (meeting the International Council for the Exploration of the Sea (ICES) noise standards) was felt by the committee to be a key requirement, although there was a concern about the increase in costs that may be required to build a ship that meets these standards.

Length	39.7m
Breadth	9.5m
Draft	3.5m
Power	1 Caterpillar 3208 geared diesel, controllable pitch propeller, bow thruster
Gross Tonnage	515grt
Range	3500nm
Endurance	20 days
Speed	10kts (cruising)

Table 2: CCGC Vector vessel specifications.

While Science will be the primary task of the *Vector* replacement, as a Coast Guard ship it will also have to respond to Search And Rescue (SAR) calls, so it will need to be crewed not only for 24/7 operations, but also to be able to respond to SAR call outs. It will need a Rigid-Hull

Inflatable Boat (RHIB) aboard for this purpose. There will be an expectation that crew and science staff of a certain rank or level is entitled to a single cabin. The *Vector* has berths for up to 8 science staff and a crew of 13, including 5 officers. She has several large water tanks, but no on-board water making capability, thus restricting her endurance.

There are other health and safety requirements for ship's crew. At least 6 hours sleep is mandated for bridge crew, which might restrict operation of low frequency (audible) sonars, station keeping (requiring thruster operation) or winch operations (requiring hydraulics) to something less than 24 hours a day. Most CCG vessels are crewed on a lay day system where two crews alternate 28 days on and 28 days off. The *Vector's* operational profile for a year is 10-2-1, or 10 months operational, 2 months in refit and 1 month out of service. This results in a maximum available ship time of 280 days per year. Ship certifications, safety audits, crew changes, replenishing fuel, water and food, change-over between science programs, etc. all contribute to a reduction in available vessel days for at-sea science. There are 254 available vessel days for *Vector* in 2009. In 2008 there were 255 days of program usage planned.

As of the date of writing this paper, no Statement Of Requirements (SOR) had been produced or approved for *Vector's* replacement. According to the Capital Project Summary Note (CPSN) requesting funding approval for the replacement vessel, design work should have been at the mid-way point with a completion in May 2009. The design lifespan for the replacement vessel is up to 30 years. The *Vector* is now 42 years old. Whenever the design work does get on track, science users will continue to push for a fuel-efficient vessel that can be run effectively by a minimum of crew and has an optimized science capability.

Regional Class Research Vessel

The proposed RCRV, being designed under supervision of the US Navy for the Univerisity Navy Oceanographic Laboratory System (UNOLS) research fleet is one model for the *Vector* replacement that holds some promise. Vessel specifications are given in Table 3. Original plans were to build three vessels by 2013 at a total cost of $91M USD. As of October 2008, cost estimates for each vessel had escalated to between $50M and $60M USD when fully outfitted. The capital plan for *Vector* replacement [Steven, 2006] identified less than $20M CAD and a planned replacement date of 2013. The list below details the proposed capabilities of the RCRV. While the specifications and capabilities of the RCRV would seem to be ideal for Science, it may be more ship than we can afford.

The RCRV will be a modern mono-hull research ship capable of integrated, interdisciplinary, oceanographic research in areas from shallow coastal bays and estuaries out to deeper water [GlobalSecurity.org, 2006]. The ships shall be capable of performing the following tasks:

a. Sampling and data collection of surface, mid-water and sea floor parameters using modern scientific instrumentation.
b. Launch, towing, and recovery of scientific packages, both tethered and autonomous.
c. Handling, monitoring and servicing of Remotely Operated Vehicles (ROVs) and Autonomous Underwater Vehicles (AUVs).
d. Deployment and recovery of Autonomous Air Vehicles (AAVs) and balloons.
e. Deployment and recovery of moorings.
f. Deployment and recovery of boats (appropriate for vessel size).
g. Deployment and recovery of free-floating instruments.
h. Shipboard data processing and sample analyses in modern, well-equipped scientific laboratories.
i. Precise navigation and station keeping and track-line manoeuvring to support deep sea and coastal operations.
j. Long periods of operation (up to 30 days) on-station or at low speeds.

Length Overall	42.7 – 50.3 metres
Draft	3.7 metres maximum navigational.
Propulsion	Integrated diesel electric propulsion plant capable of continuous speed control to ½ rev/minute throughout the entire operating speed range.
Speed	Maximum speed of at least 12 knots and a sustained speed of 10 to 11 knots in calm seas at full load. Some science operating profiles will require continuous underway survey or towing operations at speeds from 0 knots up to the normal cruising speed. The design shall consider the impacts on engine operation, maintenance and emissions, exhaust gas ingestion, water making capability, and other factors when on-station or moving at slow speeds for extended periods.
Range	5,400 to 6,500 nautical mile range at sustained speed in calm water.
Endurance	At least 21 days. A surge capacity for an occasional 30 days endurance is desirable.
Availability	Operate and meet scientific requirements continuously (24 hours per day, 7 days per week) during a 30 day at-sea deployment without sustaining a system failure that cannot be corrected at sea or that degrades scientific capabilities.
Towing	The ship shall be capable of towing scientific packages with up to 10,000 pounds of towing load at 6 knots and 20,000 pounds of towing load at 4 knots. The ship shall be capable of performing towing operations continuously during an entire cruise (up to 30 days).
Berthing Accommodations	Permanent berthing accommodations and toilet/showers shall be provided as follows: ➢ 14 single staterooms with toilet/shower facilities shared between pairs of single staterooms. ➢ 8 to 10 double staterooms with toilet/shower facilities shared between pairs of double staterooms.
Laboratories	A suite of modern, well-equipped laboratories including Main Lab, Wet/Hydro Lab, Computer Lab, and Staging Bay. The Main Lab, Wet/Hydro Lab and Staging Bay shall be located adjacent to each other and the Working Deck. It is desirable that the Computer Lab also be located adjacent to the other labs.

Table 3: Specifications of the Regional Class Research Vessel (RCRV).

Red Ships

Canadian Coast Guard and Other Issues

Just because a sonar installation design has the desired characteristics for good data quality does not necessarily imply that that design will prove acceptable to those who own and run the ship, or will be easy for the shipyard who wins the bid for vessel upgrades to be able to build it as designed. Any changes to a CCG ship require approvals through the configuration change request (CCR) process, which can take over a year as we found out.

The dry docking schedule for the *Vector* for maintenance and recertifications is twice in a five year period. A dry docking was scheduled for late December 2008; the next dry docking not planned until 2011. If we couldn't make the plan work for the first period, it was possible that we would have brand new sonars sitting on the shelf for another two years.

Refits are under the purview of CCG Fleet Engineering, but CCG Fleet Human Resources also has a stake in any changes made to the ship. Ship's crew may be accustomed and comfortable with pods and blisters for sonars under the ship. They are less comfortable with a gondola suspended by struts below the hull, even if designed by a marine architect to withstand severe impacts from submerged obstacles. They may be even less willing to accept a gondola design if it isn't pretty – fleet personnel viewed the CCGS *Matthew* gondola pictures and were ready to reject any gondola design outright without even seeing the final designs from ManTech Advanced Systems International (acoustic consultants) and BMT Fleet Engineering (naval architects). Even though the initial design of a wing-shaped gondola, modelled after the NAVOCEANO TAGS-60 class design (scaled down in x, y and z to fit the EM710 and 3x3 sub-bottom profiler array), was accepted by the required CCG personnel, modifications were later proposed to the design by other CCG personnel.

Initially, there were concerns by CCG Fleet personnel about the increase in vessel draft. These concerns were addressed by demonstrating that the increase in draft was only a few centimetres beyond the EM1002A draft when fully deployed on the mechanical ram. In addition, removal of the EM1002A and ram from the ship would eliminate the need for regular commercial dives for each hydrographic survey to install, remove and inspect the "cow catcher" – transducer protection grids.

The gondola design was modified twice by BMT due to changes in personnel and a lack of communications regarding designs and decisions made from one project engineer to the next. A finite element stress analysis was conducted on one of the designs to determine required internal changes to the ship to support the new gondola structure and to specify the materials and specifications for the structure of the gondola itself. The initial wing design, supported by one forward and two aft outer struts eventually became a much simpler design (I liken its shape to a handheld windshield ice scraper) with only a single tapered centre strut. Initial plans to have all cables go through the starboard wing strut in order to use the existing (from the EM1002A) hull penetration were abandoned in favour of a narrower gondola with a larger opening for running cables through the centre strut.

BMT also performed simulations to determine the effects of the gondola on vessel performance [Campbell, 2008]. A reduction in top speed of 0.5 knots was forecast and an increase in fuel consumption of up to 10% was also predicted. This deterioration is largely due to the increase in cross sectional area that the gondola presents to water flowing past the hull.

On the plus side, it was forecast that the addition of the gondola may have a damping effect on vessel roll, to a lesser degree pitch and possibly create a keel effect that would make line keeping easier, although minimum turning radius might suffer as a result. Removal of the EM1002 and ram was forecast to allow the return of a potable water tank to its original size. It was also hoped that the crew (cook's) cabin could be put back to the way it existed prior to the EM1002 installation in 2002, although some space would still be required for EM710 cable runs.

A later decision to move four Science transducers (12, 38, 120 and 200kHz) from an existing blister into the gondola also promised to provide a small reduction in drag by removal of the blister and restoring original hull shape. A dual axis electromagnetic speed log (Skipper EML 224) was also designed into the new gondola at the request of CCG vessel electronics. Other navigation sonars were left in their existing installations due to concerns that gondola failure would leave the vessel with limited or no sonar navigation capabilities. It was also felt that moving the sonars to the gondola would result in improved sonar performance due to better bubble sweep down rejection performance.

Other considerations for moving the 3.5kHz array included a Health Canada [2008] report on noise levels in accommodation areas – it was felt that the gondola installation could reduce noise levels – and a desire to improve its performance – 9 new transducers were purchased and configured in a 3x3 array to decrease beamwidth and improve bottom penetration. While the Health Canada [ibid.] report noted that sound pressure levels measured in crew accommodations did not exceed the Government of Canada Treasury Board baseline of 87 dB rms, nor did they exceed the Marine Occupational Safety and Health Regulations baseline of 75dB rms, the report did recommend several options for reducing nuisance noise (that which falls below legislated limits). The options provided include: administrative controls,

personal hearing protection and/or engineering controls – the gondola option being considered an option of the latter type.

Fisheries Science personnel expressed a desire to upgrade the fisheries sonars (38, 120 and 200kHz) to split-beam sonars for better species recognition. Unfortunately, upgraded transducers were not available at the time of installation so the existing sonars were used, with some minor improvements to sections of deteriorated cabling. The gondola was designed so that these sonars could be upgraded at the next dry docking in 2011, although running new cabling could present a significant challenge to this upgrade.

Blueprints

The EM710 was acquired by the end of March 2008. At that time, it was hoped, perhaps somewhat naively or optimistically, that all plans, approvals, funding and contracts could be in place by the scheduled dry-docking for *Vector* in December 2008. In early April 2008, the previously submitted Configuration Change Request (CCR – a CCG requirement for any major vessel modifications) for an EM710 (1x1) submitted in November 2007, was resubmitted for approval of an EM710 (0.5x1). The Kongsberg-supplied 1x1 configuration pod design was supplied as supporting documentation. The vision for the installation was to keep as near to the hull location and depth of the existing EM1002A (which was known to perform well even in moderate to heavy sea states).

The first of several user consultation meetings occurred in mid-April 2008. At that time, the plan to proceed with installation was announced to the Science users and to CCG. The initial CCG estimate was between $80K and $150K CAD. Approval of the CCR was required before any further discussions could proceed. No particular concerns were raised. A follow-up meeting was held with CCG in mid-May, where responsibilities and timelines were identified.

In mid-June, an extraordinary meeting of the vessel user's committee was held to make a presentation on the proposed installation so that client and stakeholder concerns could be aired and subsequently addressed. By this time, the CCG cost estimate had increased to $150-200K. Only approval-in-principle for the CCR had been received. Concerns raised at this meeting included reduced vessel speed and increased draft. CCG Marine Engineering felt that moving the transducers to a pod or gondola centred on the keel (EM1002A was offset several metres to starboard) would not be possible by December due to the many approvals required for new hull penetrations. A review of bubble sweep-down effects and modern gondola design for optimum performance was given. CHS identified potential positive benefits of the EM710 and gondola installation as:

- Improved depth capability (twice that of the EM1002A)
- Better acoustic backscatter
- Greater spatial resolution (nearly 10 times the EM1002A)
- New capability to record water column (volume) backscatter
- Improvements in vessel stability (roll damping and keel-assisted line keeping)
- Recovery of a potable water tank that was reduced in 2002
- Recovery of cook's cabin space that was taken over in 2002
- EM1002 ram would be made available to another vessel, the CCGS *John P. Tully*, for science transducers currently suffering from bubble sweep-down issues.

CCG was identified as the lead on overall project management, mechanical removal, construction and installation of hardware. CHS was identified as the lead on acoustic analysis and recommendations, wiring and integration, removal of the EM1002A electronics. Items on the critical path were identified as:

- Approval of CCR - CCG (June 18 – actual approval granted June 20)
- Direction from CCG Fleet/Operations to Marine Engineering - CCG (June 18 – actual approval from CCG Operations received July 31)
- Advice on acoustic design and performance from Mantech Advanced Systems International - CHS (July 14)
- Specifications for installation (August 18)
- Obtain funding ($150-200K) for installation - CHS (August 22)
- Gondola/blister design & construction
- Specifications to Public Works and Government Services Canada for contracting (September 8)
- Specifications posted, vessel viewing (October 7)
- Bids close, award contract (November 1)
- Gondola/blister construction complete (November 28)
- Shipyard work period (6 weeks: December 2008-January 2009)
- IOS work period (1 week: January 2009)
- Sea-acceptance testing (1 week: April 2009)

Another project review meeting was held July 15, 2008 – the day after Mantech Advanced Systems International visited the *Vector*. After some discussion, the design that met with the greatest degree of approval was a centre-line mounted gondola (scaled TAGS-60 design) using the existing through-hull penetration aligned to a starboard strut for running all cables.

A final project review meeting was held July 24, 2008. Final decisions were made about what sensors would go into the gondola and discussions were held regarding predicted vessel performance, funding envelopes and requirements for strengthening of hull and gondola.

By early September, BMT Fleet Technology Limited had been contracted to produce the gondola design.

Gondola Evolution

From an acoustic performance standpoint, the gondola is considered by far the best. This is directly associated with bubble sweep down rejection performance. A gondola has been demonstrated in the past on other research vessels to provide a very good acoustic background as well. Based on these specific issues, Mantech Advanced Systems International recommended [Gates, 2008] a gondola as the preferred method of installing the EM 710.

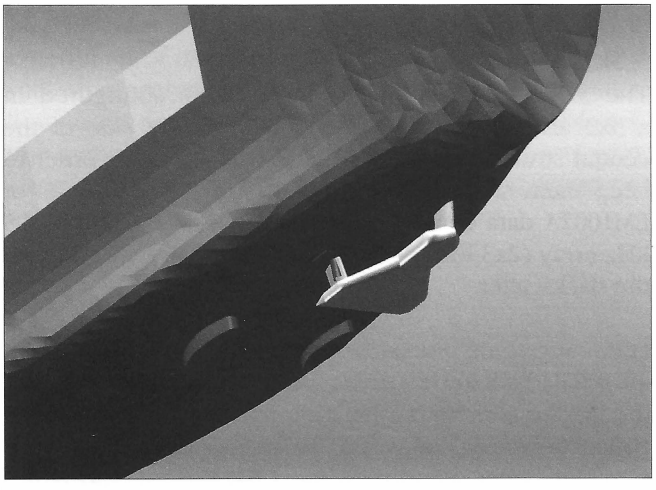

Figure 11:Mantech gondola design (modified) shown on Vector hull with existing sonar blisters.

Existing sonars in the *Vector* included the EM1002A on a mechanical ram through the hull (located at the aft starboard gondola strut in Figure 11), the science/fisheries transducers (12, 38, 120 and 200kHz) located in the port blister and geoscience Sub-Bottom Profiler (SBP) array (2 x 3 3.5kHz) located in an oil-filled box inside the hull. The port blister contains navigation sonars that were to remain there and not be moved into the gondola for navigation safety reasons. Removal of existing blister and EM1002 fairing, by relocating all science transducers to the new gondola was hoped to improve vessel performance marginally over just the addition of a new multibeam gondola. In addition, it was hoped that by moving the SBP array to the gondola, rather than firing directly through the hull would reduce nuisance noise in the crew accommodation area.

Initially, the engineering firm hired to the design and simulation work (BMT Fleet Technology Limited) was given the Kongsberg Maritime design for an EM710 blister in 1x2 and 1x1 configurations. Due to a CCG requirement to use the existing EM1002A hull penetration, this blister (or gondola) was to be mounted off the central axis of the vessel. CHS and Mantech had a performance requirement, based on built-in self tests of the EM1002A for bubble noise, for the transducers to be located at the same draft as the bottom of the EM1002A transducer when fully deployed on the ram (0.89m below the hull). Adopting a blister with this height and width would have resulted in significant powering and resistance issues.

Mantech recommended a scaled down (in x and y, but only in z to the point where sufficient height was still available to accommodate transducers and cables without excessive bending) wing-shaped gondola design based on the successful NAVOCEANO TAGS-60 refits. BIST tests on the EM1002A determined that the maximum depth of the gondola need not be any greater than the fully-deployed depth of the EM1002A transducer (89cm below the hull). Because of the requirement to use the EM1002A hull penetration, this gondola had to be larger (in x and y) than needed to accommodate the transducers only in order for the starboard strut to align and be used as the conduit for all transducer cables. This resulted in decreased vessel performance predictions. Fortunately, as the date for vessel drydocking approached a decision to use an on-keel hull penetration for all cable runs was made and the width of the gondola was allowed to decrease. With a smaller cross-sectional area, powering and resistance issues were predicted to improve.

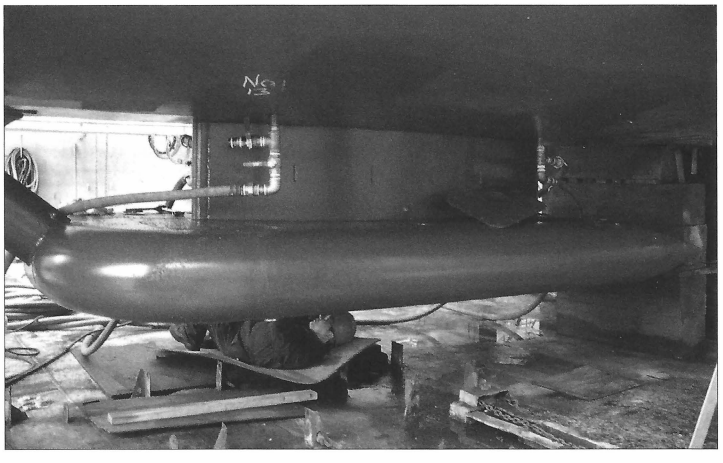

Figure 12:BMT gondola design 2, as modified by Allied shipyard with additional CCG input.

Despite the recommendation from CHS and its acoustic consultant (Mantech Engineering Ltd.), BMT Fleet Technology Limited ultimately delivered a design that was quite different than the delta wing design provided by Mantech. This was due in large part to a seemingly ongoing turnover of marine engineering staff at BMT, who did not pass on all the project details to their successor. However, after a review of the design, Mantech's conclusion was: "I suspect it will work, just not quite as hydrodynamic. I suspect it will provide adequate bubble sweep down rejection, however." Mantech did suggest that the design be modified to adopt rounded edges and an elliptical leading edge. Despite these suggestions and a modification in the design supplied by BMT to the shipyard, fabrication issues resulted in a much simpler design without the elliptical leading edge (Figure 12). CCG requested the addition of a leading strut (left side of Figure 12) to assist with debris deflection (principally submerged logs in the *Vector's* area of operations).

The final evolutions of the gondola involved monitoring its performance. Two low-light pan/tiltable underwater cameras were added to the topside of the gondola (one on the starboard side forward and one on the port side aft so both sides of the central strut and debris deflector strut could be fully observed for debris and bubble flow). In addition, a broadband omni-directional hydrophone (EDO 6140 with pre-amps) was to be installed in the interior of the gondola to monitor changes in acoustic performance. It is anticipated that the hydrophone will detect increases in acoustic noise caused by debris or structural problems in the gondola.

Readying the Ship

The EM1002A strip out internal to the ship took place at Institute of Ocean Sciences in mid-December. Some spare transmit/receive boards were returned to the manufacturer as part of a trade-in agreement. The EM710 boxes and the 9 new SBP transducers – all labelled for later connection – were loaded aboard the ship prior to its voyage to the shipyard (Allied) in Vancouver. Due to Christmas holidays, the ship did not go into drydock until the first week of January 2009. The EM1002A ram and transducer (hull unit) was removed by the shipyard and set aside for future use aboard another CCG vessel as previously discussed.

Shipyard

The vessel and gondola construction contract was awarded to Allied Shipyard of Vancouver in mid-December. An initial meeting with the shipyard was held Thursday December 18, 2008 to review the requirements for the refit and for the gondola fabrication and equipment installation. The vessel docking plan included blocking appropriate to remove the EM1002A and ram and install the new gondola and transducers. Thanks to some clever reworking of the crewing schedule by the CCG Assistant Marine Engineer Supervisor, a full 7 week drydocking period was available. This was fortunate as the shipyard was closed for 4 days in early January due to inclement weather (snow storm) in Vancouver.

While there had been initial discussions about having a different shipyard construct the gondola (for reasons of expediency and also because elliptical leading edge construction is beyond the capability of many shipyards), in the end it was easier to let the contract for all the work to the same yard. There were also discussions about sealing the gondola, filling it with air, fresh water or oil as ways of increasing its life (minimizing exposure to salt water corrosion). In the end, due to the project lifespan of the *Vector* (less than 10 years) and the complexities in trying to get a water-tight compartment, the interior of the gondola was treated with anti-corrosion coating and allowed to flood with salt water.

Ports were added to the top of the gondola to install two pan/tiltable low-light underwater cameras and to allow access to the transducers and cabling inside. An inlet port on the bottom of the gondola and plumbing for a sea water sampling loop inside the ship were incorporated so that surface sound speed was being measured at the transducer face – something that was not possible for the EM1002 installation. The final requirement of the shipyard was to ensure that the lower face of the gondola did not have negative pitch when the vessel is underway. This was accomplished by careful adherence to the BMT design.

3.5kHz Array

The 3.5kHz SBP (9 TR109 transducers configured in a 3x3 array) was located on the opposite side of the central strut (port side) to the EM710 arrays in order to keep them separated as much as possible. Analysis of EM1002A data clearly showed interference from the 3.5 kHz array (2x3 located further aft and inside the ship) in the backscatter.

Following some discussion, a decision was made to run all 9 TR109 3.5kHz cables from the gondola through the Roxtec seals into a junction box for combining all 9 connections into one wire inside the ship. This approach provides better security for the 3.5kHz array and better diagnostics should a transducer fail. Mounting a junction box in the gondola, should any failure happen there, could result in loss of the whole array.

More discussion occurred about how to mount the transducers inside the gondola. Different bottom plate thickness and material types were considered based on their ease of installation and their attenuation factors. Polycarbonate windows were considered, but in the end the ease of construction using steel plate won out and the attenuation due to firing the transducers through 3/8" steel plate was thought to be negligible at 3.5kHz. Finally, spacing of stainless studs for mounting each transducer so that there would be no lateral contact between transducers via the clamps was determined to be 1.75".

Science Sonars

The existing science transducers, mounting rings and cables were recovered from the science transducer pod. The mounting rings and transducers were still in good shape, but some of the cables required repair work before reinstallation in the gondola and some cables were not long enough and had to have extensions added. At the request of the fisheries scientists, the 38, 120 and 200kHz single-beam transducers were reconfigured into a tight triangular pattern. This makes sonar calibrations using dual calibration spheres at 30-40 metres depth much easier. The transducers in the science pod had been configured in line. The 12kHz Airmar transducer was mounted in the forward part of the gondola.

While there was a request to install new split-beam fisheries sonars in the gondola, neither the transducer, mounting rings nor required cables were available while the vessel was in the shipyard. This upgrade will have to wait for a future vessel dry dock period. The proposed 38kHz split beam replacement will have a narrower beam and hence a larger diameter. More fabrication work will be required to adapt to the new triangular pattern required by this extra diameter. However, additional room in the gondola was reserved for this transducer.

Sonar Synchronization

Because of the number of sonars of various frequencies installed in the gondola (resulting in closer proximity than in the previous installation), we had to consider what sort of synchronization would be needed. Sonar synchronizers are available commercially, but can be quite pricey. For normal hydrographic operations, the multibeam is either operated by itself, or in combination with the SBP on geo-science cruises. The fisheries sonars, if operated together, will probably be controlled by multi-frequency sonar topsides.

For CHS, the multibeam sonar needs to be the master, with other sonars slaved to it. So the challenge was to find a simple and inexpensive hardware and/or software solution to have the SBP trigger a transmit from the EM710 transmit trigger (NMEA message). The ORE topsides currently configured for the SBP on the Vector does not accept a trigger pulse. However, it is normally operated by Chesapeake SonarWizSBP software, which is capable of accepting an external trigger. Once the ORE topsides are replaced with a planned future upgrade to a Knudsen chirp SBP, this triggering issue will have to be revisited.

The 12kHz sonar had been used to provide nadir depth input to the MVP-30 controller, allowing it to retrieve the sensor fish before getting too close to the seafloor. This sounder also has to be synchronized to the EM710. It was thought that the EM710 could be configured to issue a NMEA depth message to the MVP-30 and eliminate the need for the 12kHz sonar to be on during multibeam operations.

The Skipper EML 224 dual-axis Doppler velocity log was not anticipated to cause any interference with the sonars because is operates using electromagnetic energy and not acoustic.

Sensor Survey

The Kongsberg Maritime [2006] EM710 installation manual cautions users of the more stringent requirements for precision of sensor coordinates and installation angles than had been acceptable in the past, or for earlier generation systems such as the EM1002A. While no specifics are provided in the manual [ibid.] regarding survey equipment to be used or methodology to be followed, the manufacturer will supply examples (reports) of other sensor installation surveys conducted by e.g. BLOM [2007] if requested. It was not clear to CHS in advance that Kongsberg Maritime was recommending to us to follow this approach. In any case, CHS does not have the equipment, software or expertise to conduct precision photogrammetric surveys, as used in the BLOM survey [ibid.].

Thus, CHS used the traditional survey methods (1" total station) that had been used for successful EM sonar installations as were shown in an earlier section of this paper. This resulted in the coordinates, angular offsets and estimated uncertainties shown in Table 4. Due to an unidentified calibration error with the rented total station, the sensor survey measurements had to be repeated with a different instrument (laser level), which added to delays in the shipyard. This was further exacerbated by a blunder made by the survey team (ruler taped to the level rod upside-down) which may have added an extra day's delay.

In addition, the requirements for precision machining of the gondola where the transducer frames were to be installed had not been made clear to either CHS or the shipyard in advance, although the requirements for precision in the installation of the mounting frames is provided in Chapter 3. CHS should have provided the shipyard with a copy of the installation manual well in advance. Cleaning paint and welding splatter off the surfaces where the mounting frames were making contact added more delays. In fact, it took several iterations of installing the frames, placing in the transducers, making the sensor survey measurements, recognizing that the transducers were not seated properly (twists in the transducers caused by high spots under the frames), removing everything, shimming, reinstalling and re-measuring only to find different problems. This was very frustrating for both CHS and Kongsberg staff trying to get a proper installation. Providing specific details in the installation manual about this requirement, and communications with both CHS and shipyard well in advance by Kongsberg Maritime would have gone a long way to reducing this confusion and frustration, and subsequent rework and delays.

TX Array 1 (fwd)	Required precision	Final value	Precision achieved
Position (x)	± 0.05 m	0.676 m	± 0.002 m
Position (y)	± 0.05 m	0.280 m	± 0.002 m
Position (z)	± 0.02 m	1.986 m	± 0.002 m
Pitch	± 0.05°	0.82°	± 0.06°
Roll	± 0.20°	0.15°	± 0.37°
Heading	± 0.10°	0.30°	± 0.06°
TX Array 2 (aft)			
Position (x)	± 0.05 m	-0.295 m	± 0.002 m
Position (y)	± 0.05 m	0.276 m	± 0.002 m
Position (z)	± 0.02 m	2.001 m	± 0.002 m
Pitch	± 0.05°	0.97°	± 0.06°
Roll	± 0.20°	0.25°	± 0.37°
Heading	± 0.10°	0.21°	± 0.06°
Rx array			
Position (x)	± 0.05 m	-1.114 m	± 0.002 m
Position (y)	± 0.05 m	-0.101 m	± 0.002 m
Position (z)	± 0.02 m	2.011 m	± 0.002 m
Pitch	± 0.20°	0.94°	± 0.37°
Roll	± 0.025°	0.30°	± 0.06°
Heading	± 0.10°	0.23°	± 0.06°
Motion Sensor			
Position (x)	± 0.05 m	0.000	-
Position (y)	± 0.05 m	0.000	-
Position (z)	± 0.10 m	0.000	-
Pitch	± 0.05°	0.0°	± 1.0°
Roll	± 0.025°	1.0°	± 1.0°
Heading	± 0.10°	359.6°	± 1.0°
GPS antennae			
Position 1 (x)	± 0.05 m	0.766 m	± 0.01 m
Position 1 (y)	± 0.05 m	-2.515 m	± 0.01 m
Position 1 - RTK (z)	± 0.02 m	-13.455 m	± 0.01 m
Position 2 (x)	± 0.05 m	0.755 m	± 0.01 m
Position 2 (y)	± 0.05 m	2.206 m	± 0.01 m
Position 2 - RTK (z)	± 0.02 m	-13.455 m	± 0.01 m
Water line			
Position (z)	± 0.02 m	4.297-WL m	± 0.01 m

Table 4: EM710 sebsor survey results, compared to Kongsberg Maritime installation specifications.

Ultimately, the gondola was cleaned and made free of paint and weld splatters, the frames were installed correctly and without twists, the transducers put in place and the final sensor survey was completed. The cabling was then run through the strut and into the ship, seals put in place and connections made to the transceiver unit in the multibeam room.

Despite the problems encountered, the vessel was launched and returned to IOS by the planned date. The EM710 was turned on and set to pinging without incident. The subsequent Science patrol went ahead a few days later than planned, but not due to any delays associated with the gondola/EM710 installation. Future installations might consider adopting an approach to sensor surveys as were done on CCGS *Matthew* for their EM710 [e.g. Cunningham, 2005].

Preliminary Results

CHS had 8 days of *Vector* ship time booked from April 3-11, 2009 for Kongsberg at-sea acceptance trials (SAT), harbour acceptance trials (HAT) and more rigorous proving of the new systems' capabilities. The installation engineer from Horten returned to the west coast of Canada for these trials, along with a new recruit to the Canadian office of Kongsberg Maritime who would observe and learn. In addition, John Hughes Clarke from the University of New Brunswick Ocean Mapping Group was contracted to conduct more in depth system testing.

CHS did not get possession of the *Vector* until noon on April 3. At that time loading and setting up of all the equipment commenced. By late afternoon, a ground fault had been identified and the EM710 had still not been put into operation. The Vector set sail the following morning with all systems working and a patch test was carried out.

Sea-Acceptance Trials

There are three requirements of Kongsberg Maritime for any new multibeam sonar installation before fully accepting the system as operational, and signing off the paperwork required to start the clock ticking on the three-year warranty period for the system:

- Setting to work (STW); √
- Harbour acceptance test (HAT) √ and
- Sea Acceptance Test (SAT) – had not been signed of as of April 9, 2009.

The first two tests can be conducted with the ship alongside the dock; the last test requires that the ship put to sea.

At a minimum, the SAT requires that the vessel steam three overlapping parallel lines, with one cross line, perform a statistical assessment of the overlapping and crossing data and prove that the system meets its own specifications and all the entered calibration parameters are correct. But there are many more things that can be learned about the complete system with more elaborate testing. And that's where John Hughes Clarke comes in.

The cruise plan for the *Vector* SAT, depending on weather conditions in British Columbia in April included the following EM710 assessments:

1. Bad-weather plan:
    a. Saanich Inlet – basic patch test to confirm calibration numbers; steaming to a flat area

with some sea-state in Juan de Fuca Strait, off Race Rocks to create a reference surface and conduct wobble analysis and TPU analysis in the presence of vessel motion, comparison to IHO specifications;

b. Boundary Passage sand-waves – repeating EM1002A surveys of the same area to see changes, but also to examine the benefits of improved spatial resolution for geoscience;

c. Hotham Sound, Howe Sound to look at how the system deals with steep rock slopes to the side simultaneously with relatively deep, soft seabed below the ship; comparisons with EM1002A data; change analysis; uncertainty estimates at greater depths;

d. Knight and Bute Inlets, time permitting, to compare improved resolution of seabed features against existing EM1002A data;

e. Savary Island surrounds – a new mapping project to first identify boulders on a flat sand seabed, conduct detailed target detection tests, then comparison to IHO specifications; and

f. Galiano ridge sponge reef imagery to determine what improvements in acoustic backscatter may contribute to sponge reef analysis.

g. Steaming over, or beside artificial dive sites (sunken vessels) *G.B. Church* and *HMCS McKenzie* to look at water column detection

2. Good-weather plan

a. Same as a above;

b. Some or all of b-g, time permitting; plus

c. Steam offshore to the shelf break in order to determine the extinction depth of the EM710, on the way collecting a long time series of real-time heave from the POS/MV version 4 motion sensor with delayed heave logged for later comparison and analysis; to confirm maximum swath width and sector coverage; to look at deep water (chirp, single-ping) target detection (bioherms and headscarps); and to look for evidence of Doppler heave artefacts in chirp pulses.

d. Logging water column data on LaPerouse Bank to determine the capabilities for fisheries science work (looking for schools of fish).

In addition, an examination of the contamination of the EM710 backscatter (in particular) from SBP interference if not properly synchronized was to be carried out. Fortunately, the SBP was successfully synchronized to the EM710 using the SonarWizSBP software.

Fortunately, good weather showed up in time to steam out to the shelf break. On Sunday April 5, 2009, the deep water capabilities of the EM710 were tested, as were the depth capabilities of the Science sonars. Unfortunately, no measurements from these sonars before they were moved were available at the time of writing, so a comparison has yet to be performed.

Sonar Performance

- 3.5kHz improved performance. Two of three potential improvements to this system were implemented prior to the SAT: upgrading the installation from an in-hull (with bubble wash down an issue) to an in-gondola installation; and upgrading from a 2x3 to a 3x3 array. A planned upgrade to a chirp pulse system (Knudsen) from the shorter narrow band pulses (ORE) was not implemented in time for the SAT.

- Max depth (2000). Depths of 2000 metres were observed off the shelf break, but the data was quite noisy after about 1800 metres. Useful upper limit during the SAT seemed to be about 1750 metres.

- Max swath width (2500). Swath widths exceeding 2 kilometres were observed during the SAT.

- Max swath angle (140). Angular coverage was set to ± 65° during the SAT.

- Max number of beams (800). Initially, dual ping was not working. Replacement boards were loaned from CHS East Coast (from the *Matthew* EM710 system) on April 6 and requested from Norway in addition. 380 beams were observed in single-ping mode.

- Resolution, target detection, better detail on sandwaves previously imaged, boulder fields in shallow water; bioherms in deep water/chirp mode/single ping. While the final report from John Hughes Clarke is not yet available, his conclusion is that the EM710 is producing far superior results to the EM1002.

- Science sonars. 12, 38 and 200kHz Science sonars were tested during the SAT. The 38kHz sonar performed well, achieving depths of 800 metres. There are problems with the firing rate of the 12kHz sonar that still need to be investigated.

- Sonar interference, requirements for synchronization. The 3.5kHz SBP was slaved to the EM710 using SonarWizSBP software. This ensured that the EM710 was not in receive mode while the SBP was transmitting. Interference from the SBP (unsynchronized) had been observed in EM1002 backscatter on the previous installation. In addition, the EA500 12kHz and the 38/200kHz Knudsen sonars were synchronized to the EM710 trigger. There are some possible improvements to

the SonarWizSBP software that will be passed on to the manufacturer (Chesapeake).

- Broad-band hydrophone with PicoScope digitizer. The signal levels are just right for the vessel noise dynamic range. This proved to be a tremendous diagnostic tool, identifying problems in the spectrum of both the 3.5kHz SBP and the EA500 12kHz sonars. Further investigation of why these sonars are not operating to their full capabilities is required. The ORE amplifier may not be operating properly.
- Evidence of Doppler heave effect in chirp mode? Awaiting JHC final report.

Other Sensor Performance

- Surface sound speed consistency – new sampling loop with inlet at transducer face. Evidence suggested that the surface sound speed sampling loop performance had been greatly improved by getting the intake away from the hull. Bubble interference in the previous installation frequently resulted in bogus surface sound speed readings, causing serious refraction artefacts if no action was taken to stop using the surface readings. In addition, the intake for the EM1002A installation was not at transducer depth, further exacerbating the problem. Having the EM710 and surface sound speed intake on the gondola at the same depth has resulted in proper beam steering, greatly reducing uncertainties due to refraction.
- UW cameras – bubble wash down, visibility and usefulness. Visibility in Saanich Inlet was quite poor due to suspended particulates (flocculent matter). In Juan de Fuca Strait, water clarity was better and the cameras were able to observe clouds of bubbles flowing along the hull above the gondola, which means the gondola is doing its job. The engineer aboard also liked having access to the cameras to observe the hull and strut. A strand of kelp was observed hanging from the strut during the SAT. This kelp had disappeared after docking at the CCG base, possibly due to going astern. A permanent mounting for this system will need to be established in the coming year.
- Any evidence of gondola flexure? Awaiting JHC final report.
- EML224 performance? Not tested.
- Timing delays, POS/MV problems with real-time heave? On the long lines out to the shelf break, evidence of real-time heave problems was observed. This was corrected by changing heave filter parameters and by applying the delayed heave (smoothed) solution.

Vessel Performance

- Top speed reduced? Anecdotally, there was no evidence of reduced top speed, in fact the captain opined that the top speed may actually have increased.
- Fuel consumption increased? Too soon to tell. It will probably require a full season of all types of science programs in order to determine if fuel consumption has changed.
- Minimum turn radius reduced? Still waiting on the verdict.
- Line keeping easier? Still waiting on the verdict.
- Roll and pitch damping (can this be measured?) Still waiting on the verdict.

Other Improvements

- Cooks cabin restored fully? Not quite, but it is more usable than with the EM1002 and ram installed. It is thought to be about 99% restored to its original state.
- Potable water tank mostly restored? While potable water supply aboard the *Vector* has not been fully restored to pre-2002 levels, the crew are grateful for the partial restoration of the tank towards its original size. This helps increase the endurance of the vessels which benefits all CCG and Science groups. The increase in dead weight also adds to vessel stability, as the location of the tank is below the water line.
- Reduced nuisance noise in crew accommodations from SBP? Nuisance noise may have in fact increased, although there were differing opinions on this. The location of the SBP transducers has changed and they are no longer in an oil-filled bath. The transducers are transmitting through the skin of the gondola, which transmits through the gondola strut to five hull ribs such that the noise permeates through both accommodations and work areas. It is now a 3x3 array, which potentially can output more power than the previously installed 2x3 array. In addition, because the SBP is now slaved to the EM710 in order to avoid acoustic interference, pulses are no longer uniformly spaced, making the noise source less easy to get accustomed to. Until Health Canada is able to conduct more noise testing, the best that can be said is that noise appears to be not significantly worse than before, if at all.

Summary

From the acquisition of the EM710 in late March 2008, to the SAT in April 2009 many people were involved, much consultation was carried out, lots of money was spent[2], the effort was great, but ultimately we have

[2] Initial system purchase $783K; getting the full system/gondola installed amounted to $472K, plus overtime, staff time in project management, administration, travel and at-sea acceptance trials tipped the balance in excess of $1.36M CAD

today several vastly improved sonars systems on board *Vector* for conducting better hydrography, geoscience and fisheries science. It is hoped that the many things we learned can be transferred to other installations and future inshore oceanographic science vessels in Canada and other countries.

Future Work

As of this writing, the second set of Health Canada nuisance noise tests had not been conducted, so there is no proof that the gondola installation (an engineering control) has reduced the nuisance noise in the crew accommodations. In addition, the *Vector* has not been configured to run the SBP using chirp pulses, which could add an additional nuisance noise component (frequency change, longer duration pulses).

With no multi-frequency sonar controller on board during the SAT, not all the science sonars could be tested to see if their performance had been improved or to see if there are any sonar interference issues that might require further sonar synchronization. No fisheries science has been conducted using these sonars as of this writing, so if the calibration has been improved with the tight triangular transducer configuration, this has yet to be proved. Eventually, perhaps at the next *Vector* drydock in 2011, these transducers will be replaced with split beam versions, making major improvements in the quality of fisheries science conducted from the *Vector*.

The EM1002A ram has not been installed in the *John P. Tully*, and it may be several years away. It is hoped, however, that putting the fisheries sonars on this ram, getting them below the bubble layer, will greatly improve their performance.

In order to take advantage of the new capabilities of the EM710, it will be important to integrate the acoustic seabed backscatter into our existing seabed classification processing stream.

Finally, it is important to take what we have learned from this installation and make plans for future inshore oceanographic research vessel systems – the *Vector's* eventual replacement.

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Rob Hare, P. Eng., C.L.S., is Manager of Data Acquisition and Technical Services for the Canadian Hydrographic Service in the Pacific Region of Canada. His responsibilities include managing the west coast seabed mapping program and a network of permanent water level and tsunami response gauges. A native of Victoria, British Columbia, he graduated magna cum laude in Surveying Technology from the British Columbia Institute of Technology in 1982 and soon after joined the CHS. In 1987, after working for 5 years as a field hydrographer, he obtained a Canada Lands Surveyors' commission. Late in 1987 he returned to school, graduating in 1991 with a BSc. Engineering in Geomatics from University of Calgary. He is a registered professional engineer in the province of B.C. He is Canada's representative on the IHO S-44 (Standards for Hydrographic Surveys) working group and has numerous publications on uncertainty estimation for hydrographic survey systems.

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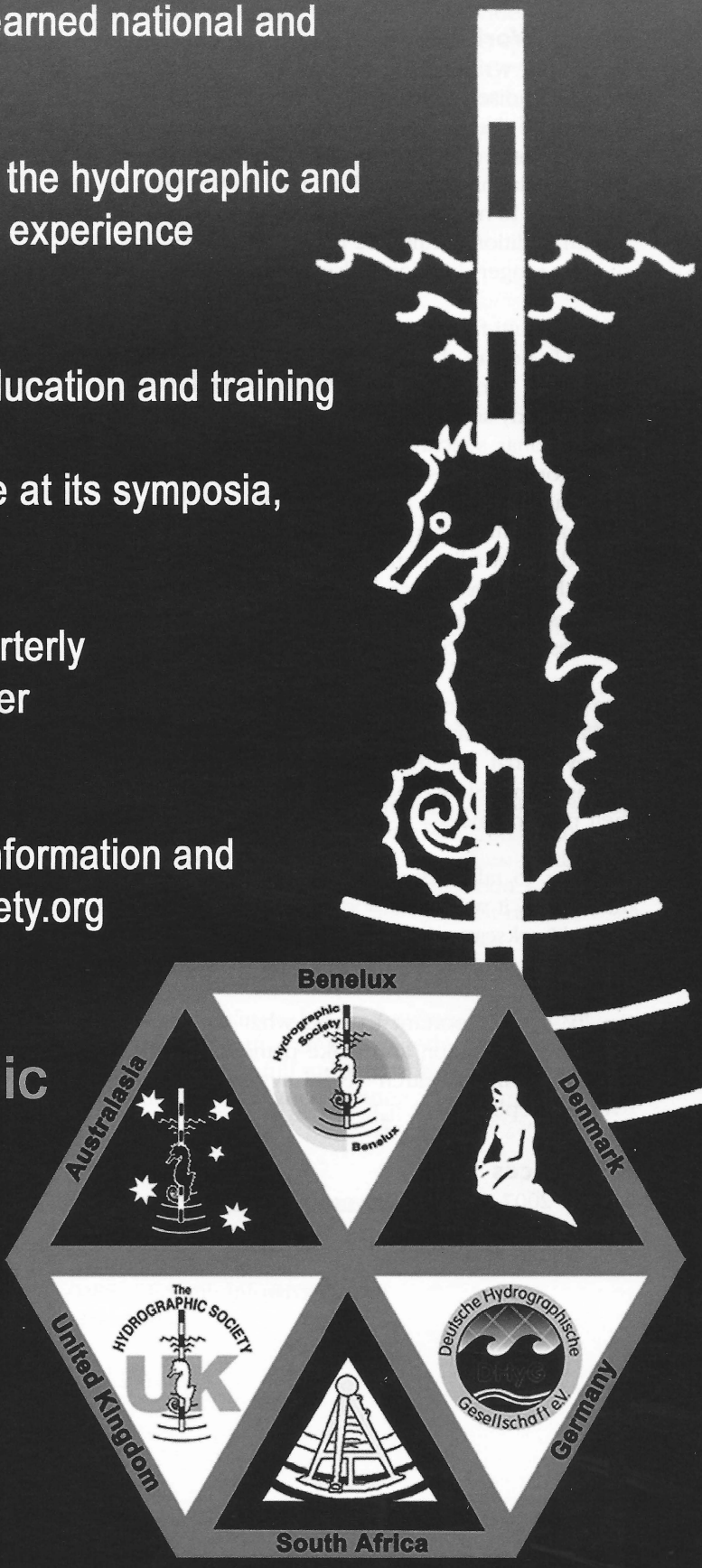

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The Grounding Of The Queen Elizabeth 2 - The Rest Of The Story

By: Nick Perugini, CAPT, NOAA (retired).

Captain Barry M. Lusk concludes his article that was published in the Fall/Winter edition of *Lighthouse* [Edition 73] entitled "The Grounding of the Queen Elizabeth 2" with an footnote that states:

" The case came before a judge in this New York court in September 1997. The court exonerated the U.S. Government of any culpability in regards to this grounding and the uncharted shoal. Do the facts support this decision? "

Captain Lusk's inference is that the United States judicial system arrived at the wrong decision regarding who was at fault for the *Queen Elizabeth II* (*QE 2*) grounding. In separate investigations, the U.S. National Transportation Board (NTSB) and a U.S. Coast Guard investigation also arrived at the wrong decision. If the only facts available to the court and the other investigative bodies were the ones that Captain Lusk presented in his article, perhaps the decisions of these three independent bodies would be more to his liking. Unfortunately, Captain Lusk offers a one dimensional narrative of the Q*E 2* grounding that is grossly incomplete. It also illustrates a new breed of lawsuits that look to blame the nautical chart for groundings—after the fact and regardless of the events that take place on the bridge of a ship. Mariners and hydrographers need to understand "the rest of the story" before arriving at their own conclusion about the grounding of the *QE 2*.

Grounding incidents involving nautical charts are extremely rare. However, when they do occur, the legal issue usually boils down to whether the hydrographic office was negligent by not conducting surveys or applying information to the chart in conformance with their stated standards. The counter argument involves whether the mariner's actions were the principal cause of the grounding. In the case of the *QE 2* grounding, there are arguments to be made on both sides. However, most reasonable people would agree that just because certain features on a nautical chart do not define the "true bottom" in the area of a grounding—that fact, in and of itself, does not exonerate all imprudent actions that might be made by a mariner on the bridge of a ship.

Even with today's full bottom coverage sonars, can hydrographers guarantee that their surveys represent the bottom with absolute accuracy? Should mariners have unconditional confidence in the information conveyed on any nautical chart? Most mariners understand that nautical charts may not be 100 percent accurate—thus the term "prudent mariner" comes into play. Generally, the deficiencies that mariners become aware of are the ones they can see—e.g. a buoy being off station, or a landmark that has been removed. It is rare that a mariner will find a depth discrepancy by grounding. There is a simple explanation for this—a prudent mariner will factor in a safety margin when using nautical charts. Prudent mariners have the wisdom to know that charted depths might not be 100 percent representative of the true bottom.

Captain Lusk's narrative that describes the charting history of the infamous 39-foot sounding is generally accurate. The Coast and Geodetic Survey vessel *Lydonia*, used a Dorsey non-recording echo sounder to conduct surveys in the area. Operation of this device involved an operator who monitored a flashing light on a circular meter. The operator recorded the instantaneous depth in a sounding volume at regular time intervals. There was no analog (paper) record that showed a continuous bottom profile as produced in later day echo sounders. Horizontal positioning was accomplished using three point sextant fixes.

The survey area was covered with basic 400-meter line spacing, and an isolated 39-foot sounding was recorded. Using the discretion it had from the Hydrographic Manual at the time, the *Lydonia's* hydrographers performed no further investigation on the 39-foot sounding. Office cartographic reports that evaluated the survey noted the need for further development on this feature, however, the Coast and Geodetic Survey and subsequently, the National Oceanic and Atmospheric Administration (NOAA), never assigned this follow up work. As Captain Lusk noted, surveys were subsequently conducted in the general vicinity of the 39-foot sounding, but the feature was never revisited after the 1939 survey.

After evaluating all of the survey and cartographic information in hindsight, Captain Lusk concludes that fault lies with the hydrographers of the *Lydonia* and the subsequent handling of the re-survey requirements by NOAA and its predecessors. However, before rendering judgment on the hydrographers of the *Lydonia*, or the U.S. Hydrographic Office, one must understand the context of the 1939 survey.

The area encompassing Rhode Island Sound, Vineyard Sound, and Buzzards Bay is one of the most geologically complex areas in the coastal waters of the U.S. The bottom is composed of glacial till—a mixture of rocks, boulders, pebbles, sand and clay. There are vast stretches of flat

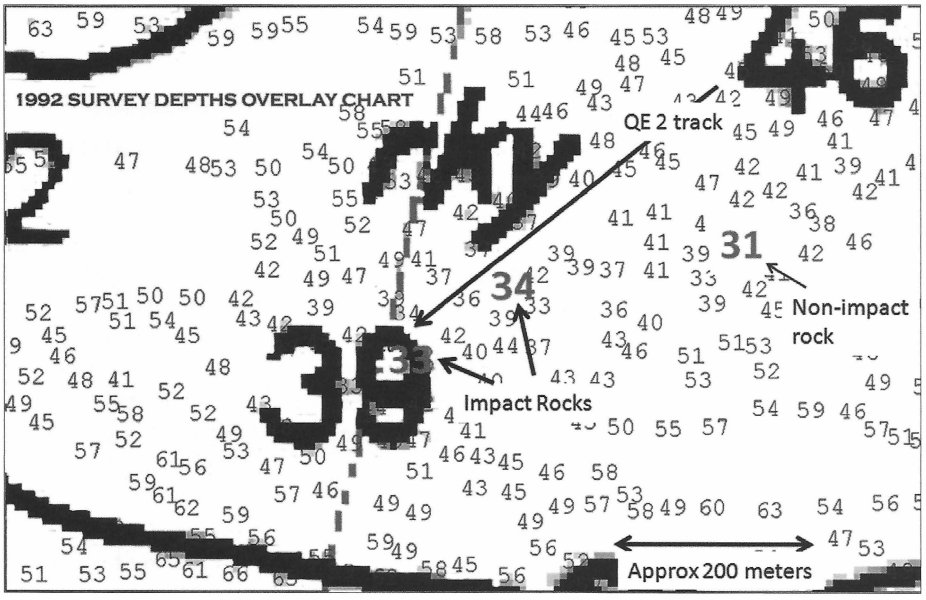


Figure 1: The smaller gray numbers are field depths in feet of the 1992 NOAA ship RUDE surveys. Depth information is overlaid on the NOAA chart covering the area.

Captain Lusk renders judgment on the *Lydonia's* hydrographers and suggests that they were negligent in not fully developing the area with their sextants and first generation echo sounders. In 1939, perhaps they and the Coast and Geodetic Survey had other priorities—like the start of World War II. When I examine the 1939 survey, I admit that as a hydrographic surveyor in 1992, I like to think that I would have further developed the 39-foot sounding. However, I hesitate to second guess the hydrographers of the *Lydonia*, given the relatively primitive tools they had to work with at the time. In fact, having surveyed in those boulder fields for over 4 years of my career, I was often amazed at how these 1939 hydrographers discovered

bottom that are littered with boulders that rise 20 feet or more off of the bottom. These boulders, called "erratics," were deposited by receding glaciers. Similarly, there are larger piles of rocks and boulders that rise in an irregular fashion off of the bottom. These are not classic ridge formations that have a wide regular foundation and build to an easily identifiable least depth. They are jagged, individual rocks and boulders that exhibit no regularity. There are boulders that may rise 20 feet off of the bottom, and have only a 20-foot wide base. If one surveyed an area with water depths of 40 feet with a narrow beam echo sounder, it would be quite possible to miss this type of feature, even with 10 meter line spacing.

As Commanding Officer of the NOAA Ship *RUDE* in 1992, I was directed to survey the site of the *QE 2* grounding. It is important to note that the *QE 2* had a static draft of 32' 4" at the time of the grounding. During the initial survey, the *RUDE* found the same bottom complexity described above. Using a narrow beam echo sounder, the ship ran line after line at 10 meter spacing over rocky bottoms. It took three days to ensonify a small area so that divers could finally identify the exact rocks where the *QE 2* grounded. The field least depths were in the neighborhood of 33 and 34 feet. Interestingly, the survey depth at the charted 39-foot depth was precisely 39 feet—so the charted depth was accurate. The 33-foot depths discovered within 200 meters of the charted 39-foot depth showed that the true bottom was not fully represented on the chart. A 31-foot depth not involved in the grounding was also discovered in the general vicinity. Figure 1 illustrates the 1992 survey depths discovered in the area after the grounding. Figure 2 shows the side scan sonar image of one of the rocks that the *QE 2* impacted.

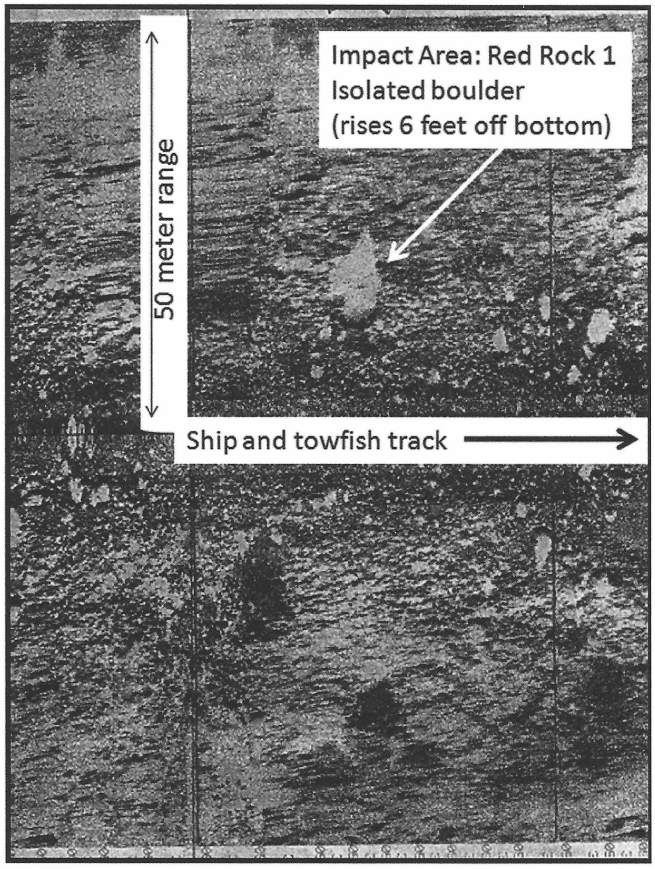


Figure 2: This is a side scan sonar record showing one of the solitaery boulders that the QE 2 impacted. The boulder was described by divers as rising approximately six feet off the bottom and had an 8-10 foot base. This kind of feature would have been extremely difficult to find with the echo sounder technology being used in the 1939 survey.

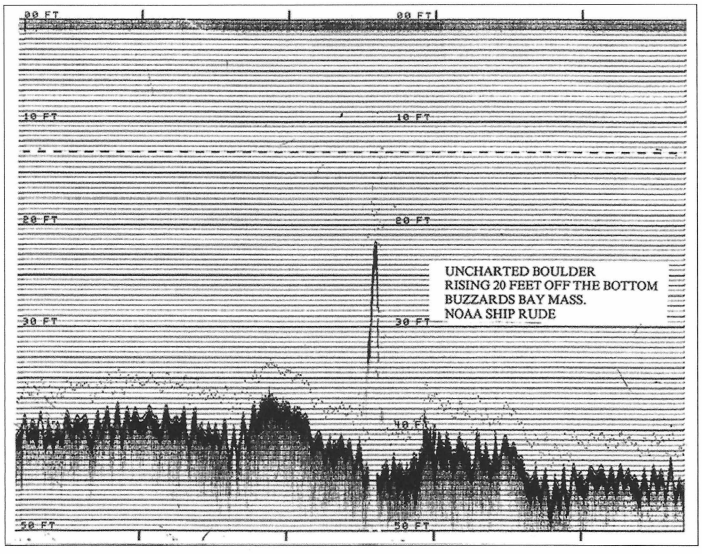


Figure 3: Uncharted boulder rising off the bottom.

Figure 4:This picture of the QE 2 hull after the grounding was taken while the QE 2 was in a Boston dry dock.

some of the isolated boulders that were accurately charted. On the other hand, there were dozens of instances where the *RUDE*, with its side scan sonar capabilities, found uncharted features not discovered by prior surveys. An example of such an uncharted feature is shown in Figure 3, an isolated boulder rising 20 feet off the bottom. Even with the *RUDE's* relative sophistication, I often wonder how many solitary boulders the ship missed with its side scan sonar, dual beam echo sounders, and sophisticated positioning systems in 1992.

So that is the hydrographic survey side of the *QE 2* story. Now, for the part of the story that Captain Lusk did not address in his article—what happened on the bridge of the *QE 2*.

The Rest of the Story

(The description of the events surrounding the QE 2 grounding were obtained from the NTSB report.)

It was the final evening of a 5-day pleasure cruise for the 1,824 passengers aboard the United Kingdom passenger vessel *QE 2*. Most of the passengers were ashore earlier in the day as the world's most famous ship anchored off the north shore of Martha's Vineyard. It was shortly before 10 p.m. on August 7, 1992, as the *QE 2* made its way out of Vineyard Sound at a speed of 25 knots, speeding up to meet its projected Saturday morning arrival time in New York City. Many of the passengers were enjoying their final dinner in the ship's luxurious dining room.

Suddenly the 963-foot ocean liner shook with unexpected vibration. Officers and crew on the bridge recalled two separate periods of shaking and rumblings. The master recollected that the bridge equipment rattled and shook as if it were in heavy seas. Many of the passengers felt a change in the ship's motion—some thought that a severe impact had occurred.

A short time later, an individual who identified himself as the Officer of the Bridge, announced over the public address system, "Ladies and Gentlemen, we seemed to have struck an unidentified underwater object. There is no apparent damage to the vessel and no cause for concern; the ship is perfectly safe."

Unfortunately, there was significant damage to the bottom of the *QE 2*. Four of the 36 double bottom tanks that had been empty were now filled with water and open to the sea. The U.S. Coast Guard was notified and the ship was ordered to anchor in Rhode Island Sound, some 20 miles southeast of Newport, Rhode Island. Over the next two days and nights, passengers were ferried ashore to Newport. Under Coast Guard escort, the *QE 2* then transited to Boston and arrived on August 10, where it was docked for survey and temporary repairs. Figure 4 are pictures taken in the shipyard that show the damaged hull.

From Anchorage to Grounding

At 21:24, after weighing anchor and maneuvering to the west and then to the south rounding the northern shore of Martha's Vineyard, the *QE 2* increased speed to approximately 25 knots. Figure 5 shows the approximate outbound track of the QE 2. The ship was generally following its inbound reciprocal course, heading approximately west southwest (235° True). At 21:44, about two thirds of the way out of Vineyard Sound, the *QE 2* passed the "NA" buoy to starboard. With the buoy abeam, the pilot altered course to the right about 15° and was now steering a course of 250°. The pilot later testified that he intended to maintain that course until he was approximately 2 miles south of the southwestern end of Cuttyhunk Island, and then steer 270° to where he would disembark. The pilot had not told the master or the watch officer of his course change, nor of his intent

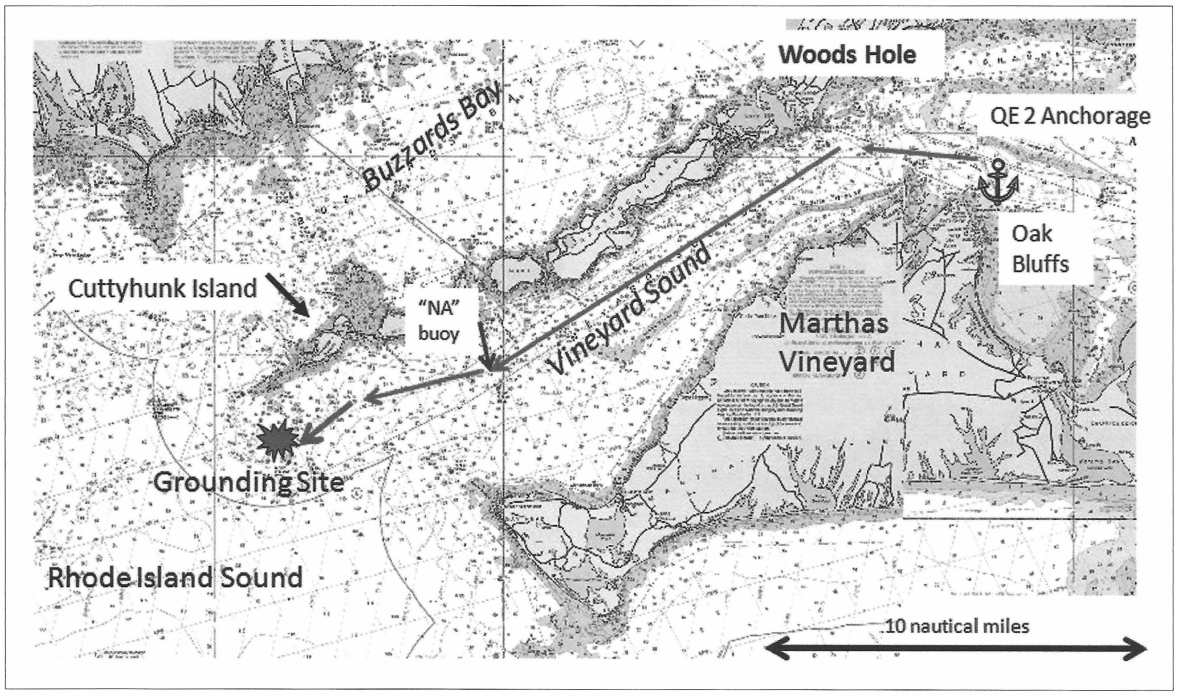


Figure 5: This is the approximate outbound track of the QE 2 after it weighed anchor off Oak Bluffs, Martha's Vineyard, until the grounding south of Cuttyhunk Island.

to alter course to 270° when the southwestern point of Cuttyhunk Island was bearing north. Figure 6 illustrates the misunderstanding between the pilot and the captain regarding the outbound course.

The *QE 2*'s second officer plotted the new course on the ship's nautical chart and saw that the new trackline did not coincide with the original course as laid out by the ship's navigator. The second officer noted that the

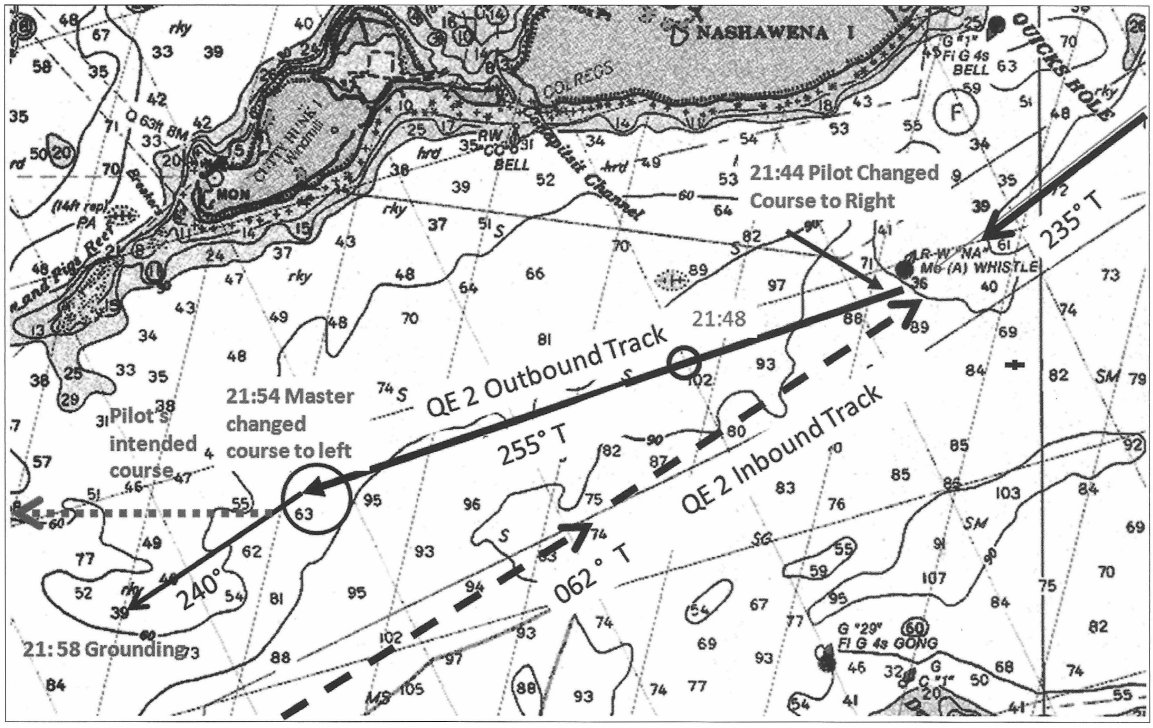


Figure 6: These are the inbound and outbound tracks of the QE 2. Note the ship passed close abeam "NA" buoy, with charted depths of 36 and 40 feet. Note that depths to the south of the outbound track would have positioned the ship in 60 to 90 feet of water, clearly out of harm's way.

projected ship's trackline crossed over a 34-foot rocky shoal area approximately 7 ½ miles down range in Rhode Island Sound north of shoal called Brown's Ledge. At a speed of nearly 25 knots, the *QE 2* would pass over the shoal area in about 18 minutes. Not knowing that the pilot intended to alter course before reaching the shoal, the second officer immediately notified the first officer, who in turn informed the master. After being made aware of the discrepancy between the original trackline and the current trackline, the master ordered the first officer to inform the pilot that he would rather pass further to the south—back toward the original trackline. At about 21:54, the pilot complied with the master's request and turned the ship left about 10°, to a more southerly course of 240°. Four minutes later at 21:58, the *QE 2* shook violently with vibration. Once the *QE 2* master and bridge officers determined that the ship had run aground, they examined the nautical chart and calculated the position of the accident. The ship had run aground near a charted depth of 39 feet. A bottom characteristic symbol labeled "rky", indicating a rocky bottom, was in close proximity to the charted 39-foot depth.

How could the ship run aground in an area that was 39 feet deep? The *QE 2*'s draft was only 32'4". In addition, an extra 1.5' of tide over the chart's water level datum should have provided a water depth of 40.5'— an under keel clearance of over 8 feet. The math didn't add up, so NTSB investigators had to unravel the mystery.

Most mariners are aware that when a vessel moves through shallow water, it experiences a complex hydrodynamic phenomenon known as squat. Squat is the combination of (a) sinkage of the hull and (b) a change in elevation of the bow with respect to the stern, known as trim. As a vessel's speed increases, the water level around the hull is lowered; consequently, the vessel sinks deeper with the lowered water level, reducing its under keel clearance. The vessel's draft remains the same; however, the water level surrounding the ship is lowered. The combination of sinkage and trim considerably increases the risk of a ship touching the bottom of a shallow waterway, particularly when a ship moves at high speeds. Squat is a complex phenomenon, unique to a vessel's hull form. It is difficult to predict by using simple mathematical formulas.

The *QE 2* master and the state pilot were generally aware of the squat phenomenon experienced by vessels in shallow water. Both testified that they thought the squat of the *QE 2* was 1 1/2 to 2 feet while leaving Vineyard Sound. However, there seemed to be no sound empirical or theoretical basis for their estimates. The NTSB commissioned a study by the U.S. Navy's David Taylor Research Center to compute theoretical values for *QE 2* squat, under similar speed and water depth conditions. The study concluded that the *QE 2* could have experienced up to 8 feet of squat under the conditions of the grounding.

Who Was at Fault?

Who or what was to blame for the *QE 2* grounding? Was it the master, the pilot, or both for not communicating properly? Was it the mysterious squat phenomenon? Or was NOAA's inaccurate nautical chart to blame?

The grounding may have been one of the unluckiest events in the history of navigation. If the ship had followed the pilot's intended track, it likely would have passed safely north of the rocky grounding site. If the *QE 2* followed its inbound track, as the master presumed it would, the ship would have passed safely south of the grounding site. The master's apprehension with the track being followed by the pilot and its projected intersection of a down track shoal, prompted him to recommend a course change to the south. If this course change had been executed a minute or two earlier or later, the grounding would probably have never occurred.

Independent of the later court case, the U.S. NTSB examined the accident and concluded the following:

1) The grounding would not have occurred if a master/pilot conference had been held, which would have made the master aware of the pilot's intentions, and if an agreement on an appropriate route to the pilot's disembarkation point had been reached.

2) If the master and pilot had discussed and determined the location of a new trackline before the pilot altered course to pass south of Brown's Ledge, they would have been alerted to the trackline's proximity to the 39-foot area and probably avoided the shoal.

3) The speed of 25 knots selected by the master and agreed to by the pilot left inadequate room for a margin of error.

4) The use of effective bridge resource management techniques by officers in charge of navigation watches increases the safety of navigation.

5) Adequate squat information was not available to the crew.

The NTSB findings highlighted the master/pilot miscommunication and the fact that there was never an intention for the *QE 2* to pass over the 39-foot charted depth. Therefore, even though depths of 32 feet were found in the area by modern surveys, the NTSB largely exonerated NOAA's charting program.

NOAA is one of the few government charting organizations in the world that can be sued for information presented on its nautical charts. The owners of the *QE 2* sued the United States in U.S. District Court in New York in 1994 (Cunard Lines Limited v. United States), alleging that the incident was caused by negligence on the part of

NOAA and/or its predecessors, in conducting improper hydrographic surveys of the area. Specifically, it was alleged that NOAA's last survey of the area (performed in 1939) was negligent because the 39-foot sounding had not been developed further, which, it was alleged, would have uncovered the shoaler soundings nearby. NOAA countered that it had discretion as to which soundings it would develop, and there was no reason to develop the 39-foot sounding further because it was outside the normal shipping lanes, and in 1939, large vessels such as the *QE 2* never traveled these waters.

The case went to trial in 1997 and the judge ruled in favor of the United States, dismissing the complaint.

There are several factors that worked against a favorable outcome for the *QE 2*. First, the ship almost ran aground elsewhere on its outbound transit. Echo sounding records from the ship (Figure 7) demonstrate that the *QE 2* nearly grounded six miles northeast of the 39-foot charted depth. While abeam the "NA" buoy, the ship navigated over charted depths of 36 and 40 feet, passing dangerously close to the irregular bottom. From a 'prudent mariner' "perspective, it is extremely difficult to justify that the *QE 2* traveling at 25 knots, passed that close to the bottom. Some mariners might argue that deep draft ships pass within a few feet of the bottom routinely when transiting in and out of ports through dredged channels. However, there are two major differences with the *QE 2* situation. First, the *QE 2* was the deepest draft vessel to transit the waters of Vineyard Sound. It may be acceptable to travel within a few feet of the bottom in a dredged channel where vessels of similar draft routinely make the same transit. However, when navigating the deepest draft ship to transit an area over a notorious rocky bottom, it would seem that a higher degree of caution might be in order. Second, the *QE 2* had no quantitative information of its squat profile. Therefore, intentionally traveling over charted depths of 36 to 40 feet near the "NA'" buoy at a speed of 25 knots was arguably reckless.

Another consideration was the fact that the *QE 2* navigator, when laying out the trackline, hachured the 39- foot charted depth as an area to be avoided (Figure 8). The misunderstanding between the pilot and master was the only reason that the ship tracked over the grounding area. There is no evidence that the master or pilot thought that it was acceptable before the accident to travel over the 39-foot charted depth. It was only after the grounding occurred that all parties focused on the charting questions, which conveniently diverted attention from the bridge communication issue.

Finally, the *QE 2* could have avoided the entire area by following a near-parallel outbound trackline only 0.5 miles to the east. Depths in this area would have kept the ship in 60 to 90 feet of water—clearly out of harm's way-- for most of its passage through Vineyard Sound. The *QE 2* followed this deep water track on its inbound voyage.

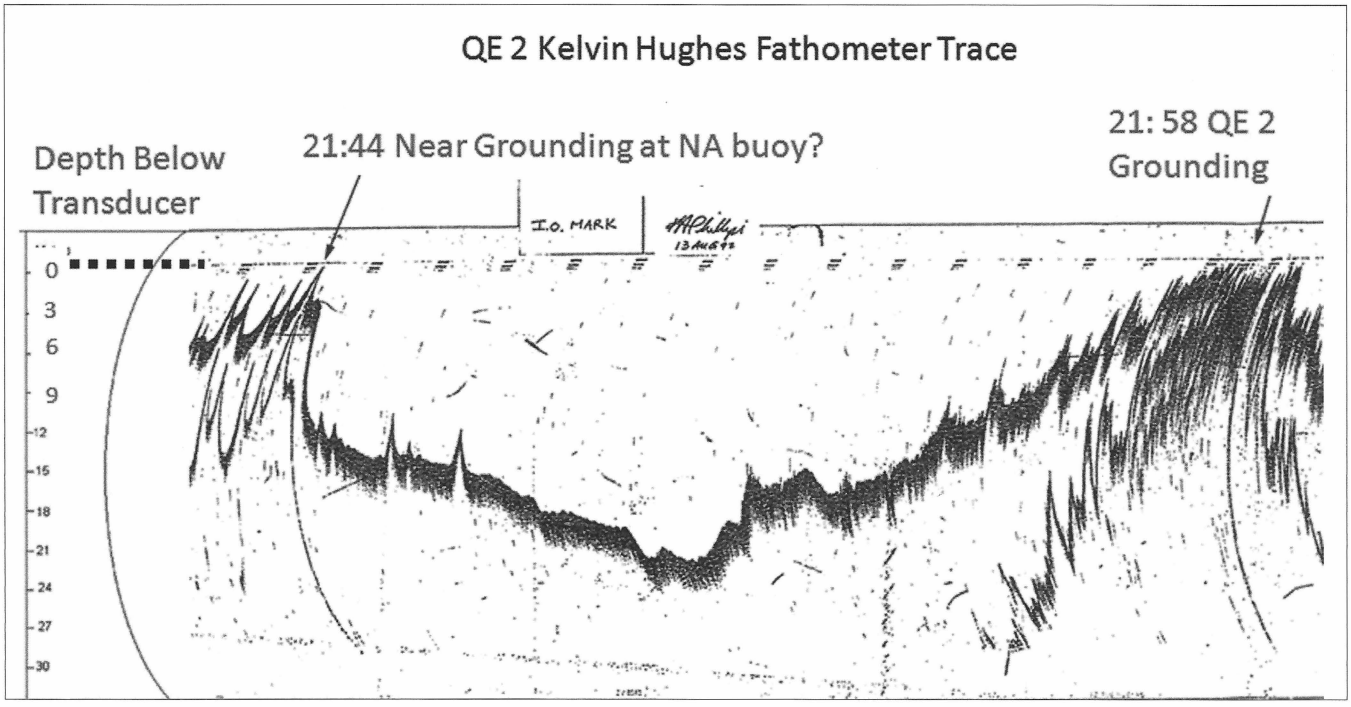


Figure 7: This is the fathometer trace from the QE 2. Notice that the ship almost ran aground abeam buoy "NA" where depths of 36 and 40 are charted. Was it prudent to navigate the ship at 25 knots over this area?

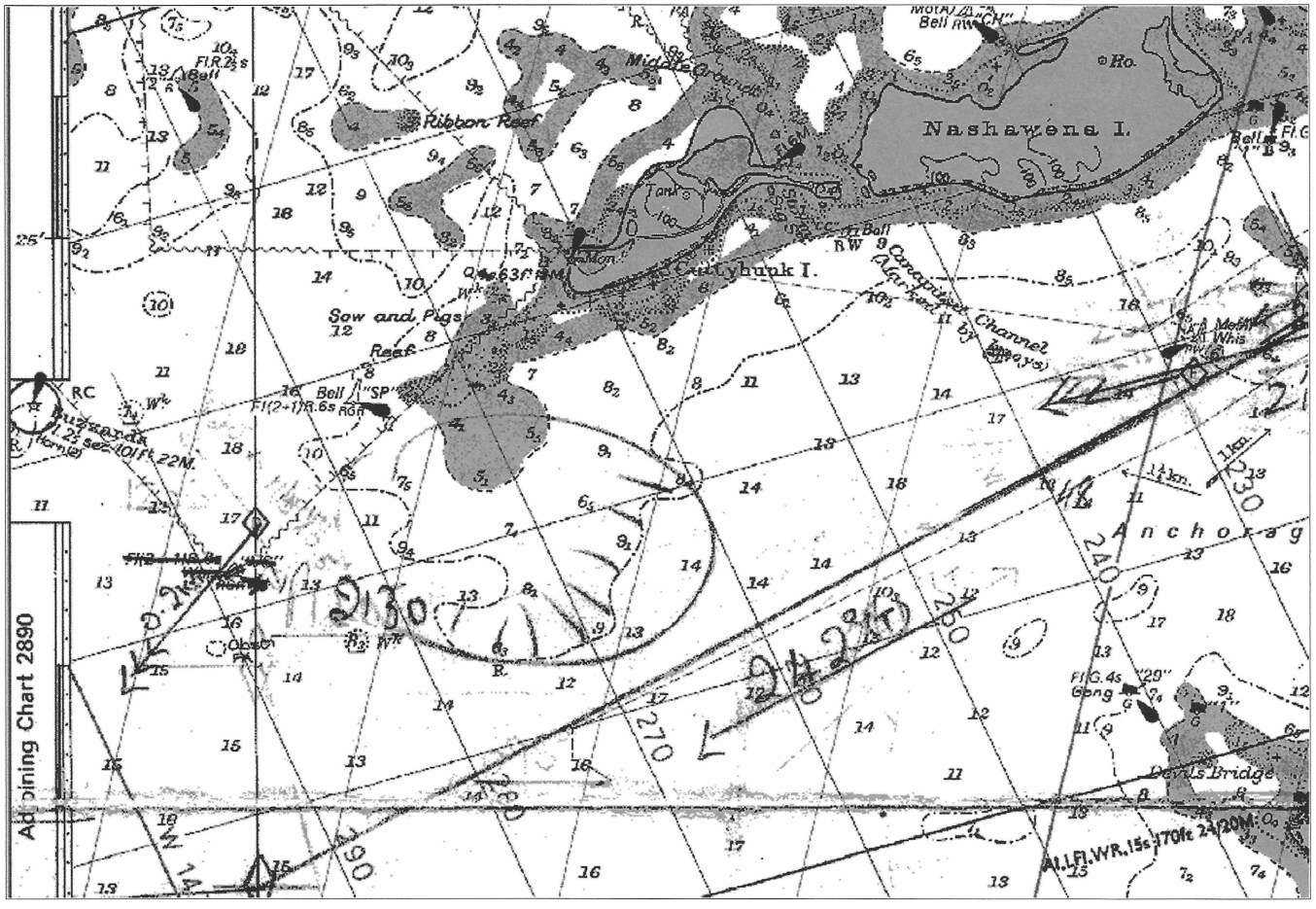


Figure 8: This figure shows the British Admiralty Chart used by the QE 2 on the bridge. DEpths are in fathoms versus feet which are shown on the comparable U.S. Chart. Notice that the10 fathom contour, contaiing the 6 fathom 3 foot (39 foot) depth, is hathured as an area to be avoided.

Conclusion

If you accept Captain Lusk's conclusion that the U.S. Hydrographic Office (i.e. NOAA and its predecessors) was primarily responsible for the grounding of the *QE 2*, you:

1) are aware that the *QE 2* may be the deepest draft vessel to ever navigate through Vineyard Sound.

2) Think that it is prudent to navigate a 963-foot ship that has a draft of 32' 4", traveling at 25 knots, to pass over charted depths of 36 and 39 feet, with charted bottom characteristics of "rky". It is acceptable to navigate over these depths inadvertently, even though your navigator hachured this area on the chart as an area to be avoided.

3) think that it is prudent to navigate this vessel at 25 knots, in shallow water, with a theoretical squat of up to 8 feet.

After reviewing all the facts, the U.S. Coast Guard, the NTSB, and the New York State District Court, all arrived at a different conclusion than that of Captain Lusk—the primary cause for the grounding was the miscommunication between the pilot and master. A U.S. government conspiracy? No, just common sense.

About the Author

Nick Perugini was a NOAA Corps Officer and a hydrographer for 26 years before retiring in 2003. During his career, he was a hydrographer aboard three NOAA survey vessels, including command of the NOAA Ship *RUDE*. He also served as chief of NOAA's Marine Chart Division. Captain Perugini is currently employed by Enterprise Information Solutions based in Columbia Maryland, and performs independent consulting work for NOAA's Office of Coast Survey.

Friends of Hydrography

A Canadian Volunteer Group

We invite you to the Friends of Hydrography Web Site 'http://www.canfoh.org'

The Friends of Hydrography are a small group of both retired and current Canadian Hydrographic Service (CHS) employees who believe there is a need to record and preserve the historical highlights of Canadian hydrography.

Please browse the many pages of the site to get a sense of the history of Canadian hydrography and the Canadian Hydrographic Service (CHS). If you ever worked with the CHS, or had friends who did, search the site for their names. If you don't find the name please contact us. Also, if you have photographs of ships or launches, used at any time by the CHS we would be grateful if you would share them with us.

The site is the primary distribution vehicle for Friends of Hydrography and is a work in progress. The site has grown nicely since its inception in 1998 and new information is added on an opportunity basis.

Please feel free to contact us at (CANFOH@cogeco.ca) We would be delighted to hear from you. Your questions, comments, corrections and/or contributions to the site are welcomed.

Supported by and in collaboration with the Canadian Hydrographic Association and the Canadian Hydrographic Service

Conférence hydrographique du Canada 2010 / Canadian Hydrographic Conference 2010

Conférence hydrographique du Canada 2010 à Québec, un rendez-vous à ne pas manquer.

La Conférence hydrographique du Canada 2010 se tiendra à Québec du 21 au 23 juin 2010 au Centre des congrès de Québec. La ville de Québec saura certainement plaire aux visiteurs de partout par son charme historique riche de ses racines indiennes, françaises et anglaises. Québec est un mélange de tradition et de modernité. Le Centre des congrès dispose d'installations modernes pour accueillir conférenciers, exposants, congressistes et visiteurs. Les hôtels Delta et Hilton y sont directement reliés et seront les hôtels officiels de la CHC2010.

L'Association canadienne d'hydrographie et le Service hydrographique du Canada sont associés dans l'organisation de cette prochaine conférence qui alterne aux deux ans avec les États-Unis d'Amérique (U.S. Hydro) organisée par The Hydrographic Society of America. Sous la thématique de *l'hydrographie : une science, des technologies et des gens dédiés au service du monde maritime* notamment la navigation maritime évoluée, la CHC2010 permettra de rassembler la communauté hydrographique internationale afin d'échanger sur les dernières nouveautés et aussi de rencontrer les diverses clientèles présentes.

Les installations du port permettront d'organiser des démonstrations à bord de vedettes pour les manufacturiers intéressés. Plusieurs sous-thèmes seront exploités au cours des différentes sessions qui seront entrecoupés de pauses permettant de rencontrer les exposants sur place.

Des activités sociales viendront compléter le programme afin de faciliter les rencontres des participants et aussi pour profiter de la joie de vivre renommée de Québec. Fait à noter le 24 juin est un congé férié au Québec, Jour de la Fête nationale. Ce sera une occasion de plus de prolonger votre séjour à Québec pour voir spectacles et festivités.

Le site web de la conférence hydrographique du Canada, www.chc2010.ca, fournira tous les détails concernant l'inscription, la soumission des résumés, la réservation de kiosque pour les exposants et le programme préliminaire.

Prévoyez donc fêtez la prochaine Journée mondiale de l'hydrographie à Québec en 2010.

Robert Dorais
Président de la conférence

Voir l'affiche de la conférence à la page 40.

Canadian Hydrographic Conference 2010, don't miss this « Rendez-vous »

The Canadian Hydrographic Conference 2010 will be held on June 21-23 2010 in the City of Quebec at the Quebec Convention Center. Visitors to the City of Quebec will certainly be pleased with its historical charm rich with Indian, French and English roots. Quebec City is a "mélange" of tradition and modernity. The convention center offers ultra modern facilities to welcome speakers, exhibiters, participants and visitors. The official hotels for CHC2010 are the Delta and the Hilton and they are located adjacent to the convention.

The Canadian Hydrographic Association and the Canadian Hydrographic Service are jointly hosting the coming hydrographic conference that alternate annually with the U.S. Hydro Conference organized by The Hydrographic Society Of America. Following the theme *Hydrography: science, technologies and people dedicated to serving the marine world*, especially e-navigation, CHC2010 will allow the international hydrographic community to exchange their latest ideas and discoveries and also to meet diverse clientele.

Interested manufacturers will find the port installations perfect for organizing live demonstrations aboard survey platforms. Many sub-themes will be developed in the different sessions, and break times will be structured to allow the participants to carry on the discussion in the exhibit areas.

Social activities will complete the program, both to facilitate meetings and exchange among participants and also to experience Quebec's Joie de Vivre. Please note that June 24th is Quebec National Holiday. On this occasion, you're welcome to extend your stay and enjoy shows and festivities.

The Canadian Hydrographic Conference website, www.chc2010.ca, will provide all the details regarding registration, abstract submissions, exhibitor booths reservation and the preliminary program.

Let's get together in Quebec City to enjoy World Hydrography Day 2010!

Robert Dorais
Conference Chair

See conference poster on page 40.

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

(Established. 1992 / Établie en 1992)

Deserving Student $2,000 / 2000$ Pour un étudiant méritant

Application Criteria

1. The applicant must be a full time student in an accredited survey science program (the program must have a Hydrographic Survey or a Geographic Information Systems, Cartographic or Land Survey component) in a university or technological college anywhere in Canada. Environmental studies only will not be eligible. The Manager of this award will determine the eligibility of the program for the award.

2. The award will be available to undergraduate students in a degree or diploma program that conforms to the basic subject topic. The applicant will be required to submit a transcript of his/her most recent post secondary 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 Canadian Hydrographic Association 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. Only the winner will be notified.

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 an 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 or preferably down loaded from the official CHA web site at *www.hydrography.ca* and sent to:

Critères d'admissibilité:

1. Le candidat ou la candidate doit être un étudiant ou une étudiante inscrit à plein temps à un programme reconnu en sciences géodésiques (ce programme doit inclure les levés hydrographiques ou un contenu des systèmes d'informations géographiques, de cartographie ou des levés terrestres) par une université ou un collège situé au Canada. Un programme en environnement seulement ne sera pas éligible. L'administrateur de cette bourse déterminera l'admissibilité du programme pour la bourse d'études.

2. La bourse s'adresse aux étudiants et étudiantes inscrits dans un programme menant à un diplôme collégial ou de premier cycle universitaire conforme aux disciplines de base. Le candidat doit soumettre une copie de son dernier relevé de notes post-secondaire avec sa demande. Les notes doivent être au-dessus de la moyenne de sa classe et être obligatoirement supérieures à 70 %.

3. La bourse sera remise au candidat ou à la candidate qui, de bonne foi, peut démontrer ses besoins financiers et qui respecte les exigences académiques mentionnées ci-haut.

4. Le candidat ou à la candidate devra écrire un court texte clair et concis, 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'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 par année civile. Il n'y aura que le gagnant qui sera avisé.

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

8. Le candidat ou la candidate 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 ne peut recevoir la bourse qu'une seule fois.

10. Une lettre d'appréciation du récipiendaire sera publiée dans l'édition suivante de notre revue professionnelle « Lighthouse ».

11. La demande devra être faite en se servant du formulaire prescrit ou préférablement téléchargée à partir du site internet officiel de l'ACH « www.hydrography.ca » et envoyée à :

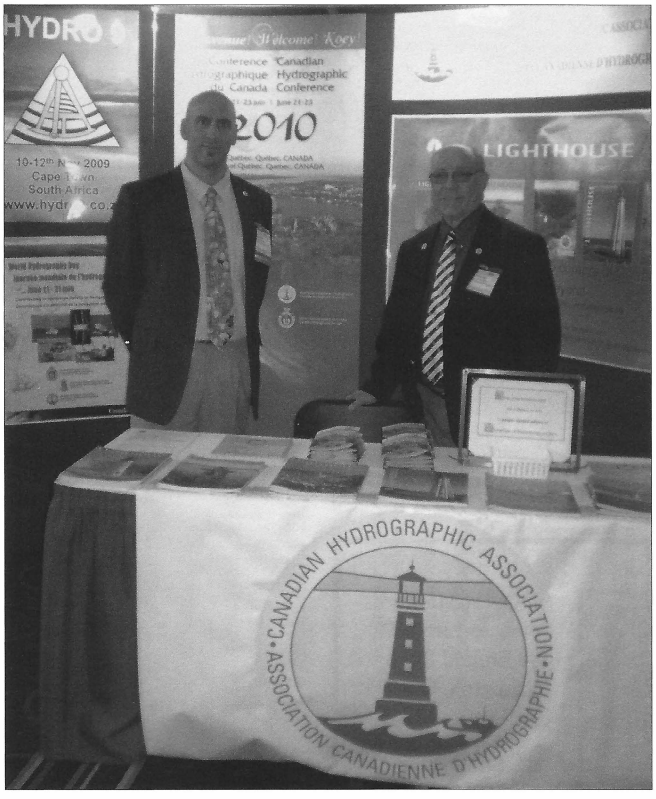
Manager / Administrateur
Canadian Hydrographic Association Award Program / Bourse de l'Association canadienne d'hydrographie
867 Lakeshore Rd, Burlington, ON L7R 4A6
FAX / Télécopieur: (905) 336-8916 *www.hydrography.ca*

United States Hydro 2009 Conference Report

By: Roger Cameron, CHA Central Branch V-P

The United States Hydro Conference (USHC) 2009 , sponsored by The Hydrographic Society of America (THSOA), was held at the Sheraton Waterside Hotel in Norfolk, Virginia on May 11-14. The conference is a continuation of the series of hydrographic conferences that alternate between the United States and Canada. This was the12th Biennial USHC. The next conference, the Canadian Hydrographic Conference (CHC 2010), will occur in Quebec City from June 21-23 and will be co-hosted by the Canadian Hydrographic Service (CHS) and the Canadian Hydrographic Association (CHA).

Conference Chair Andy Armstrong of THSOA opened the conference and was followed by a panel of distinguished individuals including Dr. Savithri Narayanan, Dominion Hydrographer and Director General of the CHS. The keynote address was presented by John H. Dunnigan, Assistant Administrator for the National Ocean Service (NOAA).



(left)Robert Dorais, Client Liason Officier of CHS Québec and chair of CHC2010 and George McFarlane, CHA National President at the CHA booth.

Seven CHS employees from across the country attended the conference including Robert Dorais Client Liason Officer of CHS Quebec and the chair of CHC 2010. Robert was there to promote CHC 2010 and brought a large poster to advertise the upcoming conference. The poster

(left)Jack Wallace, Executive Director of THSOA; Roger Cameron, CHA Central Branch V-P; Georger McFarlane, CHA National President; and Fred Oliff, Past CHA Central Branch V-P.

was displayed prominently in the CHA booth adjacent to Registration.

Many companies and organizations associated with hydrography exhibited at the conference, including NOAA, the US Navy and the US Army Corps of Engineers. Industry representatives included instrument manufacturers, survey companies and software developers. Academia was represented by the University of New Hampshire and the University of Southern Mississippi; both of which are centers of research and expertise in hydrography.

Three Hydrographic Societies were also in attendance: THSOA, CHA, and the Hydrographic Society of South Africa.

Workshops ran from Monday May 11 to Thursday May 14, commencing prior to the official start of the conference on Tuesday.

(left)Roger Cameron, CHA Central Branch V-P and Fred Oliff, Past CHA Central Branch V-P in front of the CHA booth.

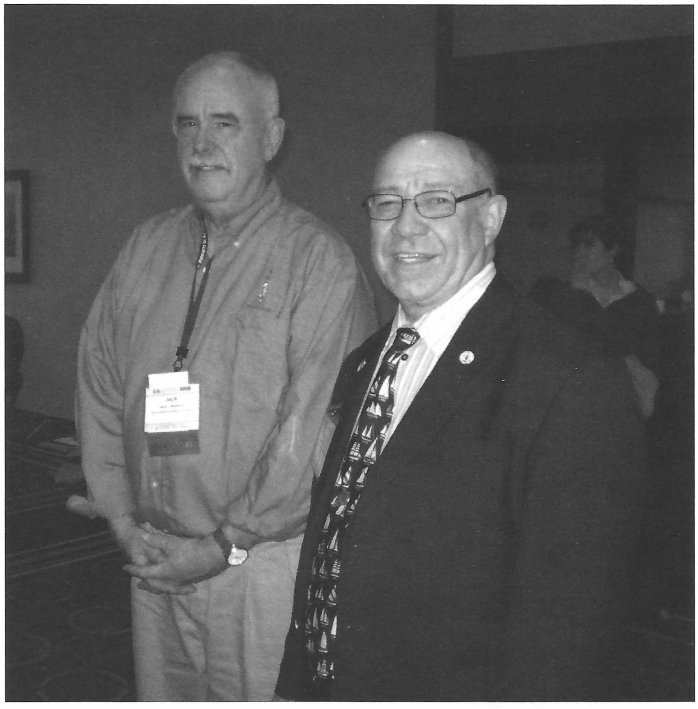
The Technical Papers were grouped into three themes, one for each day of the conference. Day One "New ways of Thinking", Day Two "Challenges to Improvement" Day Three "Growth Areas". Days one and two also had Poster Sessions.

Two survey vessels were available for on-the-water demonstrations of survey equipment.

A record nineteen students attended this year's conference as part of THSOA's student outreach program. All conference fees, travel, accommodation and meals were paid through corporate sponsorship and THSOA support. They were all grateful for the opportunity and many are now considering a career in hydrography. The students were all from geomatics programs across the US, including Alaska.

The conference concluded on Thursday afternoon with a wrap-up by Andy Armstrong followed by an expression of thanks from the student attendees. Aubrey Price of The Hydrographic Society of South Africa extended and Invite to Hydro 9, the International Federation of Hydrographie Societies conference to be held in Cape Town South Africa November 10-12.

CHC 2010 Chair Robert Dorais closed off the conference with a promotional video of Quebec and invited the audience to attend next year's conference in Quebec City.



(left)Jack Wallace, Executive Director of THSOA; and Georger McFarlane, CHA National President.

World Hydrography Day 2009

By: Roger Cameron, CHA Central Branch V-P

CHA Central Branch World Hydrography Day display at the Marine Discovery Centre in Hamilton, ON.

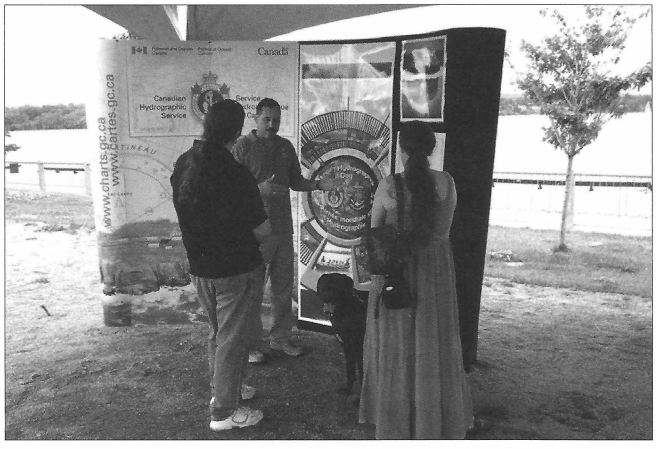
CENTRAL BRANCH

Central Branch commemorated the fourth World Hydrography Day with a joint exhibit with the Canadian Hydrographic Service at the Marine Discovery Centre in Hamilton, Ontario on Sunday, June 21st. The Marine Discovery Centre is located on the shores of Hamilton Harbour and provided a backdrop for the exhibit.

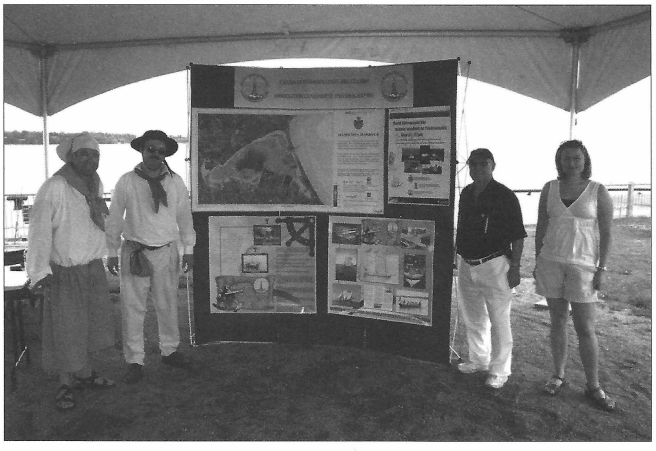
CHA Members Christine Delbridge (Secretary), Fred Oliff , Jeff Walker, Roger Cameron (V.P.), Brian Power, Heimo Duller, Brad Tinney and Jason Power staffed the exhibit. Canadian Hydrographic Service Client Liaison and Marketing Officer John Mercuri attended as a representative of the CHS and brought a nautical themed cake decorated with the crests of the CHS and the CHA topped with a model of a survey launch. CHA National President George McFarlane also spent some time at the exhibit.

The exhibit featured two displays under a canopy, each representing CHA and CHS, along with *Surveyor*, a replica of a c.1790 British Admiralty Launch which was fully rigged for sail. Fred Oliff, Jeff Walker, Brian Power, Jason Power, Heimo Duller, Brad Tinney dressed in period costume adding a sense of history to the occasion.

On display were posters featuring World Hydrography Day with Crests of the CHS, IHO and CHA. Featured



Roger Cameron (CB Vice-President) talking with visitors at the CHA World Hydrography Day display.



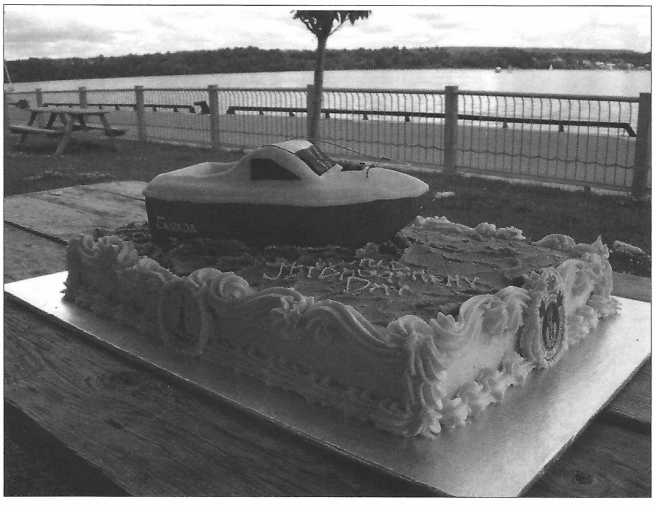
(left)Fred Oliff (Past CB V.P.), Jeff Walker (CHA Executive), George McFarlane (CHA President), Christine Delbridge (CB Secretary).

prominently in the display was the Hamilton Harbour poster produced by the Canadian Hydrographic Service featuring multibeam imagery of the harbour. It was popular with the public and attracted many people into the exhibit. Also on display was the *Surveyor* poster, Friends of Hydrography poster, copies of *Lighthouse*, membership applications and various CHA materials.

The exhibit ran from 10:00 a.m. to 4:00 p.m. Special thanks to Parks Canada, operators of the Marine Discovery Centre for permitting us to stage the exhibit at their facility.

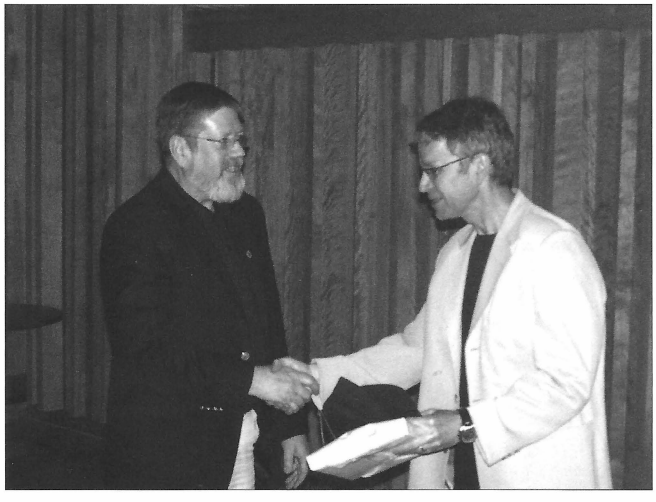
Thanks to all who contributed in making this fourth World Hydrography Day a memorable one.

Surveyor crew (left) Fred Oliff, Jason Power, Brian Power, Jeff Walker, Brad Tinney.



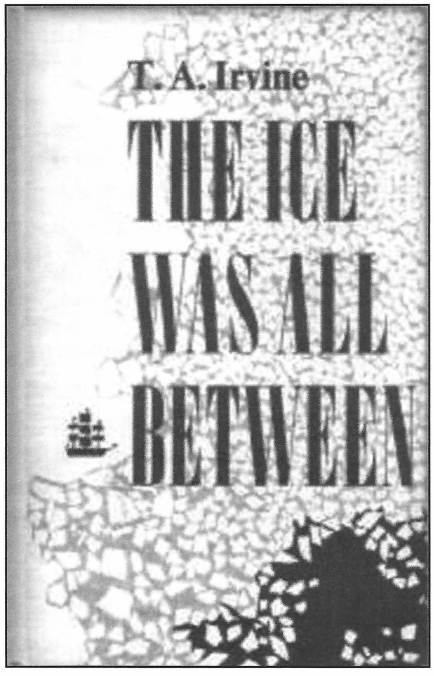
CHS and CHA crested World Hydrography Day cake courtesy of CHS.

ATLANTIC BRANCH



Director Steve Forbes thanking Dr. David Mosher for his presentation "It's a 2-way street: Bathymetric Charting for Geoscience and Geoscience for Bathymetric Charting.

Claire McCarthy and CHA Atlantic Vice President Andrew 'Chef' Smith showing off the wares.



THE ICE WAS ALL BETWEEN

Written by LCdr. T.A. Irvine

Review contributed to *Lighthouse* by David H. Gray

Published by Longmans, Green and Company, Toronto, ON, 1959. 216 pages, black & white photos. maps, diagram.

It may seem strange to see a review of a 50-year old book, but the relevance of this book is making headlines in the newspapers on a weekly basis. The book describes the Royal Canadian Navy's icebreaker, HMCS *Labrador*'s first season in the Arctic where it became the first deep-draught ship to transit the Northwest Passage.

The relevance strikes home with the Foreword, written by *Labrador*'s captain: "The rich resources that lie within the Canadian Arctic will remain there until such time as we have need of them. It behoves [sic] us, however, to carry out the research that is necessary to exploit these raw resources now, before we need them. They are in our storeroom and will remain there as long as we protect this storeroom."

Tom Irvine served during the Second World War in Royal Navy cruisers, destroyers and corvettes and following the war he transferred to the Hydrographic Department of the Royal Navy. He immigrated to Canada in 1950, joined the Canadian Hydrographic Service, and then enlisted in the RCN as a hydrographer. He was the hydrographer in charge on the *Labrador* on this momentous trip. He died in Ottawa in October 2008.

The book describes the circumnavigation of North America, from the shipyard at Sorel, Quebec, the frightening trip down river where no one, including the river pilot, knew the characteristics of the handling of a deep-draught icebreaker. There were two major equipment failures during the transit that could have wrecked the ship were it not for some excellent ship-handling. The ship went to Halifax to complete her provisioning for the trip and taking on a scientific staff of about twenty. From there, she traveled to Resolute, and then moved a RCMP special constable from Craig Harbour (south side of Devon Isand) to Alexandra Fiord (midway up the east side of Ellesmere Island) encountering massive icebergs enroute. Back at Resolute, Irvine and seamen did a harbour survey. The ship visited Beechey Island, the site of Franklin's last known winter anchorage, and then did a search and rescue of a trawler from Boston, Mass. which needed icebreaking assistance to get out of the uncharted Baring Channel (between Russell and Prince of Wales Islands). The ship then met the USN *Burton Island* and USCG *Northwind*, both having come from American west-coast bases, and then the three ships sounded parallel lines as they crossed the Beaufort Sea and rounded Point Barrow, Alaska. From there it was all haste to Esquimalt with a very sick crewman. The *Labrador* completed the circumnavigation at more leisurely pace via the Panama Canal with stops at San Francisco and Granada.

The book is light reading filled with interesting dialogue and a good amount of humor. One of the best is the signal-light message from a passing tramp steamer in the Caribbean: "I'm in the Caribbean; where are you?" I highly recommend the book as a description of Arctic navigation to those who have not had that opportunity.

I remember meeting Tom Irvine on several occasions at CHS and CHA functions in Ottawa and recognized that here was someone with a great deal of experience. It is only after reading this book that I realize that I missed a great opportunity of tapping that resource.

Mapping The Arctic Seabed: Still A Work In Progress

By: Ron Macnab, Geological Survey of Canada (Retired), Dartmouth, NS
Martin Jakobsson, Stockholm University, Stockholm

I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of Science, whatever the matter may be.

William Thomson, 1st Baron Kelvin

Measurement: The Key to Understanding

One way of paraphrasing the above quotation by Lord Kelvin is to declare that you can't begin to understand something until you can measure it. Applying that principle, there is still much that we don't comprehend about the floor of the Arctic Ocean because it has yet to be fully mapped. It is true that many observations of depth have been collected over the years, but in their density and distribution, they comprise a heterogeneous patchwork that ranges from detailed systematic surveys over small areas to near-random reconnaissance tracks across wide regions. We still lack a coherent, region-wide description of the seabed at a level of detail that supports advanced analysis and interpretation.

The International Bathymetric Chart of the Arctic Ocean

As of this writing, the International Bathymetric Chart of the Arctic Ocean (IBCAO) represents without doubt the most reliable regional portrayal of the seabed north of 64°N (Figure 1). The IBCAO project was launched in 1997 with the goal of assembling and rationalizing all available soundings from the region; a particular focus was the anticipated demand for seabed information within the context of UNCLOS Article 76. Within two years, a provisional digital bathymetric model was constructed by the project's international team; in 2000, a Beta version of the model was released into the public domain as a digital grid (Jakobsson et al, 2000). This was followed in 2001 with the release of a definitive grid comprising Version 1 of IBCAO (Jakobsson et al, 2001), and in 2004 with the production of a paper map that portrayed shaded relief at a scale of 1:5,000,000.

In the years following the release of Version 1, a number of mapping and scientific missions generated new and localized data sets that were made available for incorporation in the IBCAO database. At the same time, numerous corrections and revisions were applied to the original data base. In 2008, these enhancements and improvements culminated in the release of Version 2 of IBCAO (Jakobsson et al, 2008).

IBCAO portrays the complete seabed north of 64°N, however it's important to recall that its constituent data points are non-uniform in both quality and in distribution, as shown in the left image of Figure 2. Particularly worth noting in this Figure is the relative sparseness of data points in the central region, with numerous blank areas between track sounding profiles. It is a testament to the cartographer's art, that this disparate assemblage of data points has been transformed into a product that is simultaneously realistic and informative, and which provides attractive multimedia visualizations and hardcopy renditions.

Existing and Potential Sources of Arctic Soundings

In their character, quality, and accessibility, Arctic soundings are highly non-uniform. Below is a brief overview of the data sets that were used in the construction of Version 2 of IBCAO, or which represent potential updates to the project's data base.

Historical Canadian Sources

For years, the Canadian Hydrographic Service conducted systematic surveys and cruise-of-opportunity mapping aboard ships and launches operating within the Canadian Arctic Archipelago. North of Canada's polar margin where persistent ice was still a barrier to conventional techniques, helicopters were pressed into service to collect spot soundings through the ice at intervals ranging from 2 to 10 kilometres. Many of these airborne missions were conducted with geophysicists who collected gravity readings on the ice while hydrographers took their measurements.

Modern CHS surveys rely extensively on digital technology, which produces values that can be readily incorporated in the Arctic data base. IBCAO has included such observations collected off Canada's Atlantic margin and in selected waterways of the Arctic Archipelago. Older surveys featured analog and manual procedures, creating significant accumulations of legacy soundings that for years were archived in the form of hand-plotted field sheets. Many of these values have been digitally reclaimed, however they still require additional processing in order to rationalize sounding datums and velocities; when that task is completed and their release is approved, the retrieved information will no doubt be a valuable addition to the Arctic data base.

Historic Observations From the IHO Data Center for Digital Bathymetry

Hosted and operated by the US National Geophysical Data Center in Boulder CO, the IHO DCDB serves as a custodial agency for contributed cruise data sets that have been collected all over the world since the 1950s. Not surprisingly, the DCDB is a valuable source of public-domain information for mapmakers and scientists. Throughout its area of interest, IBCAO has absorbed a great number of data sets from the DCDB, however for the most part they are concentrated in zones outside of the central Arctic Ocean, and for a simple reason: until recently, there were few public-domain data sets available in that region (apart from those gathered by drifting ice stations) on account of the permanent ice cover which precluded conventional ship operations.

US Navy Under-Ice Observations

Between 1993 and 1999, the US Navy supported civilian research activities during six under-ice missions by nuclear submarines operating in various parts of the central Arctic Ocean. Known as Scientific Ice Expeditions or SCICEX for short, this program generated significant quantities of oceanographic observations that were promptly placed in the public domain. These measurements included soundings which were incorporated in the IBCAO data base.

Inspired by the usefulness of the SCICEX data sets, investigators began to lobby the US Navy for a general de-classification of soundings that had been collected since the beginning of under-ice patrols in the 1950s. In due course, approval was granted for a qualified release of observations collected between 1958 and 1992, and these made their way into the IBCAO data base. Recently, it was reported that suites of post-1992 observations have been cleared for public release, and that their contribution to the IBCAO data base is imminent.

SCICEX was discontinued in 1999, after which it was decided to initiate a program of Dedicated Science Missions which would accommodate unclassified civilian research interests on an opportunity basis. In principle, this program supports bathymetric mapping, but the level of data acquisition is unknown at this time.

Published Maps and Charts

Agencies of the former Soviet Union and of the Russian Federation have a long history of mapping the seafloor over large swaths of the Arctic Ocean. Most, if not all, of these observations remain classified, although depths are displayed in the form of contour lines on numerous official maps and charts. These contour lines have been digitized for the purpose of constructing digital bathymetric grids in a zone north of Russia's Arctic coast and in parts of the central Arctic Ocean, as portrayed in the right image of Figure 2.

In addition to the Russian products, Figure 2 illustrates the coverage of contour maps that were developed by agencies in other countries, relying on compilations in different parts of the Arctic Ocean. These maps were consulted to confirm the contents of grids derived from numerical values in the IBCAO data base, and to supplement the latter in places where original soundings were sparse or non-existent.

Contemporary Mapping and Research Missions

Since the mid-1990s, numerous research expeditions have been mobilized in the Arctic region by agencies in Canada, Denmark, Germany, Norway, Sweden, and the USA, which deployed surface vessels equipped for the most part with multibeam sounding systems. These cruises have gravitated to regions where detailed sea floor investigations were key to the advancement of research in fields such as oceanography, geomorphology, and tectonics.

At the same time, the five Arctic coastal states (Canada, Denmark, Norway, Russia, and the USA) have engaged in mapping operations to collect information needed for delimiting their outer continental shelves, in keeping with the provisions of UNCLOS Article 76. For the most part, these operations represent a state-of-the art approach to bathymetric measurement, but in light of their specific objectives, they tend to restrict their focus on locating and describing two features on the seabed: the foot of the slope and the 2500 metre isobath. Given these narrow priorities, UNCLOS cruises may miss the opportunity of developing more complete views of the seabed through broader survey programs that encompass adjacent areas.

Recently, the Russian Federation announced its intention of re-surveying the seabed north of its polar margin, but details concerning the timing and extent of this operation are not yet available.

With respect to data sets that are being collected to meet UNCLOS purposes, an added uncertainty is the potential availability of these observations through the public domain, where they can be expected to have some value

for map compilation and scientific research. At this time, only the USA (which has yet to ratify UNCLOS) actually releases data sets within weeks of their acquisition (see e.g. the website of the Center for Coastal and Ocean Mapping at the University of New Hampshire: http://www.ccom.unh.edu/index.php?p=49|54&page=law_of_the_sea.php).

The US data policy is notably progressive, and it would be beneficial if other Arctic states emulated it: as noted above, original Russian soundings remain classified and can only be examined in the degraded form of contour maps. Canada, Denmark, and Norway have committed to releasing their UNCLOS information in due course (Sorensen et al, 2005); however Canada in the interim appears to have adopted the curious policy of not sharing observations collected by Canadian vessels during joint UNCLOS operations with US ships.

Why Ocean-Wide Systematic Surveys are Needed in the Arctic

International access to the waters of the Arctic Ocean is undergoing an unprecedented acceleration that was triggered initially by a relaxation of Cold War tensions, and which is being sustained now by melting of the ice cover on account of global warming. In comparison with our planet's other seas, the Arctic Ocean is relatively unsullied, but changes are occurring with a rapidity that demands vigilance lest we degrade its environment before we've had a chance to understand it – or to assess the impact of our actions.

In the rush to construct maritime boundaries, to exploit natural resources, and to develop shipping routes, it's easy to overlook the fact that the Arctic Ocean is unique in several respects:

- unlike the Earth's other oceans, the Arctic ecosystem is no doubt influenced by extreme seasonal variations that affect weather, day/night ratios, and ice cover;
- as a semi-enclosed sea with just one significant connection to the world ocean (through Fram Strait), the Arctic Ocean operates as a perpetual sink for oceanic and atmospheric contaminants that arrive from elsewhere and which become trapped in its deep circulatory systems;
- as a region that features low average temperatures on a year-round basis, the Arctic Ocean transfers immense amounts of cold air and water to the rest of the planet, thereby functioning as an engine that drives global weather and climate.

Within this evolving environment, systematic seabed surveys are needed to benchmark present conditions and to anticipate future changes caused by natural or human agents. Detailed maps of the seabed are needed to support a wide range of scientific and technical investigations, for example: tidal and current patterns and their effects on sediment transport, ice movement, and shoreline erosion; habitat maps for sustainable fisheries; identification of sensitive zones that are vulnerable to the destructive aspects of commercial and industrial activities; geological evidence for past glacial and climatic episodes that impacted land and sea environments both regionally and globally; tectonic investigations to uncover the history of the Arctic Ocean's formation, in order to improve our knowledge of resource prospects and of potential earthquake activity.

Before any kind of systematic bathymetric mapping program could be contemplated in the Arctic Ocean, it would be necessary to secure an international commitment to proceed within a climate of diplomatic and technical cooperation. This would be followed by extensive planning and the dedication of adequate human, financial, and technical resources to perform the work.

Such an undertaking would be extremely ambitious, and to fulfill its requirements would no doubt compete with demands for similarly important endeavours in the Arctic and elsewhere. This does not imply that the notion of mapping the Arctic seabed needs to be abandoned: integral to the design of any survey is the need to compile and assess existing data sets to determine which areas are most in need of mapping, and to assign priorities in order to ensure that the work is carried out effectively and efficiently. There remains also a significant challenge in securing the release and contribution of data sets that are presently unavailable for proprietary and other reasons. These tasks can and should be undertaken in anticipation of future survey missions.

The assembly and assessment of existing data sets is already well in hand through the development and maintenance of the IBCAO data base, which was designed as a 'live' product that can be updated as new information becomes available. With the passage of time and with increasing marine activity in the North, it can be expected therefore that our knowledge of the Arctic seabed will continue to grow, thereby diminishing not only the areas which remain unmapped, but also the resources that will be needed to complete the task. At some future date, we may yet achieve a realization of Lord Kelvin's dictum that links measurement to understanding.

Acknowledgements

In the development of IBCAO, we are pleased to acknowledge the contributions of fellow members of the IBCAO Editorial Board who provided guidance and advice, and of international associates in many institutions who rendered data and technical assistance. We are also indebted to organizations that provided financial support at various stages of the IBCAO undertaking and helped it to maintain its momentum: the Intergovernmental Oceanographic Commission, the International Arctic

Science Committee, the University of New Hampshire, the US National Oceanic and Atmospheric Administration, the US Office of Naval Research, Stockholm University, and the Swedish Polar Secretariat.

Citations

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About the Authors

Ron Macnab and Martin Jakobsson are the Chairman and Senior Compiler, respectively, of the Editorial Board for the International Bathymetric Chart of the Arctic Ocean.

CALENDAR OF EVENTS

- CIG Coucil Meeting and AGM, Montréal, Québec, October 2009
- FIG Working Week, Hanoi, Vietnam, October 19-22, 2009
- XXIV FIG International Congress 2010, April 11-16, 2010, Sydney, Australia
- CHC 2010 June 21 -21, 2010 Québec City
- CHA National AGM June 2010
- World Hydrography Day June 21

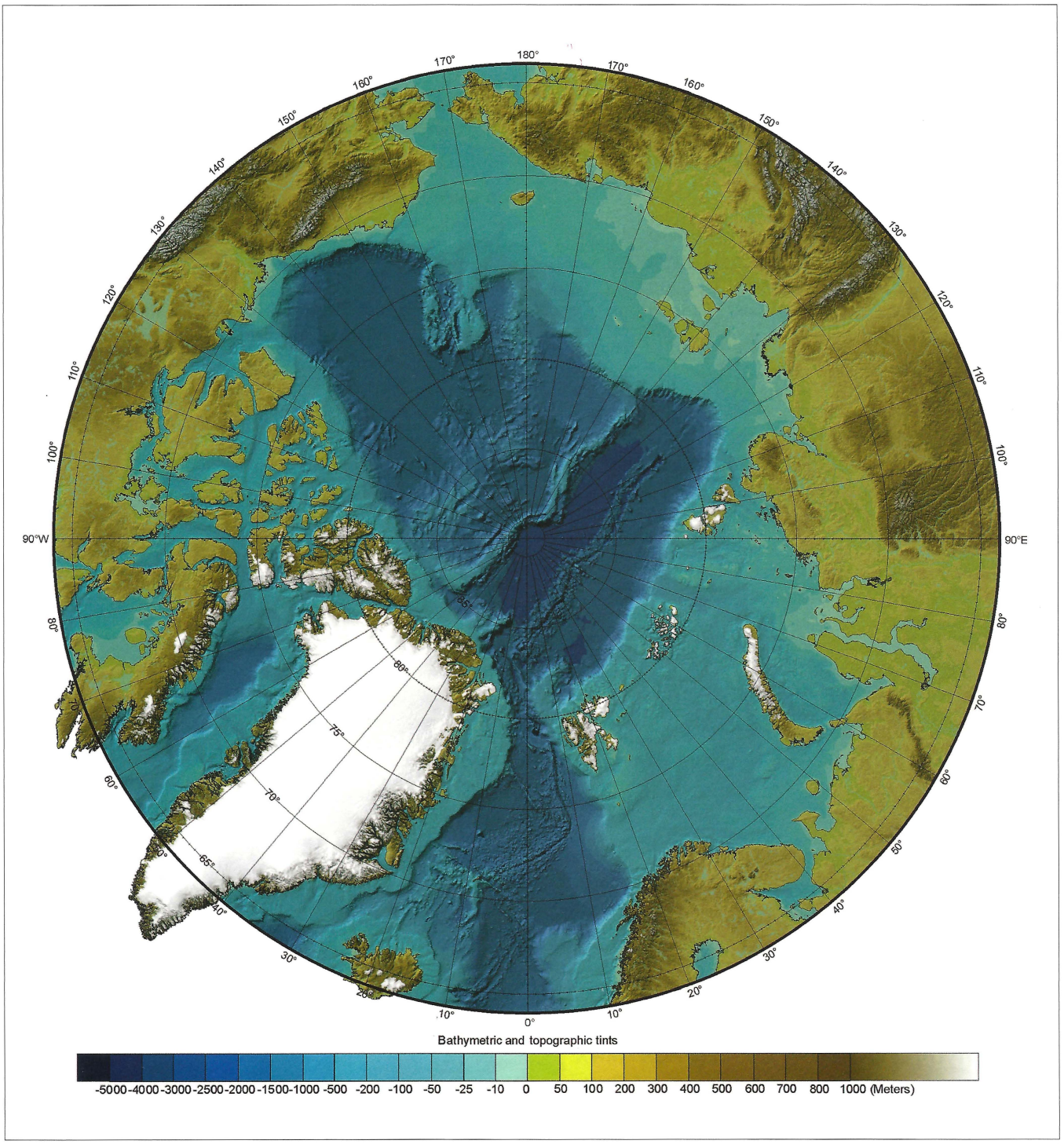

Figure 1: ['Square' representation] Shaded relief map created from the digital grid of IBCAO Version 2. A full-colour rendition may be viewed on the IBCAO website at: http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/maps/IBCAO_ver2_23_Letter.pdf

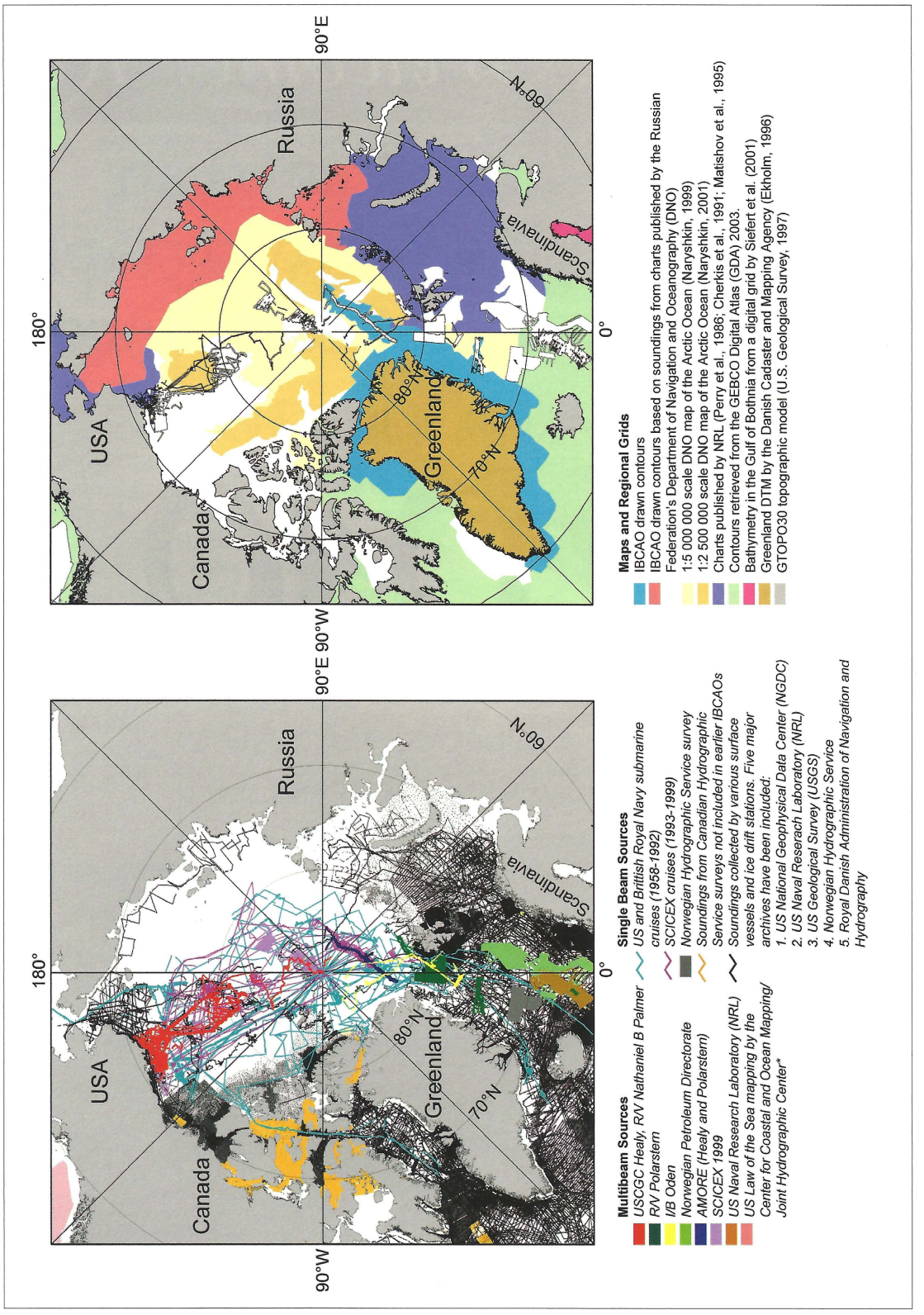

Figure 2: Left image: distribution of soundings that were used to construct the digital grid of Version 2 of IBCAO. Right image: areas where digitized depth contours were extracted from published maps and charts. Full-colour renditions may be views at: http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/images/IBCAO-sources.jpg

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UNCLOS Update : Spring 2009

By: Richard MacDougall, Director, Law of the Sea Project, Retired, Canadian Hydrographic Service

Background:

The United Nations Convention on the Law of the Sea (UNCLOS) is a comprehensive treaty to govern use of our oceans. It is signed by 159 countries and ratified by 158 which makes it one of the most successful treaties in history. The focus of Canada's UNCLOS program is the continental shelf. While Article 77 confirms a coastal state's exclusive sovereign rights to the resources on and beneath the seabed of the continental shelf, Article 76 deals with defining the outer limits of the continental shelf – i.e. "the fence" between the sovereign rights of the coastal State and "the Area" outside where the resources are managed for the benefit of all mankind by the International Seabed Authority". Article 76 also sets out the process for establishing the outer limits of the continental shelf. This includes coastal states submitting information to support their outer limits to the Commission on the Limits of the Continental Shelf (CLCS), a body of 21 experts in Geology, Geophysics and Hydrography elected by the States that have ratified UNCLOS. The primary role of the CLCS is to ensure consistency in applying the scientific information to meet the requirements of Article 76. Once a recommendation is received from the CLCS, it is the individual coastal states that declare their official outer limits. This process is the defined means for achieving international recognition of those limits. It should be noted that the CLCS does not deal with boundary disputes between neighbours, only the outer limit between a coastal state and "the Area".

Canada ratified UNCLOS in November 2003 and it came into effect 1 month later on December 6, 2003. Canada has 10 years from the date of ratification to submit the Canadian submission to the CLCS. Federal Budget 2004 announced $70 million over 10 years to Fisheries and Oceans (Canadian Hydrographic Service - CHS) and Natural Resources Canada (Geological Survey of Canada - GSC) for the preparation of Canada's submission. Federal Budget 2008 announced an additional $40 million over 4 years to address increased data collection costs in the Arctic and funding for Foreign Affairs and International Trade to prepare the legal aspects of the submission.

The Department of Foreign Affairs and International Trade (DFAIT) has the overall lead, responsible for presenting the Submission and responding the CLCS with CHS and GSC providing the scientific expertise in hydrography and geology respectively. Expertise and support is drawn from other government agencies such as Canadian Coast Guard, National Defence, Polar Continental Shelf Program, Canadian Ice Service and contract expertise. Canada is also cooperating with neighbouring Arctic countries to facilitate data sharing and reduce costs of data collection in the Arctic Ocean The Program organization is set out in Figure 1.

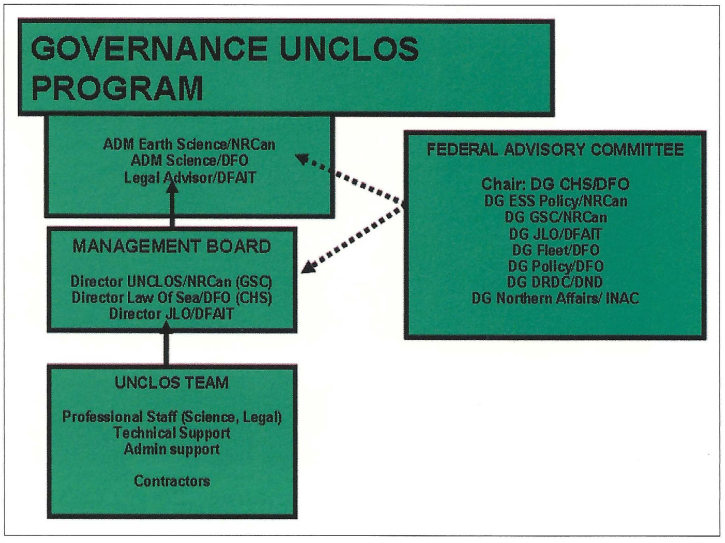

Figure 1: Program Organizational Structure.

Previous papers and *Lighthouse* updates covered off establishing an UNCLOS office at the Bedford Institute of Oceanography and data collection and can be summarized as follows:

Atlantic

- Summer 2006 - contract multibeam bathymetric survey around the Grand Banks
- Summer 2007 - contract reflection seismic and bathymetric survey off the Scotian Shelf

Arctic

- Winter 2006 - LORITA (Lomonosov Ridge Test of Appurtenance) refraction seismic survey on the Arctic Ocean – a joint Canada-Denmark project from CFS Alert.
- Summer 2006 - bathymetric survey and test seismic survey in the Canada Basin from the icebreaker CCGS *Louis S. St-Laurent.*
- Winter 2007 - Through-ice bathymetric survey from CFS Alert
- Summer 2007 - Seismic and bathymetric survey of the Canada Basin from the CCGS *Louis S. St-Laurent.*

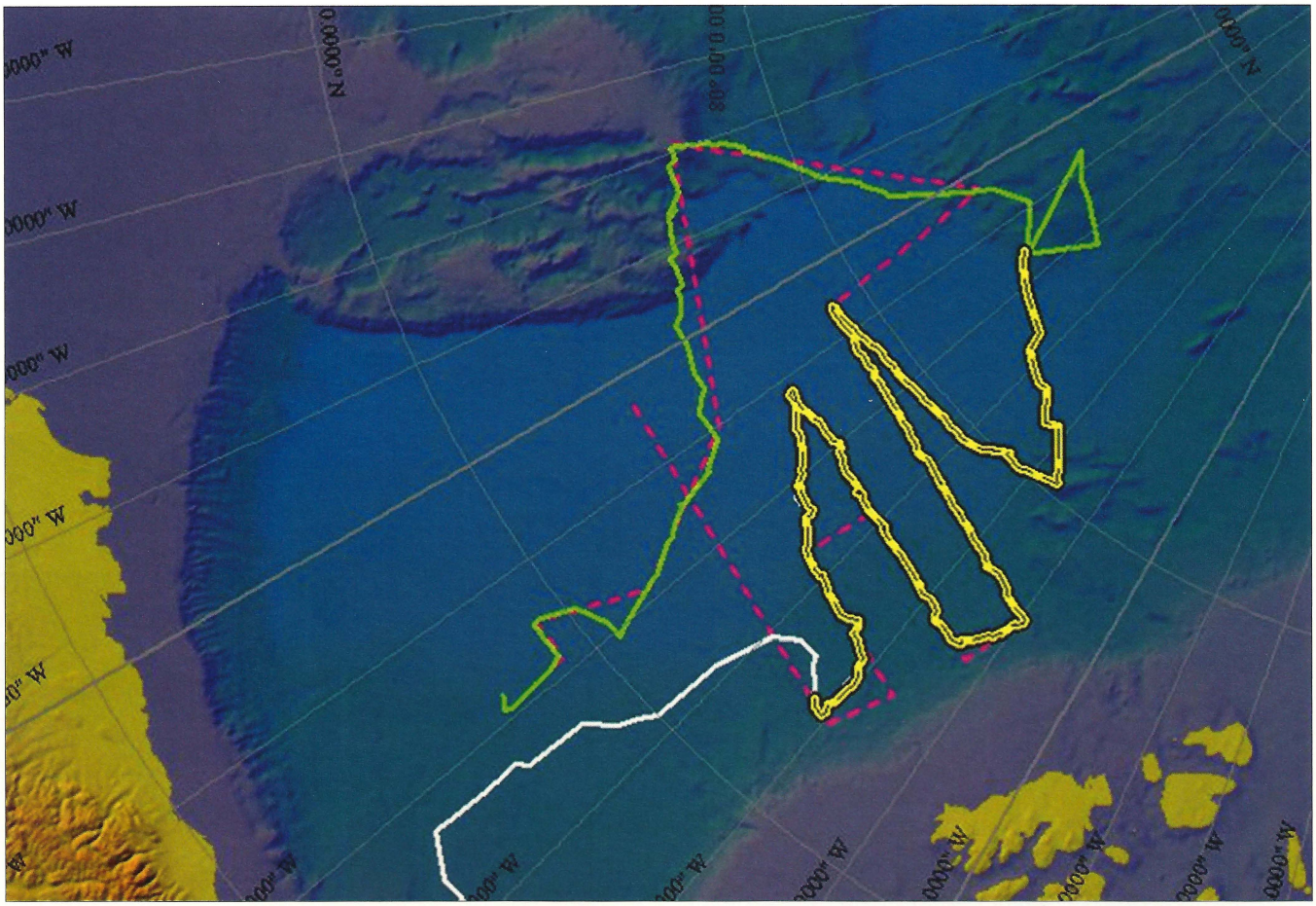

Figure 2: 2008 plan in red dashed line - 2008 CCGS Louis S. St-Laurent survey in green and white lines and two-ship (USCGC Healy and CCGS Louis S. St-Laurent) shown with double yellow line.

- Winter 2008 - ARTA (Alpha Ridge Test of Appurtenance) refraction seismic survey from Eureka and a through-ice bathymetric survey from an ice-camp at the mouth of Nansen Sound.

Update

Atlantic

There was no data collection activity on the Atlantic margin in summer 2008. However, the specifications for a reflection seismic and bathymetric survey off Labrador for summer 2009 were prepared and the tendering process completed early in 2009 for a June – July 2009 survey.

Arctic

Arctic surveys continued in summer 2008 with the CCGS *Louis S. St-Laurent* conducting bathymetric and seismic surveys in the Canada Basin (Figure 2). In 2008 the CCGS *Louis S. St-Laurent* was joined by a second icebreaker, the US Coast Guard Cutter *Healy* (Figure 3) for part of the mission. These vessels complement each other since CCGS *Louis S. St-Laurent* is equipped with a seismic system and the USCGC *Healy* with both a multibeam echo sounder and a sub-bottom profiler. This two-ship operation saw the USCGC *Healy* breaking ice for the CCGS *Louis S. St-Laurent* where seismic data collection was a priority and vice-versa when bathymetry was a priority. Ice conditions allowed the survey to proceed further north than planned for 2008.

Figure 3: CCGS Louis S. St-Laurent and USCGC Healy (Sept. 2008)

Winter 2009 (March 1 – mid May)

Bathymetric Survey

A joint Canadian – Danish on-ice bathymetric and gravity survey was conducted from an ice- camp near Ward Hunt Island (Figure 4) in winter 2009 using 5 helicopters. A second camp staffed by 2 people was located 270km offshore to provide weather information, a refuelling base and a secondary base for short periods. The objective of the project was to complete the bathymetry between the winter 2008 ARTA survey and the 2006 LORITA project. Bathymetric data was collected through the ice along a series of profiles less than 50 nautical miles apart with sounding spacing along the profiles varying from 2 to 5km. A grid pattern of spot sounding was run between profiles. Portable gravity meters were used to collect gravity measurement at roughly every third point along the sounding profiles (Figure 5). All objectives were achieved and challenges such as more snow to move to build a runway than expected and evacuating the secondary camp when the ice broke up were taken in stride.

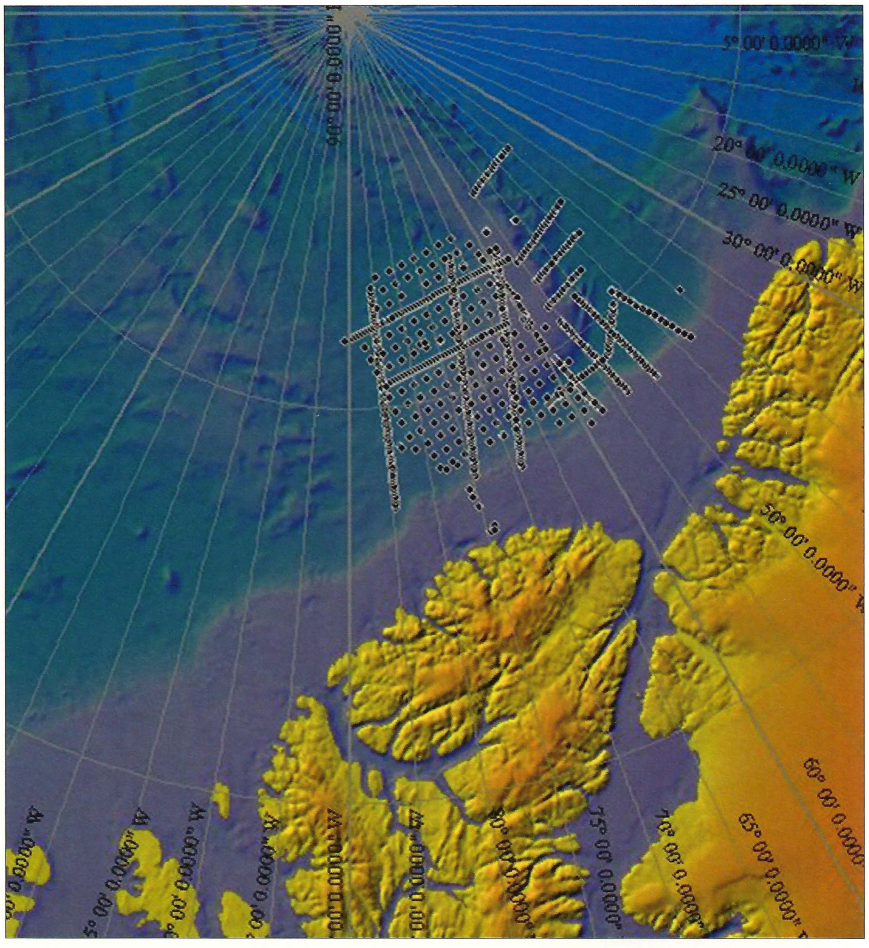

Figure 5: Data collected during 2009 winter survey.

Figure 4: Ice runway and base camp - Ward Hunt Island.

Aerial Gravity

A joint Canadian – Danish airborne gravity and magnetic survey of the Amundsen Basin, Lomonosov Ridge and Alpha Ridge was flown out of Eureka, CFS Alert and Station NORD (Greenland) between late March and mid May 2009. A Kenn Borek Air Basler 67 (Figure 6) was equipped with two gravity meters and a magnetometer and flew 7-8 hour missions for a total of 260 hours during the project (Figure 7).

Figure 6: Kenn Borek Air Basler 67 proceeding down the runway at Alert (Photo credit: Janice Lang PCSP/NRCan CHS/DFO).

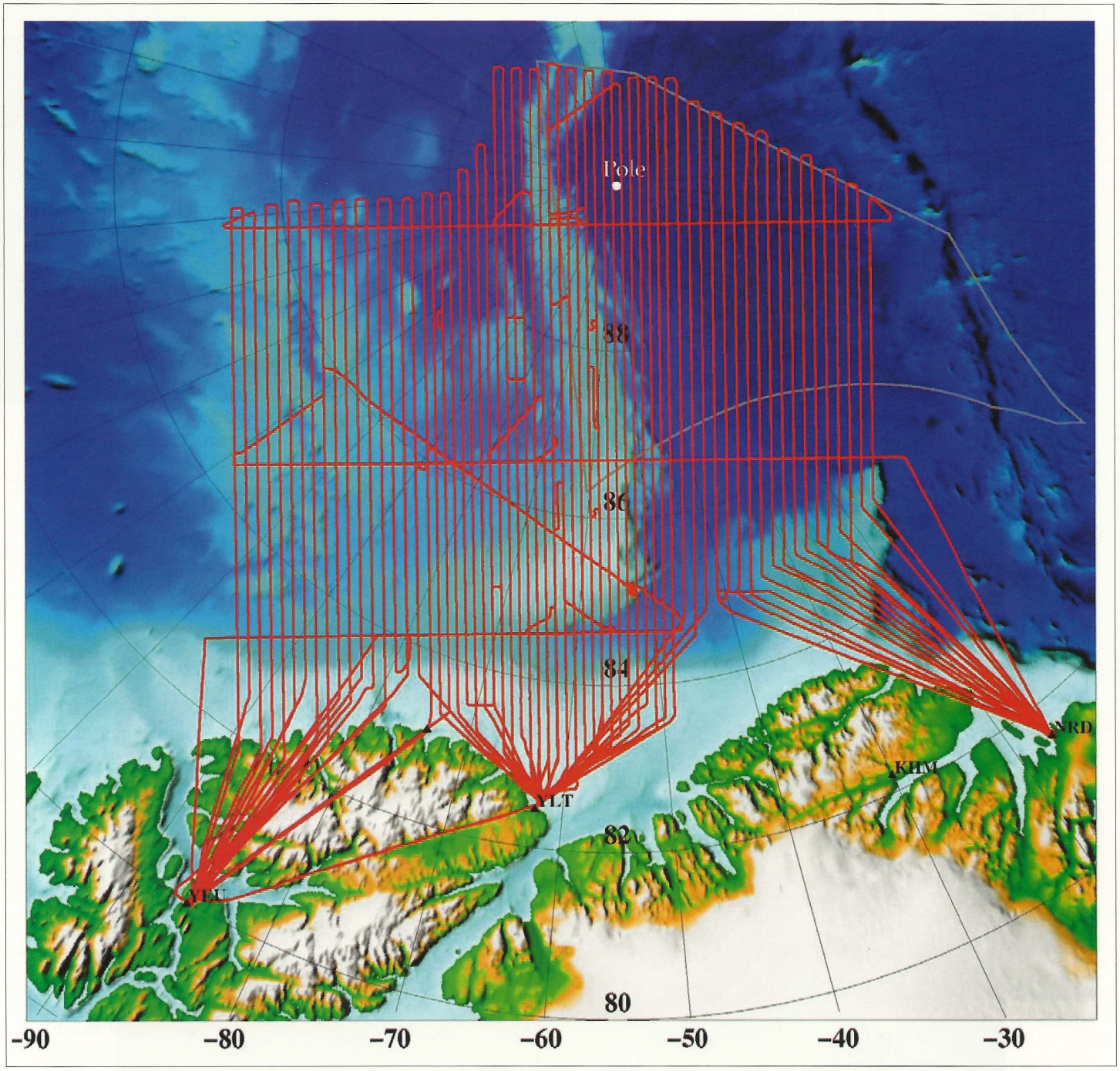

Figure 7: Survey flight plan as completed shown in red.

Autonomous Underwater Vehicle (AUV) Trials

In June 2008 a proposal to acquire two Autonomous Underwater Vehicles (AUV) was approved by the UNCLOS Steering Committee as an approach to mitigate the risk of bad surface weather in the Arctic. The Canadian UNCLOS Program and Defence Research and Development Canada (DRDC) are partnering to acquire two AUV to collect bathymetry under the ice. A contract was let to International Submarine Engineering in October to build two AUV. They will have a range of 400km, will be modular to facilitate movement to the ice, rated to 5000 metres depth and be equipped with multibeam echo sounders.

A number of development and logistic components were tested in the Arctic Ocean off CFS Alert in March and April 2009. An Explorer AUV owned by Memorial University was used for the trials which included testing options for long and short range homing, communications with the vehicle, a docking system to allow recharging without removing the vehicle from the ice and variable ballast. The logistics included cutting a 20 foot by 6 foot hole in nearly 6 feet of ice (Figure 8), removing 14 tons of ice from the hole, constructing a tent over the hole, transporting the AUV modules to the ice, assembling the AUV – then doing the development tests (Figure 9).

Figure 8: Ice thickness.

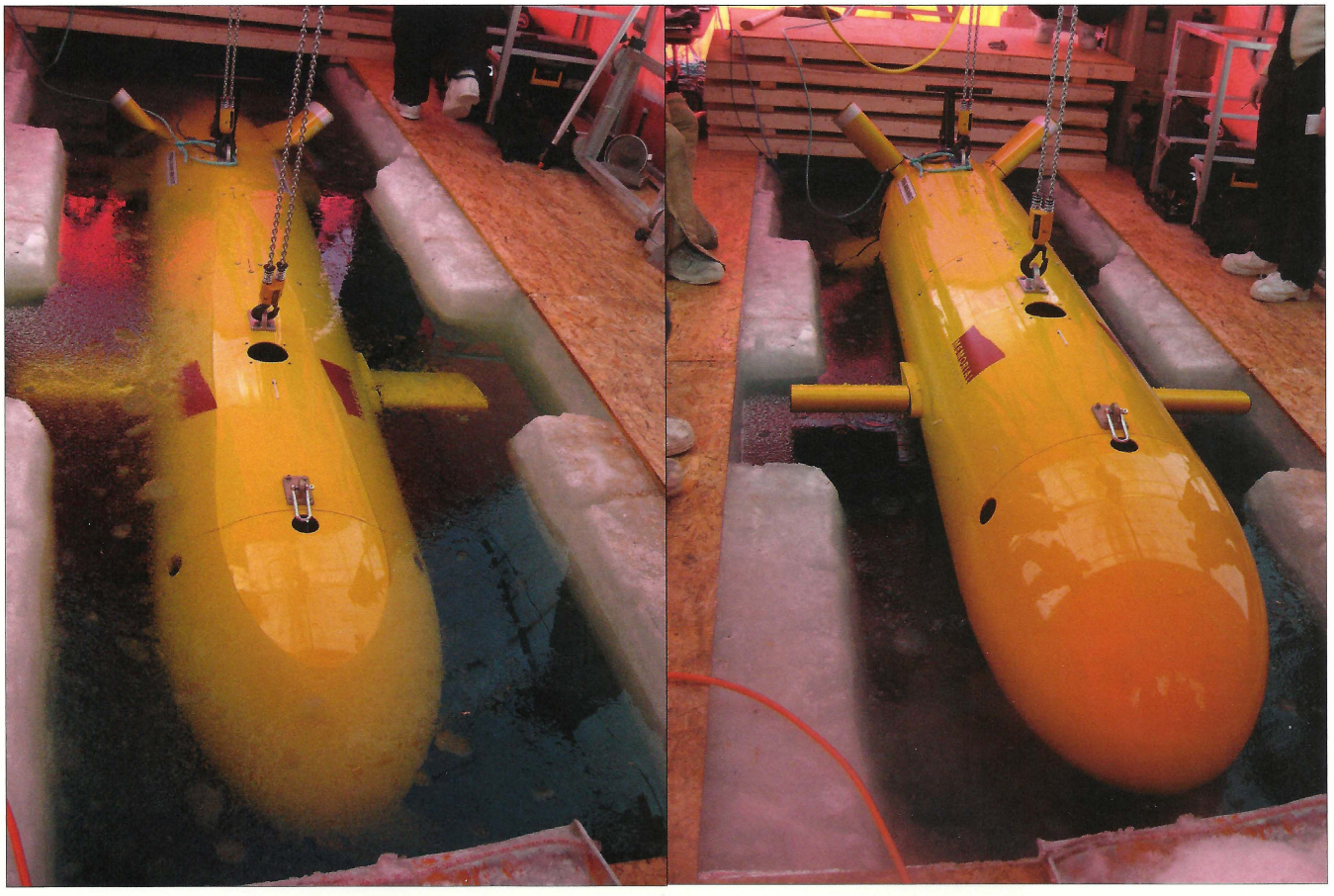

Figure 9: AUV submerged Emerging through ice.

Evolution of Team

Richard (Dick) MacDougall who has been the DFO member of the Management Board since the beginning of the Program retired as of March 30 and is replaced by Julian Goodyear. Wendell Sanford the DFAIT member of the Management Board has moved on to be the High Commissioner in Brunei and has been replaced by Allison Saunders who is Deputy Director of the newly formed Continental Shelf Division at DFAIT. Dr. Jacob Verhoef, NRCan remains a constant on the Management Board.

Dr. Ruth Jackson who has been Chief Scientist on both winter and summer Arctic seismic surveys also retired and is replaced by Dr. David Mosher. Jon Biggar who has been Chief Hydrographer of summer and winter surveys since 2006 will be replaced on the winter 2010 survey by Tim Janzen. In the coming months, CHS hydrographers, Joe Manning and Paola Travaglini are slated to join the Program in a full time capacity.

Future Plans

- Conduct a contract seismic and bathymetric survey in the Labrador Sea in June and July 2009.
- A joint Canadian – Danish refraction seismic survey is also planned between the west coast of Greenland and Labrador in June- July 2009. This survey will use ocean Bottom Seismometers and will be conducted from *CCGS Hudson*.
- Continue joint Canada – USA seismic and bathymetric surveys in the western Arctic using the *USCGC Healy* and the *CCGS Louis S. St-Laurent* in August – September 2009.
- Continue Arctic data comparisons and discussions with Denmark, Russia and the USA.
- Conduct AUV acceptance trials and mission tests in the Pacific in fall 2009 to be followed by an under-ice bathymetric surveys using AUV from an ice camp near Borden Island, NWT in March and April 2010. In parallel a through-ice bathymetric survey using helicopters will be conducted from the same base camp.

From Page 2.....

Operation Nunalivut 07 plaque on the Ward Hunt Island flag pole commemorating the Canadian Forces/Canadian Rangers patrol of Ellesmere Island in 2007.

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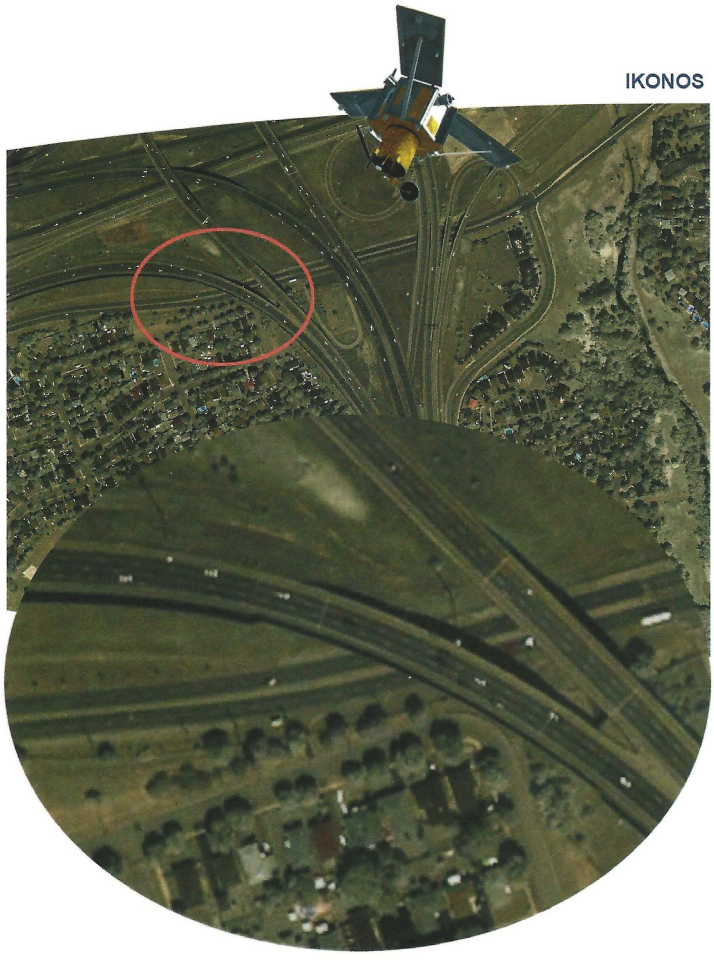

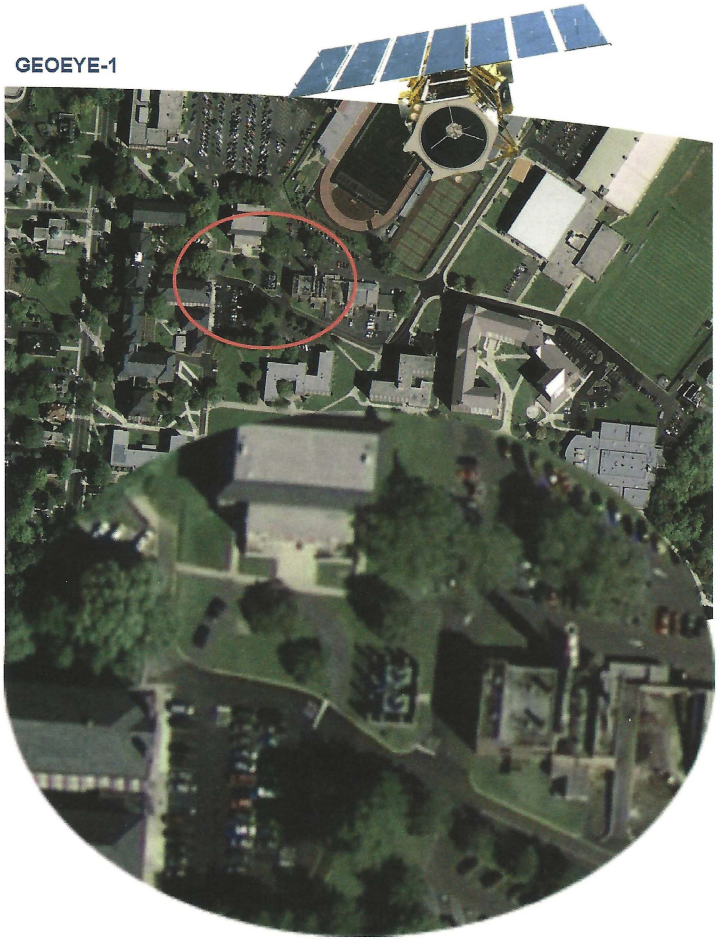

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CHA National 2009 Annual General Meeting Minutes

Tuesday March 24th, 2009, Conference Call, Canada Centre for Inland Water, Burlington, Ontario

1. Call To Order
The meeting was called to order at 12:05 EDT.

Mr. McFarlane welcomed everyone to the conference call and apologized for postponing the AGM date, but also indicated it enabled greater attendance. Best wishes were received from CIG on the occasion of our AGM.

Attendees:
National Office: George McFarlane, Terese Herron
Atlantic Branch: Andrew Smith, Bruce Anderson, Craig Zeller
Quebec Branch: Bernard Labrecque
Ottawa Branch: Sheila Acheson, Kian Faedie, Sean Hinds, Stacey Kirkpatrick, Carole Farmer
Central Branch: Roger Cameron, Christine Delbridge, Donald Kalley, Jennifer Campell, Michel Goguen, Fred Oliff, Paola Travaglini, Sam Weller
Pacific Branch: Carol Nowak, Rob Hare, Brian Port, Fred Stephenson

Regrets-Dale Nicholson, Savi Narayanan, Brian Power

Mr. McFarlane stated that this meeting would be conducted in accordance with the By-Laws and Articles of Incorporation, and reminded everyone that our By-Laws cannot to be changed without Ministerial approval.

2. Approve The Agenda
Mr. McFarlane asked if there were any changes or additions to the Agenda.

Added to the Agenda
Correspondence after item 8

Other business – formation of committees and celebration of World Hydrography Day

Motion to accept the Agenda with Amendments
Sheila Acheson/Roger Cameron - CARRIED

3. Minutes
Minutes from the 2008 AGM were circulated through the Branches and in ***Lighthouse***.

Fred Stephenson requested that the first and last names of speakers be identified in each agenda item.

Motion to accept minutes as circulated
Carol Nowak/Roger Cameron - CARRIED

ACTION: Terese Herron to ensure speakers are clearly identified in the minutes.

4. Action Items Arising From Minutes.
George McFarlane - leave for Agenda items

5. Branch Reports
Pacific Branch – Carol Nowak reported that the conference kept the branch busy all year. The conference went well, surplus funds have been transferred to National. Everything can be read in the report.

George McFarlane commented that it was an excellent conference, congratulations to the Branch, they filled their coffers and provided funds to National as per the surplus funds agreement.

Quebec Branch – Bernard Labrecque reported they were busy with the 400th anniversary of Quebec City, they had the launch *Surveyor* for 10 days which included an in the water presentation. Carnet d'abord was published, the store sold many topo maps and charts as well as Carnet d'abord. The number of copies printed was increased. The branch had eight members and one Corporate member for 2008.

George McFarlane asked if Quebec Branch was operating as an incorporated entity in Quebec?
Bernard Labrecque responded yes and that Quebec Branch had been incorporated before CHA nationally.

George McFarlane – Quebec Branch gave that up in 1988 when CHA was incorporated nationally, under this we are not to pay tax. We have told DND that we do not pay taxes when they inquired regarding sending the launch to Halifax, we are going out on limb, if one branch is paying tax then we have a problem, DND could not give the money without assurance we do not pay tax.

Bernard Labrecque – Branch AGM the last one was in 2004 - yes, Thiebault is an executive member/director. Quebec Branch pays to keep the incorporated name in Quebec.

With 2010 coming up it is critical that we understand Quebec Branch financial situation, and how/you operate/ relate into the national organization. There needs to be consistency in no payment of tax as we are a not-for-profit Association.

Central Branch – Roger Cameron – there is an extensive report, Roger commented on the highlights, seven Branch newsletters were put out covering meetings and events. The Branch had 70 members of which four were new, nineteen International of which two were new (Nigeria and South Korea).

Roger Cameron was Vice President of the Branch for 2008, Christine Delbridge was Secretary, Carol Robinson was the Treasurer.

Refer to the written report for additional information.

George McFarlane thanked Central Branch for taking care of Ottawa as they work to revitalize their Branch, Central Branch has taken care of Ottawa same as Pacific has for Prarie Schooner Branch, also thanked Pacific for taking on that responsibility.

Atlantic – Andrew Smith reported that Atlantic Branch hosted a World Hydrography Day BBQ; members attended CHC2008 and hosted conference as a flow through for cash and publicity. The final conference surplus from CHC 2006 was submitted to National.

George McFarlane – when asked by DND if CHA pays tax, he was not aware until he read the reports from Quebec and Atlantic that they pay tax, Andrew Smith will rectify and stop paying HST, and one other small tax. George reiterated that each Branch must conform to the rules of Canada Corporations to not pay tax. CHC is different from CHA. George McFarlane mentioned he appreciated Andrew Smith being on the call even though he is at home sick.

Ottawa – Sheila Acheson – Thanks National and Central Branch for helping while Ottawa branch gets on its feet. In December they had a speaker presentation lunch and 25 people attended, followed up in January with a talk on UNCLOS and are well underway with reestablishment.

George McFarlane – expressed thanks to the Dominion Hydrographer for her support in getting the branch restarted.

Sheila Acheson – introduced Kian, and George McFarlane welcomed Kian Fadaie the Director of Hydrography at CHS Headquarters.
George McFarlane thanked Sheila Acheson for her efforts in restarting the Branch.

6. Financial Statement
A financial statement prepared by national treasurer, Scott Youngblut. The statement has not yet been audited.

George McFarlane asked if there were any questions, there were none. The audited statement will be released when the audit is complete.

Motion to accept the unaudited statement and deal with any changes at a Directors meeting.
Roger Cameron/Kian Fadaie CARRIED

7. Appointment Of Auditors
Motion to appoint Brian Power and Al Koudys as auditors for the year ending Dec 31, 2009.

Roger Cameron/Carol Nowak - CARRIED

Paola Travaglini – can we include *Lighthouse* in that audit?

George McFarlane – this has not been done in the past but could be included.
CARRIED

Directors will be the Vice Presidents as elected for 2009 in each branch.

8. National Budget For 2009
Discussion:
Carol Nowak – Corporate Membership for Pacific Branch should be 3.

George McFarlane – Quebec should have 1 Corporate member, the usual AGM expense was removed as there is no expense this year, the liability insurance figure was changed to match what we paid last year, National Office travel should be changed to National President's Travel, Industry Canada fee should be changed to Corporations Canada filing fee.

AGM expense will reappear next year

Brian Port – should the proposed budget include surplus funds from CHC2006?

George McFarlane – it was included in the 2008 year end financial statement, so it is accounted for there, if you want that changed then we will take it back to Scott.

Sean Hinds – the budget is proposed how do you modify it during the year, if it sits as it is now how do you go about changing that throughout the year?

George McFarlane – a budget is a budget, the National Executive and Board of Directors, will only go to the membership if it is a significant expense, and otherwise the Director's approve additional expenditures.

Brian Port – has there been a request for forwarding of seed money to CHC2010?

George McFarlane – no request as of yet but will be discussed under that agenda item.

Motion to accept the budget.
Roger Cameron/Carol Nowak - CARRIED

9. Lighthouse Report
Craig Zeller reported *Lighthouse* – Edition 73 was released in February, two editions per year, spring/summer, fall/winter, fall/winter seems to come out in February, it is expected in the fall but never makes that time slot, he is pleased with Jim's brilliant work in layout and the quality of papers. It is a lot of work for one individual. Ed 74 for World Hydrography Day.

Final thought – something we could look at in *Lighthouse* also, Craig would entertain anyone who would like a chance at editing.

Bernard Labrecque – 2 yrs ago *Lighthouse* included bilingual abstracts, recent editions only include English, Craig Zeller apologized but will endeavour to add the French.

Carole Farmer – *Lighthouse* is two costly editions, do we have enough money, have you thought about one larger publication and one smaller in between?

Craig Zeller – yes it is difficult because Jim comes in from the field and has to do the journal right away.

Paola Travaglini – financially the two editions are fully paid for with ads. A verbal presentation of the financial statement was provided.

George McFarlane – cost is 4 to 5 thousand dollars per issue and has been sustained by ads. *Lighthouse* is more than a publication it is the face of CHA to the outside world. Many discussions have taken place on burying *Lighthouse*, this is not going to happen, so long as we can sustain it and fund it, we will continue. Most learned associations should have a journal. Even if we have to support it from other funds we receive. Edition 74 due for World Hydrography Day. The *Lighthouse* committee is functioning well and is an excellent committee.

We are taking as many *Lighthouse* copies as we can to Norfolk, for promotion for CHA and Caris is having a booth, so hopefully they will support us by taking out a full page ad.

Sheila Acheson – thanked all the folks for their efforts, the timeliness was excellent. As people paid their dues they were given a copy.

10. Student Award
The award manager has resigned, and sent all files to George. The last straw was the Board of Directors questioning his moving of the bank account and his unwillingness to be a member of CHA.

George McFarlane – thanked Captain Barry Lusk, for his service and representation to CHA. The association thanks him for all his work on behalf of the association, we need to have our business conducted the way we want it done, not the way he wanted it done.

Previous management had agreed to pay Captain Lusk an administration fee to run the award. Captain Lusk has sent 2 boxes of materials and signed over the fund to George McFarlane.

The preference was for Barry Lusk to rejoin CHA and work with a committee to run the award. There were problems with excluding certain schools among other things.

George McFarlane – anyone against accepting his resignation? Recommendation we accept the resignation as there are no objections.

Motion to accept Barry Lusk's resignation with deep regrets and appreciation for his 20 years of service to the program.

Weller/Oliff - CARRIED

George read his response to Barry.
See letter available on request from VP (distribute this to VP's) – **ACTION** - Terese

11. Correspondence And Status Of Branches
Terese Herron reported a letter was received from a Malaysian student regarding a former course and whether it was considered CAT A or B - Tom McCulloch responded.

Other item – invitation to a meeting about managing risk April 16 in Toronto, George McFarlane asked Roger Cameron to attend – Roger declined.

ACLS offshore book was requested – for Ottawa Director of Hydrography, has been presented to Kian Fadaie and will be in the branch report with a photo op. ACLS provided the book.

Sheila Acheson – Ottawa Branch has 15 members, had a meeting yesterday, decision was made to establish a separate branch with an executive. They would like to form the branch again and look after themselves.

Motion that CHA approve the formation of a branch in Ottawa and return the funds to the branch so they can service their members

Sheila Acheson/Stacey Kirkpatrick - CARRIED

George McFarlane – we will return funds originally transferred.

Terese Herron – would you like your files returned – answer no

Sheila Acheson – dues set at $20 for first year, how much to National?

Fred Oliff – for new members only the $20 fee not for previous members rejoining

George McFarlane – keep the fee low, $10 to National or apply to have National waive the fee for regular members, but not for Corporate

Carol Nowak – received Prairie Schooner Branch files, funds and have regular correspondence with Bruce Calderbank.

George McFarlane – sent notice to Bruce Calderbank, Carol Nowak also sent out notice of the meeting.

Bernard Labrecque - will try to increase membership in Quebec Branch, will be in the field May to October.

12. CHC2010

George McFarlane has had correspondence with Robert Dorais who is the designated chair for 2010. The conference will be a partnership between CHA and CHS. At the last meeting in November with the Dominion Hydrographer, Directors the outcome was that CHC2010 would be an equal partnership between CHA and CHS.

Robert Dorais sent a first draft agreement to George, CHA wants seed money protected, and surplus funds followed. Not about money but policy needs to be followed. Policy set in place after CHC2002 in Toronto.

Labrecque is representative for CHA but will be away so what will happen, CHC2010 would be going to US HYDRO 2009, free booth space is what CHA can offer. Before too long we should have a document (agreement) to submit to the board. Venue is in Quebec City.

US Hydro is in May, a face to face with Robert and the pace should pick up. CHA will have booth space at USHydro, we will promote the conference in *Lighthouse* and at the booth. Craig Zeller can offer something up in Lighthouse.

Labrecque – nothing else to report, no agreement has been signed, a draft is out, **ACTION** – Bernard to ask Robert Dorais where he is with the agreement.

George McFarlane – we will rely on Brian Port for advice before entering into an agreement, as the last chair he can guide us.

13. National Executive Activities

George McFarlane reminded all Branches to plan something for World Hydrography Day

Succession planning – think about a successor for the National President position, all VP's and members, election information will be out later in the year.

Need to form committees:
National Student Award
Hydrography Committee
Public Awareness Committee

Certification committee of CIG – Ken Mcmillan has said yes but need another individual, VP's need to get people for these positions.

National Executive Activities – formal affiliation with CIG, George McFarlane is the Technical Councilor at CIG. Usually is the president, but does not have to be. George attended the meeting in November in Saint John. The updated terms of reference was accepted at that meeting. Nominees needed from CHS, and CHA, Rob Hare if not nominated by CHS will be nominated by CHA.

CCLS – has taken notice that we exist, invited to the annual meeting in Winnipeg, they want to forge ahead with a member driven, ethics based association of surveyors in Canada, and fold CCLS, they have approached ACLS and CHA, CIG to sit on this committee and participate.

Invited to the Presidents forum of the Ontario Land Surveyors in February, provides contact with our counterparts in the profession.

ACLS – 1st vice president of ACLS is a CHA member, he will be president of ACLS as of May, CHA needs to be cautious, they are a Sustaining members of CIG, hopefully we can resolve the accreditation/certification issue. To date CHS has not accepted.

CNCCFIG Canadian National Coordinating Committee for FIG, The nominee comes from CHA for the Chair of Commission 4, the last go around was a last minute nomination put forward by the Chair of Commission 4. Michael Sutherland is not a member of CHA.

ACLS has applied for membership in FIG, but they cannot as CIG is the official national member, the committee will coordinate Canadian representation at these international conferences/meetings/congresses.

Canada's voice to the world is at these meetings, Vancouver CIG is putting a proposal for 2018 congress in Vancouver. Involvement in CIG is very important.

CIG would like to provide certification for hydrographers, but some members for the committee are needed from CHS, to develop the criteria, so far Ken McMillan has accepted we need one more person.

George McFarlane – need to know if Rob Hare or Sean Hinds would sit on the committee?

George McFarlane – he will officially send correspondence to Savi Narayanan which will not preclude CHA Ottawa Branch from having a representative.

Student Award – no volunteers
Nominations Committee – no volunteers

14. Other Business
Website – Carol Nowak/Andrew Smith/Terese Herron were to come up with proposals,
Nowak – still looking into it
Herron – individual has not come back with a response
Smith – individual has come back with approx cost of $1,000.

George McFarlane – wants something by May Director's meeting, ACLS has redone theirs and it cost about $10,000.

Will give a name to Terese of a student who worked on CIG website.

US Hydro – George McFarlane is going to go, would like to see as many CHA members there as possible.

George McFarlane – any other business – no

Other items - we will get the bank account sorted out, and the insurance sorted out.

Next annual AGM in June 2010 at the conference.

George McFarlane thanks everyone for attending and for their hard work; hopefully we will have another good year.

Terese Herron thanked Christine Delbridge for taking minutes.

Motion to adjourn.
Meeting adjourned at 14:05

Canadian Hydrographic Association - "The Corporation"

The following is the documentation and bylaws relating to the incorporation of the Canadian Hydrographic Service.

Letters of Patent

Consumer and Corporate Affairs Canada / Consommation et Corporations Canada

Canada Corporations Act / Loi sur les corporations canadiennes

THE ISSUANCE OF THESE LETTERS PATENT DOES NOT CONSTITUTE AUTHORITY TO PRACTICE OR TO REGULATE THE PRACTICE OF THE PROFESSION REFERRED TO HEREIN

CANADA

LETTERS PATENT

WHEREAS an application has been filed to incorporate a corporation under the name

CANADIAN HYDROGRAPHIC ASSOCIATION
ASSOCIATION CANADIENNE D'HYDROGRAPHIE

THEREFORE the Minister of Consumer and Corporate Affairs by virtue of the powers vested in him by the Canada Corporations Act, constitutes the applicants and such persons as may hereafter become members in the corporation hereby created, a body corporate and politic in accordance with the provisions of the said Act. A copy of the said application is attached hereto and forms part hereof.

Date of Letters Patent - January 22, 1988

GIVEN under the seal of office of the Minister of Consumer and Corporate Affairs.

Frederick H. Sparling

for the Minister of Consumer and Corporate Affairs

RECORDED 26th September, 1988

Film 605 Document 71

David D. Kirchmayer

Deputy Registrar General of Canada

Canada

Application for Incorporation

APPLICATION FOR INCORPORATION OF A CORPORATION WITHOUT SHARE CAPITAL UNDER PART II OF THE CANADA CORPORATIONS ACT

To the Minister of Consumer and Corporate Affairs of Canada.

I

The undersigned hereby apply to the Minister of Consumer and Corporate Affairs for the grant of a charter by letters patent under the provisions of Part II of the Canada Corporations Act constituting the undersigned, and such others as may become members of the Corporation thereby created, a body corporate and politic under the name of

CANADIAN HYDROGRAPHIC ASSOCIATION
ASSOCIATION CANADIENNE D'HYDROGRAPHIE
(hereinafter referred to as "the Corporation")

The undersigned have satisfied themselves and are assured that the proposed name under which incorporation is sought is not the same or similar to the name under which any other company, society, association or firm, in existence is carrying on business in Canada or is incorporated under the laws of Canada or any province thereof or so nearly resembles the same as to be calculated to deceive and that it is not a name which is otherwise on public grounds objectionable.

II

The applicants are individuals of the full age of twenty-one years with power under law to contract. The name, the place of residence and the calling of each of the applicants are as follows:

Robert William Sandilands, Director
2921 Seaview Road
VICTORIA, B.C.
V8N 1K9
Occupation: Hydrographer

Anthony Ridge Mortimer, Director
6744 Jedora Drive
BRENTWOOD BAY, B.C.
V0S 1A0
Occupation: Hydrographer

George Henry Eaton, Director
Box 2053
SIDNEY, B.C.
V8L 3S3
Occupation: Hydrographer

Michael John Woodward, Director
717 Downey Road
SIDNEY, B.C.
V8L 3R9
Occupation: Tides and Currents Expert

The said Robert William Sandilands, Anthony Ridge Mortimer, George Henry Eaton and Michael John Woodward will be the first directors of the Corporation. Barry Michael Lusk, 4719 Amblewood Drive, Victoria, B.C., shall be the first corporate President.

III

The objects of the Corporation are:

1. To advance the technical and professional ability of members by:

a) Encouraging members to acquire a comprehensive knowledge of hydrography, by a continuing program of study and development;
b) Maintaining professional standards of work;
c) Fostering a critical interest in hydrography;
d) Encouraging interest in the work of related organizations and disciplines.

2. To encourage a spirit of cooperation, tolerance, understanding and equality amongst all members in order that unity of purpose can be established and maintained.

3. To promote the free exchange of information and ideas.

IV

The operations of the Corporation may be carried on throughout Canada and elsewhere.

V

The place within Canada where the head office of the Corporation is to be situated is Ottawa, Ontario.

VI

It is specially provided that in the event of dissolution or winding-up of the Corporation all its remaining assets after payment of its liabilities shall be distributed to one or more organizations in Canada having cognate or similar objects.

VII

In accordance with Section 65 of the Canada Corporations Act, it is provided that, when authorized by resolution, duly passed by the directors and sanctioned by at least two-thirds of the votes cast at a special general meeting of the members duly called for considering the resolution, the directors of the Corporation may from time to time:

a) borrow money upon the credit of the Corporation;
b) limit or increase the amount to be borrowed;

c) issue debentures or other securities of the Corporation;
d) pledge or sell such debentures or other securities for such sums and at such prices as may be deemed expedient; and
e) secure any such debentures, or other securities, or any other present or future borrowing or liability of the Corporation, by mortgage, hypothec, charge or pledge of all or any currently owned or subsequently acquired real and personal, movable and immovable, property of the Corporation, and the undertaking and rights of the Corporation.

Any such resolution may provide for the delegation of such powers by the directors to such officers or directors of the Corporation to such extent and in such manner as may be set out in the resolution.

Nothing herein limits or restricts the borrowing of money by the Corporation on bills of exchange or promissory notes made, drawn, accepted or endorsed by or on behalf of the Corporation.

VIII

The by-laws of the Corporation shall be those filed with the application for letters patent until repealed, amended, altered or added to.

IX

The Corporation is to carry on its operations without pecuniary gain to its members and any profits or other accretions to the Corporation are to be used in promoting its objects.

X

The Corporation shall not engage in trade union activities.

XI

The Corporation may, as ancilliary and incidental to the objects expressed herein, publish, sell and distribute such literature as may be necessary, expedient, appropriate or desirable for the furtherance of the objects of the Corporation.

DATED at the City of Victoria, in the Province of British Columbia, this 16th day of December, 1987.

ROBERT WILLIAM SANDILANDS

ANTHONY RIDGE MORTIMER

GEORGE HENRY EATON

MICHAEL JOHN WOODWARD

CANADIAN HYDROGRAPHIC ASSOCATI...

BY-LAWS

CORPORATE SEAL

1. The board of directors may, from time to time, authorize by resolution a seal which shall be the seal of CANADIAN HYDROGRAPHIC ASSOCIATION - ASSOCIATION CANADIENNE D'HYDROGRAPHIE (hereinafter referred to as "the Corporation").

CONDITIONS OF MEMBERSHIP

2. Membership in the Corporation shall be limited to persons interested in furthering the objects of the Corporation and shall include anyone interested in hydrography and closely associated disciplines. Hydrography is the study, description and mapping of oceans, lakes and rivers.

3. All applicants for membership shall be deemed members upon their registration in the branch designated for their location by the board of directors.

4. Unless otherwise provided, all applications for membership are subject to the approval of both the National President and the Vice-President of the branch in which the member is registered.

5. Any member may be required to resign by the adoption of a special resolution by the affirmative vote of three-quarters (3/4) of the members at the annual general meeting or at a special general meeting convened to consider such resolution, provided that such member shall have the right to attend and be heard at the meetings so convened.

SPECIAL MEMBERSHIP

6. a) Honorary membership. Honorary membership may be conferred upon any person who, in the opinion of the Board of Directors, has made a significant contribution to hydrography and the Board of Directors may exempt such person from any other requirements of the by-laws. Honorary members shall not be entitled to vote.

b) Life membership. Life membership may be conferred upon any member who has, in the opinion of the branch executive in which he is registered, made a significant contribution to the Corporation. Life members shall enjoy all rights of the other members. The branch conferring the life membership shall be responsible for that member's fees.

c) International members. International members are members residing outside of Canada. They shall be members of the branch of their choice and shall enjoy all rights of other members. Their membership shall be administered by an individual appointed by the National President.

d) Sustaining member. A sustaining member shall be an organization or company eligible for membership. Sustaining members shall not be entitled to vote. The board of directors may, by resolution, limit the membership rights of a sustaining member.

7. Any member may withdraw from the Corporation by delivering to the head office of the Corporation by registered mail a written resignation or by lodging a copy of the resignation with the secretary of the Corporation. The National Secretary-Treasurer will inform the Branch Vice-Presidents of any resignations received.

FEES

8. There shall be two levels of membership fees.

a) A national membership fee determined by the board of directors and ratified by a simple majority of the members present at the annual general meeting of the Corporation;

b) A branch membership fee determined by the branch executive and ratified by a simple majority of the members present at the annual branch meeting.

9. All membership fees shall be collected under the authority of the branch executive in which the member is registered.

10. Fees shall be payable in the month of January of each year and will be in arrears on February 1st of the same year. Members in arrears are subject to expulsion.

HEAD OFFICE

11. The head office of the Corporation shall be situated in Ottawa, Ontario.

BOARD OF DIRECTORS

12. The property and business of the Corporation shall be managed by the board of directors of whom sixty percent (60%) shall constitute a quorum. The board of directors may on literature of the Corporation be designated as a board of governors.

13. The applicants for incorporation shall become the first directors of the Corporation whose term of office on the board of directors shall be until the election of the successors as set forth in paragraph 14 hereof.

14. The successors to the first directors shall be the duly elected Vice-Presidents of each Branch and the National President. The said Vice-Presidents shall be elected in December of each year and shall hold office for a period of one year commencing the first of January in the ensuing year. The National President shall hold office for a three year period.

15. The office of director shall be automatically vacated if the director:

a) resigns his office by delivering a letter of resignation to the secretary of the Corporation;
b) is found to be a lunatic, or becomes of unsound mind;
c) becomes bankrupt or fails to meet his current liabilities as they fall due or compounds with his creditors;

d) dies; or
e) is removed from office by a resolution passed by three-quarters (3/4) of the members present and entitled to vote at a special general meeting convened to consider such resolution;

provided that if any vacancy shall occur for any of the above reasons, or if a branch executive fails to elect a Vice-President, the board of directors may by majority vote appoint a member of the Corporation to the board of directors, and any such director shall be validly appointed, and shall serve, subject to these by-laws, until the first general meeting following the next executive election of the branch in which the vacancy was filled.

16. (a) Meetings of the board of directors may be held at any time and place to be determined by the directors provided that forty-five (45) clear days notice of every meeting shall be sent in writing to each director. There shall be at least one (1) meeting per year of the board of directors. No error or omission in giving notice of any meeting of the board of directors or any adjournment of any meeting of the board of directors shall invalidate the meeting or make void any proceedings taken thereat. Any director may at any time, in writing, waive notice of any such meeting and may in writing ratify, approve and confirm any proceedings taken thereat. Each director is authorized to exercise one (1) vote.

(b) A director may participate in a meeting of the board or of any committee of the directors by means of conference telephones or other communications facilities by means of which all directors participating in the meeting can hear each other and provided that all such directors agree to such participation. A director participating in a meeting in accordance with this by-law shall be deemed to be present at the meeting and to have so agreed and shall be counted in the quorum therefor and be entitled to speak and vote thereat.

(c) A resolution, whether by document or any method of transmitting legibly recorded messages or other means, signed by all of the directors shall be as valid and effectual as if it had been passed at a meeting of the directors duly called and held. Such resolution may be in two or more counterparts which together shall be deemed to constitute one resolution in writing. Such resolution shall be filed with the minutes of the proceedings of the directors and shall be effective on the date stated thereon or on the latest date stated on any counterpart.

17. No director of the Corporation shall receive any remuneration for his or her services as a director, provided however that the board of directors may by resolution authorize reimbursements for expenses actually incurred by a director in attending any regular or special meeting of the board of directors or any general meeting of the members. Nothing contained herein shall be construed as precluding a director from serving the Corporation as an officer or in any other capacity and receiving compensation for his or her services in that capacity. No director shall directly or indirectly receive any profit from his position as a director, provided however that any director who is engaged in or is a member of a firm engaged in any business or profession may act in, and be paid the

usual professional costs and charges for, any professional business rendered to the Corporation in connection with the administration of the affairs of the Corporation.

18. The board of directors may appoint such agents and engage such employees as it deems necessary from time to time, and any person so appointed or engaged shall perform those duties as prescribed by the board of directors at the time of his or her appointment.

19. The board of directors may appoint committees whose members will hold their offices at the will of the board of directors.

20. The remuneration of all officers, employees, agents and committee members shall be fixed by the board of directors by resolution.

INDEMNITIES TO DIRECTORS AND OTHERS

21. Every director or officer of the corporation or other person designated by the board of directors who has undertaken or is about to undertake any liability on behalf of the Corporation shall from time to time and at all times, be indemnified and saved harmless out of the funds of the Corporation, from and against:

a) all costs, charges and expenses whatsoever which such director, officer or other person sustains or incurs in or about any action, suit or proceeding which is brought, commenced or prosecuted against him, or in respect of any act, deed, matter or thing whatsoever, made, done or permitted by him, in or about the execution of the duties of his office or in respect of any liability so incurred;

b) all other costs, charges and expenses which he sustains or incurs in or about or in relation to the affairs of the Corporation, except such costs, charges or expenses as are occasioned by his own willful neglect or default.

BRANCH EXECUTIVE

22. The board of directors shall provide, by resolution, for the creation of Branch Executives and which Executives shall exercise such powers as are authorized by the board of directors, provided always that such powers shall be administrative only and all powers to enact policy are specifically reserved to the board of directors.

23. (a) There shall be a Branch Executive for each branch consisting of a Vice-President, Secretary-Treasurer and, at the discretion of the Branch, additional Executive members not exceeding one (1) additional Executive member for each fifteen (15) full members or majority fraction thereof, one of whom shall be the immediate past Vice-President. If the immediate past Vice-President is elected National President, he shall not become an executive member of the Branch and the resulting vacancy shall be filled from the Branch membership. The Branch Executive shall be elected by ballot among all the members of the Branch in good standing. The Branch Executive may, from time to time, fix the quorum necessary to transact business and unless so fixed quorum shall be a majority of the Branch Executive then in office.

(b) A "nominating committee" shall be appointed by the Branch Executive to nominate a slate of officers, subject to the approval of the nominees. The counting of the ballots shall take place at the annual branch meeting, and the new Branch Executive shall take over at the start of the fiscal year. Their term of office shall be for one (1) year and the Vice-President or Secretary-Treasurer may not serve for more than three (3) years in succession.

(c) Meetings of the Branch Executive shall be presided over by the Vice-President and shall be held at any time and place to be determined by the Vice-President provided that forty-eight (48) hours notice of such meeting shall be sent in writing to each member of the Branch Executive.

(d) Any member of the Branch Executive may resign from the office by delivering a letter of resignation to the National President of the Corporation.

24. Any member of the Branch Executive may be removed from office by a three-quarter (3/4) majority vote of the Branch Executive.

POWERS AND DUTIES OF DIRECTORS

25. The directors of the Corporation may administer affairs of the Corporation in all things and make or cause to be made for the Corporation, in its name, any kind of contract which the Corporation may lawfully enter into and, save as provided herein, may exercise all other powers and do all other acts and things as the Corporation is by its charter or otherwise authorized to exercise and do.

26. The directors shall have power to authorize expenditures on behalf of the Corporation from time to time and may delegate by resolution to an officer or officers of the Corporation the right to employ and pay salaries to employees. The directors shall have the power to make expenditures for the purpose of furthering the objects of the Corporation. The directors shall have the power to enter into a trust arrangement with a trust company for the purposes of creating a trust fund, the capital and interest of which shall be made available for the benefit of promoting the interest of the Canadian Hydrographic Association in accordance with the terms and conditions as the board of directors may prescribe.

27. The board of directors shall take such steps as it may deem requisite to enable the Corporation to acquire, accept, solicit or receive legacies, gifts, grants, settlements, bequests, endowments and donations of any kind for the purpose of furthering the objects of the Corporation.

OFFICERS

28. The officers of the Corporation shall be the:

a) National President;
b) Vice-President of each Branch Executive;
c) National Secretary-Treasurer;
d) Branch Secretary-Treasurers; and
e) any other officers as the board of directors may by resolution determine.

29. Unless otherwise provided, the officers of the Corporation shall hold office for one (1) year from the date of appointment or election or until their successors are elected or appointed in their stead.

DUTIES OF OFFICERS

30. (a) The National President shall be the chief executive officer of the Corporation. He shall preside at all general meetings of the Corporation and of the board of directors. He shall be responsible to the board of directors for the general and active management of the affairs of the Corporation. He shall see that all orders and resolutions of the board of directors are carried into effect.

(b) The Vice-Presidents shall preside over all Branch Executive or Branch General meetings and shall keep the National President informed of all activities by forwarding a copy of the minutes of all meetings to the National President.

(c) The first National President shall be as provided for in the Application for Incorporation and shall serve until January 1, 1990, unless sooner terminated pursuant to the provisions hereof.

(d) Successors to the first National President shall be elected for a period of three (3) years by a mailed ballot among the general membership.

(e) Prior to a National Presidential election, the board of directors shall appoint an elections committee to accept nominations, inform the membership and conduct the election.

(f) The National President will be eligible for re-election to one (1) additional term of office.

(g) The board of directors may, by resolution requiring the approval of three-quarters (3/4) of the board of directors, dismiss the National President from office and appoint a Branch Vice-President to fill the office of National President until a new National President can be elected by a mailed ballot among the general membership, which election shall be held within one (1) year of the date from which the National President was required to have vacated the office.

(h) Where a National President has resigned from office or has become incapable of carrying out the duties of the office of National President, the board of directors shall fill the office in the same manner as though the National President had been dismissed from the office.

(i) The officers of the Corporation, other than the National President, are removable by a majority of the directors.

31. (a) The National Secretary-Treasurer appointed by the National President, shall be responsible for keeping minutes of the proceedings of all board meetings and general meetings of the Corporation. The National Secretary-Treasurer shall also be responsible for the custody of funds belonging to the Corporation and shall keep full and accurate accounts of all assets, liabilities, receipts and disbursements of the Corporation.

(b) The Branch Secretary-Treasurers shall perform the same respective duties for their branches. They shall have the custody of the funds and securities of the branches of the Corporation and shall keep full and accurate accounts of all assets, liabilities, receipts and disbursements of the branches of the Corporation in the books belonging to the branches of the Corporation. They shall also perform such other duties as may from time to time be directed by the Branch Executive.

32. The National Secretary-Treasurer may be empowered by resolution of the board of directors, to carry on the affairs of the Corporation generally under the supervision of the President. The National Secretary-Treasurer shall attend all meetings and act as clerk thereof, and record all votes and minutes of all proceedings in the books to be kept for that purpose. The National Secretary-Treasurer shall give or cause to be given notice of all meetings of members and of the board of directors, and shall perform such other duties as may be prescribed by the board of directors or National President. The National Secretary-Treasurer shall be the custodian of the seal of the Corporation, and shall deliver the seal upon such occasions and to such person or persons as authorized by resolution of the board of directors.

33. The duties of all other officers of the Corporation shall be such as the terms of their engagement call for or such as the board of directors require of them.

EXECUTION OF DOCUMENTS

34. The directors may from time to time by resolution appoint officers on behalf of the Corporation to sign specific contracts, documents or instruments in writing. Contracts, documents or other instruments in writing requiring execution by the Corporation shall be signed by any two such officers. All contracts, documents and instruments in writing and executed in accordance with these by-laws shall be binding upon the Corporation without any further authorization or formality. The directors may give the Corporation's power of attorney to any registered dealer in securities for the purposes of the transferring of and dealing with any stocks, bonds, and other securities of the Corporation. The seal of the Corporation may be affixed by the National Secretary-Treasurer to contracts, documents and instruments in writing signed as aforesaid, or may be affixed by any officer or officers appointed by resolution of the board of directors.

MEETINGS

35. (a) The annual or any other general meeting of the members shall be held at the head office of the Corporation or at any place as the board of directors may determine and on such day as the directors shall appoint.

(b) An annual Branch Meeting shall be held by each Branch every year during the month of December, at which the election of officers shall take place.

36. At every annual general meeting, in addition to any other business that may be transacted, the report of the directors, the financial statement and the report of the auditors shall be presented and auditors appointed for the ensuing year. The members may consider and transact

other business at any regularly constituted general meeting of the members. The board of directors or the National President may at any time call a general meeting of the members of the Corporation. The board of directors shall call a special general meeting of members on written requisition of members carrying not less than 5% of the voting rights.

37. Forty-five (45) days' written notice shall be given to each voting member of any annual or special general meeting of members. Notice of any meeting where special business will be transacted should contain sufficient information to permit the member to form a reasoned judgment on the decision to be taken. Members present in person at a meeting shall constitute a quorum. Each voting member present at a meeting shall have the right to exercise one vote. A Member may, by means of a written proxy, appoint a proxyholder to attend and act at a specific meeting of members, in the manner and to the extent authorized by the proxy. A proxyholder must be a member of the corporation. Notice of each meeting of members must remind the member that he has the right to vote by proxy.

38. No error or omission in giving notice of any annual or special general meeting or any adjourned meeting, whether annual or special, of the members of the Corporation shall invalidate such meeting or make void any proceedings taken thereat and any member may at any time waive notice of any such meeting and may ratify, approve and confirm any or all proceedings taken or had thereat. For purpose of sending notice to any member, director or officer of any meeting or otherwise, the address of the member, director or officer shall be his last address recorded in the register of members of the Corporation.

MINUTES OF BOARD OF DIRECTORS AND BRANCH EXECUTIVES

39. The minutes of meetings of the board of directors or the branch executives will be available for scrutiny by the general membership of the Corporation and shall be available to the board of directors, each of whom is to receive a copy of such minutes. Provided, however, the directors may, by resolution, prohibit the disclosure of any or all minutes to any member of the Corporation.

VOTING OF MEMBERS

40. At all meetings of members of the Corporation every question shall be determined by a simple majority of votes unless otherwise specifically provided by statute or by these by-laws.

FINANCIAL YEAR

41. The fiscal year of the Corporation shall be from January 1st to December 31st.

AMENDMENTS OF BY-LAWS

42. Unless otherwise provided, the by-laws of the Corporation may be repealed or amended by resolution passed by a majority of the directors and sanctioned by an affirmative vote of at least two-thirds (2/3) of the members at a general meeting of which three (3) months' notice of the proposed repeal or amendment has been given, provided that the repeal or amendment of any by-law shall not be enforced or acted upon until the approval of the Minister of Consumer and Corporate Affairs has been obtained.

AUDITORS

43. The members shall at each annual meeting appoint an auditor to audit all the accounts of the Corporation. The auditor so appointed is to hold office until the next annual meeting. That the directors may by resolution fill any casual vacancy in the office of the auditor. The remuneration of the auditor shall be fixed by the board of directors. The accounts of each branch and the accounts of any special committees established by the Board of Directors or any Branch Executive shall be audited by auditors nominated by the said Branch or Board of Directors, as the case may be, in charge of the said committee. All reports so created shall be forwarded to the auditor appointed for the Corporation.

BOOKS AND RECORDS

44. The directors shall ensure that all necessary books and records of the Corporation required by the by-laws of the Corporation or by any applicable statute or law are regularly and properly kept.

RULES AND REGULATIONS

45. (a) The board of directors may prescribe such rules and regulations not inconsistent with these by-laws relating to the management operation of the Corporation as they deem expedient, provided that such rules and regulations shall have force and effect only until the next annual meeting of the members of the Corporation when they shall be confirmed, and failing such confirmation at such annual meeting of members shall at and from that time cease to have any force and effect.

(b) Each Branch Executive may enact rules and regulations not inconsistent with these by-laws and subject always to by law 22 hereof.

INTERPRETATION

46. In these by-laws and in all other by-laws or resolutions of the Corporation hereafter passed unless the context otherwise requires, words importing the singular number or the masculine gender shall include the

plural number of the feminine gender, as the case may be, and references to persons shall include firms and corporations.

IN WITNESS WHEREOF we have hereunto set our hands at Victoria, British Columbia, on the 20th day of APRIL, 1988.

FIG Go F.I.G.ure

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

Commission 4 Newsletter – June 2008

What can the surveying profession do to help mitigate the financial crisis? This question was posed during a panel discussion of Commission chairs held at this year's FIG General Assembly (GA) in Eilat, Israel. If we consider the contribution of hydrography towards reducing transportation costs, our work in producing high resolution surveys of ports and their approaches facilitates access to deeper draft vessels where an increase in vessel draft equates an increase in shipping capacity for the same voyage. Commission 4 chair-elect, Michael Sutherland, co-author of the recent Costa Rica Declaration on Pro-Poor Coastal Zone Management, noted (post GA) that the global financial crisis as we know it is on the forefront of our minds because it has recently affected the developed world while the undeveloped world has always known financial crisis. The Costa Rica Declaration provides good practice recommendations for sustainable development: particularly, the development of coastal zone policies that recognise the right of access for local communities to coastal resources and the development of coastal management methodologies that recognise social justice and specifically embrace pro-poor policies and environmentally balanced use of the coastal areas. Delegates from the Nigerian Institute of Surveyors have in recent years, brought to our attention the need for these recommendations within their coastal areas. Theirs is a case which includes the need for coastal hydrography and tidal monitoring to provide a better understanding of the social, environmental and economic impact on coastal communities due to changes to near shore and river systems as a result of industrial development.

The FIG/IHO/ICA International Board on the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IB) held their annual meeting in April in Genoa, Italy. The IB reviewed ten (10) courses from seven (7) countries around the world including Australia, Brazil, Ecuador, Italy, Pakistan, Turkey and the United Kingdom. A full list of the courses that were successfully recognised will be published by the IHO shortly. The IB considered the matter of funding of its activities in particular the increased workload and costs associated with meeting to review course submissions. The IB is proposing the introduction of a section within each of the existing Standards that would encompass the recognition of the competency of individuals through appropriate schemes at the national or regional level. The IB has completed a draft proposal that is to be approved by parent organisations and tabled at the 1st meeting of the IHO Inter Regional Coordination Committee, to be held in Monaco, June 2009. A report including proposals on IB funding and the inclusion of elements of individual recognition with the Standards has been circulated to Commission 4 delegates under separate cover.

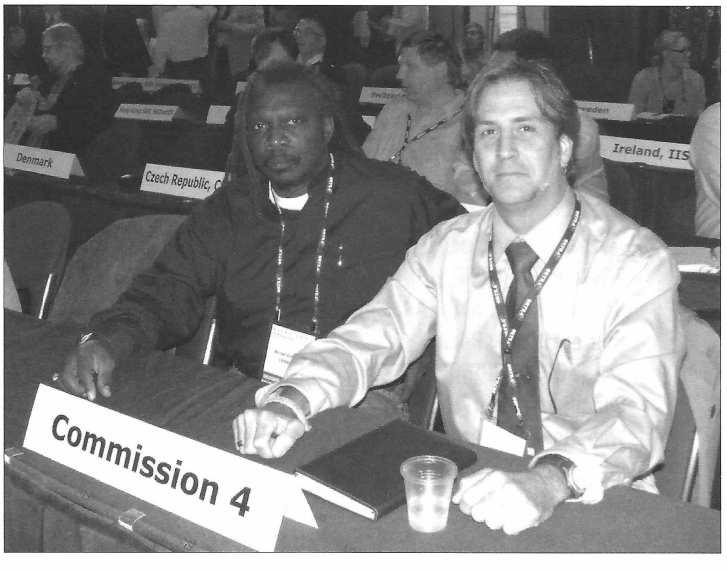
FIG Working Week 2009, Technical Session on Hydrographic Surveying in Practice

FIG Working Week 2009 took place in Eilat, Israel from 3 to 8 May 2009[1]. The conference gathered more than 500 delegates (including 60 students) – with exhibitors and accompanying persons about 650 participants from 65 countries to Eilat, a city on the southernmost edge of Israel at the Red Sea. The technical programme included almost 250 presentations in about 60 technical sessions and workshops. The conference was hosted jointly by the Association of Licensed Surveyors in Israel (ALSI) and FIG in co-operation with the Survey of Israel. Commission 4's annual meeting and technical sessions were well-attended, the latter featuring a total of 9 presentations from Canada, Israel, Nigeria and the UK. Topics ranged from sea level monitoring to the measurement and monitoring of shoreline, marine cadastre and the acquisition of bathymetry and sea bed morphology from multi beam sonar. Hydrographic Education in Israel was profiled during a Commission 2 session on Good Educational Practices. Commission 4 would like to extend a special thanks to Dr. John Hall, author of The National Bathymetric Survey of Israel, Almost Completed for his lively discussion, hospitality and contributions towards Commission 4's activities in Eilat.

Excerpt from [EM1002] Multibeam Bathymetry of Northern Gulf of 'Aqaba/Elat, Sade A.R., Hall J.K. et al

The call for papers for the **7th FIG Regional Meeting in Hanoi**, Vietnam[2] is out. The theme of this conference which will be held 19-22 October is entitled, "Spatial Data Serving People: Land Governance and the Environment - Building the Capacity" and its timing coincides in time with Ha Noi's 1000 year anniversary. As a highlight of the conference, our hosts the Viet Nam Association of Geodesy, Cartography and Remote Sensing (VGCR) will organise a one-day trip for all participants to Ha Long Bay, a famous world heritage site for its outstanding geological value listed by UNESCO. Delegates will be pleased to know that this is one of the most affordable registration packages yet. The early bird registration fee is 300 Euros and includes meals and the day-tour to Ha Long Bay. Commission 4's goal is to hold at least two focused sessions with invited papers: one on the Economic Benefits of Hydrography and the other on Coastal Zone Development. The latter will be a joint session with Commissions 5 and 8. This regional meeting will also provide a forum for chairs and chairs-elect to focus on the development of commission work plans for 2011-14. As delegates you have the opportunity to influence the present and future direction of Commission 4 so we invite you to share your opinion on the hot topics relevant to hydrography today.

Andrew Leyzack
Chair of Commission 4



Chair-elect Michael Sutherland and Chair Andrew Leyzack, FIG General Assembly 2009A.R., Hall J.K. et al

Web References

[1] www.ortra.com/fig/
[2] http://www.fig.net/vietnam/

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Contact *Lighthouse* at the address listed in this journal or at www.hydrography.ca

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

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- ***News from corporate members in every edition of Lighthouse.***

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

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

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

ASI Group Ltd

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 packages. In addition to surface vessels, ASI owns and operates a fleet of purpose-built remotely operated vehicles (ROVs) to deploy sonar and video imaging in open water, tunnels and pipelines.

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

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

The ACLS is a national self-regulating professional association. It has 560 members located across Canada (and the world), who have expertise in surveying, photogrammetry, remote sensing, geodesy, hydrography and land information systems.

The ACLS is committed to raising awareness of the responsibilities and concerns of respective stakeholders in offshore Canada lands, and to find a common strategy to move this industry sector forward for the betterment of all. The following is a short list of the current main thrusts:

- Promotion of a Marine Cadastre for Canada
- Promotion of the ACLS national certification program for hydrographers
- Publication and promotion of the new book entitled "Canada's Offshore: Jurisdiction, Rights, and Management". Copies can be purchased from: www.acls-aatc.ca or www.trafford.com

L'A.A.T.C. est une association professionnelle de juridiction fédérale. Elle est composée de 560 membres répartis aux quatre coins du Canada (et du monde) qui ont une expertise en arpentage, en photogrammétrie, en télédétection, en géodésie, en hydrographie et en systèmes d'information foncière à référence spatiale.

L'A.A.T.C. est engagée à l'amélioration de la sensibilisation aux responsabilités et aux préoccupations des intervenants respectifs des terres extracôtières du Canada et de l'adoption d'une stratégie commune pour faire progresser ce secteur de l'industrie en vue de la plus-value pour tous. Voici la liste des activités principales en cours :

- Promotion d'un cadastre marin pour le Canada.
- Promotion du programme national de certification des hydrographes de l'AATC.
- La publication et la promotion du nouveau livre : *Zone extracôtière canadienne : juridiction, droits et gestion*. La version française sera disponible en novembre 2007. Vous pouvez faire l'acquisition de copies en visitant : www.acls-aatc.ca ou www.trafford.com

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 400 employees and seven 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 ROVs, 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 4500 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 100,000 kilometres 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, 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*

Canadian Seabed Research Ltd

Canadian Seabed Research Ltd. (CSR) is an established company of geophysicists, hydrographic surveyors, and geologists. We operate worldwide, conducting hydrographic and geophysical surveys for a wide range of applications including charting, offshore petroleum, port engineering and marine environmental applications.

Our team of professionals provide a complete marine survey solution that includes positioning, hydrographic surveying, seafloor imaging, subbottom profiling, geotechnical analysis, comprehensive reporting and mapping.

Established in 1985, CSR has developed a solid reputation for achieving the highest quality results. This is based on careful project planning, the use of innovative equipment, and the unique experience our professional team brings to project interpretation and reporting.

CSR's suite of geophysical systems enable us to offer a wide variety of services to our clients. Our multiple profiling systems are used to accurately map depth to bedrock and surficial sediments. Sidescan sonar technology allows us to achieve high resolution seabed imagery for geohazard detection. Our single and multibeam surveys achieve the highest quality bathymetric data for hydrographic and engineering applications.

CSR has conducted surveys throughout Canada and the United States, Beaufort Sea, Russia, South America, North Sea and the High Arctic. Our survey solutions are innovative and based on a thorough understanding of marine geologic and geophysical principles.

Our future will continue to be based on excellence and creative innovation in the earth sciences.

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Fugro Jacques GeoSurveys Inc.

Fugro Jacques GeoSurveys Inc. (FJGI) is a Canadian established company owned by Fugro NV and the Jacques Whitford Group. FJGI has offices in St. John's NL and in Dartmouth, NS and has one the largest private sector suites of hydrographic, geophysical, geotechnical and positioning equipment in Canada. With approximately 85 employees, FJGI has established an impressive track record in Canada and on the international stage.

FJGI has provided seabed mapping and construction support services for all of Eastern Canada's offshore oil and gas developments and is also actively involved in marine based non-oil and gas projects such as Canada's UNCLOS mapping, hydrographic charting in Canada's North, large area habitat mapping, pipeline and cable route surveys, ice scour studies, wharf investigations and a broad range of engineering and construction support surveys.

FJGI's Hydrographic Group operates a wide range of multibeam systems such as Reson 8101, 8111 and 8125 systems. These systems are routinely mobilized by FJGI on ocean going vessels, as well as our customized 26 foot inshore survey launch. Systems have also been mobilized on ROVs for detailed infield mapping.

Multibeam data are processed in the field and at base in St. John's and Dartmouth using CARIS HIPS/SIPS, IVS' Fledermaus visualization tools, and Fugro's own Starfix software suite. The resultant multibeam data are commonly integrated with seabed sampling, underwater imagery, geotechnical, seismic, sidescan and sub-bottom profiler data to deliver superior data products for use in seafloor and sub-seafloor assessments.

Throughout each project, FJGI is committed to the health and safety of its employees, partners and clients, and to the protection of the environment. This is accomplished through the Company's comprehensive HSE policy and Safety Management System which is OHSAS 18001 certified.

If you would like to receive further information about Fugro Jaques GeoSurveys Inc. please contact:

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HYPACK, Inc.

HYPACK, Inc develops Windows-based software for the hydrographic and dredging industry. Founded in 1984, HYPACK, inc. (formerly Coastal Oceanographics, inc.) has evolved from a small hydrographic consultancy to one of the most successful worldwide providers of hydrographic and navigation software. HYPACK® is one of the most widely used hydrographic surveying packages in the world, with over 4,000 users. It provides the surveyor with all of the tools needed to design their survey, collect data, process it, reduce it, and generate final products.

Whether you are collecting hydrographic survey data or environmental data or just positioning your vessel in an engineering project, HYPACK® provides the tools needed to complete your job. With users spanning the range from small vessel surveys with just a GPS and single beam echosounder to large survey ships with networked sensors and systems, HYPACK® gives you the power needed to complete your task in a system your surveyors can master.

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Interactive Visualization Systems (IVS 3D)

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

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

IVS 3D has a dynamic and creative team of professionals that are committed to advancing visualization technology; and dedicated to unveiling opportunities to develop and improve visualization and interpretation software in ways that will provide our clients with first-rate software tools to ensure success of their business or research endeavours.

IVS 3D 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 3D and its services please contact:

Interactive Visualization Systems (IVS 3D)
Tel: (603) 431-1773 FAX: (603) 766-0485 E-mail: info@ivs3d.com
Website: *www.ivs3d.com*

Jeppesen Norway AS

Through Jeppesen's aviation heritage, the company has over 70 years of valuable experience working with complex data, enhancing, assembling and packaging that data to meet the needs of its customers. Jeppesen has long believed in the value and importance of strategic partnerships with industry groups and source providers, and we carry those beliefs forward with us into the marine industry.

Based upon Jeppesen Marine's relationships with hydrographic offices around the world, we share a common goal of providing superior data solutions to mariners, whether they are on the high seas, coastal or inland waterways. Jeppesen Marine also shares a common bond in improving waterway safety, increasing customer efficiency, and ensuring environmental protection.

Coupled with the acquisition of C-Map and HydroService AS, Jeppesen Marine utilizes a range of data types including vector and raster navigation charts and other digital products. By applying advanced technologies, Jeppesen Marine increases the usefulness, availability and timeliness of hydrographic data, tightly packaging that information into systems and tools that anticipate and meet customer needs.

Customers count on Jeppesen Marine to provide them with the most innovative, reliable navigational tools and data solutions for their commercial or maritime needs. Services include: Cartography services, dKart office tools and services, CM-93 data services and OEM toolkits, CM-ENC toolkit, and 24/7 customer support.

Jeppesen Marine values the unique contributions of hydrographic offices and other data providers and looks forward to continuing to build strategic alliances in the spirit of working together to advance the interests and welfare of mariners around the world.

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Kongsberg Maritime

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

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

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

For more information regarding Kongsberg Maritime please contact:

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or visit Offshore: *www.km.kongsberg.com* and Marine: *www.simrad.no*

NetSurvey Limited

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

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

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

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

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

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

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

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Website: *www.netsurvey.co.uk*

RESON Inc.

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

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

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

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

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

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

For further information please contact:

RESON Inc.
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Website: *www.reson.com*

SANI-INTERNATIONAL TECHNOLOGY ADVISORS INC. (SANI-ITA)

SANI-INTERNATIONAL TECHNOLOGY ADVISORS INC. (SANI-ITA), an Ontario Corporation, provides services and consulting in geographic information systems, remote sensing, softcopy photogrammetry and hydrography. The Corporation is a Distributor for GeoEye (IKONOS and OrbView imagery) Lizardtech (MrSID GeoExpress and DocumentExpress) and Nuvision (softcopy photogrammetry hardware) and is also the Authorised Training Centre in Canada for the complete suite of ERDAS IMAGINE software products running on SUN Solaris (UNIX) and Microsoft Windows platforms. SANI-ITA is a sister company to Spatial Geo-Link Limited, the exclusive distributor in Canada for Leica Geosystems softcopy photogrammetry and geographic imaging products.

SANI-ITA is ISO 9001:2000 registered. ISO 9001:2000 (the most comprehensive of the ISO 9000 series of standards for quality assurance developed by the International Organisation for Standardisation) encompasses all aspects of quality management inclusive of understanding customer requirements, design control and development and consulting services.

Services offered by SANI-ITA include:

- Project Consulting and Project Management
- Airborne and spaceborne data acquisitions
- Control surveys
- Hydrographic surveys
- Aerial triangulation and orthorectification of airborne data (metric, digital or video cameras) and satellite sensors (SPOT, IRS-1C, IKONOS, ASTER, QuickBird, EROS1A, OrbView SPOT5, THEOS1, FORMOSAT2 and Landsat)
- Digital Elevation/Terrain collection – automatic or static mode
- Orthomagery production
- Digital topographic mapping and map and chart revision
- GIS data structuring
- Map conversion and data translation services
- Image compression services (lossy and lossless)
- Third party audits of mapping and image data
- Visualisation services including dynamic fly-throughs and stereoscopic viewing

For additional information on the Corporation, please visit our website at:

www.sani-ita.com
or contact us at
Tel: (905) 943-7774 FAX: (905) 943-7775

News From Corporate Members
Nouvelles de Membres corporatifs

News from the ACLS

The last National Surveyors Conference was held from May 27th to 29th, 2009 in Canmore, Alberta. The Conference was a success with over 160 delegates attending.

The following members were elected to the ACLS Council positions by acclamation: George Schlagintweit, President; Jeff Fee, Vice President; Estelle Moisan, Councillor; Ivan Royan, Councillor.

New CLS Commissions were presented to the following people at the business meeting: Eryn Gibbs, Calgary, AB; Cody B. Moser, Whitecourt, AB; Arne O. Hals, Edmonton, AB; Ryan M. Pals, Edmonton, AB; Carlo Monnett, Calgary, AB; Charles Zwicker, Yellowknife, NT; Johnathan Lunn, Whistler, BC; Iain Skinner, Calgary, AB; Rares Caraba, Calgary, AB; Jason Bartlett, Burlington, ON; Calvin Bourassa, Saskatoon, SK; Jeffrey Patton, Calgary, AB; Todor Latev, New Westminster, BC; Rocky Annett, Calgary, AB; Matthew Bigney, Canmore, AB; Nicole Head, Calgary, AB; Kristopher Jewett, Calgary, AB; and Roger Leeman, Calgary, AB.

The new ACLS logo was launched at the May 29th business meeting. See top of page.

But the highlight of the meeting was the launch of the ACLS 25th Anniversary GeoCoin. The coins were issued to the members in attendance.

The idea is that to help raise the awareness of the ACLS, a coin would be issued to all members who want to participate. Members would then activate the coin on www.geocaching.com (each coin has a unique identifier) and hide the coin in an official cache. Finally, the member would log the cache on the geocaching Web site. Our hope is that the coin would be picked up, and moved to other caches, and geocachers would visit our Web site. To encourage participation the following contest was announced at the business meeting:

- Round trip airfare for one member to next year's National Surveyors Conference:
    - For the coin that traveled the longest distance
    - For the coin that traveled to the most different caches
- Draw for members who put coin in a cache

The contest will end on February 28th, 2010.

Our major project for the summer is a promotional video that will be ready in the fall. The plan is to have a 3 minute video to be posted on the ACLS Web site and used in career fairs. We also want to use a short excerpt of the video for a television commercial to be aired on the Aboriginal Peoples Television Network (APTN).

Jean-Claude Tétreault, CLS, a.-g., P. Eng., MBA
Executive Director

Geomatics Data Solutions Partners with IVS 3D

Portsmouth, NH- June 2009- IVS 3D (http://www.ivs3d.com) announced its partnership with Geomatics Data Solutions (http://www.GeomaticsDataSolutions.com) to provide sales, support, and training to Fledermaus clients located on the western coast of North America.

With over 25 years combined experience developing spatial work flows and processing marine and terrestrial survey data, Geomatics Data Solutions provides end to end solutions for their clients. From the collection of raw data to the final presentation product, their specialties include; GIS (ArcGIS, GeoMedia, MapInfo), CAD (AutoCAD, MicroStation), 3D Point Clouds and XYZ Data, DEM and DTM in various formats, 3D Visualization and Fly-Throughs and Digital Image Mosaics.

Carol Lockhart, co-founder and Commercial Manager for Geomatics, stated, "We are excited to team up with IVS 3D and foster a close working relationship. This partnership will provide us with the ability to develop faster and more efficient work flows for intuitive data processing and quality control; an integral part of the Geomatics Data Solutions' business model. Our business spans many environments using multibeam offshore, bathymetric lidar in the coastal zone and topographic lidar onshore. The Fledermaus software provides us with the environment we need to merge all these data types in a way that is efficient and intuitive for our data analysts or clients."

"Geomatics not only has the industry expertise to understand how to leverage the Fledermaus' software solutions for their clients, but their process and workflow has been developed from over 25 combined years of experience." said Bill McKernan, VP of Sales and Marketing for IVS 3D. "We expect that this partnership will provide IVS 3D with a consistent presence on the west coast of North America and in the global lidar markets"

Interactive Visualization Systems' (IVS3D) was founded in 1995 to provide the Fledermaus software suite to educational, commercial, and government institutions. The Fledermaus software suite provides users with a powerful set of interactive 3D visualization tools for data processing, analysis and presentation. Because Fledermaus allows users near real-time, interactive 3D display of very large complex scenes at their full resolution- users gain powerful insight and the ability to extract and report on more information from their combined data.

Fledermaus is currently used across many industries by a variety of disciplines such as geoscientists, oceanographers and hydrographers. The interactive tool has been used to analyze environmental and geological hazards, plan oil drilling and rig locations, and determine placements for pipeline and cable routes.

If you would like more information on this topic, or to schedule an interview, please contact:

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Facebook:
http://www.facebook.com/home.php#/group.php?gid=88332086275

IVS 3D

Fledermaus Version 7 Showcased at FCRM 09

Flood and Coastal Risk Management Attendees Impressed with FM 7 Functionality

Oxfordshire UK, July 2009- IVS 3D recently participated in the 44th annual Flood and Coastal Risk Management Conference. The conference is widely attended by local and central government authorities as well as industry service providers, consultants and research organizations. The conference focuses on the development and maintenance of strategic flood management plans for the United Kingdom.

Catriona Rollason, Product Specialist for IVS 3D Ltd., attended the conference and was available for one on one demonstrations of the newly released Fledermaus Version 7. She noted that many visitors were impressed with the level of detailed analysis that the new release is capable of. She commented, "While there are some companies who allow for visualization of topographic data in 3D and even 4D, none are able to compare to Fledermaus' functionality which gives users the ability to interact and manipulate their data sets for analysis."

Ian Davies also attended the conference with Ms. Rollason and commented on the response to iView 4D. "With the

availability of this free viewer, organizations can share 3D and 4D imagery as targeted deliverables for use in modeling and risk analysis. This functionality enables Fledermaus users to share their findings and collaborate on critical issues, all within the environments of their own desktops. Attendees quickly realized that this not only saves their organization valuable time and resources, it also enabled them to provide a higher quality end product."

"This is the second time we have attended this conference and it has become a major factor in our initiative to broaden our visibility among government agencies in the United Kingdom. We will certainly plan on attending future conferences to help us in our marketing and development objectives." stated Bill McKernan, VP of Sales and Marketing for IVS 3D.

Interactive Visualization Systems' (IVS 3D) was founded in 1995 as the developer of the Fledermaus 3D visualization and analysis software suite. Government, commercial and academic clients in all areas of ocean mapping use the software internationally.

The Fledermaus software stands apart in providing scientists and engineers with interactive and intuitive tools for processing, quality control and analysis of multibeam sonar and related data. Its use significantly improves efficiencies in areas such as; nautical charting, geologic interpretation, the assessment of seabed habitats, planning routes for pipelines and cables, and the identification of geohazards during engineering development.

The company has offices in Canada, USA, and the UK, and a worldwide distribution network. For more information about the company and products, visit www.ivs3d.com.

If you would like more information on this topic, or to schedule an interview, please contact:

Carole Mahoney at 207-636-7887 or via email: carole@minternetmarketing.com

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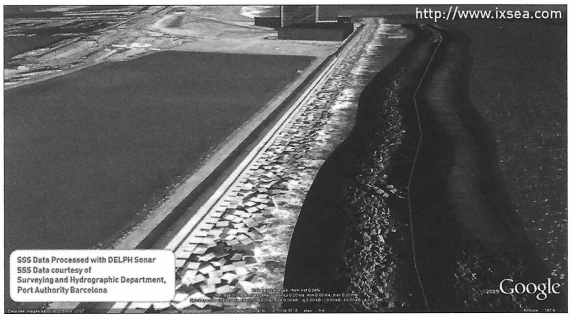
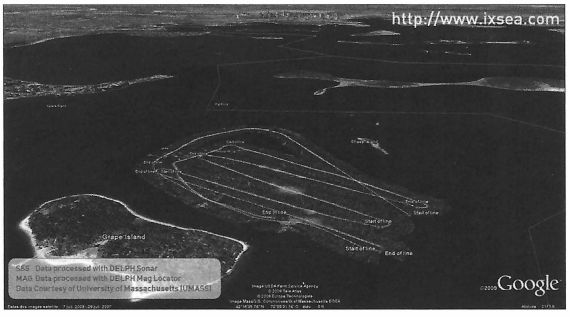
IXSEA

10th July 2009

DELPH V 2.7 : sonar & mag data export to Google Earth





A growing number of organisations, universities, ports, river authorities, survey companies are interested in visualizing their own sonar and magnetometer data in Google Earth.

With the new release of DELPH Sonar V 2.7, IXSEA is pleased to announce easy and intuitive export functionality to Google Earth in sonar interpretation.

DELPH Sonar Interpretation enhances sonar data interpretation in a very user friendly environment.
Export of .XTF sonar data into Google Earth is accurate, quick and easy. (The same facility is also available in DELPH Mag V 2.7).

IXSEA offers to all sonar data users the possibility to visualize their own data in this environment. All interested parties are invited to send one or several of their favourite data sets to IXSEA who will return them processed and ready for visualisation in Google Earth.
(for the Sonar: XTF, for Mag data: ASCII with time, position and field values).

Data set can be sent by CD/FTP or other means (please contact delph@ixsea.com).

About IXSEA
The IXSEA Group is the world leader in fiber-optic gyroscope technology. Combining excellence in innovative design and technology, our teams design, execute and maintain a complete range of gyroscopes, navigation units, acoustic positioning systems, magnetometers, sediment sounders, acoustic releases and sonars.

With a presence on all five continents, the Group has over 400 customers of reference in the scientific, offshore oil, construction and defense sectors on land, at sea, in the air and in space.

The IXSEA Group has nearly 230 employees and generated annual sales of €38 million in 2008.

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IXSEA 24th July 2009

AT EURONAVAL, IXSEA TAKES ITS PLACE AS KEY PLAYER IN THE DEFENSE INDUSTRY

(Left to right) Richard Pender, IPOZ Director, Stephane Loeul, Land & Air Division Sales Director and Yves Paturel, Head of the Land and Air Division at IXSEA finalizing contract details.

IPOZ has ordered three LANDINS, the high-end INS positioning system specifically designed for areas where GPS quality is often poor and the need for geo-referenced information is most critical.

Houston based IPOZ provides its clients with inertial navigation based solutions to problems encountered on the earth's surface, in the marine environment and underground.

The LANDINS system will be used on the IPOZ Surveyor, which is comprised of a single enclosure containing an inertial measurement IMU, a CPU and a lithiumion battery pack. It was developed as a solution for seismic surveying in areas not suitable for GPS or in environmentally sensitive areas where line-of-sight instruments require damaging tree clearance.

"We are proud to help IPOZ receive rapid geo-referenced data by extending their operational capacities even when GPS is missing," said Stephane Loeul, IXSEA Land and Air Sales Director. "IXSEA can respond quickly and effectively to clients specific requirements. This was a key factor in making this decision", commented Richard Pender, IPOZ Director.

About IXSEA
Formed in 2000, IXSEA designs and manufactures navigation and positioning systems based on its state of the art Fibre Optic Gyroscope technology, along with a complete range of seafloor mapping solutions for the scientific, offshore and defense industries.
IXSEA has more than 400 clients on five continents with a turnover of €38 million in 2008.

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News From Corporate Members
Nouvelles de Membres corporatifs

New CEO appointed at RESON

(8 June 2009) Mr. Kim Lehmann has been appointed CEO and President of RESON, the provider of underwater acoustic solu-tions,

The board is very pleased to announce that Mr. Kim Lehmann has accepted to join RESON as of the 1st of June. Mr. Lehmann brings a track record of developing customer focus, growing sales, and expanding business markets from the companies with whom he has served during the last 20 years.

Most recently he comes from a position as President & CEO of Spectronic Denmark, a leading developer and manufacturer of mission-critical surveillance solutions. Prior to this Mr. Lehmann worked as Director of Product Marketing and Communication at Brüel & Kjær Sound & Vibration Measurement A/S, which is a world leading manufacturer and supplier of sound and vibration solutions, including transducers and hydrophones.

Mr. Lehmann has an MBA from Copenhagen Business School, a B.Sc. in Mechanical Engineering from the Danish Technical University, and an education as reserve officer in the Royal Danish Air Force.

Kim Lehmann states: *"During my years working with acoustic products, I have known RESON as an innovative and professional company with a good reputation. I am looking forward to take RESON into the next phase of business development, where a number of new products and features to improve efficiency are being launched."*

Additional information

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E-mail:	kim.lehmann@reson.com

About RESON

RESON is a market leader in underwater acoustic sensors, state-of-the-art echosounders, multibeam sonar systems, transducers, hydrophones, and PDS2000 software. RESON's SeaBat® sonars and NaviSound® echosounder systems have become an industrial standard in areas such as hydrography, dredging and offshore operations as well as within defense and security applications.

Thanks to continued product and technology development, RESON leads its technological field. The company is growing and expanding into new markets and application areas – and its fourth generation of sonar systems will provide unprecedented performance for naval and commercial sys-tems in terms of accuracy, resolution, depth rating, and range. RESON has its corporate headquarters in Denmark, with subsidiaries in the U.K., the U.S., the Netherlands, Germany and Singapore.

HYPACK, Inc.
HYPACK Training Course

HYPACK Canada - October 05 - 07, 2009
The 3-day training will cover all the aspects of single beam and multibeam hydrographic surveying and dredge management using our HYPACK2009, HYSWEEP and DREDGEPACK packages.

For more information, contact HYPACK Sales - Our HYPACK Certification Test will be given on the last day of the seminar.

To register for HYPACK Canada, please visit:
https://secure.hypack.com/minicamp/Canada

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VACHON, Don

VACHON, Don On June 2nd, 2009 the hydrographic community lost a valued friend and colleague with the passing of Don Vachon, Director of the Integrated Science Data Management, Fisheries and Oceans Canada. Don spent his career advancing the technology used by the Canadian Hydrographic Service to develop, produce, maintain and distribute CHS data holdings and products to the world.

Throughout his career, Don was a firm believer in the use of commercially available tools, the use of Standards, and in supporting Canadian industry to provide the CHS with state of the art technology to maintain their position as a world leader. After graduating as an electrical engineer Don joined the CHS in 1979, where he was first involved in chart production hardware and software, then moved into system development for Electronic Chart production, Oracle Spatial development and implementations, and more recently implemented SDI technology for Web mapping and exchange of data. On the international level, Don was active in the development of IHO S-57 and the development of supporting production systems. He led the charge for and has been actively involved in the development of the enhanced standard for hydrographic exchange based on ISO TC211, which is now known as IHO S-100. Don's personal stamp sits on endeavors like the Hydrographic Production Database (HPD), a unified charting production line which reduced the duplication of effort tremendously in the CHS offices.

The GeoPortal, a project devoted to making geospatial data holdings available interdepartmentally and to all Canadians, is also his creation. In recognition of this outstanding contribution to information resources management, Library and Archives Canada and the Council of Federal Libraries selected Don Vachon as the winner of the 2004 Agatha Bystram Award for Leadership in Information Management.

In 2005 Don moved from his CHS role to become Director of the newly created Integrated Science Data Management Branch in Science. This was formed by merging his group at CHS, which managed digital chart production and distribution, with the Marine Environmental Data Service, the oceanographic data archive centre for DFO. Don managed this merger very successfully with his usual straightforward manner and strong leadership.

Don served as mentor to many; and his professionalism, energy, enthusiasm and humour inspired all who worked with him. He will be greatly missed.

Sheila Acheson

HASLAM, Sir David

HASLAM, **Sir David**, Rear Admiral KBE CB FRICS. David passed away suddenly but peacefully during the first weekend in August. He was found sitting in his armchair, pipe in hand, and presumably watching the Ashes Test Match between England and Australia. Just the week before he had enjoyed the company of friends and family of all ages and as usual was at the centre of a very good party.

He was 86 years old and had made many friends around the world. I first met David in Washington while we both took part in the 1974 Federation International de Geometre Conference. Shortly thereafter he was appointed Hydrographer of the Royal Navy, where his interests and mine coincided on matters concerning the hydrographic commission of FIG and in hydrographic affairs connected with the International Cartographic Association. Over the years we met at such exotic places as Wellington NZ, Melbourne,Taunton, London,and even Ottawa and Burlington etc. Good times, hard work, followed by wonderful parties where David was the last man left standing and the first on parade to following morning.

He became Sir David as a result of his work prior to and during the Falklands War where RN Hydrographic vessels not only charted previously unknown waters but also acted as hospital ships to convey the wounded to safety . Shortly thereafter he became the President of the Directing Committee of the International Hydrographic Organization. His impact was enormous in this role where he was supported by Adam Kerr, the first Canadian director of the IHO.

David was very attached to his old school, Bromsgrove, and gave much attention and some wealth to the school to enable it to expand its staff and the number of pupils to be educated therein. I visited the school at his invitation and was most impressed by not only its approach to modern education, but also how it proudly celebrated its history. Can you imagine, that one school produced four winners of the Victoria Cross in the First World War. He was rightly proud !

We last saw him in Victoria a few years ago when he visited with us and the Sandilands. He will be sadly missed by all who knew him. A good true friend of Canada and Canadians.

Tom McCulloch

CENTRAL REGION

Data Acquisition Oct 08 - June 09 Report

Revisory Survey

Continued to work on 2008 data submissions for Port Credit (Chart 2048), Lakefront Promenade Marina (Chart 2086), Clarkson (Chart 2047), Charts 2204 and 2205 in Georgian Bay, Oshawa/Whitby (Chart 2049 and 2050), Port Hope (Chart 2053), and the Scugog River (Chart 2026).

Arctic Surveys

The Canadian Coast Guard Ships provided numerous platforms for last summer's surveys. The CCGS *Louis S. St-Laurent* final cruise report was submitted for Canada Basin area as it relates to the UNCLOS work. The CCGS *Sir Wilfrid Laurier* was the platform for Opportunity-based surveys in the Queen Maud Gulf area. A collaborative effort with Parks Canada (the search for the Franklin Ships) provided new corridor information to safely navigate to O'Reilley Island. Data for this western arctic survey was processed but awaits information for final submissions. The CCGS *Nahidik* Science program in the Beaufort in conjunction with NRCan was successful and CHS provided the client with the 2008 data submissions. The CCGS *Henry Larsen* was a cooperative survey with UNB. The data continues to be processed and submitted. A large scale ENC for Nanisivik was produced.

ArcticNet data was acquired and archived in CHSdir for some current and future charting initiatives.

UNCLOS Arctic Ice camp had a successful survey collecting 764 spot soundings by helicopter and gravity readings. The camp was established just offshore of Ward Hunt Island and ran from Feb 23 - May 20, 2009.

Backlogs of field sheet data continues to be processed for final archiving.

Additional multibeam surveys were conducted for Kempenfelt Bay, Lake Simcoe and the Welland Canal in the Fall of 2008. In addition a study in a testbed site (Ontario Power Generation's Pump Generation Station Reservoir) was conducted in order to compare the EM3002 with the C3D shallow water interferometric system.

A new Ford F450 truck and utility service box was acquired for Revisory surveys. Approval was granted to replace four of our aging Hourston survey launches with new trailers. A 31' Nelsonlaunch (CSL *Pintail)* has also been funded for refurbishment.

A couple days of data collection here in Burlington this Spring 2009 will contribute to the bathymetric mapping of the Lake Ontario - Ecosystem Research Initiative pilot area. A three week survey was conducted for a northern segment of Lake Simcoe collecting multibeam data from May 25 - Jun 12, 2009.

Nautical Publications Oct 08 - May 09 Report

In the period from October 2008 to May 2009 a total of eighteen ENCs were published including several new ENCs in the Arctic for large scale harbours in Nunavik. During that same period, two new volumes of Sailing Directions were published in the Arctic using the new Print-On-Demand format. This new format will enable the CHS to update the digital copies to enable users to order an up-to-date version to meet their requirements. This is in stark contrast to the past where mariners were required to glue/tape SD Notices to Mariners into existing lithographically printed volumes.

Eleven new editions of charts in the Mackenzie River were published after rectification to NAD 83. The Hydrographic Production Database (HPD) is now the primary production tool for charts and ENCs and the division is making progress in loading the HPD with all Central and Arctic region ENCs to enable the use HPD software to create S57 updates exclusively.

PACIFIC REGION

CHS Pacific Region, Data Acquisition and Technical Support Division July 20, 2009

The 2009 field season is in full swing. The *Otter Bay* c/w EM3002 and 2x2 sub-bottom profiler is working in the Kitimat Gateway area for the next month and then it's off to the Gwaii Haanas National Marine Conservation Area for an additional month. In September, it will close out the year with surveys in the San Juan Islands.

The *Vector*, with its new gondola-mounted EM710 (0.5° x 1.0°) and 3x3 sub-bottom profiler spent 8 days on EM710 at-sea acceptance trials in April, supervised by Dr. John Hughes Clarke. The new system has proven to be at least twice as efficient as the predecessor EM1002 system and 10 times as capable. She will be headed for the Kitimat

Gateway shortly. There she will carry out surveys and provide support for the *Otter Bay*, including escorting her across Hecate Strait to the Queen Charlotte Islands where both vessels will, weather permitting, survey the west coast, in many places for the first time. CHS hydrographers are once again tagging along on other program cruises, collecting additional multibeam coverage whenever the *Vector* has idle time from the other program.

The fast response craft *Shoal Seeker*, has now been outfitted for hazard investigations using the Teledyne Benthos C3D integrated with a Coda Octopus F185 motion sensor. She will be departing shortly to resurvey the Bella Coola area. Later in the year we hope to prove the concept of shallow water habitat mapping using this vessel and system.

Meanwhile, our tidal group has been very busy making much needed upgrades to several of the Permanent Water Level Network (PWLN) and Emergency Response (tsunami) gauges. They will once again provide support to the Arctic gauging program as well as many of our own surveys closer to home. One of our new MDH recruits, Greg Dixon, is presently working with the tidal group before his *Vector* assignment. He will join 5 other new MDH's on the Data Transformation course this fall.

Hydrographic Systems Support and Computer Support have been integrated into a computer and technical support unit, reporting to newly-minted supervisor George Schlagintweit. One of George's first duties will be to staff a CS-02, who will be mentored by Keith Lee before he retires early in 2010.

Sonar Systems Group is about to get much smaller. Both Jims (Parks and Galloway) have decided to pull the plug in the coming months, ending long and prolific careers on the cutting edge of seabed classification. A retirement celebration is being planned for fall for both Jims and Bill Hinds, who retired in June.

Navigational Products and Services Update July 2009

Navigational Products and Services Division have completed a number of projects that were reported on in the last edition of Lighthouse and we have set an ambitious production schedule for ourselves this year.

Chart 3313 Gulf Islands Cruising Atlas was successfully completed in time for the 2009 boating season and sales of this beautiful new chart are doing very well. The new version of Pacific Coast Catalogue 2 was released as were the charts that were in production for the Approaches to Kitimat.

This year we expect to complete production on an additional 8 new charts for the Approaches to Kitimat. In addition to the charts in the Kitimat area we also have new charts in production for Dixon Entrance and Halibut Bank to Ballenas Channel. Recently new chart Kyuquot Sound and Approaches was released. We also have several small craft charts in production to replenish stock.

We have 36 ENC projects in hand specific to a project with DND and many additional ENC's have been upgraded this year. Small scale ENC's of the West Coast of BC have been produced and we have been actively involved in a Transboundary ENC project with NOAA.

The Navigational Information support group reports that PAC 200E Sailing Directions General Information Pacific Coast has been released and is now available as a Print on Demand Product.

Recently we have taken the big step towards moving away from a file based approach to production, to a database approach using CARIS HPD. This has involved a lot of R&D, training and commitment to ensure the database is populated with good quality validated data.

A key focus of our division this year has been recruitment and training. This year we have hired 4 new Multidisciplinary Hydrographers, 1 Data Technician and 2 Co-op students. The associated training and development of our new staff will continue throughout the year.

We have explored opportunities for improvement in the division this year through participation with the consulting firm Sierra Systems and through being involved with the CHS ISO National Coordination Team.

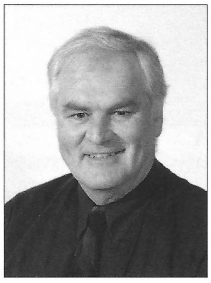
We have had to opportunity to liaise with our clients at the Seattle and Vancouver Boat Shows, with the Pacific Marine Review Panel, the Canadian Marine Advisory Council and the Canadian Power and Sailing Squadrons among others.

Events NPS division have participated in recently have been World Hydrography Day and the visit of the Japanese Imperial Family to the Institute of Ocean Sciences.

ATLANTIC REGION

J. Richard (Dick) MacDougall retires from the Department of Fisheries and Oceans by Andrew G. G. Smith and Kevin DesRoches

On March 30th, 2009, Dick MacDougall retired from the Canadian Hydrographic Service (CHS). This is a brief summary of his illustrious career.



From his early beginnings at the Miramichi Rural School, who knew that his survey career would span five decades and take him to the heights of achievement in the world of Hydrography? J. Richard (Dick) MacDougall has been affiliated with the survey business since 1969, when he apprenticed for his New Brunswick Land Survey Licence with Tom Williston in Newcastle, New Brunswick. He took the proverbial plunge the following year, when he joined the Canadian Hydrographic Service (CHS) in 1970. His work has taken him to all three of Canada's Oceans, as well as the Great Lakes, St. Lawrence River, Lake Winnipeg, Hudson Bay and the high Arctic. Dick worked in Burlington and Ottawa Ontario, as well as at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, and he has held a wide variety of positions. Dick has been a field hydrographer, Hydrographer in Charge, Database Engineer, Manager of Chart Maintenance, Distribution, Nautical Geodesy and Tides.

In 1999, Dick became a Director for the Atlantic Region of the Canadian Hydrographic Service. There, he was responsible for the Hydrographic Survey program, paper and electronic charting, nautical publications, overseeing the implementation of the Permanent Water Level Network, and providing hydrographic expertise and information to government, academia and the public.

After eight years at the helm of CHS(Atlantic), Dick took on the challenge of heading up DFO's component of Canada's Law of the Sea project. The goal of the project is to map the outer limit of the continental shelf using guidelines laid out in the United Nations Convention on the Law of the Sea (UNCLOS). Considering the vast ocean territory involved and the difficulties of working in Canada's far north, the challenge was and remains great. Dick's extensive experience working at sea as a surveyor and managing the logistics of offshore projects in the Atlantic and (especially) the Arctic Oceans made his contribution both unique and critical. Not just anyone can convert planned survey lines on a map to fuel consumption estimates, personnel requirements, and fuel cache and camp locations with the apparent facility that Dick has. To do this while working congenially with two other government departments (Natural Resources Canada and Foreign Affairs and International Trade) sets a precedent that his successor, Julian Goodyear, will have to work hard to maintain.

We know he is a motivated and ambitious man – he will likely craft a retirement as varied and interesting as his career. Good Luck!

NATIONAL

National AGM Minutes

The minutes of the Canadian Hydrographic Association 2009 National Annual General Meeting, that took place via conference call from Canada Centre for Inland Waters, Burlington Ontario, Tuesday March 24th 2009, may be found on page 48 in this edition of Lighthouse.

National Student Award 2009

The evaluation for the 2009 National Student Award was carried out by an interim committee comprised of: Terese Herron - National Secretary, Christine Delbridge - Central Branch Secretary, Kirsten Greenfield (past Executive member - Central Branch) and George McFarlane - National President. CHA is soliciting volunteers to become permanent members of this committe to carry on the program.

CIG Hydrography Committee

The CIG's Hydrography Committee has been reestablished in accordance with the updated Terms of Reference approved by Council at their meeting in Saint John, New Brunswick on Tuesday November 18, 2008. The members of the committee are: Wendy Woodford - Chair, Rob Hare - CHA Nominee, Paola Travaglini - CHS Nominee, Bruce Calderbank - Representing Industry and Dr. Susan Skone - Representing Academia.

PACIFIC BRANCH

The branch held their Annual General Meeting in December with the following elected as executive: Carol Nowak, Ken Halcro, Craig Lessels, Brian Port and Fred Stephenson. The past executive would like to thank Alex Raymond and Tracey Prentice for their dedication and hard work. Congratulations to Tracey and Erwin on the birth of their son Morgan.

World Hydrography Day was celebrated June 5th, to tie into IHO World Hydrography Day. A gathering of members and non members was held at the Rumrunner, with the branch providing nachos to all and beverages to members.

We would like to welcome the members from the Prairie Schooner Branch.

It is now field season which means a quiet summer for the branch since most of the members are field going personnel.

ATLANTIC BRANCH

Once again, the Atlantic Branch of CHA is a going concern. With an early-year AGM (in February), the membership drive commenced and once again approaches numbers from previous years. The Atlantic branch will be sponsoring a BBQ in celebration of World Hydrography day at Oaklawn House, in Dartmouth, Nova Scotia. As the year unfolds, CHA Atlantic hopes to sponsor a couple of lectures or interesting scientific visitors. Recently, some members have attended the Hydrographic Conference in Norfolk, Virginia. Also noteworthy is the retirement of J. Richard MacDougall, longtime CHA member. Stay tuned for more news and updates as the year unfolds.

CENTRAL BRANCH

38th Annual H2O Bonspiel

The Canadian Hydrographic Association's 38th annual H2O Bonspiel took place at the Grimsby Curling Club on Saturday the 21st of February 2009. Sixty-four enthusiastic curlers enjoyed a day of curling and a fantastic dinner. Each year the run for the first and second place trophies is very competitive, with a lot of great shot making providing enjoyable entertainment though out the day. The organizing committee was very pleased to hear the many enthusiastic and positive comments from the curlers on the day's activities. As in past years there has been a trend to enter family teams and we always encourage first time curlers to come out and experience our sport. We know that once you have played the game you will be back.

Congratulation to this year's First place winners, the rink skipped by Earl Brown with Vic Cairns as vice, Jeff Walker as second and Elaina Gendron as lead.

Congratulations are also extended to the Second Place winners, the rink skipped by Mike Bell with Stewart Teasell as Vice, Tim Pascoe as second and Doka as lead.

On behalf of the Canadian Hydrographic Association many thanks to this year's bonspiel committee of Earl Brown and Brian Power for their continued hard work in making this annual curling event a success. As well, we wish to thank our sponsors for their generosity and continuous support. During the last 38 years that the CHA, Central Branch has organized the H20 Bonspiel the association has been very

2009 H2O Bonspiel first place team : (left)Earl Brown, Elaina Gendron, Jeff Walker and Vic Cairns.

fortunate to have so many great sponsors. This year's prize table had an excellent selection of goodies for all curlers. Our sincere thanks to the following sponsors:

Canadian Hydrographic Association
Canadian Hydrographic Service
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BRANCH NEWS

Central Branch has been very active since our last update and was busy making preparations for upcoming events. On June 21st, we celebrated the fourth annual World Hydrography Day at the Marine Discovery Centre in Hamilton. The display featured the *Surveyor* and a booth promoting Hydrography and the CHA. *Surveyor* and Crew departed in mid July to attend the celebrations of the 250th Anniversary of the "*Founding of the Royal Navy Dockyard 1759-2009*" that took place in Halifax NS July 17-19 2009.

Seminars

Since the previous edition of Lighthouse Central Branch has held seven General Meetings including the Annual General Meeting in December. In addition to the business portion of the meetings a number of interesting topics were presented by guest speakers.

- Paola Travaglini of CHS did a presentation on displaying CHS data utilizing Google Earth.
- Dr. Robert Park an archaeological anthropologist and professor at the University of Waterloo gave a presentation entitled 'The Lost Arctic Expeditions' about the lost Arctic Expeditions of Sir John Franklin, and the lesser known expedition by Hans Krüger.
- Jon Biggar, a Hydrographer-In-Charge with CHS on the UNCLOS project, gave an update on the status of CHS's data collection efforts in support of Canada's claim under Article 76. The presentation included stunning photography and video footage of operations and living conditions during the 2008 ice camp winter survey, as well as the summer survey aboard the CCGS *Louis S. St. Laurent.*
- Fred Oliff gave a presentation on his recent trip to Guatemala building houses for the campesinos (a Spanish term for farmers) in the Altiplano surrounding Lake Atitlan.
- Robin Martel of Northpoint Systems manufacturers of Fugawi software gave a presentation at the Canada Centre for Inland Waters. The presentation covered the new software developed which offers access to Canadian Charts for Fugawi Navigation Software, iNavX for the iPhone and MacENC for Mac OS. This software will enable Electronic Chart navigation to a wider market of recreational boaters.

In addition to the guest speakers, Branch business was the main focus of discussion at the January meeting. The CBC documentary entitled "The Tipping Point" was shown at the March meeting. The documentary looks at the effects of the changing climate and ice conditions in the Arctic.

Special Thanks to Heimo Duller and Brian Power for hosting meetings, your hospitality is greatly appreciated. Meetings were also held at The Burlington Art Centre and at the Canada Centre for Inland Waters.

Correspondence

Announcements for upcoming meetings were sent out to members. Regrets were noted and included in the meeting minutes. Frequent correspondence occurred within the CHA Executive regarding CHA business.

Canadian Institute of Geomatics reports were circulated to CHA members.

Robert Dorais sent Central Branch a letter of thanks from Quebec Branch for the use of Surveyor in Quebec City's 400-year anniversary celebration.

Todd Ralph from Fugro Jacques GeoSurveys Inc. of St. John's requested a copy of the UNCLOS update presented by Jon Biggar during the February meeting.

Employment opportunities at ASI-Group of St. Catharines, Ontario were sent out to the membership. ASI-Group is a corporate member of the CHA.

Canadian Institute of Geomatics (CIG) and CHA exchanged correspondence.

Central Branch and CHA National corresponded on a number of items.

Admiralty Launch Surveyor

The Launch was inactive and remained in storage at CCIW until it's journey to the Halifax event. The major event for *Surveyor* in 2009 ws the naval centennial "*Founding of the Royal Navy Dockyard 1759-2009*" that took place in Halifax NS July 17-19 2009. Many tall ships attended

including the *Bounty*. A large number of longboats also participated in the event. Volunteer crew were housed in the residence of the University of King's College and bussed to the harbour during the event. The Navy issued contracts to attendees and helped cover some of the cost and expenses involved in the transport of the boat and crew.

Membership

Central Branch currently has 57 paid-up members including Life, Honorary and Corporate members. Membership renewals continue to be received. The Branch is honoured to include several special people in its membership. Earl Brown, Tom McCulloch, Ab Rogers and Sam Weller - Life Members. George Macdonald – Honorary Member and Steve Ritchie- International Life Member. Central Branch extends a warm welcome to its newest member Donald Kalley.

Central Branch administers International members on behalf of the National Office. The membership committee helps to maintain contact with the CHA's International members and ensures they have an opportunity to voice opinions and take part in CHA activities. All International members receive the Central Branch Newsletter to keep in touch between issues of the CHA journal Lighthouse.

Central Branch is currently administering memberships for the revitalized Ottawa Branch and will continue to do so until a Branch Executive is established. Ottawa Branch currently has 15 members.

CHA President and Central Branch member George McFarlane has invited Dr. Michael Sutherland, Chair-elect of FIG Commission 4 to become a member of the CHA. Dr. Sutherland will succeed current FIG Chair Commission 4 and CHA Past-President Andrew Leyzack next year.

The membership committee would like to thank all of the members for their continued support.

Elections

Nominations closed at the AGM in December. Roger Cameron will continue as Vice President, Christine Delbridge as Secretary, and Jim Weedon and Jeff Walker as Executive Members. Carol Robinson stepped down as the Treasurer in January. The position was filled in March when Donald Kalley offered to assume the position.

Website

The association maintains a website that covers National and Branch information. The site is updated throughout the year for Central Branch activities as well as for National and other Branches, as information becomes available. Direct your browser to *http://www.hydrography.ca*. Central Branch is currently looking for someone to take over the updating of the website.

Summer BBQ

The Annual Summer BBQ will be held on Saturday September 26th, 2009.

Celebrate...

World Hydrography Day - June 21st

The United Nations, in its General Assembly Resolution A/60/30 of 29 November 2005, "Welcomes the adoption by the International Hydrographic Organization of the "World Hydrography Day", to be celebrated annually on June 21st, with the aim of giving suitable publicity to its work at all levels and of increasing the coverage of hydrographic information on a global basis, and urges all States to work with that organization to promote safe navigation, especially in the areas of international navigation, ports and and where there are vulnerable or protected marine areas."

Rates / Tarifs

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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.

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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.

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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%.

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Body, Full Page *Pleine page*	$475	$675
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LIGHTHOUSE publishes material covering all aspects of hydrography.

Authors submitting manuscripts should bear the following points in mind:

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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.
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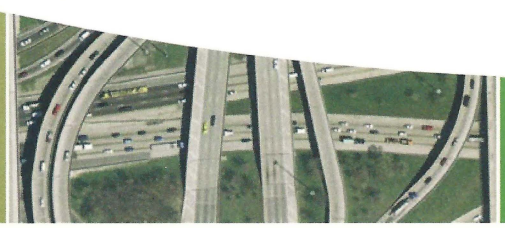

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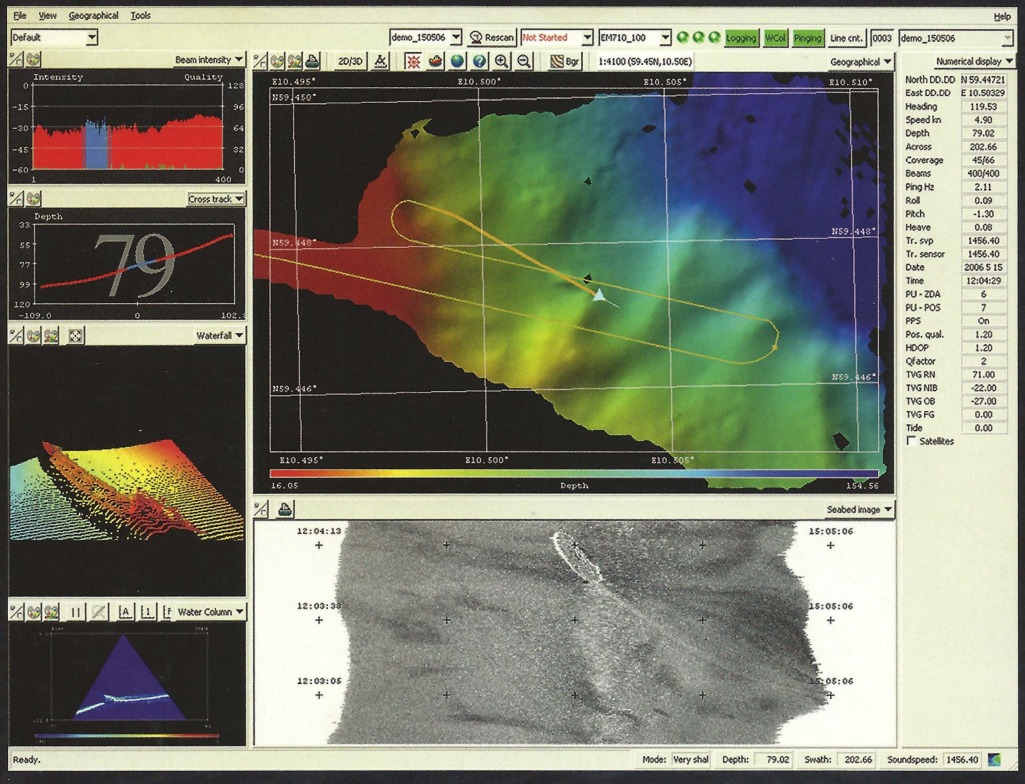

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